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Volume 10

Proceedings of the Second International Conference on Research in Intelligent and Computing in Engineering

March 24–26, 2017. Gopeshwar, Uttrakhand, India

Vijender Kumar Solanki, Vijay Bhasker Semwal,
Rubén González Crespo, Vishwanath Bijalwan (eds.)

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Editorial Preface

To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.

Albert Einstein

LIFE seems more evocative when Engineering ascertains the ways of new commencement. RICE-17 caters its social responsibility to find new possibilities in the field of Engineering and Technology. RICE-17 deliberated the new trends in intelligent computing. A three day conference dated on 24-26/March/2017; provide an international forum that brings together those who are actively involved in the research, to report state of the art works, to exchange ideas and advances in all aspects of informatics and intelligent systems, technologies and applications. The second edition of RICE-2017 is organized by the **Institute of Technology, Gopeshwar (A Govt. of Uttarakhand Institution)** India. The RICE is the wonderful platform, where number of researchers and academician are exchanging and discussing the cutting-edge technological issue.

Chief patron Prof. Dr. K. K. S. MER inaugurated RICE-17 by lightning the diya of knowledge and wisdom, during inaugural session Prof. Vishwanath Bijalwan and Dr. Vijender Kumar Solanki (Organizing Chair), Dr. N. Sengottaiyan (Director HIET, Coimbatore), Mr. Rohit Dhall (Enterprise Architect, HCL Technologies, Noida), Prof. Pramod Benjwal (Dean Administrator, IT Gopeshwar) and Prof. Abhishek Chauhan (Session Chair) inked their presence.

In the RICE-2017 Institute of Technology, Gopeshwar (A Govt. of Uttarakhand Institution), witness the presence of about 200 academicians, industry personnel, students and intellectuals from various fields. The Department of Electronics & Communication Engineering organized a three-day International Conference on Research in Intelligent & Computing in Engineering (RICE-2017) from 24 March 2017 to 26 march 2017, in association with IEEE UP Section and Annals of Computer Science & Information system (ISSN 2300-5963). The RICE also gives the chance to authors to submit their extended version paper in reputed journal. This conference has provided a platform for researchers and academicians to share and exchange ideas on the various research topics in the fields such as Machine learning, Computer Networks, Data Mining and Databases, Artificial Intelligence & Cryptography, Pattern Recognition and Image Processing .

The conference had six sessions spread “The three day conferences was having two high tech end Key note Speaker, Dr. N Sengottain, Director HIET, Coimbatore and Dr. M. P. Thapliyal, Department of Computer Science, HNB Gharwal University Srinagar, UK, India also it is cater by two perfect workshop keynote speaker, Mr Rohit Dhall from HCL Noida and Dr, Joyeeta Singha, LNMIIT, Jaipur Rajsthan. These talk were highly appreciated by group of conference listeners. The confrece also witnessed one table discussion which is participated by Industry and academia personality, the theme of discussion was to understand the Research Opportunity and placement for engineering educations. ”over two days with expert’s key note addresses and interactive discussions. Total number of 62 papers among the 185 from various universities and institution across the national and international have been selected to register and presented papers in the conference.

The experts and the resource persons were invited as session chair were having sound knowledge in the field of Computer Networks, Data Mining and Databases, Artificial Intelligence and Cryptography, Pattern Recognition and Image Processing are, Dr. Anchit Bijalwan Uttaranchal University, Dr. Dinesh Sati HNBGU, Dr. Vinod Rawat HNBGU Srinagar, are few of the name in the list of more than 20 plus session chairs.

Experts was discussing about role of various computing technology in real type applications like defense, power plants and various critical applications. Moreover, it was mentioning that different approaches can also be implemented to give training to the faculty community in higher education which will in turn responsible to mold the student community not only in the academic field but also towards research activities. Furthermore, Prof. Dr. Vijender Kumar Solanki underlined that the evolution of the Computer Technology takes industrial applications a new era and discussed the various computing technologies like Peer to Peer, Mobile, Cloud computing technologies. He also discussed about the future technology like E-Governance and its importance etc.

Session 1 is Chaired by Prof. Ashish Nainwal, Gurukul Kangri University Haridwar, UK, India & Prof. Arun Shekhar Bahuguna, HNB, Gharwal University Srinagar, UK, India.

Session 2 was chaired by Dr. Anchit Bijalwan Uttaranchal University, Dehradun, India & Prof. Anudeep Gusain, Govt. Polytechnic, Dehradun, India,

Session 3 is chaired by Prof. Banit negi, THDC-IHET, Tehri, UK, India & Dr. T. Rajendran, Arignar Govt College, Nammakal, Tamilnadu, India.

Session 4 is chaired by Prof. Pramod Benjwal, IT Gopeshwar, India & Dr. Joyeeta Singha, LNMIIT, Jaipur, Raj, India.

Session 5 is chaired by Dr. Dinesh Sati, Govt. PG College Gopeshwar, India & Prof. Mukesh Mohan Bahuguna, WIT deharadun, India,

Session 6 is chaired by Dr. Vinod Rawat,Govt. PG College Gopeshwar, India & Prof. Abhishek Chauhan, IT Gopeshwar, India

A few participants who gave their feedback on the conference praised the institution for hosting its first ever conference in such a perfect manner and said that they were overwhelmed by the hospitality offered by the organizers.

Prof. Vishwanath Bijalwan thanked all the sponsors, advertisers, delegates, representatives from the media and the faculty and students for their magnanimous support and as-

sured that IT, Gopeshwar will organize more such activities in the future. After the valedictory program, one day excursion tour was arranged in which participants got chances to visit Auli, Chaupta and in return they were given chances to visit Sri Nagar, Rudra Parayag, Dev Prayag, and thrilling 15 km rafting in Shivpuri was enjoyed by the delegates.

The more detail of RICE could be seen at fb pages & conference portal:

http://www.facebook.com/riceconf

http://www.riceconference.in

The three days conferences ended with the joy, learning, interaction, outing and many more memories which could not be possible to write in text.

Vijender Kumar Solanki, *ITS Ghaziabad, Uttar Pradesh, India.*
Vijay Bhasker Semwal, *IIIT Dharwad, India.*
Rubén González Crespo, *UNIR, Spain.*
Vishwanath Bijalwan, *IT, Gopeshwar, India*

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Second International Conference on Research in Intelligent and Computing in Engineering

We welcome your participation and contribution to the Second International Conference on Research in Intelligent and Computing in Engineering (RICE'17) which will be held at Institute of Technology, Gopeshwar, Uttarakhand, India during 24-26 March 2017.

The second edition of RICE-2017 is organized by the Institute of Technology, Gopeshwar, Uttarakhand, India. RICE-2017 provide an international forum that brings together those who are actively involved in the research, to report on up-to-the-minute innovations and developments, to summarize the state-of-the-art work, to exchange ideas and advances in all aspects of informatics and intelligent systems, technologies and applications.

The RICE-2017 is technically sponsered by IEEE UP Section. The accepted and presented paper will be published as a volume of Annals of Computer Science and Information Systems (ISSN- 2300-5963). The Volume will be having an ISBN number and each paper will be assigned DOI number. The conference papers will be indexed in Cross Ref, BazEkon, Open Access Library, Academic Keys, Journal Click, PBN, ARIANTE. The conference papers will also be submitted for indexing to Web of Science, Index Copernicus, SCOPUS and DBLP.

The extended version of accepted paper will be invited to submit in reputed journals as listed in conference journal page.

Important Tracks

AI and Machine Learning

- Fuzzy & Neural System
- Bioinformatics
- Pattern Recognition
- Robotics
- Smart Cities
- IoT & Big Data

Control Automation

- Network Control System
- Fault tolerant Control System
- System Performance & Reliability
- Application Controls
- Power Instrumentation
- Resilient System

Network Communication

- Ad-Hoc & WSN
- Network & Information Security
- Cloud & Networking
- Smart City
- 3-4G Network
- Network Models
- Mobility in wireless comm'n

Signal Processing

- Bio Imaging & Signal Processing
- Signal Processing & Network Comm'n
- Adaptive Signal Processing
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Proceedings of the Second International Conference on Research in Intelligent and Computing in Engineering pp. 3–13
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AERSCIEA: An Efficient and Robust Satellite Color Image Enhancement Approach

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***Abstract*—Image enhancement is an important preprocessing step in any image analysis process. It helps to catalyze the further image analysis process like Image segmentation. In this paper, an approach for satellite color image enhancement on HSV color space is introduced. Here, local contrast management is given main focus because noises exist on local regions are found over amplified when enhancement is done through global enhancement technique like histogram equalization. The color arrangement and computations are done in HSV color space. The V-channel has been extracted for the enhancement process as this is the channel which represents the intensity and thereby represents the luminance of an image. At first, the image is normalized to stabilize the pixel distribution. The normalized image channel is analyzed with Binary Search Based CLAHE (BSB-CLAHE) for local contrast enhancement. The results obtained from the experiments prove the superiority of the proposed approach.**

***Index Terms*—Binary Search; CLAHE; Color Image Enhancement; HSV Color Space; Histogram Equalization; Image Normalization; Multispectral Image; MSE; PSNR;RGB Color Space.**

I. Introduction

Image enhancement is a major step for any image analysis process. This has to be conducted if the results of the further analysis process are needed to be improved. Most importantly, if it is the case of satellite images, then this becomes a mandatory condition as because most of the satellite images consist of noises. Satellite images use to carry a large amount of information with them, so the presence of noises may hamper the extraction of such huge amount of useful information [1][2][3]. In the case of satellite images, a small block of the whole image concerns a lot, so, local contrast management should be given major priority here. Also, RGB color space is not able to deal with the satellite color image analysis properly [4][5], hence we need a color space which has the ability to arrange the colors in a way so that any change of intensity will not distort the color information of the image. HSV color space has the ability to deal with the color in the same way that human eyes can perceive [6]. It has a separate channel for intensity information (V-channel). These are the reasons why we have selected HSV color space for the proposed color enhancement approach.

The outline of the paper is as follows: Section II presents a review of the previous work done in the field; Section III discusses the different steps involved in the proposed approach. From section IV to section VI, the topics involved in the proposed approach are explained with proper examples. Section VII is the experiment and results discussion section. The conclusion is given in the section VIII and finally, we have the reference section

II. Literature Review

In [7], an underwater image enhancement technique has been proposed which is a novel extension of histogram equalization (histogram specification) to overcome BPHEME (Brightness Preserving Histogram Equalization with Maximum Entropy), a drawback of Histogram Equalization. The experimental results claim that BPHEME enhances the image effectively and also preserve the original brightness quite well.

In [8], a new contrast enhancement technique for satellite images based on clipping or plateau histogram equalization is proposed. Here, a Bi-Histogram Equalization with Plateau Limit (BHEPL) is adopted for image decomposition and Self-Adaptive Plateau Histogram Equalization (SAPHE) for threshold calculation. The proposed enhancement technique performs comparatively better than the other available histogram equalization technique.

In [9], a genetic algorithm (GA) based histogram equalization technique is proposed. Here, images are enhanced with histogram equalization by reconfiguring their pixel spacing using optimization through GA. The results obtained are more optimized than the same done by other available techniques.

In [10], here the value channel of the HSV converted the image of the input RGB color image is enhanced in two steps: (1) It is divided into smaller blocks and in each block dynamic range compression is carried out using nonlinear transfer function, and (2)In each block, every pixel is further

enhanced depending upon the centre pixel and its neighborhood so that the contrast of the image has been adjusted. Then it is converted back to RGB. The experiments results show the better performance of the proposed approach.

In [11], the authors propose a new underwater image enhancement technique known as mixture CLAHE color models. The proposed method operates CLAHE on RGB and HSV color models.Results obtained from both are combined together using Euclidean norm. This approach significantly improves the visual quality of underwater images by enhancing contrast, as well as reducing noise and artifacts.

III. The Steps involved in the Proposed Approach

Step1. The input RGB color image is undergone conversion to HSV color space.

Step2. The Value channel (V Channel) has been extracted from the HSV converted the image. The V channel has been chosen as this represents the luminance of the image. Another important fact is that H (Hue) channel should not be affected during the enhancement process as otherwise color information may be misjudged.

Step3. The extracted V channel has been normalized between o and 1 to bring stability to the pixel distribution.

Step4. The normalized V Channel has been undergone local contrast management by BSB-CLAHE (Binary Search Based-CLAHE).

Step5. The old V-channel has been replaced by the enhanced V channel to obtain the enhanced HSV image.

Step6. The Enhanced HSV image is converted back to RGB color space to obtain the final enhanced image of the original input color image.

IV. HSV COLOR SPACE:

Color space can be defined as a mathematical model used to describe the organization of different colors of an image. It represents different color attributes with respect to three or more components that help to learn accurately how each color spectrum looks like [4][12]. HSV is one of such frequently adopted color space because of its efficiency in organizing any color image in the same way that our human eyes can perceive. In this color space, there are three channels: Hue (H), Saturation(S) and Value (V). The first one represents an angle in the range [0,2π] and is directly related to color. Different hue angles represent different colors. The second one, i.e., S channel shows how pure the hue is with respect to a white reference. This can be thought of as a radial distance from the central axis whose value is 0 at the center to 1 at the outer surface. Finally, the value represents a percentage value goes from 0 to 100. This percentage value exactly shows the amount of light illuminated with respect a particular color. This means V-channel is the luminance channel in HSV color space. So, with the 'V' channel of HSV color space, it is possible to measure and extract the luminance level of a color image, which makes it perfect color space for color image enhancement and also for color image segmentation [4]. A pseudo code to convert an RGB image into HSV color space can be found in [13].

The coordinate system showing the relationship between the three channels of HSV color space is shown in the following figure:

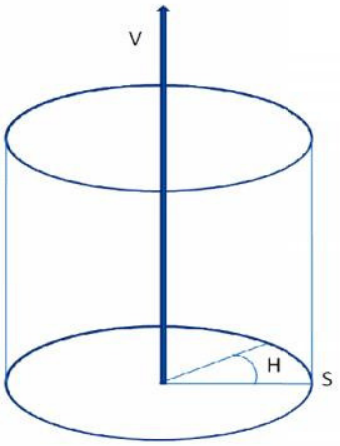


Fig. 1: HSV Color Space Showing the Relation between H, S, and V

The distribution of different colors with respect to Hue values (ranges 0 to 2π) can be shown in the following color wheel diagram. The color first started with red, as the Hue value changes, then it changes in the following pattern:

red →yellow→green→cyan→blue→magenta→red.

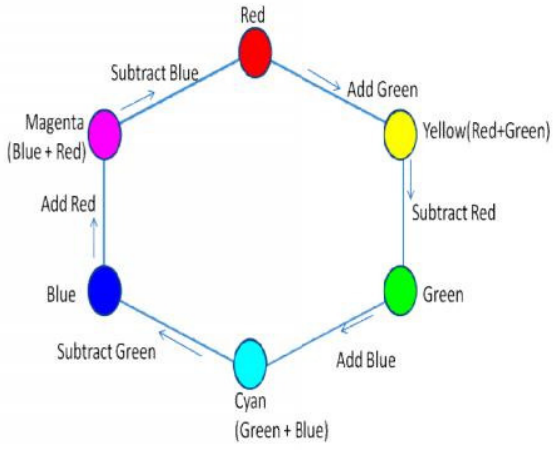


Fig. 2: Color Wheel Showing Distribution of Different Colors in HSV Color Space With Respect to Different Values of V

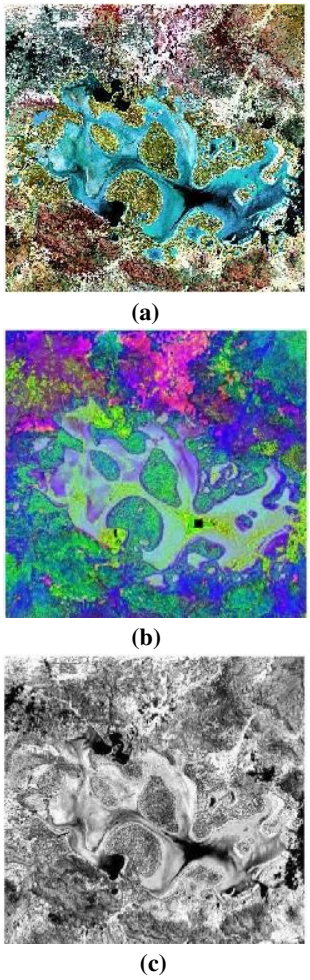


Fig. 3: (a)Original Satellite Image in RGB; (b) HSV Converted image of (a); and (c) The V-Channel of HSV Converted Image of (b).

V. IMAGE NORMALIZATION

In general 'normalization' can be considered as a preprocessing stage to find out a new stable range from an existing one[14]. While when the concerned area is image processing, then 'image normalization' can be defined as a technique for changing the ranges of pixel intensity values and thereby bringing stability to it [15]. Normalization of the image is required in order to shape the pixels of the image into a range that is more proverbial to the dealt application. Image variations may occur during image acquisition process. These variations may take different forms like illumination, noise or occlusion which are no way relevant to object identity. So, we need a process to eliminate such unwanted variations to retain a standard image containing no artifacts. Image normalization is such a process to make the image artifact free and thereby get it ready for the further image analysis process [15][16]. This way the accuracy of the image enhancement can be increased to a satisfiable extent. In our proposed approach, the V channel of the HSV converted image has been normalized and bring its range to fall within 0 and 1. Following equation performs this task:

Say, V1 is the current V-value and V2 is the normalized one.

V2={V1-minimum (V1)}/{maximum (V1)-minimum (V1)};

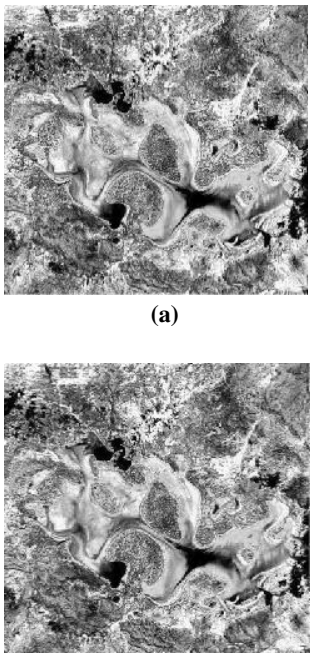


Fig. 4: (a)V Channel; (b) Normalized V Channel.

In figure 5,(b) is the normalized version of (a) obtained through the application of the above equation.

VI. BINARY SEARCH BASED CLAHE (BSB-CLAHE)

Contrast management is one of the most needed steps involved in an image enhancement process. With this, the contrast of an image can be modified to a satisfactory level such that the result of the whole image analysis process becomes more efficient. Contrast management is of two types: (1) Global contrast management and, (2) local contrast management. Histogram Equalization (HE) is an example of global contrast management and Adaptive Histogram Equalization (AHE)[17] is an example of local contrast management. Histogram equalization is a frequently adopted image enhancement technique which enhances the contrast of an image by spreading the intensities values over the entire available dynamic range [1][4].But, it has a drawback that it tends to over enhance the image contrast if there are high peaks in the histogram [18]. AHE works on the basis of computing several histograms and using them to redistribute the lightness values of the image [19][20]. But, its main drawback is that it over amplify the noises in homogenous

regions. For this reason, we have gone for the other option that is CLAHE. CLAHE means we need to put a limit on the contrast enhancement. For some intensity levels, the slope of the CDF (Cumulative Distributive Function) at the intensity level is directly proportional to the contrast enhancement of those intensity levels [4][20]. Again, at a bin location, the slope of the CDF can be determined by the height of the histogram for that concerned bin. This implies that by limiting or clipping the height of the histogram to a certain level, we can limit the slope of the CDF function and thereby the contrast enhancement can be limited [4]. So, the only thing we need a mechanism for clipping the histogram before evaluating its CDF for putting a limit on the contrast enhancement done by AHE. For this, we have introduced Binary Search Based CLAHE. Here, we have adopted a Binary Search Method [4][17][21] for determining the points at which the clipping should be done. The algorithm is discussed below:

Step1. Say T is the top and B is the bottom of the concerned ClipLevel.
Step2. Repeat until T- B< $\in$, *where* $\in$ > 0 *is negligibly small*
[*a*] *Find M where M is the middle between T and B*
[*b*] *Find S where S is the sum of excess above M in each bin of the histogram*
[*c*] *if S+M > ClipLevel*
then assign T = M
[*d*] *if S+M < ClipLevel*
then assign B = M
[*e*] *if S+M == ClipLevel*
then M is the required value at which clipping should be done. So, break binary search loop.
Step3. Clip the histogram at M and redistribute the excess into each bin equally.

VII. EXPERIMENTS AND RESULTS

Matlab is chosen for implementation of our proposed approach. The system used for conducting the experiments has an i5 processor with 64 bit Windows 10 operating system. The satellite image data are collected from Earth Science World Image Bank [22] and The USC-SIPI Image Database [23].

To measure the quality of the enhancement results, we have selected the MSE (Mean Squared Error) and PSNR (Peak Signal to Noise Ratio) metric. The cumulative squared error between the compressed and the original image will be given by the first one, whereas the second one will give the peak error [24][25]. Following equation [2] is used calculate MSE :

$$MSE = \sum_{y=1}^{M} \sum_{x=1}^{N} [I(x,y) - I'(x,y)]^2$$

where, $I(x,y)$ is the original input color image, $I'(x,y)$ is the output enhanced image. M, N stands for the dimensions of the images.

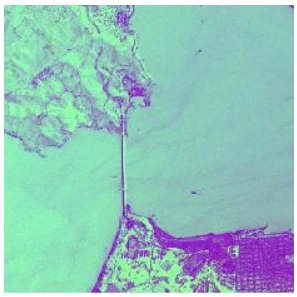
The formula for PSNR[25] is:

$$PSNR = 10 \log_{10}(MAXi^2/MSE)$$

Where MAX_i contains the maximum possible pixel value of the image. For a better enhancement of the image, the MSE value should be as low as possible and PSNR values should be as higher as possible.

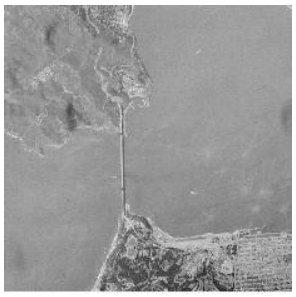
The following is the series of images illustrating the results obtained at every stage of the proposed approach. The image is the aerial image of San Francisco (Golden Gate) consisting of 512x512 pixels with size 768kb.

(a)

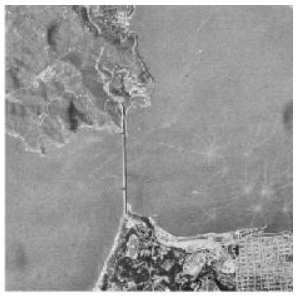


(b)

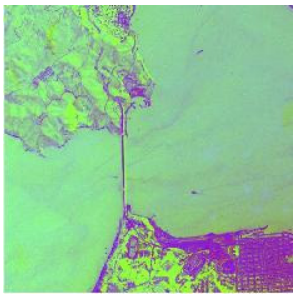
(c)



(d)

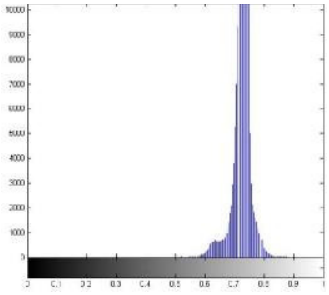


(e)

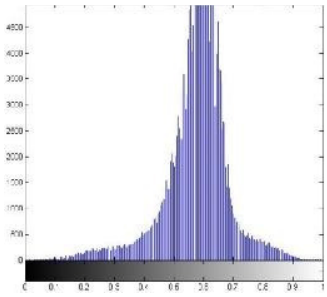


(f)

(g)



(h)

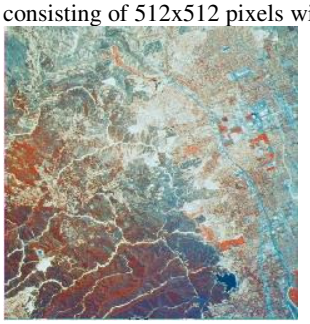


(i)

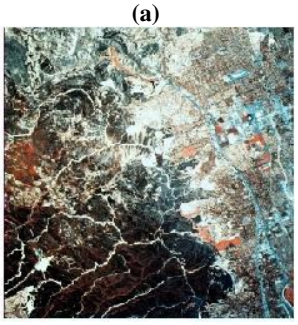
Fig. 5: (a) Original Image; (b) HSV Converted Image; (c) V-Channel; (d)Normalized V-Channel; (e) BSB-CLAHE Enhanced V-Channel; (f)Enhanced Image in HSV Color space; (g) Final Enhanced Color Image; (h) Histogram of the Original V-Channel; and (i) Histogram of the enhanced V-Channel by Our Proposed Approach.

The proposed approach has been applied to around 30 different satellite images. To compare the results with existent state of the art algorithms, we have selected D.Ghimire'sMethod[10] as the recent one in the area. Also, as Histogram Equalization is the most popular and frequently adopted method for image enhancement, so this is selected for comparing the same. The results for 4 images are shown below:

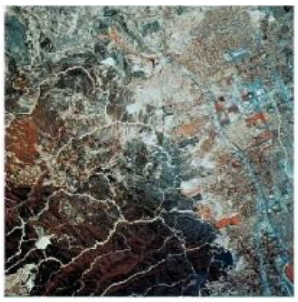
Image 1: This is the image of Woodland Hills, Ca.[23] consisting of 512x512 pixels with size 768kb.



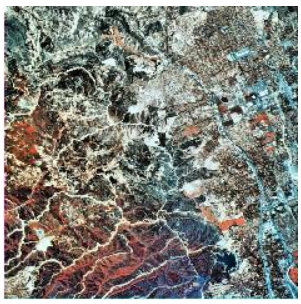
(a)



(b)



(c)



(d)

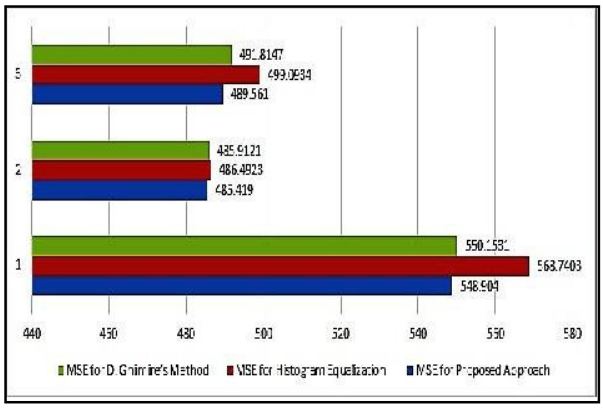
Fig. 6: (a) Original Image; (b) Enhanced Image by Histogram Equalization; (c) Enhanced Image By D. Ghimire's Method; (d) Enhanced Image by the Proposed Approach.

Table 1: MSE Values

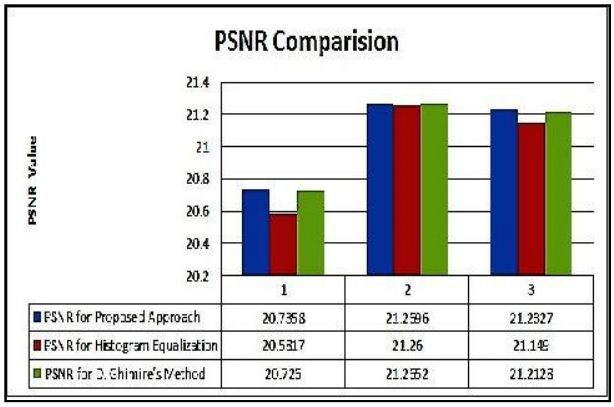
MSE	Proposed Approach	Histogram Equalization	D. Ghimire's Method
MSE(:,:,1)	548.9040	568.7403	550.1531
MSE(:,:,2)	485.4190	486.4923	485.9121
MSE(:,:,3)	489.5610	499.0934	491.8147

Table 2: PSNR Values

PSNR	Proposed Approach	Histogram Equalization	D. Ghimire's Method
PSNR(:,:,1)	20.7358	20.5817	20.7260
PSNR(:,:,2)	21.2696	21.2600	21.2652
PSNR(:,:,3)	21.2327	21.1490	21.2128



(a)



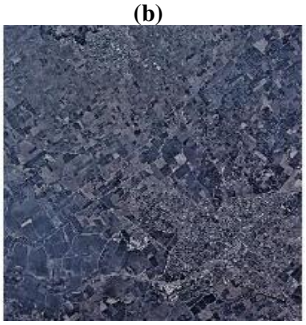
(b)

Chart 1: (a) MSE Values Comparison; and (b) PSNR Values Comparison.

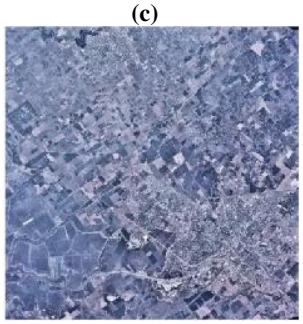
Image 2: This is the image of Stockton [23] consisting of 1024x1024 pixels and of size 3072kb.

(a)

(b)



(c)



(d)

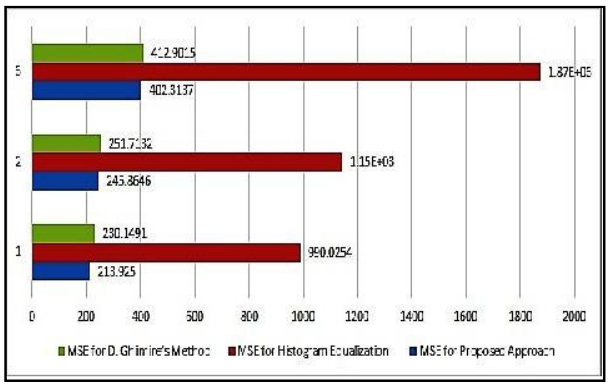
Fig. 7: (a) Original Image; (b) Enhanced Image by Histogram Equalization; (c) Enhanced Image By D. Ghimire's Method; (d) Enhanced Image by the Proposed Approach.

Table 3: MSE Values

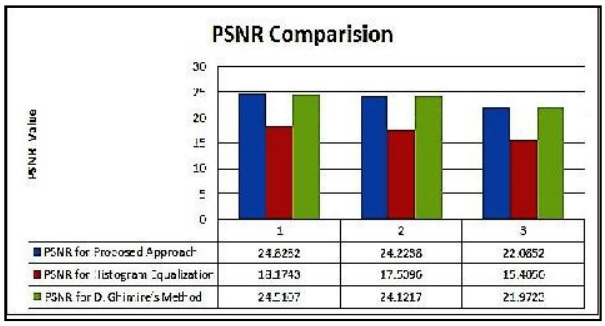
MSE	Proposed Approach	Histogram Equalization	D.Ghimire's Method
MSE(:,:,1)	213.9250	990.0254	230.1491
MSE(:,:,2)	245.8646	1.1458e+03	251.7132
MSE(:,:,3)	402.3137	1.8729e+03	412.9015

Table 4: PSNR Values

PSNR	Proposed Approach	Histogram Equalization	D. Ghimire's Method
PSNR(:,:,1)	24.8282	18.1743	24.5107
PSNR(:,:,2)	24.2238	17.5396	24.1217
PSNR(:,:,3)	22.0852	15.4056	21.9723



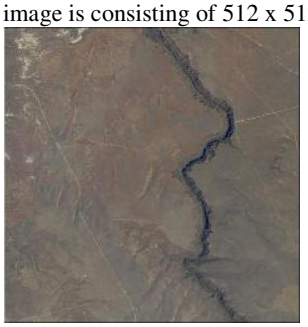
(a)



(b)

Chart 2: (a) MSE Values Comparison; and (b) PSNR Values Comparison.

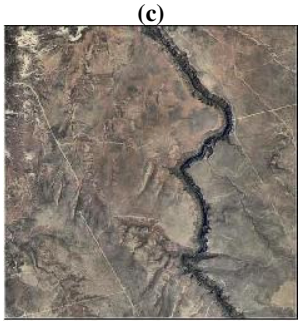
Image 3: This is the image of The Bruneau River[22]. The image is consisting of 512 x 512 pixels and of size 30.7 kb.



(a)

(b)

(c)



(d)

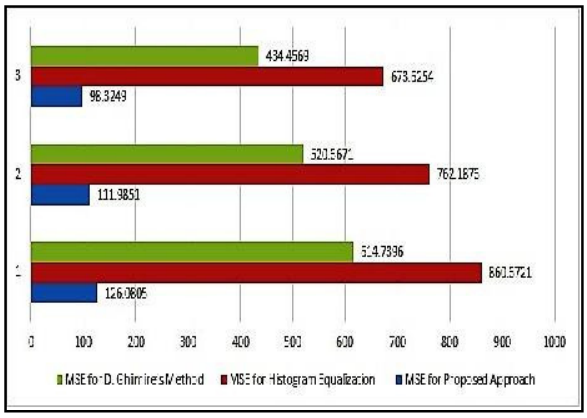
Fig. 8: (a) Original Image; (b) Enhanced Image by Histogram Equalization; (c) Enhanced Image By D. Ghimire's Method; (d) Enhanced Image by the Proposed Approach.

Table 5: MSE Values

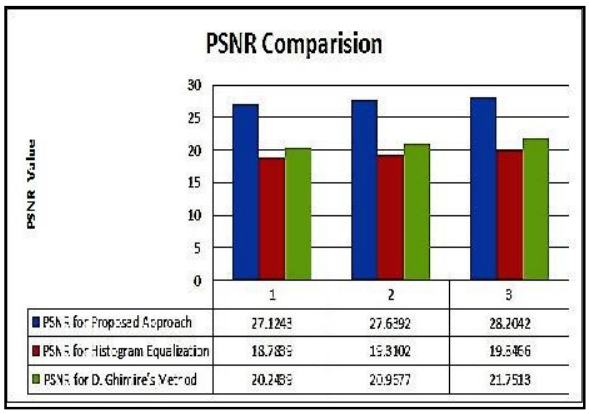
MSE	Histogram Equalization	D. Ghimire's Method	Proposed Approach
MSE(:,:,1)	860.3721	614.7396	126.0805
MSE(:,:,2)	762.1873	520.3671	111.9851
MSE(:,:,3)	673.6254	434.4569	98.3249

Table 6: PSNR Values

PSNR	Histogram Equalization	D. Ghimire's Method	Proposed Approach
PSNR(:,:,1)	18.7839	20.2439	27.1243
PSNR(:,:,2)	19.3102	20.9677	27.6392
PSNR(:,:,3)	19.8466	21.7513	28.2042



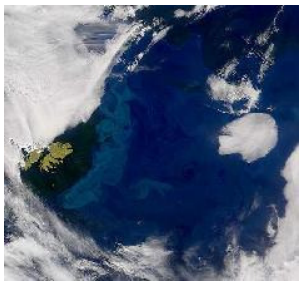
(a)



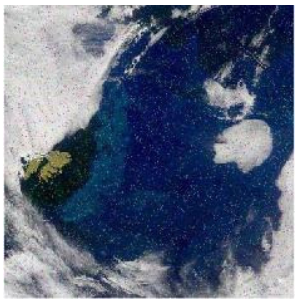
(b)

Chart 3: (a) MSE Values Comparison; and (b) PSNR Values Comparison.

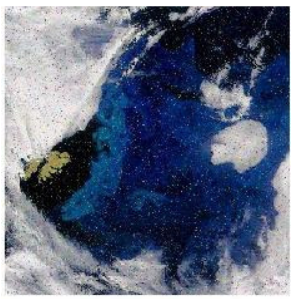
Image 4: This image of South Atlantic Ocean east of the Falkland Islands [22] showing numerous eddies highlighted by phytoplankton. The image is consisting of 464 x 512 pixels and of size 38.8 kb. Salt and pepper noise of density 0.04 is added to this image and then performed the enhancement by the proposed approach, D. Ghimire's Method, and histogram equalization. Results are shown below:



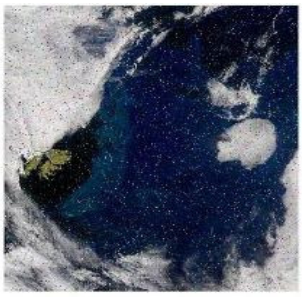
(a)



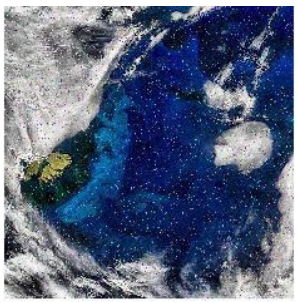
(b)



(c)



(d)



(e)

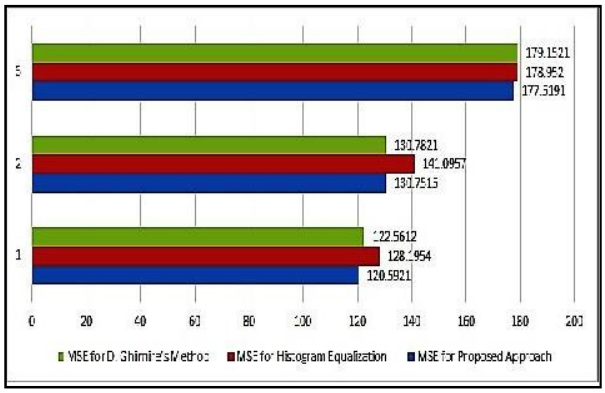
Fig. 9: (a) Original Image; (b) Noisy Image; (c) Enhanced Image By Histogram Equalization, (d) Enhanced Image By D. Ghimire's Method; and (e) Enhanced Image By the Proposed Approach

Table 7: MSE Values

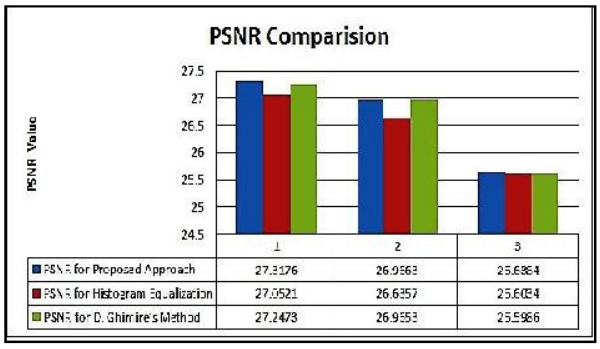
MSE	Proposed Approach	Histogram Equalization	D.Ghimire's Method
MSE(:,:,1)	120.5921	128.1954	122.5612
MSE(:,:,2)	130.7515	141.0957	130.7821
MSE(:,:,3)	177.5191	178.9520	179.1521

Table 8: PSNR Values

PSNR	Proposed Approach	Histogram Equalization	D.Ghimire's Method
PSNR(:,:,1)	27.3176	27.0521	27.2473
PSNR(:,:,2)	26.9663	26.6357	26.9653
PSNR(:,:,3)	25.6384	25.6034	25.5986



(a)



(b)

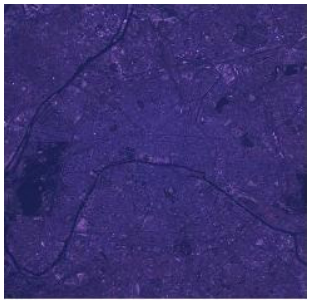
Chart 4: (a) MSE Values Comparison; and (b) PSNR Values Comparison.

So, from the experimental results, it is observed that the enhancement done by our proposed approach is noise free, and every little region is enhanced equally with clear identification of the present objects. While the results

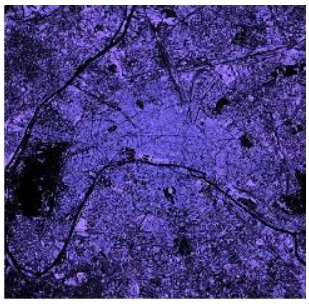
obtained by the histogram equalization are somewhat noise over amplified and thereby appearance of high darkness shades are found in the resultant image. D.Ghimire's Method succeeds to produce good enhancement. But, visually the enhancement results of our proposed approach are better than both the Histogram Equalization and D.Ghimire's Method. The MSE values for all the images are found low for the proposed approach in comparison to histogram equalization and D.Ghimire's Method, while the respective PSNR values for the proposed approach are higher than the same of histogram equalization and. Also, in the case of image 4, we have seen the proposed approach is producing a better result even in the situation when salt and pepper noises are added to the input color image. This implies that the proposed approach succeeds to produce better enhancement of satellite color image than histogram equalization and D. Ghimire's Method.

Multispectral Image:

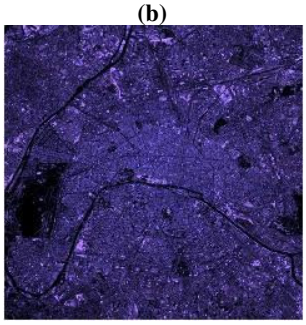
A multispectral image is an image that captures image data at specific frequencies across the electromagnetic spectrum[26]. The spectrum is generally divided into many bands. Each band is a monochrome image of the scene taken with a different sensor. As for example, Landsat 5 consists of 7 band images with the wavelength of the bands being between 450 and 1250 nm. Multispectral images mostly used in remote sensing applications [27]. It is found that there has always been a need of enhancing multispectral radiance data to produce an image that will be more suitable for visual interpretation. To analyze the efficiency of our proposed approach in enhancing the multispectral image, we have collected a LAN file, paris.lan, containing a 7-band 512-by-512 Landsat image which covers a part of Paris, France. [28]. The bands 3, 2, and 1 from this LAN file are read and mapped to the red, green, and blue planes, respectively, of an RGB image, the result is a standard truecolor composite. The image has been undergone enhancement with three different techniques: Histogram Equalization, D.Ghimire'sMethod and our proposed approach. The results are shown below:



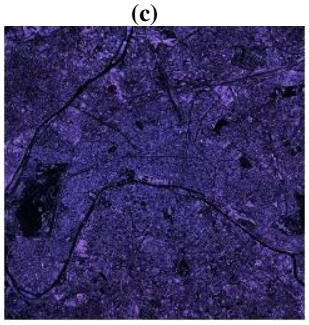
(a)



(b)



(c)



(d)

Fig. 10: (a) Original Image; (b) Enhanced Image by Histogram Equalization; (c) Enhanced Image By D. Ghimire's Method; (d) Enhanced Image by the Proposed Approach.

From the results, it is clearly visible that histogram equalization is producing over enhancement of the contrast of the original multispectral image. In this case, both the techniques: D. Ghimire's Method and our proposed method succeeds to deal with the over enhancement problem. But, the proposed approach is producing better enhancement of the image because of the fact that the normalized distribution of the concerned V-channel makes it easier to enhance the local contrast more efficiently and thereby resulting in a smooth global contrast enhancement of the image.

VIII. Conclusion:

In any image analysis process, image enhancement is always considered as an important preprocessing step. Through image enhancement, the noises or irrelevant information is tried to remove to the maximum possible extent. Contrast management is one of the important tasks during enhancement process. It is of two types: global and local. Global contrast management although possessing low

computational complexity, but fails to produce better enhancement results and maximum times enhanced images are found suffering from noises. So, local contrast management is needed for better enhancement. In this paper, a BSB-CLAHE based enhancement technique for satellite color images is introduced where local contrast management is given main focus. The enhancement process is done on HSV color space because of its capability to deal with satellite image in a far better way than RGB color space does. Normalization procedure is adopted here to bring stability in the range of pixels distribution of the input color image. The results of the proposed approach are found quite satisfactory and hence establish a good framework for satellite color image enhancement. In future, the application of the proposed approach will be extended to different emerging areas like medical color image enhancement, underwater color image enhancement etc.

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Optimal design of 2-Bit Optical Magnitude Comparator using electro-optic effect inside Mach-Zehnder interferometers

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***Abstract*—In this paper, 2-bit magnitude comparator using electro-optic effect inside lithium-niobate based Mach-Zehnder interferometers (MZI) is proposed. The design is based on six MZIs only, hence proposed device is optimized in comparison of previous design. The mathematical description of device is well described. The results are verified using MATLAB and Beam propagation method simulation.**

***Index Terms*—Lithium-niobate, Mach-Zehnder interferometers, Beam propagation method.**

I. Introduction

In recent years, interferometric based optical switches have been explored in switching area largely. As light propagates through the Mach–Zehnder interferometer (MZI) means switching speed is high. MZI rooted on electro-optic effect in LiNbO3 appears to be an optimistic solution [1-3], because of its quality attributes of compact size, thermal stability [1], re-configurability [2], integration potential [1], low latency [3] and low power consumption.

In this paper, a new approach is used to realize an optimal design of 2-bit magnitude comparator that reduces the complexity of the previous design [14] because in pervious design there were 12 MZI's required but in our design only six MZI's are used.

II. Proposed design of 2-bit optical magnitude comparator

Fig.1 is showing the structure of 2-bit optical magnitude comparator, implemented by using only six MZIS. A single optical continuous source is applied to the whole design which is propagated from first input port of first MZI mentioned as MZI1 to the last MZI i.e MZI6 following the various combination depending upon the different combinations of the control signal provided to the electrodes in the MZI. On the basis of 2-bit control signal A and B, there are three different outputs and that are; $A>B$ which is obtained at output port 3 feeding directly with MZI6, second output of the proposed device is $A=B$ which is available with MZI5 at its first output port and represented by port 1, third output of the proposed device is $A<B$ which can be extracted by using the outputs of MZI4 and MZI6 and finally at output port 2.

A. Mathematical expressions of the different output ports

Normalized power at different output ports can be calculated and used to verify the Opti-BPM results using MATLAB.

Using figure 1, the normalized power for output port 1 (A=B) can be calculated as:

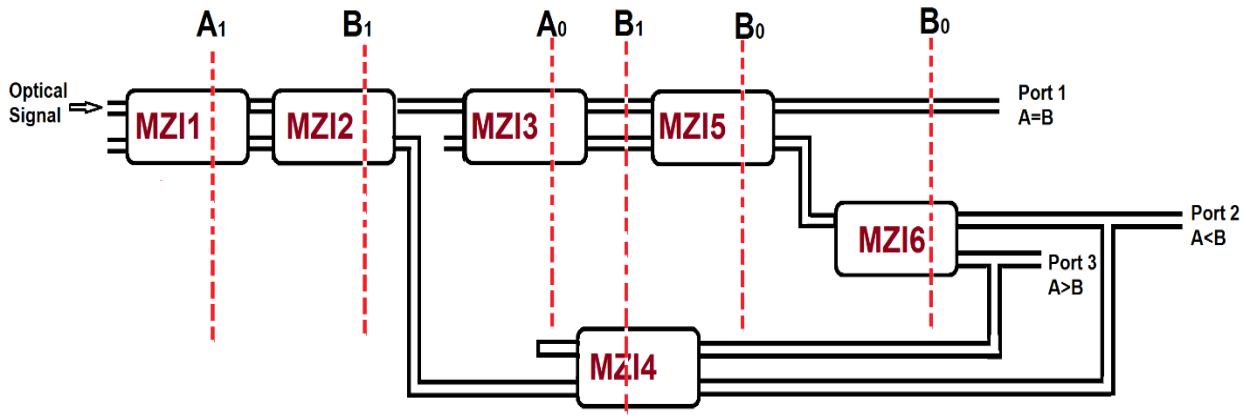


Fig. 1. Design of Optimal 2-bit optical magnitude comparator using the MZIs.

Output Port 1=

$$\left\{\sin^2\left(\frac{\Delta\varphi_{MZI1}}{2}\right)\sin^2\left(\frac{\Delta\varphi_{MZI2}}{2}\right)+\cos^2\left(\frac{\Delta\varphi_{MZI1}}{2}\right)\cos^2\left(\frac{\Delta\varphi_{MZI2}}{2}\right)\right\}$$
$$\left\{\cos^2\left(\frac{\Delta\varphi_{MZI3}}{2}\right)\cos^2\left(\frac{\Delta\varphi_{MZI5}}{2}\right)+\sin^2\left(\frac{\Delta\varphi_{MZI3}}{2}\right)\sin^2\left(\frac{\Delta\varphi_{MZI5}}{2}\right)\right\} \quad (1)$$

In the continuation, the normalized power of port 2 collectively obtained by MZI4 and MZI6 as shown below:

Output Port 2 =

$$\left\{\sin^2\left(\frac{\Delta\varphi_{MZI1}}{2}\right)\sin^2\left(\frac{\Delta\varphi_{MZI2}}{2}\right)+\cos^2\left(\frac{\Delta\varphi_{MZI1}}{2}\right)\cos^2\left(\frac{\Delta\varphi_{MZI2}}{2}\right)\right\}$$
$$\left\{\sin^2\left(\frac{\Delta\varphi_{MZI3}}{2}\right)\sin^2\left(\frac{\Delta\varphi_{MZI5}}{2}\right)\sin^2\left(\frac{\Delta\varphi_{MZI6}}{2}\right)\right\}$$
$$+\left\{\cos^2\left(\frac{\Delta\varphi_{MZI1}}{2}\right)\sin^2\left(\frac{\Delta\varphi_{MZI2}}{2}\right)\sin^2\left(\frac{\Delta\varphi_{MZI4}}{2}\right)\right\} \quad (2)$$

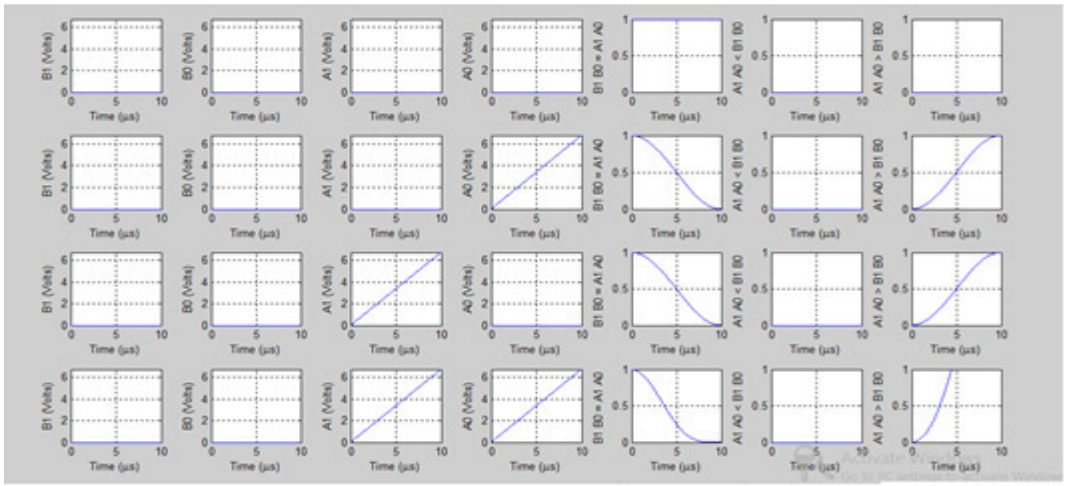
Similarly,

Output Port 3 OUT3=

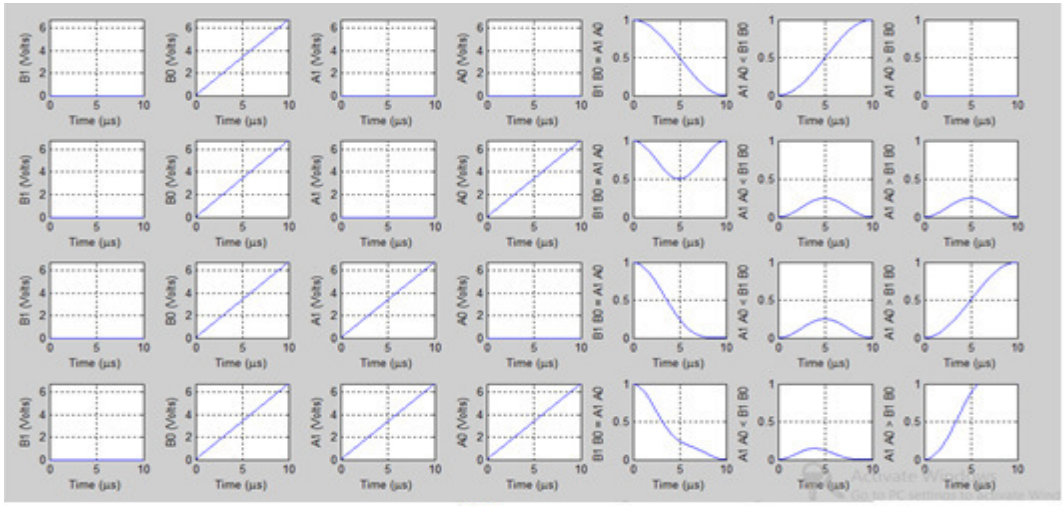
$$\left\{\sin^2\left(\frac{\Delta\varphi_{MZI1}}{2}\right)\sin^2\left(\frac{\Delta\varphi_{MZI2}}{2}\right)+\cos^2\left(\frac{\Delta\varphi_{MZI1}}{2}\right)\cos^2\left(\frac{\Delta\varphi_{MZI2}}{2}\right)\right\}$$
$$\left\{\sin^2\left(\frac{\Delta\varphi_{MZI3}}{2}\right)\cos^2\left(\frac{\Delta\varphi_{MZI5}}{2}\right)\cos^2\left(\frac{\Delta\varphi_{MZI6}}{2}\right)\right\}$$
$$+\left\{\sin^2\left(\frac{\Delta\varphi_{MZI1}}{2}\right)\cos^2\left(\frac{\Delta\varphi_{MZI2}}{2}\right)\cos^2\left(\frac{\Delta\varphi_{MZI4}}{2}\right)\right\} \quad (3)$$

The above three equations are used to obtained the MATLAB results of the proposed device, where two control signals A and B are compared and applied at second electrode of the MZIs B1, A1 and B0, A0 are representing the MSB and LSB bits of numbers B and A respectively. As shown in Fig 3when both the control inputs are at 0V (low) then the signal gets at output port A=B (high) and all other output port have no signal. When A0 is increasing from 0 V to 6.75V and

B1 = A1 = B0 =0 V, then signal intensity at port (A=B) is decreasing and output at (A>B) is increasing. Similarly, all other cases can be described from Fig 2.



(a)



(b)

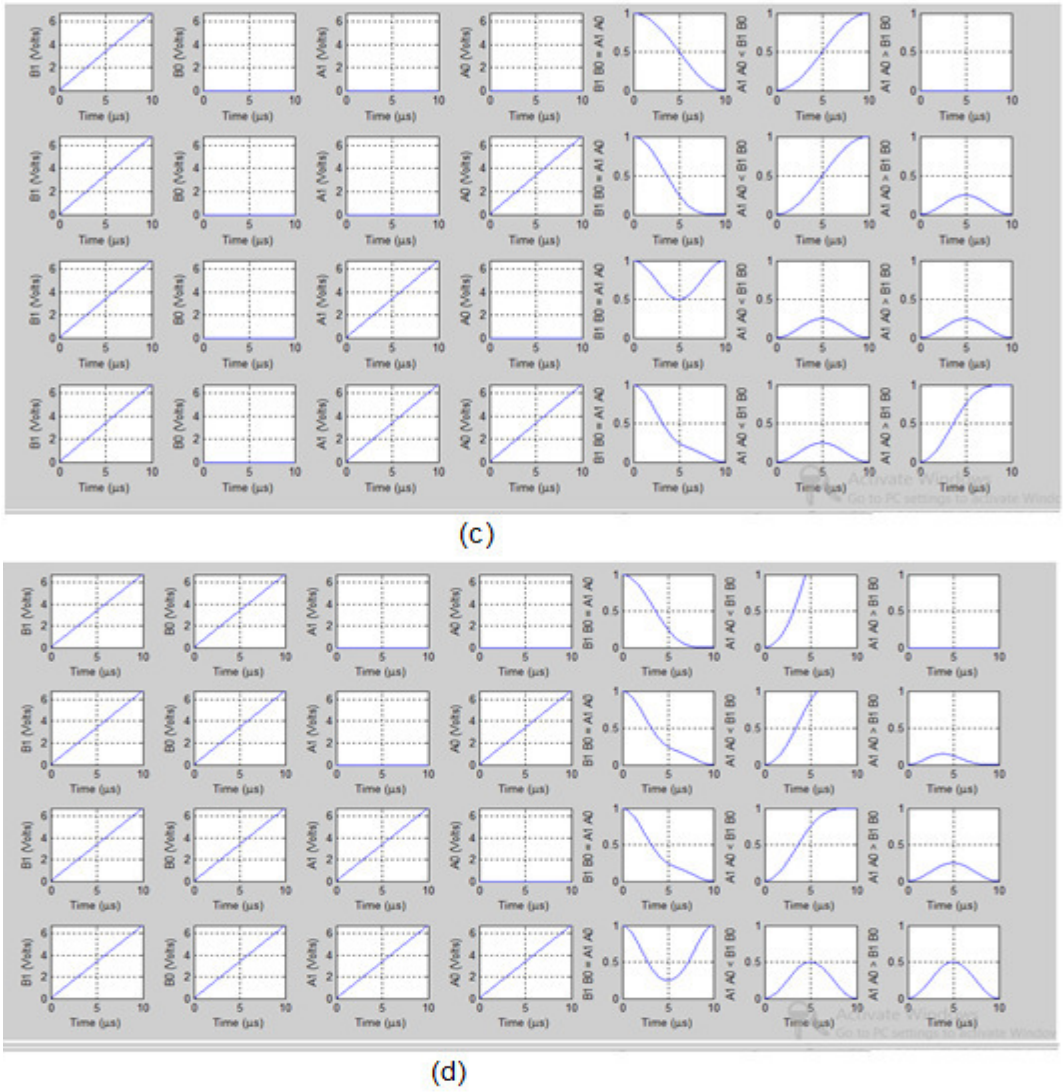


Fig. 2. MATLAB simulation results of optimal 2-bit magnitude comparator for different combinations of control signals, B is (a) 0 (b) 1 (c) 2 (d) 3 and magnitude of control signal A changes from 0 to 3.

III. Opti-BPM design of the optimal 2-bit optical magnitude comparator

BPM is used to examine the proposed device. Mainly it works on the principle of finite difference Beam propagation method (FD-BPM).

The schematic layout diagram showing in fig 3 is used for comparing two 2-bit numbers A and B. In this proposed design we are using only six MZIs and the final outputs are taken by output port 1(A=B), port 2(A<B) and port 3(A>B). An optical signal is applied to first input port of MZI1 which is propagating till the output obtained. As shown in above fig 3 the first output of port of MZI6 and second output of MZI4 gives the result of A<B at output port 2. The first output port of MZI5 gives the result of A=B at output port 1. Third output of the proposed device at port 3 can be obtained with the combination of MZI6 and MZI4, which results in A>B as shown in Fig 3.

Opti-BPM results of optimal 2-bit optical magnitude comparator are shown in below Fig 4 and these results can be verified using the truth table of 2-Bit magnitude comparator listed above in Table 1.

The Opti-BPM results shown in Fig 4 can be explained as:

Case 1: A1 = 0 A0 = 0 B1 = 0 B0 = 0

A single optical signal from continuous wave optical source is feeding to the first input port of MZI1. For this case the control signal to all the MZIs are LOW and therefore light signal is propagating from MZI1 to MZI5 via MZI2 and MZI3. As the control signal at MZI1 is A1 = 0, the light signal applied to the first input port of MZI1 is emerged at second output port of MZI1. Similarly Light signal propagates from MZI2 (second input port) to MZI2 (first output port) and then from MZI3 (first input port) emerged at second output port of MZI3 and finally light feeding to second input port of MZI5 emerged at first output port of MZI5 and then

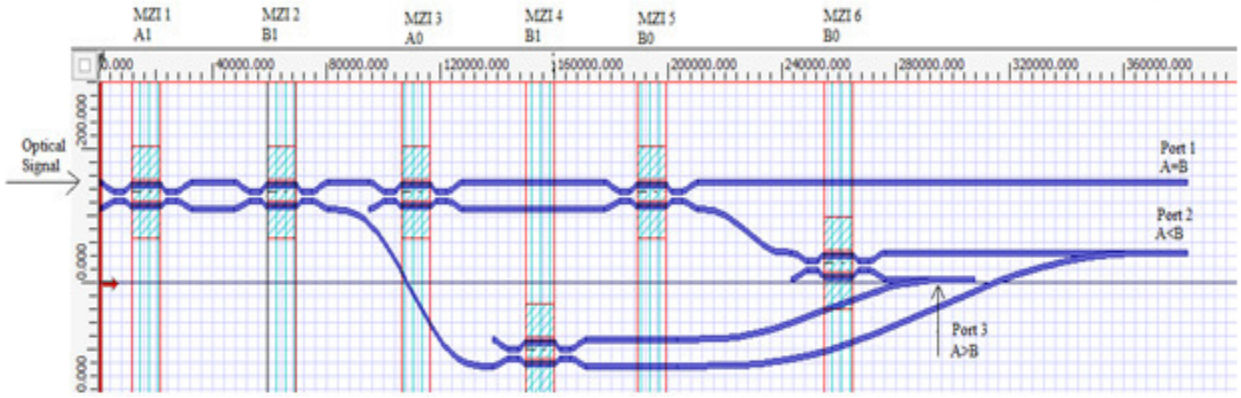


Fig 3. Opti-BPM layout of optimal 2-Bit optical magnitude comparator.

reached to output port 1 as shown in Fig 4(a), verifying the result i.e. A=B.

Case 2: A1 = 0 A0 = 0 B1 = 0 B0 = 1

Continuous wave (CW) optical signal is propagating from MZI1 to MZI6 (first input port) by means of MZI2, MZI3, MZI5. As the control signal, B0=1, the light comes out from first output port of MZI6 and appears on output port 2, executes the logic A<B.

Case 3: A1 = 0 A0 = 0 B1 = 1 B0 = 0

Impenitent CW optical signal at MZI1 is arrived to MZI4 by means of MZI2. As the control signal is B1=1, the light comes out from second output port of MZI4 and executes the logic A<B as shown in Fig 4(a).

Case 4: A1 = 0 A0 = 0 B1 = 1 B0 = 1

Inward CW optical signal at MZI1 is arrived to MZI4 by means of MZI2. As the control signal B1=1, after propagation of light signal it comes out from second output port of MZI4 and meet to the desired result i.e. logic A<B as shown in Fig 4(a).

Case 5: A1 = 0 A0 = 1 B1 = 0 B0 = 0

Continuous wave (CW) optical signal is propagating from MZI1 to MZI6 by means of MZI2, MZI3 and MZI5. As B0=0 applied on the electrode, light comes out from second output port of MZI6 and results in A>B as shown in Fig 4(b).

Case 6: A1 = 0 A0 = 1 B1 = 0 B0 = 1

Continuous wave (CW) optical signal is propagating from MZI1 to MZI5 by means of MZI2 and MZI3. As B0=1, the

Table 1: Truth table of 2-bit magnitude comparator

Control signals				**Optical output at different ports**		
B		**A**		**Port1**	**Port2**	**Port3**
B1	B0	A1	A0	**A=B**	**A<B**	**A>B**
0	0	0	0	**1**	**0**	**0**
0	0	0	1	**0**	**0**	**1**
0	0	1	0	**0**	**0**	**1**
0	0	1	1	**0**	**0**	**1**
0	1	0	0	**0**	**1**	**0**
0	1	0	1	**1**	**0**	**0**
0	1	1	0	**0**	**0**	**1**
0	1	1	1	**0**	**0**	**1**
1	0	0	0	**0**	**1**	**0**
1	0	0	1	**0**	**1**	**0**
1	0	1	0	**1**	**0**	**0**
1	0	1	1	**0**	**0**	**1**
1	1	0	0	**0**	**1**	**0**
1	1	0	1	**0**	**1**	**0**
1	1	1	0	**0**	**1**	**0**
1	1	1	1	**1**	**0**	**0**

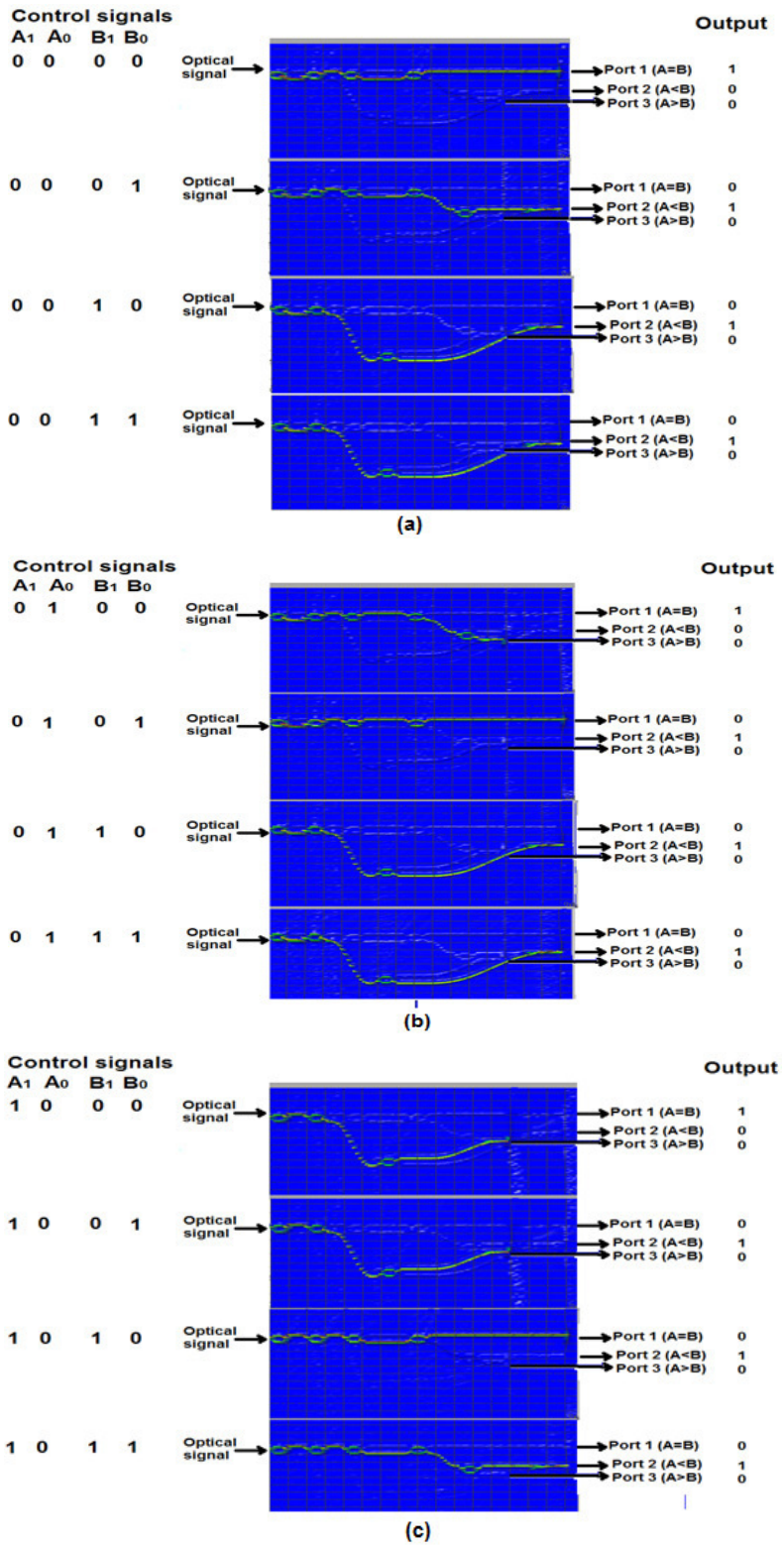


Fig. 4.Opti-BPM results of optimal 2-bit optical magnitude comparator for different combinations of binary number A is (a) 0 (b) 1 (c) 2 (d) 3 and magnitude of B changes from 0 to 3.

light comes from MZI5 (first output port) and results in logic A=B as shown in Fig 4(b).

Case 7: A1 = 0 A0 = 1 B1 = 1 B0 = 0

Applied CW optical signal at MZI1 is arrived to MZI4 (second input port) by means of MZI2. As the control signal is B1=1, the light comes out from MZI4 (second output port) and results in logic A<B at port 2 as shown in Fig 4(b).

Case 8: A1 = 0 A0 = 1 B1 = 1 B0 = 1

Continuous wave (CW) optical signal is propagating from MZI1 to MZI4 by means of MZI2. As the control signal is B1=1, the light comes out from MZI4 (second output port) and executes the logic A<B at port 2 as shown in Fig 4(b).

Case 9: A1 = 1 A0 = 0 B1 = 0 B0 = 0

Applied CW optical signal at MZI1 is arrived to MZI4 (second input port) by means of MZI2. As the control signal is B1=0, the light comes out from MZI4 (first output port) and reached on output port 3 which results in logic A>B as shown in Fig 4(c).

Case 10: A1 = 1 A0 = 0 B1 = 0 B0 = 1

Continuous wave (CW) optical signal is propagating from MZI1 to MZI4 by means of MZI2. As the control signal is B1=0 and B0 =1 , the light comes out from MZI4 (first output port) and reached on output port 3 which results in logic A>B as shown in Fig 4(c).

Case 11: A1 = 1 A0 = 0 B1 = 1 B0 = 0

Applied CW optical signal at MZI1 is arrived to MZI5 (second input port) by means of MZI2 and MZI3. As the control signal at MZI5 is B0=0, the light comes out from MZI5 (first output port) and reached on output port 1 which results in logic A=B as shown in Fig 4(c).

Case 12: A1 = 1 A0 = 0 B1 = 1 B0 = 1

Continuous wave (CW) optical signal is propagating from MZI1 to MZI6 by means of MZI2, MZI3 and MZI5. As the control signal at MZI6 is B0=1 and B1=1, the light comes out from MZI6 (first output port) and reached on output port 2 which results in logic A>B as shown in Fig 4(c).

Case 13: A1 = 1 A0 = 1 B1 = 0 B0 = 0

Applied CW optical signal at MZI1 is arrived to MZI4 (second input port) by means of MZI2. As B1=0, the light comes out from MZI4 (first output port) and results in A>B as shown in Fig 4(d).

Case 14: A1 = 1 A0 = 1 B1 = 0 B0 = 1

Continuous wave (CW) optical signal is propagating from MZI1 to MZI4 by means of MZI2. As the control signal at MZI4 B1=0, the light comes out from MZI4 (first output port) and reached on output port 3 which results in logic A>B as shown in Fig 4(d).

Case 15: A1 = 1 A0 = 1 B1 = 1 B0 = 0

Applied CW optical signal at MZI1 is arrived to MZI6 (second input port) by means of MZI2, MZI3 and MZI5. As the control signal at MZI6 is B0=0 and B1=1, the light comes out from MZI6 (second output port) and reached on output port 2 which results in logic A>B as shown in Fig 4(d).

Case 16: A1 = 1 A0 = 1 B1 = 1 B0 = 1

Continuous wave (CW) optical signal is propagating from MZI1 to MZI5 by means of MZI2 and MZI3. As the control signal at MZI5 is B0=1, the light comes out from MZI5 (first output port) and reached on output port 1 which results in logic A>B as shown in Fig 4(d).

IV. Conclusion

As Electro-optic based Mach-Zehnder Interferometers are become the back bone of optical devices for high speed communication, our proposed device fulfill the requirement of high speed communication in terms of low complexity. Optimization in optical devices helps in fast processing of optical data in the optical devices.

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Passenger Abnormal Behaviour Detection using Machine Learning Approach

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***Abstract*—In this paper we have proposed the clustering approach to classify the random walk trajectories from the synthetic bus station video. Bus station one of the most crowded locations that consist of more than thousands of passengers or travelers waiting for the buses to travel to the destination point. These crowded locations can be highly prone to accidents or terrorist activities. Work is classified into two steps i.e Firstly we find out the trajectories from the image by using the machine learning approach after that we apply the agglomerative clustering algorithm which is used to group the abnormal trajectories with the similar spatial patterns and normal trajectories with similar spatial patterns.**

***Keywords*—Path detection, Anomaly Detection, Trajectories, Clustering.**

I. INTRODUCTION

Data mining is the extraction of intelligent information from a large set of data [1-2]. This information can be utilized to provide different solutions for real time problems. Data mining has a proven track record in almost every domain such as bioinformatics, healthcare data analysis, transportation, social media analysis etc [3-14]. Popular data mining techniques are classification, clustering, association rule mining and anomaly detection [15]. Anomalies are data objects with abnormal behavior. Anomaly detection can be defined as a sub-domain of data mining that deals with identification of abnormal data objects. Bus stations or bus depot can be defined as a crowded location that consists of more than hundreds of passengers or travelers waiting for the buses to travel to the destination point. These crowded locations can also be a point that can be highly prone to accidents or terrorist activities. The persons involved in these bad activities have some kind of abnormal behaviors due to some psychological effect on their mind. Therefore these persons can be treated as anomalies in the crowd of passengers. If these anomalies can be detected due to some means, it can help in preventing bad activities in the bus depot or bus stations. The surveillance camera is a great source of data in the form of images captured at bus stations. This image data can be analyzed to perform analysis using anomaly detection techniques and further persons with anomalous behavior can be detected for further investigation. Various studies on anomaly detection using image data exist in the literature [16-25]. In this study, security issues and maintenance of a bus station is the primary focus. The anomaly detection at bus stop surveillance data is very important as it can lead to detection of accidents or mischievous behavior by people in real time. Therefore, it can be utilized to detect and alert any kind of anomalous behavior in real time. The assumption made for this study is based on the fact that the images are captured through a surveillance device at the bus station. These images are then used for processing using data mining techniques to detect any anomalous behavior of any individual who may be involved in wrong activities. The automation of this process would be helpful to reduce the human efforts and to increase the security of the bus station. However, the detection of anomaly in the crowd is a hard problem that we trying to solve. The organization of the paper is as follows: Section 2 will present the methodology and data set used in this study. The results and discussion is presented in section 3 and a conclusion is provided in section 4.

II. MATERIALS AND METHODS

This section presents a description of the data and methodology used in this study.

A) Dataset generation

In this paper, as Data Mining is main emphasis, preprocessing and tracking parts of solution are not implemented as they belong mostly to image processing domain. Instead a dataset is generated to get a supposedly real dataset which simulates surveillance data. A 20x20 graph is taken to represent the bus station. Three blocks are taken as entrance blocks and three are taken as exits. Now the spatial- temporal paths of objects are generated in following way, for every combination of entrance and exits few intermediary nodes are selected arbitrarily and thus random paths are generated. These arbitrary paths thus generated represent the path followed by a

particular object's/individual. We consider the fact that the number of anomalous paths will be considerably less than the non anomalous paths while generating the dataset. We consider a path non-anomalous when the person/ objects enter and leave the block without any diversions/ delay. Also there are paths such that objects is entering but never exiting or exiting after following a very long path, these paths are anomalous and should be detected by the implemented algorithm.

Figure1. Sample of Bus station video

Figure2. Image Frame is extracted from video

The dataset is all the coordinates in each path. For example in this sample, the first column represents the x-coordinates and second column represents the y-coordinate. The third column is for the purpose of identifying where the next move of the random walker will be horizontal or vertical. In which 1 represent the random walker may move in the vertical direction were as 2 represents the random walker may walk in the horizontal directions.

Table 1. Apart of dataset used

X-coordinates	y-coordinates	People move in vertical direction	People move in horizontal direction
34	21	0	2
33	21	1	0
33	22	1	0
33	23	0	2
32	23	1	0
32	23	0	2
34	42	0	2
42	33	0	2
32	23	1	0
44	37	1	0
38	32	1	0
33	22	0	2
49	44	1	0

B. Preprocessing

Data preprocessing [2] plays a very important role in data analysis. CCTV cameras are installed in most of the crowded region and which generate a lot of data in the form of frames but this data is not used directly in the system, so we have to first perform the preprocessing because there is high frequency noise is generally critical to be identified and removed. So this has to be done by converting video frames in to gray scale images. After converting into gray scale images it should be filtered through Gaussian low- pass filter. Then apply the object detection technique of frame subtraction is applied.

Figure 3 is sample image which is taken from the video that is captured from bus station and image extraction process is already explained in the above paragraph, were as this image is shows the trajectories.

In the below figure 3 we have shown the spatial model that we have developed for representing the routes from the images. In which each path having number of nodes which are bounded by the envelope and which is used to determine the variation of the trajectories in the route where each route having end and exit point. And all the nodes are equal separation distance.

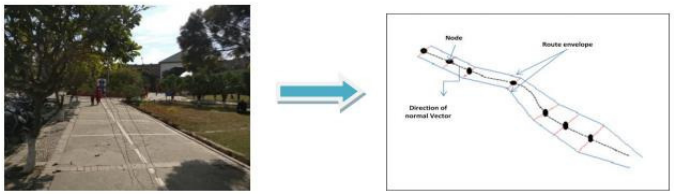

Figure.3 Sample trajectories are plotted in Spatial Model of a route.

C. Tracking

Once the objects are detected, these objects are tracked using various attribute like contrast, Correlation, Energy and homogeneity for each frame [21]. Several objects tracking algorithms can be used to track the objects and obtain the path followed by each object's/ person to decent accuracy. In the below figure 3 we have shown the spatial representation of route. Once we are having the path followed by each object's/person then we can use Data mining techniques to analyze these motions and detect and flag an anomaly if present.

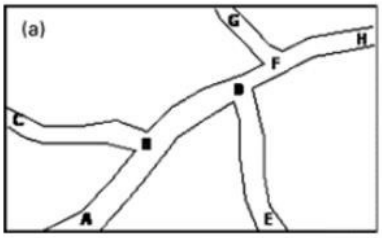

Figure4. Spatial representation of route

D. Clustering

Once we have the paths of each object's/person our next job is to detect anomaly in these paths. For this our basic approach will be to use a clustering algorithm to cluster similar paths. All the outliers that emerge out as a result of the clustering algorithm can be flagged and called as anomaly. Explaining the clustering process in details, these paths are clustered using fixed width clustering methods so that similar paths are

in the same cluster. As the second step, similar clusters are merged based in the distance between clusters. If the average intercluster distance is more than φ number of standard deviations of the inter-cluster distance from the mean inter cluster distance, than a cluster is declared as anomalous. This anomaly detection algorithm is further explained in the pseudo code section.

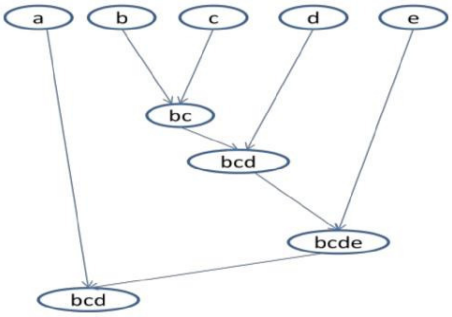

Figure.5 Agglomerative hierarchical clustering

Steps involved in agglomerative hierarchical clustering as explain below.

1. Calculating the proximity between the two trajectory using the weighted Euclidean distance and average linkage method and variable number of clusters.
2. Then find the most similar pairs of cluster by using the proximity matrix. Combine two patterns into one cluster and update the proximity matrix to reflect this merge operation.
3. Do above steps until all the patterns in one cluster. Maintaining the Integrity of the Specifications

E. Distance Measure for Clustering (DMC)

For clustering the paths and extracting meaningful clusters we need to choose a good distance measure. Given that we have many entry and exit points, there are many possibilities of non-anomalous paths. We need to choose a distance function as follows: Let P1, P2 be any two paths represented by array of 20 20 matrix where the paths is represented by joining of 1s.

Distance measure for clustering (DMC) is calculated by using the below formula.

$$D(P_1,P_2)= \sqrt{\left(\left(\frac{w_1}{w_{1+}w_2}\right)(l1-l2)^2+\left(\frac{w_2}{w_1+w_2}\right)(\cos(avgP_1)-\cos(avgP_2))^2\right)} \quad -(1)$$

Pseudo Code

Algorithm 1: Anomaly Detection

1. Apply preprocessing step and identify foreground object.
2. Obtain the tracks/paths as explained using the *Kalman Filter*.
3. Obtain the length of path and average of cosine of all vectors present on the path to represent the path in the form of a point on 2D space.
4. Apply *agglomerative* clustering with distance metric as weighted Euclidean distance and average linkage method and variable number of clusters.
5. Identify the clusters corresponding to anomalous paths and report the corresponding paths.

III. RESULTS AND DISCUSSION

Firstly we have shown the number of trajectories that we have obtained from the above image. In which all the normal path is represented by the white line from the entry to exit gates. The blue line is anomalous path following in the different trajectory. For this we have use the kalman filtering in matlab.

Steps are shown below.

1. Firstly we create the vision. KalmanFilter by using the KalmanFilter.
2. Then to eliminate the noise present in the image we use predict and correct methods.
3. When the trajectory is detected, then its firstly predicts its state at the current video frame, then on the newly detected trajectory it uses previous detected object location to correct its state.

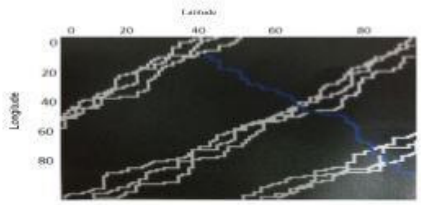

Figure 6 A plot of all trajectories in the dataset in which 10 random trajectories are highlighted in color.

After that we apply the agglomerative clustering algorithm, in which each data points combine as singleton cluster, until all the data points have been combining to form the single cluster.

In the below figure the clustering results are shown. The clustering results are as expected we get four separate clusters corresponding to a four different trajectories with clusters belonging to normal paths being close to each other and the one with anomalous path is segregated

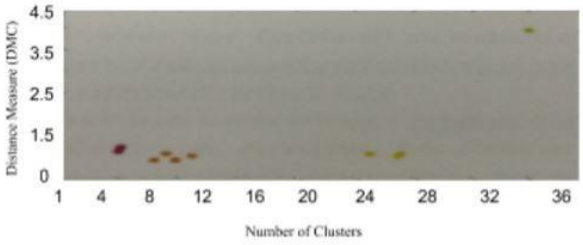

Fig.7 Results of agglomerative Clustering

We have used the agglomerative hierarchical clustering algorithm because it has many advantages as ease of handling of any type of similarity o distance, flexible in regarding a level of granularity and it can be apply in any type of attribute.

IV. CONCLUSION

This paper deals with practical approach of anomaly detection from the bus station. For that we have practically analyzing the trajectory data that we have extracted from the image. Then finding the nodes in the path so we can easily identify the whether the path is abnormal or normal. Apply agglomerative clustering algorithm to obtain the abnormal clusters. In my knowledge of point no one has before apply anomaly detection in the bus station although it is a crowded location that consists of more than hundreds of passengers or travelers waiting for the buses to travel to the destination point. These crowded locations are highly prone to accidents or terrorist activities. So in the future work we may apply this practical approach in the real dataset. Or it can be helpful in many applications like in anomaly detection in the airport etc.

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Content Accessibility Evaluation of Government Website using WCAG(Web Content Accessibility Guidelines)

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***Abstract*—A well designed and highly accessible websites are very important for organizations to communicate with different categories of the users in this IT world. It has also became mandatory for various organizations to design websites and offer all its services. Analysis of specific group of government websites across a spectrum shows that there was tremendous need for longitudinal study of website content accessibility. To accomplish this they put heaps of diligent work to represent information on sites which are client driven and can be open easily by the clients having distinctive capacities. This is possible with the help of continuous monitoring by the designers to design websites according to the website content accessibility standards i.e. WCAG(Web Content Accessibility Guidelines). The responsibility of designer or concerned organization is to evaluate the web content accessibility using web content evaluators. These evaluators will generate compliance reports according to which developers can modify their website content as per the need of every user. In this paper, the current scenario of various accessibility checkers and WCAG compliance for government website is analyzed.**

***Index Terms*—WCAG; Compliance; Website Accessibility**

I. Introduction

II. *Motivation*

A website is a combination of related website pages served through single area. Various types of websites are there however most generally utilized classes of the websites are government, instructive, business, social and employment gateways. It has turned out to be required for an association to build up a website to outfit its administrations online through various systems. With increment in the quantity of websites and its prominence it is currently essential for an association to put lots of efforts to design the websites and its substance deliberately so that it can easily cater the requirements of various classes of clients with full accessibility.

Various web composition issues are there that should be kept into thought while outlining the website. One of the most critical issue among all is the web content accessibility[6]. Web content accessibility means removing barriers that prevents access to the people with different abilities so that they can recognize, understand, navigate, and interact with the content of the websites. Web content accessibility benefits others, including older people with changing abilities due to aging.

Some People with different abilities faces lot of problems to interact with the website and related web contents. Recent studies shows that contents of many websites are still not accessible to the people with different abilities[15][12]. A common observation is that the majority of the open-source systems were designed to be used by website developers who should have a solid background in the web accessibility and its guiding principle. Also, some web developers perform manual or automatic evaluations. In manual evaluation

the developers manually examine web pages to find out problems. The developers might have potential bias while manually evaluating the accessibility quality of a web page[11].

B.WCAG(Web Content Accessibility Guidelines) and Web Content Evaluation

WCAG (Web Content Accessibility Guidelines) is developed through the W3C (World Wide Web Consortium) process in collaboration with people and associations around the globe. The fundamental objective of WCAG is to demonstrate a solitary shared standard for web content accessibility that addresses the issues of governments, associations, and people, globally. WCAG 2.0 has 12 guidelines that are sorted out under 4 principles: perceivable, operable, understandable, robust. For every Guideline, there are testable achievement criteria, which are at three levels: A, AA, and AAA [16]. Web content accessibility evaluation is the procedure to verify the conformance of a website with the guidelines set by the standards organizations.

In this paper, the state of accessibility verification systems is evaluated. This paper focuses on the web content accessibility of government website and their compliance. The structure of the paper is as follows: In Section 2 literature is reviewed regarding web accessibility. Section 3 presents analysis and comparison of existing accessibility evaluation systems Section 4 presents proposed methodology. Section 5 concludes this paper and Section 6 includes the references.

C. Literature Review

There are many existing online accessibility evaluation tools to test the web Pages according to the WCAG Standards. These tools provide software support by analyzing HTML codes of a websites and also perform an analysis to identify usability problems depending on specific guidelines. More complicated tools may provide suggestions to improve the web sites quality. Some repair tools are also available which not only identifies the problems but also repair them automatically[9]. this literature review provides related research on Website Evaluators consisting of questionnaires. Specific automatic evaluation tools are introduced below.

AChecker: AChecker is an online accessibility evaluator, which assesses HTML pages as per the WCAG 1.0 and WCAG 2.0. AChecker is a semi-mechanized evaluator as it can't confirm all the guidelines of WCAG. Three types of errors are identified in AChecker namely known, likely and potential. Likely and Potential problems include the problems that AChecker require Human intervention to make a decision[13][10]. WAVE: WAVE is an evaluation tool developed by Web Aim. It gives a visual representation of the page being assessed with yellow notices which shows a mistakes. Warnings on the right side show accessibility issues. While those on the left side give an outline of the issues found. WAVE does not have a repair tool and does not show the implemented guidelines[7]. TAW: TAW is a free accessibility tool which is developed by the Spanish Foundation Centre for the Development of Information and Communication Technologies in Asturias (CTIC). TAW tests the accessibility according to WCAG 1.0 and 2.0. and its motivation is to analyze the accessibility of Web Design and Development for Access to each Individuals despite of their characteristic. The Accessibility problems produced by TAW are of three categories: problems, warnings, and “not reviewed.” The “not reviewed” errors have no repair options. TAW does not show the implemented guidelines. HTML Tidy: HTML Tidy is a free evaluation tool which is fit for automatically settling basic HTML issues and distinguishing some potential accessibility problems[8]. HTML Tidy permits input HTML in three structures: as a URL, as direct HTML code written or pasted into text area, or as an uploaded file. This tool permits the user to choose several alternatives identified with the repairing procedure. Subsequent to uploading the HTML code and selecting the "Tidy" alternative, the repairs are done[3]. WAI(Web Accessibility Initiative): WAI was found by the World Wide Web Consortium (W3C) Web Accessibility[4], and enhances the availability of web for individuals having distinctive capacities[14].

III. PROPOSED METHODOLOGY

A. Web Crawler

A web crawler is an Internet Search Bot or a program which peruses the World Wide Web steadily. Fundamental motivation behind web crawler is web ordering or web spidering. Web search tools and some different sites utilize web creeping or web spidering programming to upgrade their web substance or records of others sites' web content. Web crawlers copy every one of the pages they visit for later handling by the search engine which indexes the downloaded pages so the clients can seek significantly.

B. HTML Parser

HTML Parser is only the software or Java library which is utilized to parse HTML in either a direct or settled design. It has two important purposes HTML traversal and HTML clean. It is principally utilized for transformation or extraction. HTML parser is a quick, strong and very well tested package.

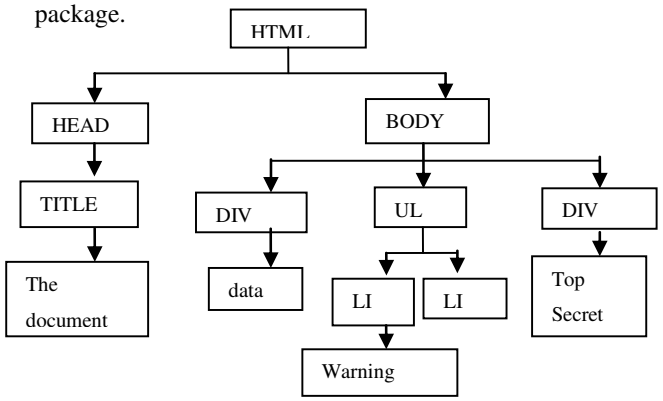
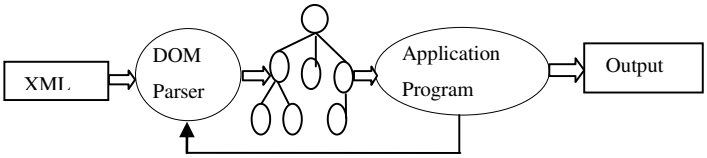


Fig. 1 HTML Parser

C. DOM(Document Object Model) Parser

The DOM is an official recommendation of the World Wide Web Consortium (W3C). DOM characterizes an interface that empowers programs to get access and redesign the structure, style, and contents of XML reports. The DOM is a typical interface for controlling document structures.



Application invokes DOM Parser

Fig. 2 DOM Parser

D. Time Stamping

A time stamp is the present time of an event that is recorded by the computer. Computer keeps up precise current time, adjusted to minute fractions of a second through components, for example, the Network Time Protocol (NTP).

IV. ANALYSIS AND COMPARISON

A. WAVE And AChecker

Name of the tool used: AChecker And WAVE

Technique Used: They collect the URLs of University Web Pages as an input and extract those URLs with the help of web scraping tool named 'import.io' from web Page. Websites homepages are evaluated with any of the tool such as AChecker and WAVE. After evaluation, websites are classified into three groups namely Low Accessible Websites called Tier-III, Medium Accessible called Tier-II and High Accessible Websites called Tier-I[1].

Advantage: Provide administrators, summarized results in terms of problems and also provides better solutions for errors[1].

B. Accessibility Analyzer with JavaScript Algorithms

Name of the tool used: Social4all Platform, JavaScript accessibility Analyzer

Technique Used: Social4all platform is framed, which permits an arrangement of an accessibility issues to be fathomed without adjusting the original page code. The primary expectation of this stage is to enhance the access of online information for individuals with various types of confinements. The proposed platform can investigate sites and distinguish numerous accessibility issues naturally [2].

Advantage: User can create its own adaptation profile. It also improves the accessibility of website[2].

C. IWAET(Interactive Evaluation Tool)

Name of the tool used: IWAET(is an extension of AChecker)

Technique Used: IWAET consist of five modules:

1) Parse module: Accessibility results in HTML format are taken. Parsing algorithm accesses the HTML files and gets the content of the HTML tags and saves them into an array of results.

2) Unclear module: It replaces no clear description accessibility errors with simple, understandable, and clear words.

3) Redundant module: Merges redundant errors so only one error is produced. It is based on IWAET database.

4) Repair module: It is used for fixing of errors.

5) Results module: It stores the accessibility problems encountered, each described by its id, description, and fixed code[3].

Advantage: Simple and attractive Graphical User Interface. IWAET display results in tabular format containing the error number, the error description and the violating code[3].

D. TAW And Webometrics

Name of the tool used: TAW and Webometrics

Technique Used: The specialized assessment is done utilizing TAW and non-specialized assessment through direct perception utilizing webometrics achievement criteria. Technique and assessment stages is isolated into 5 phases [4]:

1) The Literature Study and Information Collection: It incorporates literature study about the webometric positioning and web assessment, comprise of web assessment tool and web accessibility.

2) Examination of Web based-on Criteria Webometrics: Literature study recognize the issue criteria which are examined, in view of the webometrics ranking technique.

3) Mapping to WCAG 2.0 Criteria of Webometrics: Web-based assessment criteria were mapped into the assessment criteria of WCAG 2.0.

4) Classification Criteria of the Webometrics: Grouping of criteria is done in two technical and non-technical. Technical criteria contains web specialized appraisal assessment of webometrics criteria with WCAG 2.0, while the assessment of the non-technical criteria is impossible with WCAG 2.0 however done through the social evaluation.

5) Assessment Criteria for Technical and Non-Technical: The technical assessment of the criteria was done utilizing a web assessment test device or tool and Non-technical criteria were assessed by direct perceptions of the site.

Advantage: Technical and non-technical evaluation to improve the university website[4].

E. Accessibility Analyzer

Name of the tool used: Own Accessibility Analyzer

Technique Used: Techniques are based on the qualitative method of data collection consisting of four steps[5]:

1) Choosing the profile of the clients participating in the research: Adults who were enlisted up to the fourth grade, as per the UNESCO arrangement are picked.

2) Performance of an ethnographic study: This progression is utilized to get some answers concerning the behavior of the chose individuals and analyze their association with the computers.

3) Execution of a case study which comprised in analysing functionally illiterate persons: This step comprise of two stages. To begin with is Evaluation with clients who were not practically uneducated and the second one is Evaluation with practically unskilled clients.

4) Justification of the rules: The outcome was produced as a rundown of those qualities that add to adjustment of usability assessment strategies with functionally illiterate users [5].

Advantage: Increase the usability for functionally illiterate users[5].

V.CONCLUSION

With a specific end goal to better present the website content accessibility aspect, web specialists must have to consider web content accessibility guidelines(WCAG) standards. With the result analysis of existing website content accessibility, it is very clear that majority share of the website classifications are not too much worried about giving content accessibility highlight in their website and optional approach for web content for individuals with various capacities. In

this research work, compliance validation of government websites is proposed using web content accessibility guidelines(WCAG). The main aim of web content accessibility evaluator is to provide uniform access to each user for using any websites. Application proposed in the context of this research facilitates the evaluation process and provides information to website owners to realize the deficiencies of their websites. It also gives a comparison with its rival websites to determine a roadmap to take necessary measures.

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A review of NoSQL Databases and Performance Testing of Cassandra over single and multiple nodes

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***Abstract*—Today in the era of Internet, there is a huge explosion in the size of data. The traditional relational databases are failing to handle the current increase size of the database efficiently, leading to slow data access rate. NoSQL has thoroughly overcome the challenges for handling big data, distributed clusters and the scalability issues. Cassandra is one the leading NoSQL database gaining its importance in various applications. In this paper, Read and write performance tests are carried out which describes that Cassandra improves its performance as the number of cluster increases with increasing access speed.**

***Keywords*—NoSQL; Cassandra; performance testing**

I. Introduction

In the process of development of the data store, database technologies have undergone drastic changes in order to fulfill the user requirements. Therefore traditional relational database has made a remarkable stand in the field of database storage. Coming around the recent years, the increase in the use of Internet Network technology, various modern changes have emerged in applications. Accordingly, some changes were expected in order towards encountering the requirements using the Distributed Data Models. Relational databases are not able compete these requirements. NoSQL (Not Only SQL) is a non-relational database methodology which approaches the increasing changes required to fulfill the requirements.

This paper focuses on NoSQL databases conceptions and technology along with read and writes performance testing on Cassandra, a representative of NoSQL databases. This test is performed for single as well as multi-node scenario.

II. Limitations of SQL

1) Unstructured data:

Relational databases are not capable of managing unstructured data like multimedia files and documents effectively. Although, it can be handled using various methods such as storing the file in file system and just passing a reference to the database or storing the Binary Large Object File (BLOB) in database. But it cannot be done efficiently as it does not have indexes or problems of indexes, unreferenced data, unrecognizable patterns of data, etc.

2) Volume of data:

The complexity in the system increases as the size of database increases (such as in Terabytes and Petabytes), the complexity in the system increases. There is a possibility that this data can be structured, unstructured or both. Therefore Relational database consumes lot of time to process this huge amount of data which hampers the overall efficiency and throughput of the system.

3) Joins:

Relations among the databases are maintained with the help of joins. With the growing size of the database, a complex operation to maintain the joins which leads to slower database access at times. Joins can even make the fastest hardware to slow due to its complexity.

4) Lack of Efficiency and performance:

It is possible to manage large data with the help of relational databases, but cannot be managed in an efficient way. When the database is designed, should be in normalized form; consist of appropriate joins at the right place. It becomes difficult to manage the database while dealing with the large datasets. As the size of the data increases, operations such as data retrieval, searching, aggregations, etc. are increased thus making the database slow that leads to the lack of efficiency.

5) Scalability and Management:

Relational database requires more management as the complexity of databases grows. Database management is required if the database is to be implemented in a distributed approach. Management has to be involved when scalability comes into picture. Administrators have to perform the scaling operation manually which is a complex task to be carried out as all properties of the database must remain intact.

6) Performance:

When the performance of the database falls, it therefore leads to lack of efficiency. Performance degradation can be due to various reasons such as complex batch operations, indexing etc. The performance of the database degrades, as the data size increases.

7) Stability issues:

Relational databases with respect to references and auditing are less reliable. They have weak scalable replication and

distribution as they require more management when replicated and/or distributed. It makes it difficult to process long and complicated queries, making it to crash. Therefore in order to run those, it has to be part by part with the stored procedures).

8) User and Query conflicts:

Transactional locks and deadlocks may lead to slow access to database which may frustrate the users.

III. NoSQL (NOT ONLY SQL) DATABASES

NoSQL [1] is a schema less non-relational database. It is quickly growing database over SQL due to factors such as higher scalability, easy replication and distribution of database. NoSQL databases are different from the traditional SQL databases in many aspects such as tabular format, queries, etc. NoSQL does not require pre-designed tabular format as in SQL for storing the data. It is therefore known as unstructured database.

It solves many problems over the traditional relational approach such as distributed, open source, scalable etc. Today there are more than *thirty five* different NoSQL databases available for different purposes, developed for different scenarios.

A. Advantages of NoSQL Databases

NoSQL databases ensures following benefits compared to the traditional ones:

a) Schema Independent: At present, there are few prevalent types of NoSQL databases: Column Store, Document Store, Key Value Store, Graph Store and some other modes. These modes don't require creation of the data fields before usage. Plus, these NoSQL databases do not require fixed table structure which can store custom data formats at any instant of time.

b) Scaling Horizontally: Conventional relational database use scaling up approach to improve performance, while NoSQL databases are utilized to enhance the performance levels by horizontal scaling mode, results in distributing the load equally to each of the host system.

c) Less Management and Low cost: NoSQL databases are open source databases exclusive of expensive licensing charges. This requires less management as most of the operations are carried out through the databases itself. It does not require management as the data goes beyond threshold limit of the data, load is distributed automatically.

e) Easy replication: Easy replication of databases is done in NoSQL thus helping the database to be cooperative in distributed approach.

B. Disadvantages of NoSQL Databases

Evaluated with the conventional relational databases, NoSQL databases even though ensure several benefits, there are various drawbacks too:

a) Complex for beginners: Every NoSQL database has its own query programming, which makes it faster. But users have to be trained in order to work on NoSQL databases as they query differently than traditional SQL, which users are used to be with.

b) Not Reliable: ACID (Atomicity, Consistency, Isolation, and Durability) properties are supported by relational databases; while NoSQL databases won't therefore they do not reach the reliability level that ACID properties provide. If the users require NoSQL databases to employ ACID properties for a dataset, they should perform extra programming.

c) Eventual Consistent: ACID transactions cannot be maintained by NoSQL databases, therefore there are limitations to maintain consistency. Although it supports better performance and scalability still there are complications for specific applications and transactions, for example those comprised with banking. NoSQL databases use this type of consistency which is known as Eventual consistency.

C. Why NoSQL database be choosen

Though NoSQL overcomes traditional SQL databases, but there are several reasons why any user should choose for NoSQL databases:

- NoSQL Databases helps in improving programmer's productivity by using appropriate NoSQL database to match the needs of the application.
- NoSQL databases improve the performance of data access. This is because NoSQL relies on denormalization and is optimized due to the denormalized case. For example, if there is blog containing comments, then comments are stored with blog in NoSQL data stores. This makes the data access faster as the data can be retrieved all together from single location.
- It can handle large data quantity efficiently by not executing any joins or indexing such as in SQL.
- It can helps in reducing the latency period therefore enhancing the overall throughput of the application.

IV. TYPES OF NoSQL DATABASES

D. Key Value Database

The key-value store or key-value database is constructed for storing, retrieving, and supervising hash or dictionary i.e. the data structure. A collection of objects or records are enclosed in these dictionaries, which contains data in many different fields within them. A key is used to store and retrieve these objects or records which uniquely identifies the record, and can be used immediately to locate the data present in the database. [2][3]

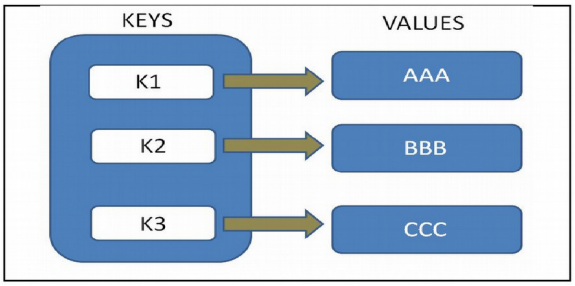

Fig. 1. Key Value Pair

Key Value Database is generally useful for warehousing, client reports, session data, shopping cart information, inclinations, etc. It should be avoided as soon as there is a necessity for data quering which have relations within the data i.e. stored actually or want to function at the same time over multiple keys.

Examples of Key Value Pair Database are: Redis, CouchDB, Riak, Memcached, Berkeley DB, Upscale DB, DynamoDB, Voldemort, etc.

B. Document oriented Database

A document store or document-oriented database is defined as a computer software package intended for warehousing, retrieving, and handling document-oriented data. It can be called as semi-structured data. The fame of the term 'document store database' has developed the utilization of idiom NoSQL procedure. XML documents are being adjusted to work with XML documents which are subclass of document-oriented databases. [2][4] Documents may comprise of collections, maps and scalar values which can be self-illustrating, categorized, tree data structures.

Document Databases can be useful for blogging programs, web analytics, content management techniques, real time analytics, and ecommerce systems. It should be avoided for applications that require composite transactions concerning several queries or operations in contradiction to variable aggregates in structures.

Examples of Document oriented Database are: MongoDB, CouchDB, Terrastore, OrientDB, RavenDB, etc.

C. Column Family Database

A NoSQL object that contains columns of related data is a column family. A key-value pair is a tuple (pair) where the key exemplifies a value which can be a set of columns. A column family is a table where each key-value pair can be represented in the row, like in relational databases. A column name, a value, and a timestamp are the tuples comprised in each column. Within a table along with other non related data, this data could be fabricated collectively, in a relational database table.[2][5]

Comparison of the container of rows in table where the key recognizes the row and the row comprises of multiple columns in every column family. A name and a value which can be used for mapping of the column are included in the Super Column which is the container of columns.

Column Family Database are convenient for blogging platforms, preserving counters, content management systems, terminating procedures, intensive write levels for example Log Aggregation. It should be avoided for systems that are in early development and have changing query patterns.

Examples of Column Family Database are: Cassandra, HBase, HyperTable, DynamoDB, etc.

D. Graph Database

A NoSQL database which uses graph structures for interpretation queries together with edges, nodes and properties to denote and warehouse the data, is known as graph database. The main hypothesis in this system is the graph along with relationship or the edge, which can precisely relate to the store data items. The relations permit store data to be correlated in sync unambiguously, to be retrieved in numerous cases with a single process.[2][6] Traversing the relationships and the joins are boosted by the Graph databases.

Graph databases are appropriate for problems which have data connected like social networks, routing data for money and goods, spatial statistics and for the recommendation engines.

Examples of Graph database are: Neo4j, Infinitegraph, OrientDB, FlockDB, etc.

TABLE I. COMPARISON OF VARIOUS NOSQL DATABASES

Name	API	Language	Concurrency	Replication	Misc.
KEY VALUE STORES					
Redis	Several Languages	C	Asynchronous saves in memory	Master/ Slave	Rich Set of Data types
CouchDB	HTTP	Erlang	Eventual Consistency(Availability and Partition Tolerance)	Selectable Replication Factor	Built for offline devices
COLUMN STORE					
Cassandra (Facebook, Twitter)	Many Thrift Languages	Java	Eventual Consistency(Availability and Partition Tolerance)	Multi-version Concurrency Control (MVCC)	Combination of Dynamo and BigTable
Hypertable (Rediff)	Thrift (Java, PHP, Perl, Python, Ruby, etc.)	C++/ HQL (Hyper table Query Language)	Strong Consistency (Consistency and Partition Tolerance)	Multi-version Concurrency Control (MVCC)	High performance with C++ implementation of Google's BigTable, Commercial support
DOCUMENT ORIENTED					
Couch DB	Representational State Transfer	Er-Lang/ JSON	Eventual Consistency(Availability and Partition Tolerance)	Multi-version Concurrency Control (MVCC)	JSON object queries, Better durability
MongoDB	Variety of dynamic object APIs available	BSON	Eventual Consistency(Availability and Partition Tolerance)	Master and Slave appr-oach	Query builder including a Javascript Map reduce implementation, GridFS specification

V. CASSANDRA

Apache Cassandra [7][8] is an open-source and a distributed database management system which can manage servers with data of huge amounts, delivering no single point of failure with high availability. Robust backing can be supported by Cassandra for clusters which comprise multiple datacenters.

To dominate the Facebook inbox search feature, Cassandra was invented at Facebook. On July 2008, Cassandra was launched by Facebook as an open-source project over Google code.

Cassandra is highly scalable, fault tolerant, consistent, and reliable, delivering high performance in distributed database. It has flexible data storage which can suit all possible data formats including structured, semi- structured and unstructured data. It has fast write speed without sacrificing the read efficiency. Users can access Cassandra via its nodes using Cassandra Query Language (CQL).

A. *Cassandra overall structure*

1) Data Model:

Table can be described using a key which is used to index multi-dimensional map. Column families are made by grouping columns. Simple and Super are the two types of Column Families. Every Column consists of Name, Value and Timestamp.

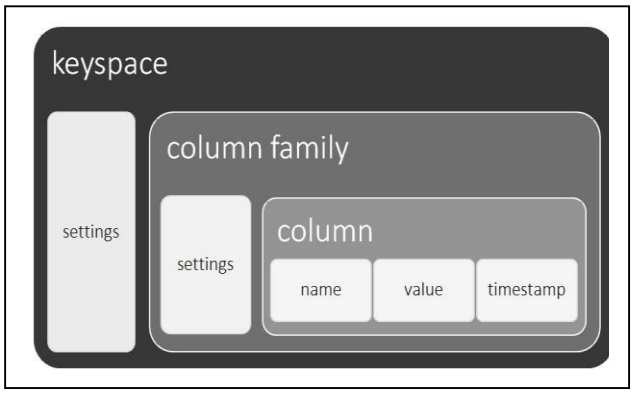

Fig. 2. Cassandra Data Model

1) System Architecture:

a) Partitioning: Ring topology is used for structuring nodes logically. The node in the ring is being assigned by hashed value of key related to the data partition. For backing the ring composition hashing rounds off after specific value. And to alleviate the highly loaded nodes it moves its position.

b) Replication: How the data is reproduced through the nodes is expressed using replication factor. At N (replication factor) nodes, each data item is being replicated.

i) Rack Unaware: The data at being replicated at N-1 successive nodes following its coordinator in this approach.

ii) Rack Aware: Zookeeper service is used which elects the leader to rectify nodes their range for replication in this approach.

iii) Datacenter Aware: This is analogous to Rack Aware however the leader is being elected at Datacenter level as a replacement for Rack level.

c) Cluster Management: Cluster Membership describes how nodes are added and deleted to the cluster nodes. It also describes how the communication between cluster nodes will take place.

Gossip Protocols are used for periodic, pairwise and inter node communication. Motivated from actual life rumours these are network communication protocols are being developed. Low cost factor is ensured by them delivering low frequency communication. Nodes are selected randomly for communication.

For e.g. – Node A requests to explore for a data pattern

Round 1 – Node A locally searches first, then gossips with node B.

Round 2 – Node A and B then gossip with C and D.

Round 3 – Nodes A, B, C and D then gossip with 4 other nodes and so on and so forth.

Round by round doubling makes protocol very robust.

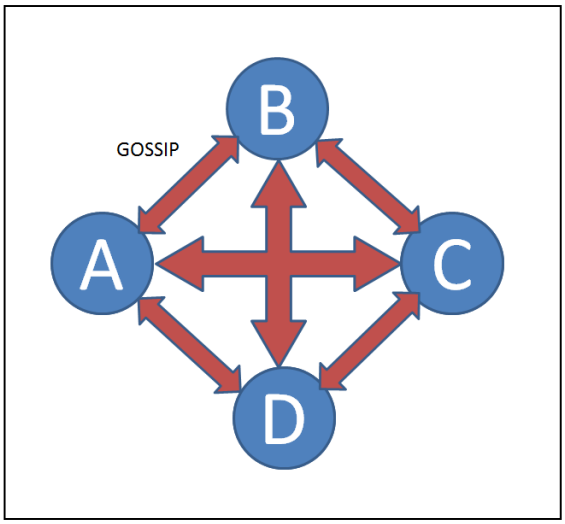

Fig. 3. Typical Gossip between nodes

Scuttle Back, a gossip protocol is used for managing the nodes in cluster. Variable '*phi*' provides distinctive node fail state which expresses by what means a node could fail (suspicion level) instead of the simple binary values (up/down).

There are two ways to add new node:

i) A random token is being allotted to the new node which provides its ring position. To the rest of the ring its location is gossiped.

ii) New ring node reads its configuration file to contact its initial contact point.

New nodes are included manually by administrator via CLI or Web interface provided by Cassandra.

VI. CASSANDRA PERFORMANCE TESTING

The test environment is as below. A Linux machine illustrates Cassandra representation. Four machines are used to fabricate the Cassandra cluster.

1) The Column Family Test:

The objective behind this experiment is to inspect and understand the relativity of the column families and their performance. In this experiment, 1000 queries are fired on every column family. Results are recorded in Table II and III.

The result demonstrates that large memory column family is backed by Cassandra, where speed of writing is considerably enhanced compared to speed of reading. Processing is slow for the input provided in case of single node for single database. The processing of provided input improves significantly in the multi-node environment for the same single database in distributed environment.

TABLE II. SINGLE SERVER SCENARIO

	Single Server Scenario				
No. of queries	1	10	100	500	1000
Reads/sec	10	94	156	147	170
Writes/sec	18	189	344	420	596

TABLE III. MULTI SERVER SCENARIO

	Four Server Scenario				
No. of queries	1	10	100	500	1000
Reads/sec	25	111	139	143	155
Writes/sec	6	29	170	368	489

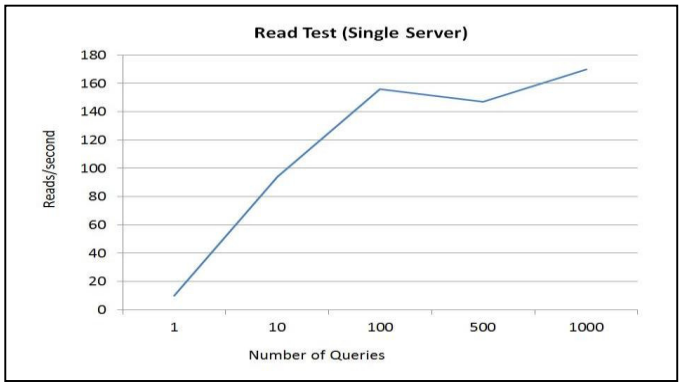

Fig. 4. Graphical representation for Cassandra Read Test in Single Server Scenario

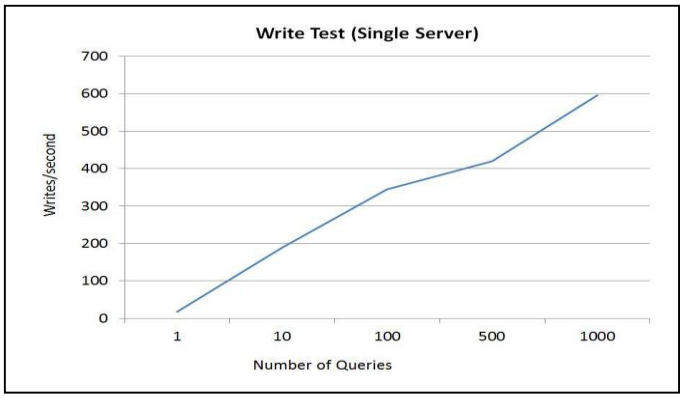

Fig. 5. Graphical representation for Cassandra Write Test in Single Server Scenario

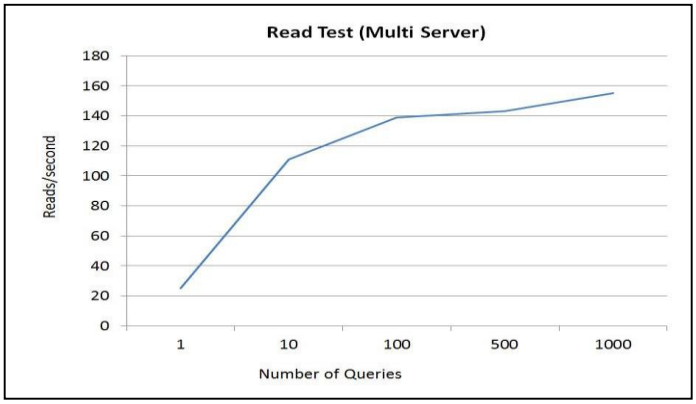

Fig. 6. Graphical representation for Cassandra Write Test in Multi Server Scenario

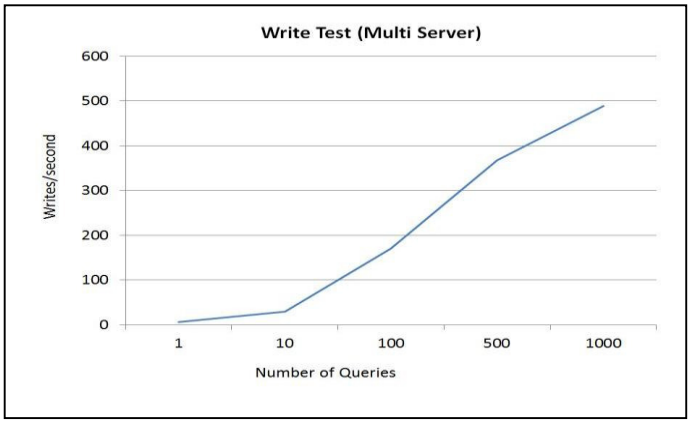

Fig. 7. Graphical representation for Cassandra Read Test in Multi Server Scenario

As per the graphs shown in Fig. 4 and Fig. 6, by using Cassandra in multi-node environment over single node environment, the timing to retrieve the outcomes from the queries are less than any other existing NoSQL databases. In this case only four servers are used.

In the case of write also as shown in Fig. 5 and Fig. 7, the graph shows that Cassandra surpasses other databases for insert operation in the case of multi-node for the identical single database over distributed environment.

VI. Conclusion

As the data size in internet is increasing extensively, NoSQL databases are used thus confirming to be a substitute for the traditional relational databases to a definite limit. The test result show that Cassandra improves its performance as the number of cluster increases with increasing access speed.

Many applications today use both relational and NoSQL database in combined format for resolving the problems in both the approaches.

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Analysis of TCP streaming over VANETs

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***Abstract*—In this article is considered Vehicular Ad-Hoc Networks (VANETs) as a technology aimed at the exchange of information between vehicles, where the nodes/vehicles of origin and destination, do not have a direct communication. Also is emphasized and analized the use interest of a TCP (Transition Control Protocol) traffic flow, since it is one of the fundamental protocols for Internet of things (IoT). Most Internet applications use TCP to create "connections" with each other, in order to maintain applications with a continuous data flow, it is, TCP over Internet guarantees the integrity and delivery of the data to its destination without errors and in the same order in which they were originally transmitted. At the end of the article, it is discussed how the mobility in VANET networks, impacts a continuous flow of data on TCP, performing this analysis by modeling a scenario in NetLogo and its simulation with NS2.**

I. Introduction

Network Simulator (NS2) software provides models to simulate wireless network environments, allowing the reading and trace generation to estimate data traffic behavior in general or particular case studies.

NS2 integrates with tools such as Traffic and Network Simulation Environment (TraNS) based on the vehicle traffic simulator SUMO, to generate realistic simulations in VANETs networks. TraNS allows the information exchanged in VANETs to influence the behavior of the vehicle in the mobility model, such is the case, that a vehicle transmits information from an accident to neighbors vehicles, so that vehicles in the velocity model can slow down.

Alternative, NetLogo allows to make more complex models capable to characterize particular behaviors, that is, to characterize vehicles of load, of particular use, of public transport and elements that interact in the roadways like traffic lights, pedestrian crossings, and vehicular roundabouts, among others[1]–[4]. In NetLogo you can also incorporate the behavior of people and other objects, assigning them as agents that act with rules, with or without intelligence, depending on the complexity that is wanted to be given to them.

This article analyzes the impact of a TCP communication in End-to-End streaming on VANETs, with the characterization of a wireless communication using USB adapters that support IEEE802.11b on a raspberry pi 2, in Ad-Hoc mode, simulated in NS2.

In a first approach to NetLogo as an alternative tool to SUMO, a VANETs simulation is performed in the city of Oviedo - Asturias Spain, with the interaction of 40 mobile agents (vehicular nodes) and two static ones corresponding to the source and destination nodes. In this simulation, the normal, binomial, geometric and exponential distributions were evaluated on the velocities of the remaining 40 mobile agents/nodes, analyzing performance metrics: one-way delay, normalized routing load, normalized packet delivery ratio and throughput.

II. Simulation Tools

A. NetLogo

It is a multiagent environment that allows simulating natural and social phenomena, used in the modeling of complex systems. The models created in NetLogo allow creating rules of behavior for hundreds of agents/nodes that operate independently or according to the interactions with their surroundings. This makes it possible to explore the relationship between the individual behaviors of the agents/nodes and observe patterns of emergent behavior arising from individual interactions. This feature highlights NetLogo over SUMO, since SUMO is the most widespread simulation tool in VANETs networks[5]–[7]. By its multi-agent behavior, NetLogo approaches the edge of the video game engines, obtaining more realistic results than with the simulation tools used so far.

B. NS2

It's one of the most widespread mobile wireless simulators accepted by researchers and developers. It is an open source tool, which supports the simulation schemes shown in Table I[8]–[16].

NS2 allows reading in its main script an external file, which contains the mobility information that is required to evaluate, according to the requirements of the VANETs simulation scenario and the communication protocol, as shown in Figure 1.

TABLE I
SIMULATION SCHEMES

Transport	TCP, UDP, SCTP, XCP, TFRC, RAP, RTP, PGM, SRM, RLM, PLM
Network	Unicast: IP, MIP, DV, LS, IPinIP, SR Multicast: SRM MANET: AODV, DSR, DSDV, TORA, IMEP Queuing: DiffServ, RED, WFQ, DropTail
Link & Mac	ARP, HDLC, GAF, MPLS, LDP, MAC: CSMA, 802.11b, 802.15.4 satellite Aloha Queuing: Drop Tail, RED, RIO, SRR, WFQ, REM
Physical	Two-Way, shadowing, Omni Antennas, Energy model, Satellite repeater

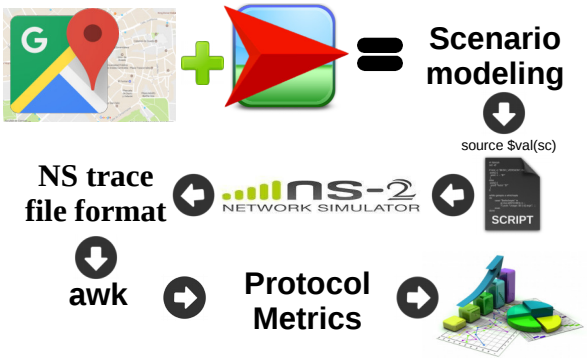

Fig. 1. Protocol performance for VANETs

III. IEEE802.11B - DCF

IEEE802.11b is a link-level protocol that can operate in Distributed Coordination Function (DCF) and uses the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) protocol as a medium access mechanism[17]–[19], since its topology in VANETs Is random and distributed. In DCF there is a mechanism for unicast frames called Request to Send/Clear to Send (RTS/CTS), which is activated by default in NS2 to prevent the hidden terminal problem[20].

TABLE II
CHIPSET/DRIVER IN AD-HOC NETWORK RASPBERRY PI 2

Adapter	Chipset
Wi-Pi Ralink	RT5370
N150 Ralink Ralink	RT5370
TP-LINK TL-WN722N	Atheros AR9271

Table II shows some wireless terminals that allow a configuration for raspberry pi 2 Chipset in ad-hoc network, with the option to place antennas with gains of 3 to 5 dB, obtaining coverage ranges of 100 to 300 meters.

IV. METHODOLOGY

Based on Figure 2, for the creation of the scenario and case study, we selected the science faculty as the origin node and the gymnasium of the University of Oviedo - Spain as destination node, separated by a distance in a straight line of 800m. The area selected in Google maps is 900m x 500m. Each mobile node was configured with an omnidirectional coverage radius of 150m, to obtain approximately 38 vehicles, which can guarantee a dense topology with an end-to-end connectivity probability greater than 0.95[21]. The vehicles in NetLogo were distributed on the main streets and avenues, in most of the cases were realized cyclical trajectories.

TABLE III
SIMULATION PARAMETERS

Network Simulator	NS2 âĂŞ ns2.35
Scenario modeling	NetLogo 5.31
Simulation time	300s
Simulation Area	900m x 500m
Number of Nodes	42
Background traffic sources UDP	0,1,2,3,âĂę,19,20
Tx Range	150m
Speed	Distributed normal, binomial, geometric and exponential. With average 16m/s
MAC Protocol	IEEE802.11b - DCF
Routing protocol	AODV
Data Packet Size TCP/UDP	1000 bytes

The type of network traffic to be evaluated corresponds to TCP traffic in streaming to a transfer rate of 1Kbps, since for bandwidths greater than 20Kbps with a uniform speed of 16m/s distributed between vehicles, more than 55% of the Data transmitted is lost [22], [23]. As vehicles in a city do not have uniform speed and behavior, it is decided to evaluate speeds with different distributions and to analyze the impact they have on a VANETs.

Fig. 2. Simulation done in NetLogo

As it is analyzed TCP traffic in streaming between the Faculty of Sciences and the Gym of the University, UDP/CBR traffic is configured as traffic background or traffic that can generate other vehicles. Then, the performance metrics are analyzed in the modeling scenario (see Figure 2), for which the most important simulation parameters are summarized in Table III.

A. Metrics

1) One-Way Delay (OWD): The OWD measure is complex to obtain in relation to the Round-Trip Delay Time (RTT) measure, since the source node must send a packet with a timestamp, and this must be compared with the timestamp of

the destination node, making it necessary for the clocks of both end nodes to be synchronized. In an actual implementation it is required that each raspberry pi contain a GPS (Global Positioning System) module that provides a clock reference signal to each of the end network cards, or synchronize with the internal clocks of each card. For the case dealt with in this article, the synchronization is performed by the host where the simulation is executed in NS2 and by means of an awk script applied to the trace of the simulation; this measurement can be obtained[24]. The expression to evaluate the OWD is:

$$\Delta T_{ij}^{k} = x_{ij}^{k} - \tau_i + \tau_j \tag{1}$$

that is, the test packet k as it moves from the $i-th$ transmitting node to the $j-th$ receiving node is represented by the plus the time difference between the two clocks is τ. This time offset can be estimated as the difference of time zero time $Time_0(t_0)$ (reference time) and the time of sending of the package i $(Time_i(t_0))$, that is:

$$\tau_i = Time_0(t_0) - Time_i(t_0) \tag{2}$$

2) Normalized Routing Load (NRL): The NRL can be defined as the total number of routing packages transmitted per packet of data. This measure estimates the overhead of the routing protocol; That is, how many routing or control packets need to be added to a data packet to discover, transport and maintain a route that can successfully transport the data packets to their destination[25]. The NRL is determined as:

$$NRL = \frac{p_{rc}}{p_d} \tag{3}$$

where p_{rc} is the total number of routing and control packets sent, p_d is the total number of data packets sent.

3) Packet Delivery Ratio Normalized (PDR): The PDR is the traffic ratio between the number of packets transmitted by a source node and the number of packets received by a destination node. It measures the packet loss rate in the User Datagram Protocol (UDP) and Transmission Control Protocol (TCP) transport protocols[26]. The PDR is given by:

$$PDR = \frac{\sum p_r}{\sum p_d} \tag{4}$$

Where p_r is the total number of packets received at the destination node and p_d is the total number of data packets sent.

4) Throughput: Throughput is the number of packets successfully delivered per unit of time, controlled by the available bandwidth. For the purpose of this article it will be understood as the measurement from the arrival of the first data packet on the receiving node, during a time window, in this way is also interpreted as the satisfactory rate of transmissions[27]. It is defined as follows:

$$T_{hr} = \frac{\sum p_r \cdot 8}{T_{ts} \cdot 1000} \tag{5}$$

where p_r is the total number of packets received at the destination node and T_{ts} is the total time it takes the packets to be transmitted.

B. Speed distributions

The vehicle movement dealt with in this article was made by 40 vehicles with the following distributions of speed:

- Normal: rnorm(40, mean = 16, sd = 3)
- Binomial: rbinom(40, 16, 0.75)
- Geometric: rgeom(16, 0.18)
- Exponential: 20*rexp(16, rate = 6)

Most of the proposed distributions have an average speed of 16m/s, which is equivalent to 57.6K/hour. The distributions were made in the statistical software r and its histograms are shown below:

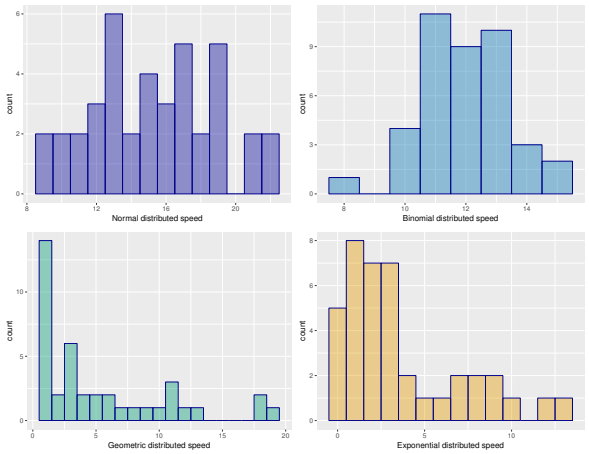

Fig. 3. Histogram of velocities

V. Results

The experiment was characterized by 42 nodes/agents, to which an independent speed was assigned to each one. The assigned speeds did not depend on any speed of another vehicle, therefore, in NetLogo, no rules were assigned for the safety distance, reaction distance and braking distance between the nodes/agents. For the delay (See Figure 4), it is observed that the results obtained with the normal distribution are higher regarding the other distributions, since the average speed of this distribution is greater than the others. In contrast, with the exponential distribution, the average velocity was the lowest of all distributions. In networks it is generally characterized by the Quality of Service (QoS) and the delay is one of the metrics that help to characterize it, however, this metric is not decisive within the realized experiment.

The obtained results are in accordance with the average speed obtained, for the normal distribution, an average speed of 15.31m/s, binomial of 11.97m/s, geometric of 5.32m/s and exponential of 3.61m/s, values which are proportional to the delay and results obtained. The TCP data traffic in VANETs is sensitive to packet loss by mobility; again, in Figure 6, it is observed how speed affects packet loss. Data traffic in

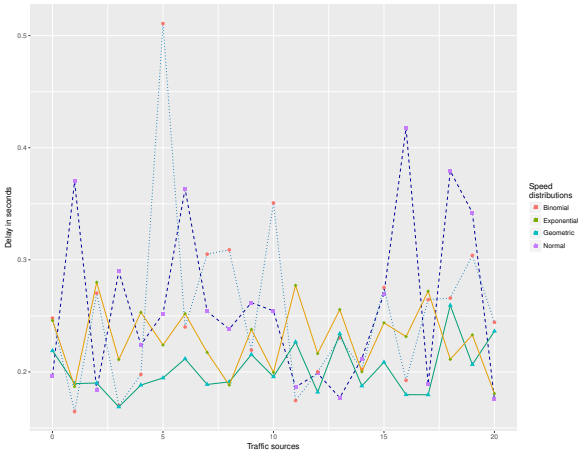

Fig. 4. End-to-end delay

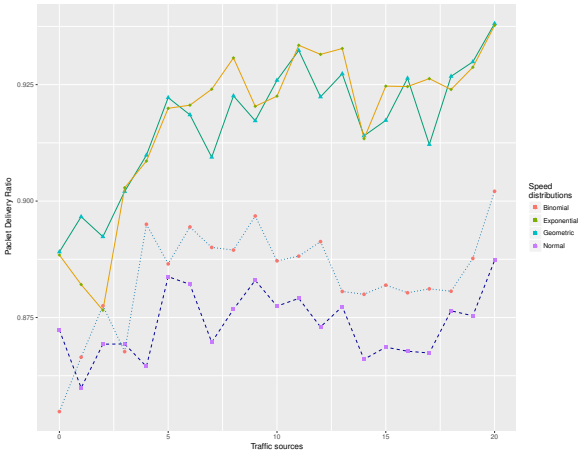

Fig. 6. PDR Normalized

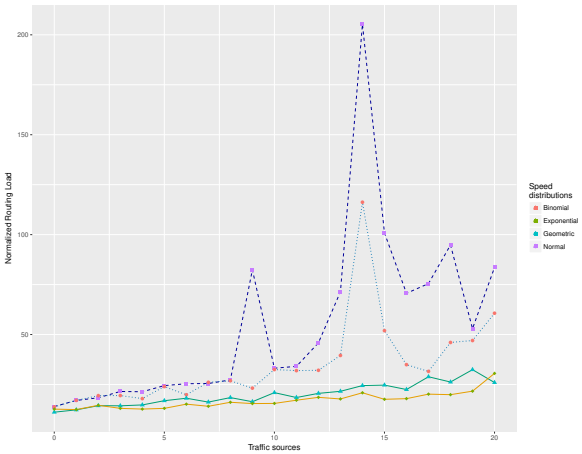

Fig. 5. Load Normalized Routing

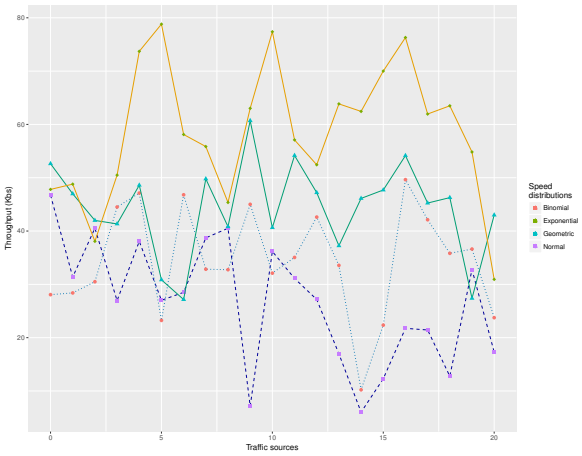

Fig. 7. Throughput (kbps)

TCP is characterized by ensuring the integrity of information in networks with infrastructure, such as the Internet, but in the case of VANETs and topological dynamics, TCP cannot guarantee the total integrity of the streaming data flow, for the obtained results was obtained for all distributions, the "guarantee" of 85% of the data in destination node, losing 15% of data in streaming, noting a proportion of data loss according to the velocity distribution evaluated.

In the experiment proposed in VANETs networks, we observe how the data are grouped according to the distributions, we observe similar behavior trends between the Normal and Binomial distributions, and between the geometric and exponential distribution. The NRL presents for a flow streaming of data in TCP of 1kps, a behavior proportional to the background routing increased by the traffic sources, such is the case, that for 14 traffic sources a maximum value is found in the metric of the NRL, while That for this same value of traffic sources, there is a notorious minimum in the Throughput metric. Related to these graphs the bandwidth is affected by very high NRL values, finding that the NRL is inversely proportional to the Throughput.

VI. Conclusions

In a TCP streaming, the data flow in VANETs for low-hop transmissions the information is lost, and although TCP mechanisms are related to retrieve the transmitted data, the dynamic topology of the VANETs prevents this retrieval of information. This generates an increase of control and routing packets of the network protocol that is being used and is reflected in the increment of the NRL.

Respect to the Background traffic, which corresponds to traffic sources, it is observed in the results of the VANETs networks proposed experiment, which is stable for the first four traffic sources, for the results of the following traffic sources, there is an increase in the NRL that is also reflected in the decrease in Throughput.

As for the PDR and OWD, their behavior is a little varied; we do not note points that characterize the flow of TCP data streaming in the experiment. Due to the results obtained it is not advisable to carry out data transmission from end to

end in TCP for VANETs of high mobility, it is advisable to periodically send packets of data, in such a way, that the integrity of the information in the communication can be guaranteed. On the other hand we evaluated the integration of NetLogo with NS2, by the power of the multiagent modeling that presents NetLogo. For future scenarios, we could consider experiments that combine different types of networks and their integration in NS2, since it is possible to deepen the modeling of multiple scenarios, such as MANETs, VANETs, WSN, FANETs, among others.

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A Wide Band Speech Coding Technique using Low Delay Code Excited Linear Predictive Algorithm (LD-CELP)

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***Abstract* – A fair level of speech quality is desired in speech transmission for mobile voice services. The effective utilization of bandwidth and higher bit rate is must for a best quality speech coder. But at a time the both requirements are not fulfilled in desired format. The research is ongoing in the area of designing speech coder's. In general the CELP is an algorithm to design a good quality speech coder. From 80's to present the advancement in this technique is going on. In this paper a wide band speech coding technique is proposed using LD-CELP algorithm. The overall performance of LD-CELP (16Kbps) is summarized and computed on MATLAB version R2016a with parameters MSE and SNR. In conclusion we observe that SNR for LD-CELP is not much better and enhancement in this is necessary.**

Key Words — Speech coding, CELP, LD-CELP, Perceptual weighted filter.

I. INTRODUCTION

In present era, digital representation of voice signals is necessary for transmission of those signals over wireless channels. The limited bandwidth and more power requirements are major issues for enhancement in this field of technology. After converting the voice data into time domain representation the process of speech coding is applied on the data. Basically there are two types of speech coding technique-

1. Waveform Coding Techniques (Time Domain) - (PCM- Pulse code, DPCM-Differential Pulse Code ADPCM- Adaptive Differential Pulse Code) Modulation.
2. Parametric Method- LPC (Linear Predictive coding), RELP, MELP, CELP (Residual excited, Mixed excited, Code excited)

The quality of speech is provided by the encoded bit rate of the speech signal. According to bit rates the classification of speech coders is as follows –

a) High bit rate (HBR) coders: bit rate >16 kbps.
b) Medium bit rate (MBR) coders : bit rate 5-16kbps
c) Low bit rate (LBR) coders : bit rate 2-5kbps
d) Very Low bit rate (VLBR) coders : <2kbps

The concept for LD-CELP is based on the parametric coding. In parametric coding the Pulse code modulated data is excited to fetch the filter coefficients at encoder side. The filter coefficients are extracted with the help of linear predictive filter which works on forward and backward error prediction method. After that the Levinson-Durbin method is used to reduce the errors and complexity of the filter. The block diagram representation of linear predictive filter is shown in Fig.1 given below.

The algorithm is given by the formula given below:-

$$y(n)= \sum_{i=1}^{N} ay(n-i) \quad (1)$$

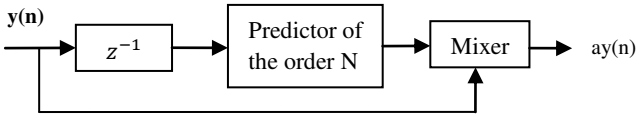

Figure 1: Block Diagram of Linear predictive filter

II. CODE EXCITED LINER PREDICTION (CELP)

CELP is originally proposed by M. R. Schroeder and B. S. Atal in 1985. The basic principle of CELP is based on linear prediction, the digitized voice signals are highly correlative waveform. Each sample is represented as the combination of previous samples. The coefficients a_1, a_2 ….. a_N are linear prediction coefficients which are basically generated by Levinson Durbin algorithm and abbreviated as LTP (Long Term Predictor) coefficients. The CELP coder is a parametric coder hence it is work on the principle of 'Analysis by Synthesis' [2]. A Codebook is used to track the variation in input coded speech and analyzed by the fixed generated code whereas in waveform coding techniques the synthesis is done on the real data sequence and thus it required large bandwidth and time as per compared to CELP coders or parametric coders. A fixed codebook provide initial code vectors for data bit comparison and hence the high quality of speech is attained

at much lower bit rate then waveform coders thus the bandwidth is optimized as compared to waveform coders.

A. Low Delay - CELP

The total coded delay for CELP is 20ms which is not acceptable for high speed voice decoding thus, in an advancement for this a new version of CELP was designed in may 1992 and officially adopted as the CCITT G.728 standard for 16kbps speech data transfer, which is called LD-CELP (Low delay Code excited linear prediction) basically the delay for this coder is less than 5ms and the transmission rate is 16kbps [3].

The next target for researchers is LD-CELP for delay less than 2ms and speech data transfer rate will be 8Kbps, which is again the high quality bandwidth optimization.

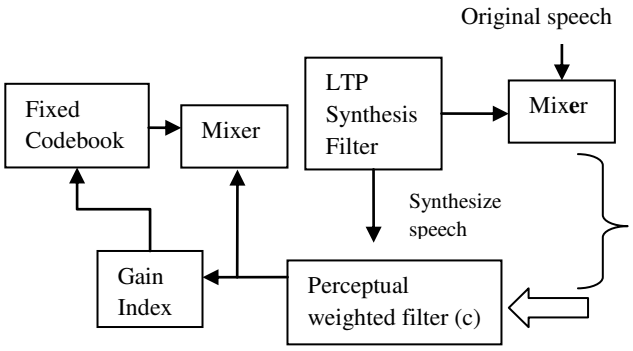

Figure 2: CELP Coder Block Diagram

B. Perceptual weighted filter

The perceptual weighted filter technique is usually used to provide improved speech quality and for minimizing the MSE (mean square error) in CELP coder [4]. This weighted filter used LP (Linear Predictive) analysis for generate autocorrelation function between noise and coded speech.

This process is also called as noise shaping of the signal. The perceptual optimization is a close loop system in which all possible combinations of speech signal is checked for every decoded bit sample with the help of the generated Fixed Gaussian codebook, and only one of them is stored for output which is having the best quality decoded speech among all of them.

The value for the perceptual weighted filter is set as constant value (c) the appropriate time delay is generated by the system in the output stream for best noise level detection and to get the efficient results for overall synthesis of the signal. The typical values for c are in between 0.5 to 0.9. The perceptual weighted filter is a linear filter and the time domain representation of this filter is given by the formula –

$$W(n) = \sum_{i=1}^{N} \frac{a(ni)}{a(ni/\gamma)} \quad (2)$$

$$W(z) = 1 - \sum_{i=1}^{N} \left(\frac{aiz^{-1}}{aiyz^{-1}}\right) \quad (3)$$

Here the $a(ni)$ represent the nth order LP coefficients and the γ is a perceptually weighting factor, the factor γ is taken as constant value depending on the channel conditions. This factor is usually used for enhancing the bandwidth for some particular instants.

III. RESULT AND DISSCUSSION

Here, a detail performance analysis of LD-CELP 16kbps with perceptual weighted value c=0.85, and c=0.65 (constant) is presented. These simulation based comparative analyses illustrate the output speech quality in terms of SNR (signal to noise ration) and MSE (mean square error) of proposed speech coding technique.

IV. EVALUATION AND ANALYSIS

Analysis of 16kbps LD-CELP is done with the MATLAB simulating software version R2016a. The coder is designed to take audio speech samples at 8 kHz and output is observed in 16kbps. The extension for audio input file is (.wav) and total duration of this sample sound is 8sec. The audioread command is used in MATLAB to read audio voice sample as the (.wav) command is not working properly with MATLAB R2016a version. The x axis is used for time intervals and y axis is used for amplitude of coded audio data. The audio wave is generated 73113 sample points which are further compressed to 100 samples to find out the LP coefficients. The ‘hello’ file is taken as input audio and ‘xhat1’is decoded sound file in 16kbps sampled format for CELP. Finally the experiment is performed for different values of c.

Firstly the LP analysis is done by the Levinson Durbin algorithm and the LP coefficients were calculated. The coefficients are real value samples. The graph for original speech is shown in Figure 3(a) and graph of LP coefficients is given in Figure 3(b). The comparison graph between original speech and 16kbps LD-CELP is given in Figure 3(c) and finally the input and output waveform shown together in graph with perceptual weighted constant value (c) is 0.85 on Figure 3(d) and 0.65 on Figure 3(e).

V. COMPARISON OF VARIOUS PARAMETERS

A. SNR

SNR is basically signal to noise ratio. The two signals ‘hello’ (original) and ‘xhat1’ (16kbps CELP) are the signals for comparison. Firstly mean square values are calculated then directly the command applied for SNR value

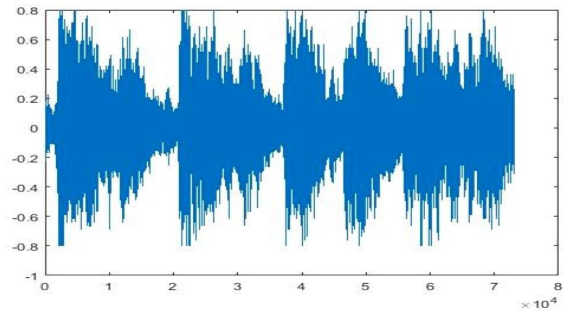

Figure 3(a): Original Speech signal sampled at 8 KHz

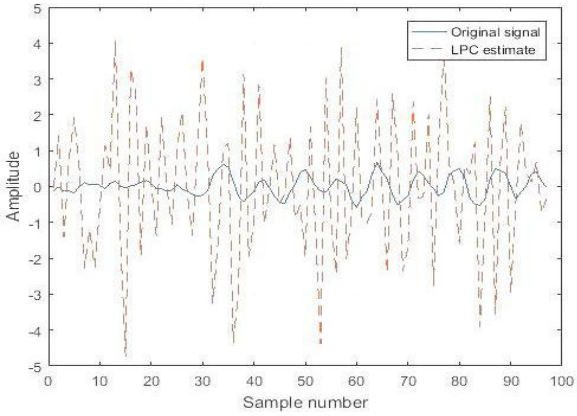

Figure 3(b): LP coefficient estimate

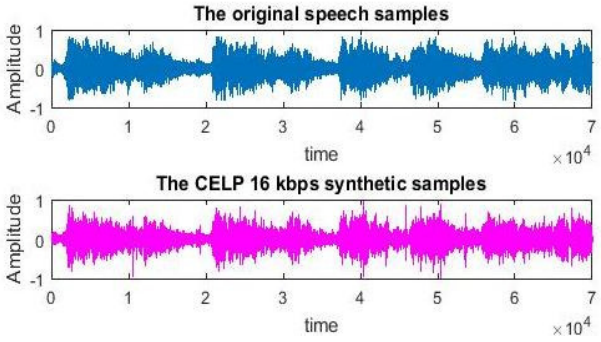

Figure 3(c): Graph between 16kpbs LD-CELP and original signal

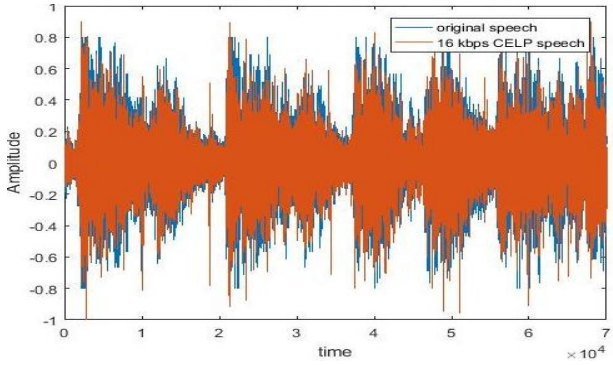

Figure 3(d): Comparison between 16Kbps LD-CELP and original speech in one graph with c=0.85

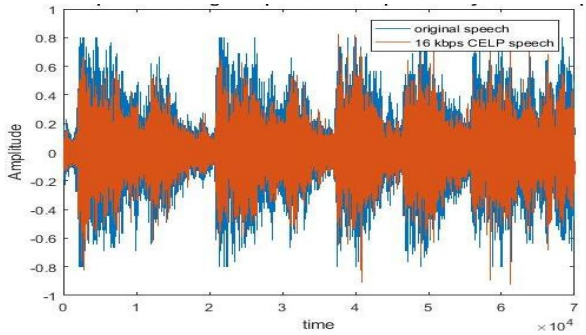

Figure 3(e): Comparison between 16Kbps LD-CELP and original speech in one graph with c=0.65

B. MSE

The MSE is mean square error estimation of speech signals. In MATLAB MSE is calculating with the command -: mean ((desired - mean). ^2).

Table I shows the MSE (mean square error) of the 16 kbps LD-CELP compared with original 'hello' signal. From Fig. 4 it is concluded that for higher value of c the MSE is higher.

Table I

Speech signal	**MSE estimation in dB**		**Comment**
	c=0.65	c= 0.85	
'hello'	0.0385	0.0385	Original signal
'xhat1'	0.0217	0.0274	16 kbps decoded speech

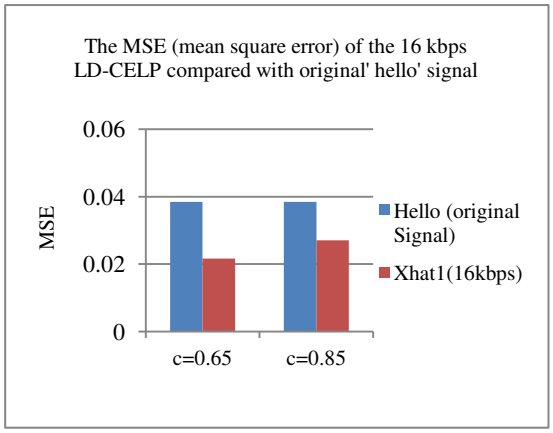

Figure 4: Graphical representation of the MSE (mean square error) of the 16kbps LD-CELP compared with original 'hello' signal.

Table II shows the Signal to noise ration of the 16 kbps LD-CELP compared with original 'hello' signal. From Fig.5 it is concluded that for higher value of c lower the SNR.

Table II

Speech signal	SNR estimation in dB		Comment
	c=0.65	c= 0.85	
'hello'	109.704	109.662	Original signal
'xhat1'	98.367	85.009	16kbps decoded speech

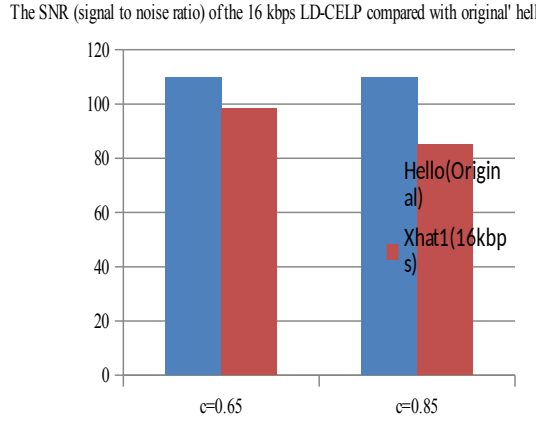

Figure 5: Graphical representation of the SNR (Signal to noise ratio) of the 16kbps LD-CELP compared with original ' hello' signal

VI. CONCLUSION

In this paper, the Low Delay Code excited linear prediction (LD-CELP) algorithm for 16kbps is simulated. The 16kbps coder is designed using MATLAB simulation software. The linear prediction technique is used to find the coefficients for generation of fixed Gaussian code book and the whole parametric coding technique works on the 'Analysis –by- Synthesis' concept. Finally the parameters for coder comparison are evaluated and from graphical as well as from estimation values it is clearly shown that the coder is totally depend on the value of perceptual weighted constant (c). The comparison shows the results that the lower value of (c) is desired for better reconstruction of original speech signal for LD-CELP. Still the observations for SNR are not much better and enhancement in this technique is required for best speech quality.

VII. FUTURE SCOPE

LD-CELP for 16 kbps is a parametric speech coder based on LP analysis the calculated SNR value for output speech is not good as per requirements of present day Digital Telephony. So advancement in this technique is necessary.

The other coders are also designed for better voice quality for speech as well as data services like iLBC and EVS. The frame independency is achieved with the help of adaptive codebook rather than fixed code book in iLBC. In 2014 recently 3Gpp standardized a new codec 'Enhance Voice Services' (EVS) codec which is the latest advancement in speech coding [7],[8]. The work for better quality speech and bandwidth optimization is continuing for the best outcomes, as the Digital Telephony expanding day by day.

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Realization of Colpitts Oscillator using second generation current controlled current conveyor

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***Abstract*—An inductor-less tunable Colpitts oscillator using second generation current controlled current conveyor (CCCII) is implemented. The circuit uses a CCCII and three grounded capacitors. The passive inductor has been replaced by an active inductor [14] connected to the ground. Thus the absence of external resistor and an inductor in the circuit makes it more complacent for IC Design. The frequency of oscillation can easily be electronically adjusted. The PSPICE simulation results have been deduced. The theoretical results are verified with the parameters of BJT PR100N (PNP) and NR100N (NPN) using PSPICE simulation tool.**

***Index Terms*—Inductor-less tunable, Colpitts oscillator, active inductor, CCCII**

I. Introduction

An oscillator circuit is an electronic circuit that produces signal of repetitive oscillations, often a sine wave or a square wave [1] . Over the last three decades or so various schemes of the design of the R-C oscillator, based on various current conveyors have been developed [2-4]. The generation of oscillation was invented by Edwin Henry Colpitt's (1872-1949) [6]. The Colpitts oscillator is mostly designed for generation of high frequency oscillations. The Colpitts oscillator is the exact opposite of the Hartley**;** instead of using a tapped inductance, Colpitts oscillator uses a tapped capacitor. In 1966 [7] introduces, a new analog building block for high frequency application named as current controlled current conveyor. The most important advantage of current conveyor, compared to the operational amplifier provides high electronic tunablility, wide bandwidth, and low power [8] etc. Colpitts oscillator design is available in various forms like: RF Chaotic Colpitts oscillator [9], BJT transistors based oscillator [10-12], Colpitts oscillator using ICCII [13], complementary Colpitts oscillator in CMOS technology [14].

The purpose of presenting work is to analyze and exploit the CCCII based current mode oscillator circuit [2-6] which uses only three CCCIIs and two grounded capacitors. The previously introduced concepts were partly reflected and extended, especially in the following points:

- Inductor has been replaced by the CCCII based Active Inductor [15].
- No resistance and inductor have been used in proposed circuit.
- Minimum number of components (only three capacitors) has been used.
- The frequency of oscillations for active mode inductor-less Colpitts oscillator has been adjusted by bias current I0 and capacitor values individually.

Also a simulation and experimental implementation of the Colpitts oscillator circuits performed using commercially available IC AD844AN.

II. Circuit Description

A. Second generation current controlled current conveyor (CCCII)

Active block CCCII [8] can provide electronic control in various circuits like in filter [16], sinusoidal oscillator [17] etc. The circuit symbol of the CCCII and its trans-linear circuit is shown in Fig.1. Further use I_X and I_Y to denote current and V_X and V_Y to denote the voltage at terminal X and Y, respectively, and $R_x = \frac{V_T}{2I_o}$ to denote intrinsic series input

resistance of a trans-linear mixed loop (Q1 to Q4) at the X port has electronically tunable via I_0 and V_T = 26 mV is the thermal voltage at room temperature.

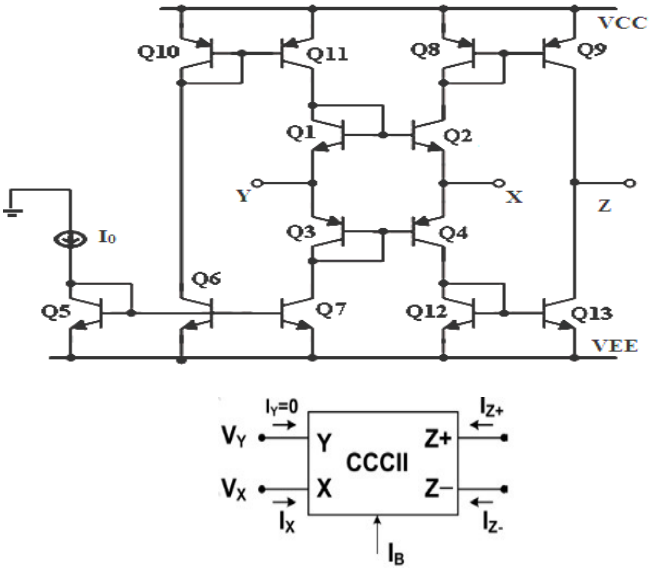

Fig.1. Symbol of CCCII and its trans-linear circuit

The Standard port relationships of CCCII are given below:

$$\begin{aligned} I_Y &= 0 \\ V_X &= V_Y + I_X R_X \\ I_Z &= I_X \end{aligned} \qquad (1)$$

B. Active Inductor connected to ground [15]

An inductor based on two current conveyors and a capacitor [15] has been realized.

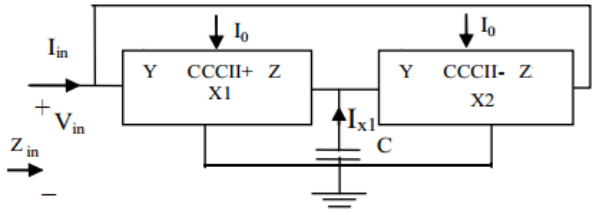

Fig. 2. The realization of an inductor connected to ground [15]

Fig.2 depicts the realization of inductor design by taking into account the presence of both parasitic resistors R_{x1}= R_{x2}=R_x Here we have considered input impedance which is the ratio of input voltage V_{in} and input current I_{in} as given by the equation below:

$$Z_{in} = \frac{V_{in}}{I_{in}} = s(\mathrm{R_x})^2\,\mathrm{C} \qquad (2)$$

Which is equivalent to the standard form of reactive inductance (sL):

$$L = \mathrm{R_{x1}R_{x2}C} \qquad (3)$$

C. Inductor-less Colpitts oscillator circuit and tunable frequency

The inductor-less active mode Colpitts oscillator has well designed using two grounded capacitors and tunable active mode inductor with analog building block CCCII as the active device shown in Fig.3.

The CCCII based active mode amplifier's X terminal has been connected to the junction of capacitors i.e. series connection of C_1 and C_2 (center of the two grounded capacitors) which are placed across a common inductor L acting as a simple voltage divider. The characteristic equation of active mode inductor less Colpitts oscillator is written as:

$$s^2 + \frac{1}{R_X C_1 \mathrm{R_{x2}}\,\mathrm{R_{x3}C_3}}\,s + \frac{C_1 + C_2}{C_1 C_2 R_{x2}\,R_{x3} C_3} = 0 \qquad (4)$$

C_{eq} is the equivalent capacitor of C_1 and C_2 which are connected in series and is given as.

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} \text{ or } C_{eq} = \frac{C_1 C_2}{C_1 + C_2} \qquad (5)$$

The frequency of oscillations for active mode inductor-less Colpitts oscillator is determined by the resonant tunable frequency which is given as:

$$f_r = \frac{1}{2\pi\sqrt{R_{x2}\,R_{x3} C_3\,C_{eq}}} \qquad (6)$$

Where, $\mathrm{R_{X2}}$, $\mathrm{R_{X3}}$ represents the intrinsic resistance of the conveyor at the X terminal of CCCII which is adjustable via $\mathrm{I_0}$, which gives the tunable active inductance value. If R_{X2} = R_{X3} = R_X ($R_X = \frac{V_T}{2I_o}$), resonant tunable frequency f_r given as:

$$f_r = \frac{1}{2\pi R_x\sqrt{C_3\,C_{eq}}} \qquad (7)$$

Also written as:

$$f_r = \frac{I_0}{\pi V_T\sqrt{C_3\,C_{eq}}} \qquad (8)$$

Here, (8) show that frequency of oscillations for active mode inductor-less Colpitts oscillator is directly adjusted by bias current I_0 and grounded capacitances of equivalent capacitor. The concept of grounding of capacitor and absence of passive resistance provides advantage of monolithic IC implementation [18]. This fact is also supported by the Fig.4 which shows the variations of frequency of oscillation w.r.t

capacitor, when bias current is constant and fixed at I_0 = 100µA, here value of frequencies are decreasing as the capacitor values are increased and further Fig.5 shows the variation of the frequency of oscillation with bias current I_0 for two different fixed values of capacitances i.e for 1pF and 10pF respectively. Here frequency has been increased by the value of bias current.

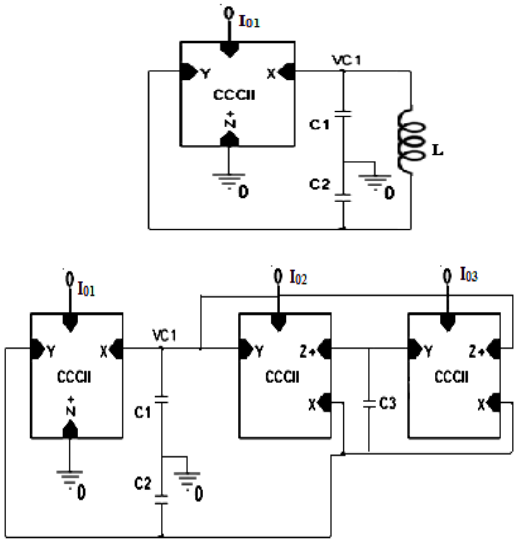

Fig.3.Inductor-less active mode Colpitts oscillator using CCCII

III. SIMULATION

The proposed active mode inductor-less Colpitts oscillator circuit is simulated with ORCAD 10.5 in which the circuit is implemented with CCCII using the model parameter [19] with power supply voltages fixed at $V_{ss} = -V_{ss} = 2.5\,\text{Vdc}$ and bias current I_0.

The active mode inductor less Colpitts oscillator circuit has been designed with capacitor values of $C_1 = C_2 = C_3$= 5.6 nF.

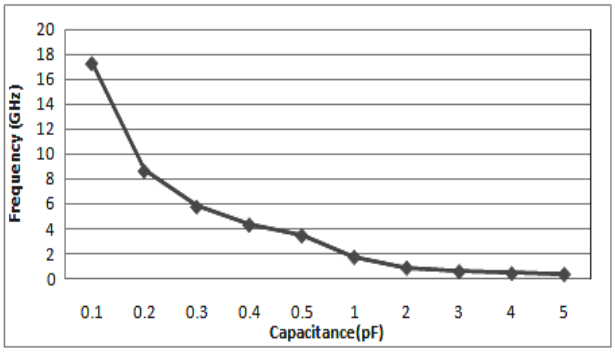

Fig.4. Variations of the frequency of oscillation with capacitor, when bias current is constant (I_0 = 100µA)

Finally, after simulation, practical realization is performed using AD844AN and three capacitors to confirm theoretical analysis. The DC power supply voltages were taken as ±12V and $C1 = C2 = C_3$ = 5.6 nF ±5%. The main advantage of the proposed structure is that no resistance is required in the design. The observed frequency of 38.76 MHz is closer to in the simulated value of 40.22 MHz. The obtained experimental results in DSO are depicted in Fig.6.

IV. COMPARISON

The literature survey reveals that a wide variety of circuits have been studied by researchers. In this research work an effort has been made to study and improvement has been achieved. Proposed active mode tunnel diode has several advantages over earlier reported circuits [9-14]. Oscillator circuit has been designed using second generation current controlled current conveyor (CCCII) as active block. The frequency of oscillations for active mode inductor-less Colpitts oscillator has been adjusted by bias current I_0 and capacitor values individually as shown in fig.4 and fig.5.Also a practical and experimental implementation of Colpitts oscillator circuit has been performed using commercially available IC AD844AN.

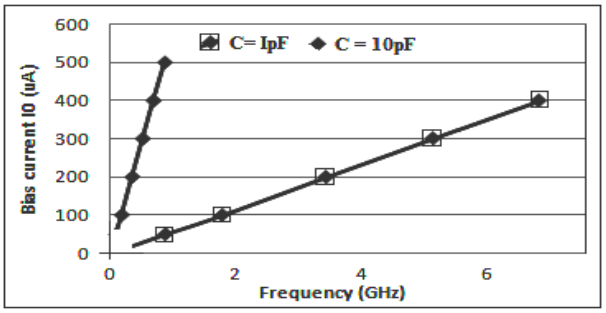

Fig.5. Variations of the frequency of oscillation with bias current I0 when capacitor values is constant (1pF and 10pF)

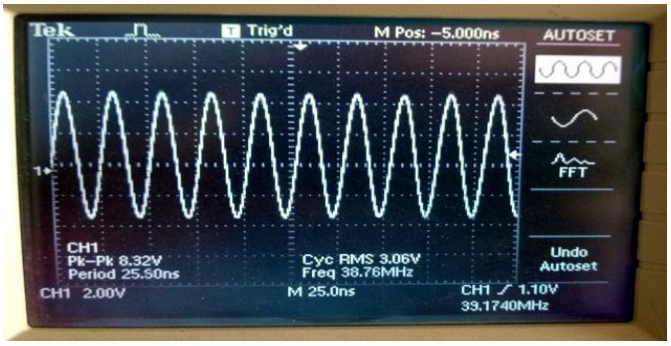

Fig.6. Experimental results: transient response at 38.78 MHz

CONCLUSION

A new active mode inductor-less tunable Colpitts oscillator circuit using CCCII (38.78 MHz) was proposed with apart from offering almost all the advantage like less number of hardware only capacitor are used no inductor and resistor is used for simulation which is the best for IC fabrication. The proposed approach is verified through PSPICE simulations and commercially available IC AD844AN.

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A Conjoint Analysis of Road Accident Data using K-modes Clustering and Bayesian Networks (Road Accident Analysis using clustering and classification)

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***Abstract*— Road and traffic accidents are one of the important concerns in today's world. Every country receives a huge damage from road accidents in terms of public health and property loss. Therefore, road accident analysis plays an important role in public health domain. Road accident analysis is performed in order to identify the associated factors that are responsible for road accidents. Knowledge of these factors would be very useful to understand the circumstances of road accidents and can be used to avoid the road accidents. One of the problems in accident analysis is that most of the road accident data is of biased nature. For example, the critical road accidents are very few in comparison to slight/minor injury accidents. Various studies has focused that clustering prior to analysis can increase the efficiency and accuracy of classification. The motive of this study is to perform a conjoint analysis on road accident data, to investigate improvement in the performance of classification of unbiased data after clustering.**

***Index Terms*—Clustering; Road Safety; Bayesian Network; Accident Analysis**

I. Introduction

Road and traffic accident [1] is one of the biggest harm received from the transportation to the public health. Transportation systems itself is not responsible for these traffic accidents but several other factors [2, 3]. These factors can be defined as environmental factors such as weather and temperature, road specific factors such as road type, road width, and road shoulder width, human factors i.e. wrong side driving, excess driving speed and other factors. Whenever a road accident took place in any road across the world, some of these accident factors are involved. Also, these factors and their influence on road accident are not similar in all countries; but they influenced every road accidents in different countries in different ways. Several studies [4-13] have focused on identification of these factors so that relationship between accident factors and accident severity can be established. This relationship can be utilized to overcome the accident rate by providing some preventive measures [13]. Analysis of road and traffic accidents is widely known as road and traffic safety in which outcome of accident analysis can be utilized for traffic accident prevention. The literature in the traffic safety domain is quite rich as it consists of several research studies [14-20] on road accident data analysis using several techniques such as statistical techniques, mathematical models, data mining and machine learning techniques. It has been observed that classification accuracy is one of the most important parameter to evaluate the performance of the classifier on certain data sets. But, if the data is not balanced or if the distribution of target attribute class values is not uniformly distributed, the classifier accuracy can be biased. In this study, we are using k-modes clustering and Bayesian networks to perform a conjoint analysis on imbalanced road accident data from Leeds, UK in which severe injury accidents and slight injury accidents has a large difference in accident counts. The results reveal that although conjoint analysis on imbalanced data is efficient enough to improve the accuracy of classifier but it is not guarantee that all clusters will achieve a biased classification or improved performance that ca n be achieved without clustering. The organization of the paper is as follows: The section 2 will discuss about the data set used and the methodology adopted for this study. Section 3 will discuss the experimental results and discussion. Finally, we conclude in section 4.

II. Materials and Methods

A. Data Set

The data set used for this study is obtained from Leeds, UK [21]. The data set consists of 14 attributes and 1246 accident records over a period of five years from 2011-2015. The

accident attributes in the data are geo-coordinates of the accident locations, number of vehicles, accident date, time, month and year, type of victim, sex of victim, type of accident, severity of accident, type of vehicle, road type, road surface conditions, weather conditions etc.

B. Cluster Analysis

Clustering [22] provides homogeneous segments out of the large data set. Usually, clustering is applied on large data set in which class labels are missing. After clustering, homogeneous segments are achieved, this can be assigned with a label after investigating the properties of the data objects in the group. We have used k-mode clustering technique to segment our accident data into homogeneous groups. K-modes algorithm [23] is an enhanced version on traditional k-means algorithm with only difference of the similarity measure that is given as follows.

The distance function of k-modes algorithm can be defined as,

$$d(A,B) = \sum_{i=1}^{x} \delta(A_i, B_i) \quad (1)$$

Where,

$$\delta(A_i, B_i) = \begin{cases} 1, & If(A_i = B_i) \\ 0, & If(A_i \neq B_i) \end{cases} \quad (2)$$

Given a set of categorical data objects D defined by n attributes A_1, A_2… A_n. A mode of D = {D_1, D_2…., D_n} is a vector V= {v_1, v_2…,v_3} that minimize

$$d(D,V) = \sum_{i=1}^{n} d(D_i, V) \quad (3)$$

K-modes algorithm is quite suitable for nominal or categorical data sets. Our accident data consists of categorical attributes; hence we have selected k-modes clustering for road accident analysis. The procedure of k-modes algorithm is given as follows:

K-mode clustering Algorithm:

Input: Data set D, k number of cluster to be formed

Output: k clusters

1. Initially select k random objects as cluster centers or modes
2. Find the distance between every object and the cluster centre using k-modes distance measure
3. Assign each object to the cluster whose distance with the object is minimum
4. Select a new center or mode for every cluster and compare it with the previous value of centre or mode; if the values are different, continue with step 2.

C. Number of Cluster Selection

In order to determine the number of clusters to be formed out of the data, Bayesian information criteria (BIC) is used [24]. The BIC criteria can be defined in Eq.4.

$$BIC = -2\log L + p \log(n)) \quad (4)$$

Where, p is the number of model parameters and n is the sample size.

D. Bayesian Networks

Bayesian Networks (BNs) have proven track record in the field of data analysis. It is widely applicable to establish relationships between different set of attributes using probabilistic calculations. It has wide applications is bioinformatics, text classification, medicine, information retrieval, gaming and transportation. In BNs, the relationships between different set of variables is represented by arcs or edges in a graph, and variables are represented as nodes.The detailed desciption about Bayesian Networks can be found in [25-26].

E. Performance Evaluation Parameters

In this paper, several performance paameters [22] have been used to calculate the model fittingfor every clusters made from the data. These indicators/parameters are accuracy, sensitivity, specificity and the HMSS (Harmonic means of sensitivity and specificity) and ROC area. This indicators can be calculates using follwing equations:

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN} \times 100\% \quad (5)$$

$$Sensitivity = \frac{TP}{TP + FN} \times 100\% \quad (6)$$

$$Specificity = \frac{TN}{TN + FP} \times 100\% \quad (7)$$

$$HMSS = \frac{2 \times Sensitivity \times Specificity}{Sensitivity + Specificity} \quad (8)$$

Where, TP-True Positive, TN-True Negative, FP-False Positive, FN-False Negative.

III. Results and Discussion

This section presents the experimental analysis and discussion on results. Initially, data preprocessing is performed on the road accident data to give it a proper shape required for analysis. Several attributes are transformed into suitable form using data transformtion methods..

A. Cluster Analysis

After data selection and data preprocessing, the selected data is used for cluster analysis using k-modes clustering algorithm. The number of clusters for k-modes algorithm is determined by observing the BIC values for different cluster models. The Fig 1 illustrates the cluster selection using BIC values.

Based on fact mentioned in previous studies [27-28], a cluster model with 4 clusters is selected. Further, k-modes technique is applied on the data and the four cluster obtained. The description of these four clusters are given in Table 1.

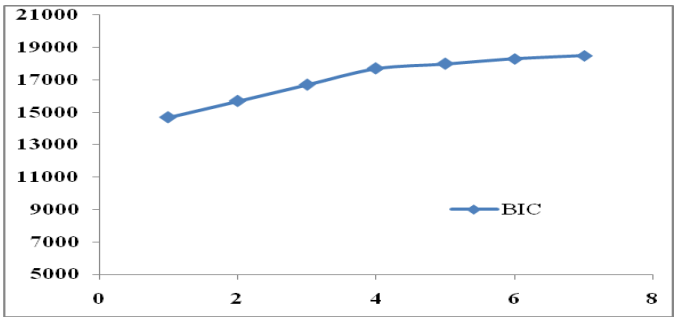

Fig. 1: Cluster selection using Bayesian Informantion Criteria

Table1: Cluster description

Cluster Id	Description	No. of accidents	Size (%)
C1	Two wheeler accidents in bad weather	196	15
C2	Other accidents in bad weather	299	24
C3	Other accident in clear weather	247	20
C4	Two wheeler accidents in bad weather	504	41

Table 2: Bayesian network performance on each cluster and whole data set

Subset	Accuracy	Sensitivity	Specificity	HMSS	ROC
C1	0.88	0.68	0.91	0.778	0.776
C2	0.85	0.59	0.94	0.724	0.874
C3	0.78	0.40	0.93	0.559	0.796
C4	0.85	0.78	0.86	0.818	0.708
WD	0.84	0.59	0.90	0.712	0.856

B. Performance Evaluation of Bayesian Network

Further, Bayesian Networks (BNs) are used to investigate the responsible factors that contribute to accident severity. Therefore, several BNs were built for each clusters and the whole data set.

The main objective of this study is to identify if some new findings are there after performing a conjoint analysis (k-modes and BN). Further, these BNs that were built for 4 clusters and whole data set were compared using performance indicators and complexity to validate the goodness of model fitting. Table 2 illustrates the accuracy, sensitivity, specificity and HMSS and ROC for each cluster and whole data (WD).

It can be seen from Table 2 that minimum accuracy is achieved in C3 and the highest accuracy is achieved in C1. As the accident data was imbalanced data, ROC values are also taken into consideration. The ROC values indicate that performance of classification is better in C2 whereas in other clusters, the ROC values are lower than the ROC value of WD. It simply indicates that although more accuracy can achieved as a result of clustering process but is the data is of imbalanced nature, it is not guarantee that efficient classification results can be achieved.

IV. Conclusion

The paper presents a conjoint analysis using k-modes clustering and Bayesian Networks on an imbalanced road accident data from Leeds, UK. The main objective of this study was to validate the performance of classification before and after the clustering process. Initially, the k-modes algorithm is used to cluster the data into 4 homogeneous groups and further these clusters and the whole data set is analyzed using Bayesian Networks. Different Bayesian Networks are built for each cluster and the entire data. Further, these Bayesian Networks are evaluated on the basis of performance indicators. The result indicates the classification accuracy is slightly improved as a result of clustering process but the ROC values are slightly decreased for some clusters. This indicates that performance of the classifier in terms of accuracy is biased towards one class value which has comparatively large number of instances. The future work will comprise of detailed analysis of these Bayesian Networks to establish the relationships between different road accident attributes to identify which attributes have higher impact on severity of accidents.

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Bilrost: Connecting the Internet of Things through human Social Networks with a Domain-Specific Language

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***Abstract*— Nowadays, we have many Smart Objects near us connected to the Internet. These objects could make things together if an easy platform existed. There are many researches about interconnecting Smart Objects but we propose a novel approach using human Social Networks and a Domain-Specific Language. This approach makes easier the creation of intercommunications not only among objects but also between objects and humans. We propose a novel DSL that allows defining objects with sensors and actuators, and defining connections to Social Networks in order to publish the sensors' values and to do actions based on events triggered by messages. Moreover, with the DSL we will be able to establish external actions and status in order to make the objects be aware of the environment.**

Keywords—Internet of Things; Smart Objects; Model-Driven Engineering; Domain-Specific Language; Social Networks

I. Introduction

Currently, the Internet of Things (IoT) is a term very popular because everybody has Smart Objects in his pocket like smartphones, wearables, tablets [1], and many others devices connected to the Internet. The possibilities of IoT are very diverse and they can include from Smart Homes [2]–[4] to Smart Earth [5], Smart Cities [6]–[8] or any type of intelligence located in heterogeneous and ubiquitous objects.

The interconnection among objects is very important in the context of the IoT. Smart Objects can be located in places separated by millions of kilometres or in unreachable places. Nevertheless, the objects can be connected and take decisions considering other Smart Objects. However, there are many problems related with the interconnections. First, there is not a unique standard or protocol that allow interacting with objects. Moreover, everybody has not knowledge about programming or creating programs that established the connection among objects or even, they have not knowledge about how to interact with objects.

The aim of this proposal is the creation of applications using a Domain-Specific Language (DSL) created applying Model-Driven Engineering (MDE) With these applications, devices with sensors or/and actuators would be connected to other devices through Social Networks. We propose the creation of a language that defines the different required aspects to define the devices, the data required by Social Networks, the sensors with their properties, the actuators with their properties and conditions that make the actuators run or make the devices publish their sensors' values.

Moreover, the usage of Social Networks prevents us from developing a specific platform and it is a solution more intuitive for people who use Social Networks daily.

The remainder of the paper is organised as follows. In Section II, we introduce involved topics in this research the works related. Section III shows our proposal, the Bilrost platform, how Bilrost DSL, called Bilrost-Specific Language (BSL), is. Section IV contains the conclusions of this paper and the possible future work that can be done from here.

II. State of the Art

In order to present a theoretical frame of our proposal, we have to talk about the Internet of Things, Smart Objects, Online Social Networks, Model-Driven Engineering, and the related work.

A. The Internet of Things

Currently, the IoT is one of the most important topics in many researches and business [9]–[12]. It could define as the interconnection between heterogeneous and ubiquitous objects between themselves.

B. Smart Objects

One important part in the IoT are the Smart Objects. They can be classified in three dimensions [13]: Level of Intelligence, Location of Intelligence, and Aggregation level of Intelligence. The first one indicates the object's intelligence. The second one describes if the intelligence belongs to the object or to the network. The last dimension indicates if the intelligence is in the element, for example, when the object is composed of various elements and each one has their own intelligence, or in the container when it is the contrary case.

Our proposal offers Smart Objects with an intelligence in the container. The other two characteristics depend on the implementation that the user made in the devices.

C. Online Social Networks

However, according to interconnect different objects, we need some network. They could be WSAN, IoT Networks or, in our case, Online Social Networks (OSNs). OSNs provide many services to create applications like identity and authorization services, Application Programming Interfaces (APIs) to read or write in timelines, receive updates, receive and send private messages, and so on. OSN is a basic piece of the Web 2.0 and the convergence of the real world with OSNs allows the development of new applications which interconnect things and humans [14].

Moreover, scientists of Ericsson [15] observed that if there is an analogy of using IoT technologies and Social Networks, people are capable of familiarising better with IoT technologies.

D. Model-Driven Engineering

Model-Driven Engineering (MDE) appeared to solve software development problems that we have had since the 1960s [16]. With MDE we can automate processes to make the creation of repetitive process easier [17]. Applying MDE, developers can abstract the problem and automate some parts to facilitate the production of similar solutions. For instance, with the creation of Domain Specific Languages (DSL).

E. Related Work

Our proposal is a novel way of intercommunicating Smart Objects using actual human Social Networks instead of common web services to publish messages. These messages could be a sensor's status or calls to actuators' actions. However, there are not very similar researches related to this proposal. Some research that deals with these issues about interconnecting objects through the Internet are based on Service Oriented Architecture (SOA) like REST [18]–[20]. However, we propose the usage of OSNs to establish the communication not only among Smart Objects but also between humans and Smart Objects. Related to the communication among objects there are some researches like [15], [21] and between humans and objects could be considered [22]–[25].

There are some IoT platforms that allow interconnecting objects like Midgar [9], [26]. Midgar uses a graphic DSL to make the creation of the interconnection easier for people without out development skills. However, Midgar has the requirement of use a server and only allows interconnecting objects whereas Bilrost does not need any server because of the usage of OSNs and allows interconnecting objects with objects and humans with objects.

However, Social Access Controller (SAC) [22] could be an approach similar to our proposal. It uses Social networks to share Smart Objects and it allows managing them and knowing their states. However, the usage of the Social Networks is very different. It uses it to share your Smart Objects with your friends in order to allow them to use it.

The interconnection not only can be done through Social Networks. Old researches used instant messages to interconnect objects and humans [23]–[25]. The principal disadvantage of this approach is the dependence on specific applications which were developed to the research whereas Social Networks are used by everybody.

III. Bilrost Platform

Bilrost platform is our proposal to investigate the possibility of interconnecting Smart Objects through human Social Networks. The usage of human Social Networks gives us the possibility of interconnecting objects in an environment enough tested by millions of real users. Moreover, these networks not only allow us to interconnect objects but also allow us to interconnect humans and objects. In this way, we would be making the Internet of Things bigger due to the addition of people to the network.

We propose the usage of a DSL to make easier the creation of the interconnections. However, in first steps, Bilrost will not be able to implement the logic to access to the sensors' values or to implement the logic to control the devices' actuators. The users will have to implement this logic in the project generated by Bilrost. So, Bilrost will be able to generate projects that will be able to interconnect objects through Social Networks but the users will have to complete them with the specific logic for each device.

Therefore, our proposal will have the two principal parts: **projects generation** and **specific logic programming**.

In this section, we will present how the generated projects will be able to interconnect objects through Social Networks and the two stages in which the user interaction will be required, the projects generation and the completion of the project.

A. Interconnecting objects through Social Networks

The aim of Bilrost will be the interconnection between objects through human Social Networks. Currently, there are many popular Social Networks like Whatsapp, Facebook, Twitter, and many others that we could use in our proposal.

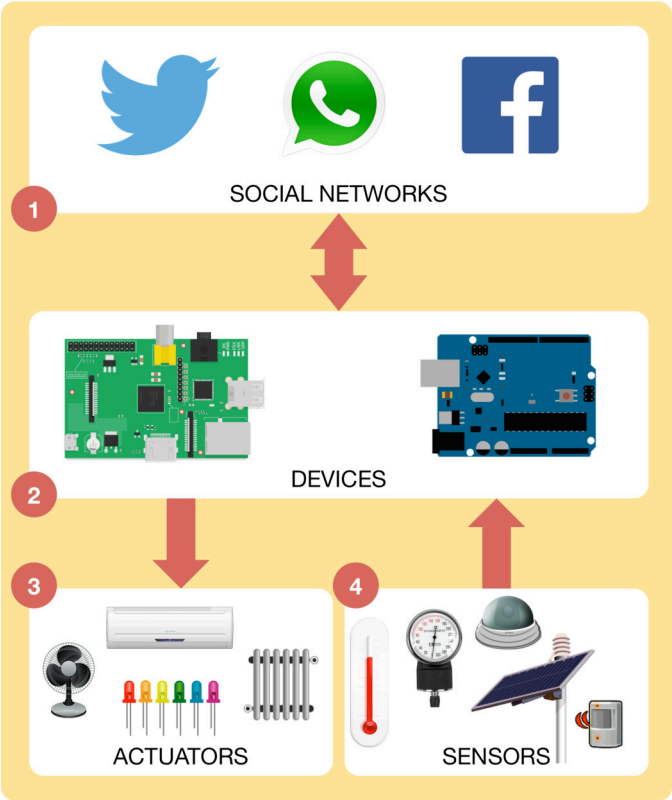

Fig. 1. Interconnection of devices through Social Networks.

However, in the first stages of our proposal, we will use Twitter because of its philosophy of short public messages and the common use of keywords, which are called hashtags.

Bilrost will create projects that devices will be capable of running. For that, we will implement a DSL that we call Bilrost Specific Language (BSL). The content of the BSL will be described in the subsection III.B. After processing the BSL program, Bilrost platform will be able to generate projects where the connection to the Social Networks will have already been implemented.

The generated projects will connect devices like Raspberry Pi or Arduino to the Social Networks selected by the users. These projects will have specific parts that retrieve the sensors' values and do actions with the actuators. As Fig. 1 shows, the devices will be connected to Social Networks in order to publish the retrieve sensors' value and to do the actuators' actions invoked by Social Networks' messages.

In order to explain how Bilrost will work, we will use a simple example. We want to interconnect a Raspberry Pi and an Arduino with several sensors and actuators. Fig. 1 represents these Arduino and Raspberry Pi as devices with the number 2, their sensors with the number 3 and their actuators with the number 4. The Arduino is controlling a door lock and it has a light sensor. The Raspberry Pi has a presence sensor and it controls the lights of a room. With Bilrost, we will be able to interconnect the two devices through a Social Network like Twitter which is represented in Fig. 1 with the number 1. If the Arduino detected that the light level is low, it would publish in Twitter, using special keywords, the level of the light. Then, the Raspberry Pi would receive the level of the light and it would turn on the light if the value sensed accomplish certain conditions. Moreover, if the Raspberry Pi detected a person, it would publish on Twitter that it detected anything and the Arduino would lock the door in order to prevent this person from going into the room.

This example will possible with Bilrost. Using the BSL, we will be able to specify the language of resulting projects, the keywords to use when publish messages or when listen messages, the usernames that the devices can listen, the tokens required by the Social Networks APIs, the actuators and their possible actions that the devices have, the sensors that the devices have and how the devices have to publish the sensors' status like the refreshing time. Furthermore, with the BSL, we will also be able to specify external states and actions. The external states will allow Bilrost to invoke actions of its own actuators when other devices publish a state that accomplishes certain conditions specified with the BSL, and the external actions will allow Bilrost to invoke actuators' actions of other devices when the state of its own sensors accomplish certain conditions also specified with the BSL.

Besides, the usage of human Social Networks will open the possibility of handle human messages like they were messages from other devices. Thus, humans will be able to manage the devices. For example, a person will be able to turn off the heating system remotely publishing a message in a Social Network or a person will be able to know the temperature of its house searching the messages published by the device that has a temperature sensor located at his house.

However, there is a limitation of our proposal. In the early stages, the user will have to implement the access to the sensors' values and the invocation to actuators' actions inside of the projects generated by Bilrost. Bilrost will have the capacity of using users' implementation without any other interaction.

B. The User Interaction

Bilrost will use a DSL, called BSL, to define devices with actuators and sensors, and also, to define the Social Networks that it will use to connect the devices and the external actions and events that the devices will listen through the Social Network. However, the user interaction is required to define the BSL that generates the projects and to complete the generated projects as Fig. 2 shows. In this section, we will explain these two stages.

1) Projects Generation

In order to generate a project that connects a device to a Social Network, firstly, the user will have to define the device using BSL. With BSL, the user will be able to define the programming language of the generated project thinking in the device where the project will run. Running the project on a smartphone is not the same than running the project on a Raspberry Pi because the first one needs programs programmed with Java language and the second one needs programs programmed with Python language. However, due to our proposal, the users do not need advanced programming knowledge in these languages because they only will have to implement the access to the sensors' values and the actuators'

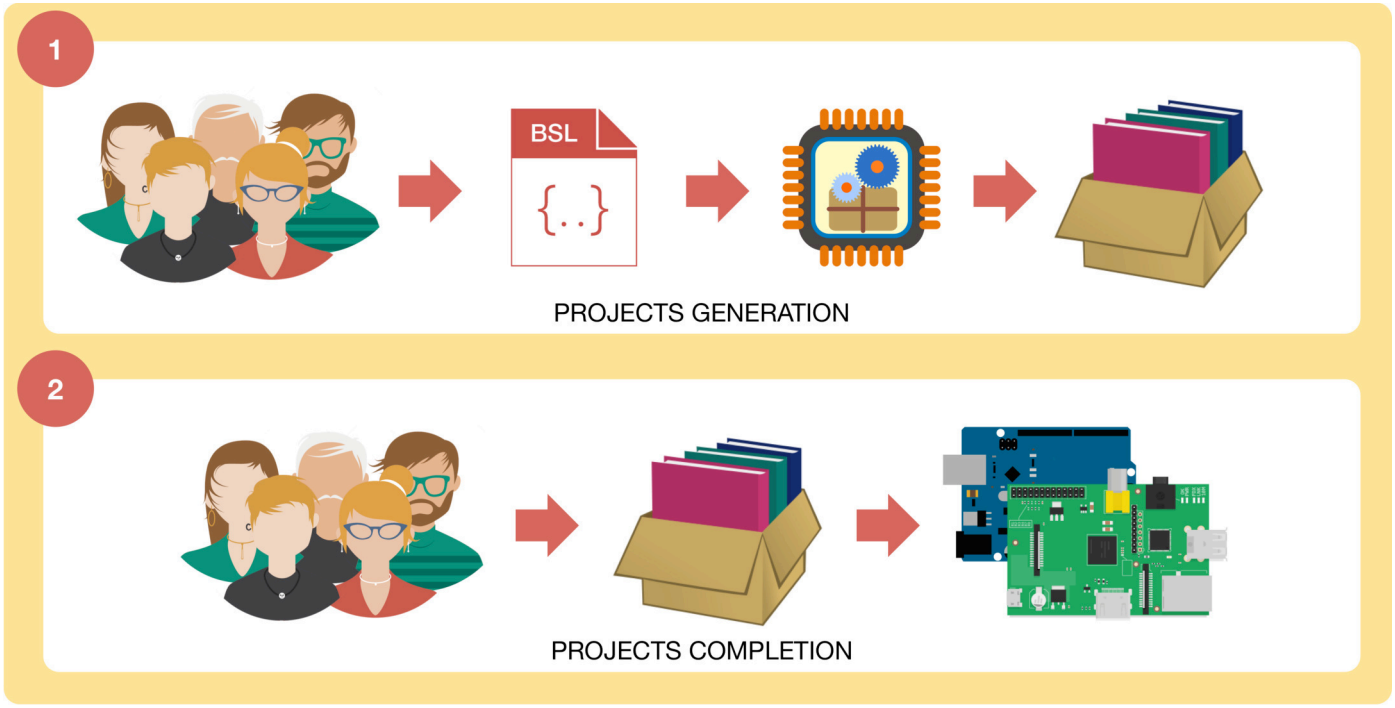

Fig. 2. Stages where there is some user interaction: 1. Projects generation and 2. Projects completion.

actions, they will not implement the connection to Social Networks and many other aspects related to the connection.

Fig. 2 shows the process of projects generation with the number 1. This stage will start with the users of Bilrost. These users will have to define the BSL as they want. Afterwards, Bilrost will process the BSL file and it will generate a project that accomplishes the rules defined in it the BSL.

The final project will be a project in a specific programming language for the device, and it will contain the logic required to connect the device to the Social Network specified in the BSL with the data required by the Social Network's API. Moreover, the project will have the necessary logic to invoke certain empty methods that users will have to complete, as we will explain in subsection III.B.2, and to accomplish the conditions specified in the BSL related with external states and actions as we explained in section III.A.

2) Projects Completion

The project generation will not be the last stage in which the user interaction will be required. The users will have to complete the projects that Bilrost will generate with the logic that retrieves the sensors' value and with the logic that controls the actuators. Our proposal does not include the generation of specific code because we are focused on the interconnection of objects through Social Networks. Thus, the specific code will have to be coded by the users, at least in the first stages of the investigation.

Fig. 2 shows the process of projects completion with the number 2. This stage will start with the users of Bilrost. The users will have to take the generated project and update it. The projects will have methods with an empty body but with descriptions that will explain to the users what they will have to implement and how they will use the existing code. Afterwards, the users will have to deploy the project in the devices and run it.

IV. Conclusions

We presented our proposal about interconnecting Smart Objects from the Internet of Things through human Social Networks. The usage of human Social Networks opens the possibility of interconnect objects and humans. Thus, our proposal would make the Internet of Things bigger because of the addition of humans. In order to make the connection easier, we proposed the used of a Domain-Specific Language to define devices that are connected to Social Networks using specific keywords. The Bilrost Specific Language will also define the devices' actuators with their actions and the devices' sensors with the time that it will be used to decide when to publish the sensed value. Moreover, the BSL will define external states that the devices will have to interpret and respond doing some action with their actuators and external actions that the devices will be able to use in order to invoke actuators located in other devices.

However, more work can be done related to this proposal. One possible future work could be the addition of the specific implementation in the BSL like the way of getting the sensors' values or the logic of the actuators' actions. Moreover, Social Networks are not similar so, doing an investigation that analyses the available Social Networks in order to decide the best one to use with objects is a good future work too. Finally, we made our proposal thinking in the Internet of Things and devices like Arduino or Raspberry Pi but there are many others fields where our proposal could be used and a future work is to discover it.

ACKNOWLEDGMENT

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Comparative Study of Tachyarrhythmia ECG and Normal ECG

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***Abstract*—ECG is the electrical activity of heart functioning which is used to diagnosis the heart related diseases. ECG helps to decide whether human is healthy or not. Today most of death happened in the world due to the heart diseases. It is very important to know the accurate information about the heart activity to diagnosis the actual diseases. The data base is taken from the MIT-BIH physionet bank. In this paper the features of tachyarrhythmia ECG and normal ECG are extracted using wavelet transform. After that t-test is used for statically analysis. This study shows that the most of morphological features of tachyarrhythmia ECG has strongly significant changes.**

***Index Terms*—ECG, Tachyarrhythmia, Wavelet transform, Hypothesis test, MITBIH.**

I. Introduction

The electrocardiogram is graph which shows the electrical activity produced by the heart. Electrical activity is due to electrical potential of heart muscles. When the heart rate of human heart is exceeds above the 100 beats per minute that is tachycardia. Tachycardia is also called tachyarrhythmia. In Tachyarrhythmia 'tachy' for increased rate and 'arrhythmia' for changes or irregularities in heart rhythm. This type of heart condition is occurred due to abnormal electrical impulses of heart. Tachyarrhythmia can be diagnosed by an electrocardiogram (ECG). The disturbance of rhythm and patterns of heart rhythm can be observed on monitor [1].

The structural graph of electrocardiogram ECG is widely used to diagnosis the heart disease because of it is low cost and effective procedure [2]. The polarization and depolarization of atria and ventricles generates electrical activity which is reflects in ECG graph. Normal ECG has five prominent points [3]. The Fig 1 shows the ideal waveform and the prominent point of ECG.P wave is small spike occurs due to atrial depolarization. Inter ventricular depolarization relates to Q wave. Ventricular depolarization reflects in R wave which is biggest wave in term of amplitude in ECG signal. Final depolarization of ventricular reflects by the S wave. T wave reflects the re-polarization.

The major symptoms of tachyarrhythmia are increased heart rate and irregular heart rhythms. This type of condition can be occurred due many causes. Super ventricular tachycardia caused narrowing of the QRS complex. Ventricular tachycardia caused wider QRS complex and rapid heart rate. In this paper the morphological features are extracted from tachyarrhythmia ECG and statistically analyze with normal ECG. After analysis result shows the changes in tachyarrhythmia ECG as compared to normal ECG.

II. Database

Database is the most important task for this work. Normal ECG data base is taken from MIT-BIH arrhythmia Database

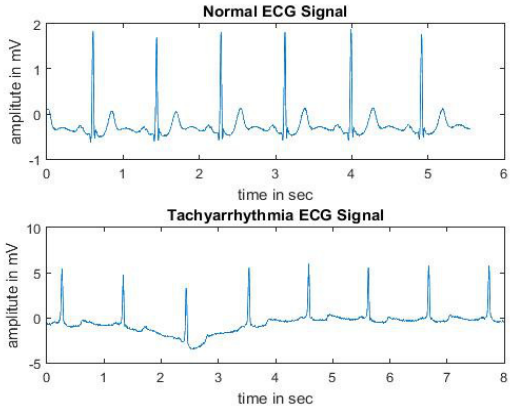

Figure 2: Tachyarrhythmia and Normal ECG signal

directory of ECG signals from physionet [5]. The sampling frequency of this signal is 360Hz and the resolution of signal is 11bit. The tachyarrhythmia ECG is taken from MIT-BIH tachyarrhythmia Database directory of ECG signals from physionet [6]. The sampling frequency of these signals is 250Hz and resolution is 12bit. 10 signals of both databases are used for this purpose. The Fig. 2 shows the normal ECG and tachyarrhythmia ECG signals.

III. METHOD

Fig. 3 shows the process of this work. MIT-BIH phsyionet bank provides raw ECG data. When ECG data is fetched from human body there are low and high frequency noises introduced in ECG. To remove these types of noises high and low pass filters are used. After noise removal features of ECG signals are extracted using wavelet transform. The morphological features are used in this work [7]. For statistical analysis the t-test is used. Result of features is represented as mean and standard deviation (SD). 5% significance level is chosen for two tailed t-test.

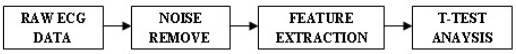

Figure 3: Block Diagram of Process.

A. Preprocessing of Signal

At the time of data acquisition through electrode various type of noises introduce with ECG signal. Power line interference, shot noise, electrode motion artifacts, base line wander, electrocardiography noise(EMG),etc. are various type of noises. Due to these types of noises it is very difficult to extract features of ECG signals. Appropriate filters (LPF, HPF and BPF) are used to remove these noises [8].

B. Wavelet Transform

ECG signals are the mixtures of multiple components of time varying properties. These types of components may have varying duration and overlap one another. Wavelet transform is

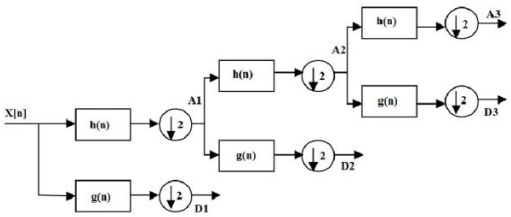

Figure 4: Decomposition of signal using wavelet transform.

used for different purpose in ECG signal processing like noise removing [9], heart rate detection [10] and feature extraction [11]. In this paper wavelet transform is used for morphological feature extraction of ECG signals. Daubechies wavelet of order 8 was used for their simplicity.

Wavelet transform provides both time and frequency domain representation [12]. Decomposition of signal over frequency and translated (time) version of a prototype wavelet provides time and frequency domain signal. A low pass filter and high pass filter is used to decomposed the input signal followed by down sampling in each stage (Fig. 4). First stage high pass filter provides detail coefficient D1 and low pass filter provides the approximation coefficient A1. Fig.5 shows the four level decomposition of ECG signal.

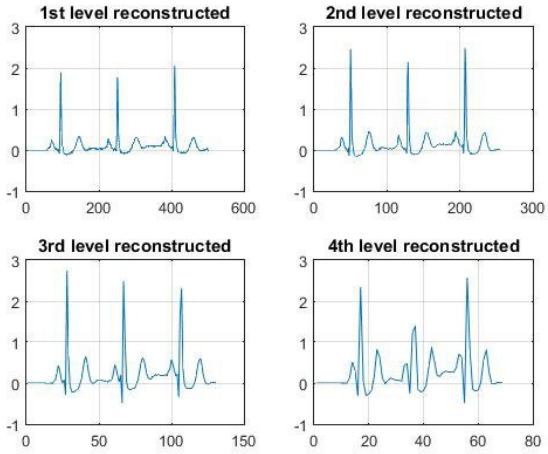

Figure 5: Four level Decomposition of ECG signal using wavelet.

C. Hypothesis test

It is a statistical test which is used to determine in a sample of data to guess for a certain condition is true or not. The Hypothesis test checks two opposing hypothesis about a sample of data, the null hypothesis and the alternative hypothesis. Normal null hypothesis is a `"no effect" statement and alternative Hypothesis is the statement user actually wants to conclude is true. In this work two tail t-tests is used for analysis. t-test formula is

$$t = \frac{\bar{X} - \mu_{H_0}}{\sigma_s/\sqrt{n}} \quad (1)$$

Where

$$\sigma_s = \sqrt{\frac{(X_i - \bar{X})^2}{(n-1)}} \quad (2)$$

Where n is the number of samples, $\bar{X}$ is the mean of samples, μ_{H_0} is the null hypothesis mean and i=1, 2, 3.....n.

IV. RESULT AND DISCUSSION

The statistical test of ECG signal is to test the variation in between tachyarrhythmia and normal signal. Morphological features of ECG are used for this purpose. The statistical

analysis of these features are given in table I. According to result Q wave duration, PR interval, QT Interval, ST Interval, height of RS and QR have strongly significance changes. Slop of RS and QR has moderate significant changes and suggestive significant changes respectively. The result shows that if patient have these types of changes in morphological features it may be possible that he has tachyarrhythmia diseases.

Table I Results of Statistical Analysis

ECG Feature	Normal ECG	Tachyarrhythmia	P value
Q wave (sec)	0.015 ± 0.040	0.066 ± 0.047	$P < 0.01$
S wave (sec)	0.159 ± 0.031	0.119 ± 0.031	$0.01 < P \leq 0.05$
T wave (sec)	0.070 ± 0.045	0.035 ± 0.023	$0.01 < P \leq 0.05$
QR slope (degree)	84.18 ± 4.303	87.428 ± 0.748	$P > 0.1$
RS slope (degree)	-86.49 ± 2.02	-86.37 ± 3.07	$0.01 < P \leq 0.05$
PR Interval (sec)	0.057 ± 0.147	0.120 ± 0.066	$P < 0.01$
QT Interval	0.066 ± 0.053	0.360 ± 0.068	$P < 0.01$
ST Interval (sec)	0.335 ± 0.134	0.063 ± 0.065	$P < 0.01$
Height of QR (mV)	1.330 ± 0.455	4.699 ± 1.200	$P < 0.01$
Height of RS (mV)	1.456 ± 0.441	4.105 ± 1.802	$P < 0.01$

Mean $\pm$ SD (Standard Deviation)
P value: $0.05 < P \leq 0.10$ =suggestive significant
P value: $0.01 < P \leq 0.05$ =moderately significant
P value: $P \leq 0.01$ =strongly significant

Tachyarrhythmia patient have higher number of beats in a minute as compared to normal person. It can be prove in results that the duration of wave decreased in tachyarrhythmia ECG with respect to normal ECG that is repetition of ECG wave is increased. This results RR interval will be decreased. This decreased duration raised the heart rate of human because the heart rate defines 60/RR Interval (in sec).

V. Conclusion

The statistical analysis of morphological features shows that six features have strongly significant changes and rest of four has either moderate or suggestive changes. The PR, QT and ST interval, Height of QR and RS have significant changes. The duration of waves (Q, S and T) have either moderate or significant changes. These results define that the major difference in between tachyarrhythmia and normal ECG is occurred in time domain. Another point in these results that the height of QRS complex is also affected in tachyarrhythmia ECG that is the depolarization of ventricular is not functioning properly. These results can help doctor to classify the tachyarrhythmia from other type of diseases at the time of diagnosis.

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Privacy and Security of User's Sensitive Data: A Viable Analysis

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***Abstract*— Big data is a collection of large amount of data. Big Data is known for any collection of data sets which is enormous and intricate that it becomes challenging to process using on-hand database management tools or traditional data processing applications. Because data stored in these days are too large in enormous in size, Security and privacy of user's sensitive data is a great challenge in this era. There are too many methods and techniques are introduced in past decades for storing and protecting the user's sensitive data such as cryptographically techniques or anonymization method which derive to hiding the sensitive data. While the anonymization techniques cannot fulfill requirements of preserving privacy of sensitive data. So we require a system of techniques, that the sensitive information can be protected from hacker.**

***Index Terms*—Big Data, Security & privacy, User's Sensitive Data, Data Anonymization, Confidentiality.**

I. Introduction

The slang of big data is a watchword used to elaborate a great amount of structured and unstructured data. Traditional database and software's cannot efficiently process big data. Now day's industries, academics and researches generate large amount of data, which access at higher speed and higher than the existing capacity. Big data [1] facilitate to industries, researchers, academics to help their work, operations efficiently, that's why they can find a perfect solutions.

Big data is used by various companies and researchers for online searching applications and they search over those big data for appropriate results. Big data may vary from sizes to petabytes or Exabyte's, which consist of various records consisting of industries, academics, research, and mobile information and so on. Basically these data stored in big data era are in unstructured, unfinished and unapproachable [2].

Big data having characteristics unknown sources, massive amount of data, heterogeneous data, decentralized, unstructured and complex relations among these data. Data sharing is the basic and ultimate object of big data, that's why data privacy in an important challenge of big data. The object of privacy is to preserve the integrity, confidentiality and preventing the leakage of sensitive data.

Big Data may contain massive amount of information and those data may contain more sensitive and confidential information of the users. To preserve the confidentiality of user's sensitive data it is to name as privacy of user's sensitive data in big data platform [3, 4].

An experimental and widely-adopted methods and technique for data confidentiality is to anonymizing the data [5]. Anonymization of data means to hide data confidentiality and the identity of individual user while the information from big data is being analyzed and queried. That's why there are various techniques which focus on methods which may provide privacy of user's sensitive data.

Privacy of users sensitive and confidential data is one of the most important and hot topic in research in big data processing and applications. Due to the limited number of research result, development confidentiality techniques and solutions to provide big data sensitivity. For data privacy of unauthorized access we need to enforced security schemes and policies to secure sensitive data effectively securing and protecting confidential data in big data storage and as well as in transmitting is one of the other challenging task[6].

So protecting the leakage of sensitive data at the time of processing over web and at the time of data rest.

Finally we needed a system that can protect the data confidentiality and privacy of user's sensitive data in a large range of web applications against random server compromises.

II. User Role-Based Methodology

Looking upon the different stages for knowledge searching and discovery from data processing can define four different types of data users [1], named as namely Data Provider, Data Collector, Data Miner, Decision Maker [7] as shown in Figure I. now if we differentiate each four data user with their roles we can easily found out the privacy and security issues in data mining at big data by illustrative ways. All of the users possessive about the privacy and security of confidential and sensitive data, but other user's role views the security issue from its own viewpoint.

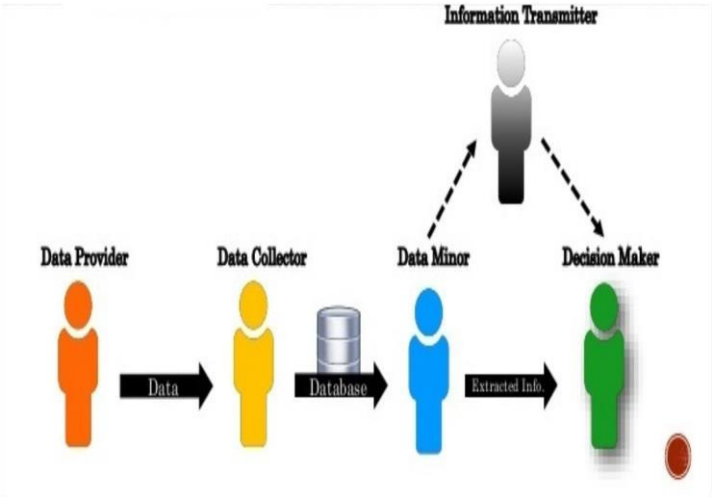

Fig 1. Data Mining in Big Data, Application Functioning

A. Data Provider

Data owner's main concern is to whether to control the confidential and sensitive data, which is provided to others. Where the users owns some data, which is provided for discovery (mining task).

B. Data Collector

The main objective of data collector is to collect data and information from data owners and data provider for publishing purpose for the data miners. Collected data from different data providers may contain some sensitive and confidential data. If that sensitive and confidential data is directly provided to data miners, then the privacy and confidentiality of sensitive data may violates.

C. Data Miner

Data miner, mining to the provided data from data collector from various sources, using different data mining algorithms.

D. Decision Maker

Decision maker can find big data mining result from data miners or from some information transmitter as shown in figure I. information transmitter may harm the data by changing it intentionally or unintentionally, by which it is serious loss to the decision makers.

These different users' roles having their own security and privacy concerns.so we need to focuses upon the data collector phase for privacy concerns. Because if data can be disclosed if the data collector did not take too much security concerns before mining the data to public.

III. RELATED WORK

For privacy of sensitive and confidential data, there have been introduced numbers of techniques implemented and suggested. Mylar can support wide range of applications, whereas others cannot. It can compute encrypted data at the server side and support for processing sensitive data securely for shared data [8].

Each record in storage is identical with each other with at least k-1 records using k-anonymity [9]. In k-anonymity method, confidentiality of sensitive data cannot be achieved, if the confidential and sensitive data having equivalent values in same class.

If there is an equivalence class in a database with the ℓ-diversity [10], if there having at least ℓ well-formed defined values for the user's sensitive and confidential attribute.

Wang [11] proposed a security model, (α, k)-Anonymity model, represents a view of the database table, which is defined as an (α, k) anonymization, where the k-anonymity and α-disassociation properties with respect to the quasi-identifier for modification of the table.

In the t-closeness techniques, if there is distance between distributed classes attributes for sensitive data and distributed of attribute of sensitive data in the global database, where the complete table and database table having no more than a threshold t [12], then that class is defined as t-closeness. The outcome of this method is to preserve the confidentiality of sensitive data with respect to homogeneity and background knowledge attacks.

Web platforms are designed for security purpose, before Mylar is designed. As well as keyword searching is normal and common techniques in web applications. It is often nonpractice to execute because it required too much time to take run client systems due to storing massive amount of data. There are numbers of cryptographically techniques for searching keywords, and they required to encrypt sensitive data using a single unique key [13].

Due to only single key encryption, it is not successful for applying these techniques to the web applications where numbers of users can access the data [14]. There are several numbers of web platforms which support different browsers , on which data can be encrypted before uploading to the server and also can be decrypted before granted to the users [15]. Where the encryption key is stored in the hash fragment of the websites or entered by the users and there the encryption keys and data can be accessed by JavaScript code from the web pages [16]. So the conclusion of this method, the adversary of the java Script code can send to client, where the encryption keys may be able to leak during processing.

A new authentication approach is defined by SUNDR [17] where a specialize protocol is proposed, which helps to

authorized user to identify the updating or alteration of data, which is tried by an unauthorized user in the internet. This technique can define the integrity and consistency of data stored in the unprotected servers.

SPORC [18] and Depot [19] improves the techniques of SUNDR. In this technique, the applications can serve over the encrypted servers. Where the proxy system does not give permission to perform any computation on server side, for example Mylar can define server-side keyword search. In this technique the SPORC, determine the application at run time, when the user visits the server for processing the data.

Now data confidentiality is more interesting to prevent from the threats. Then Crypt DB [20] introduced as new technique, which provide privacy of sensitive data confidentiality from threat over executing SQL queries to the encrypted data in the servers. As well as Crypt DB can perform security from the attacks on the server, even if it does not give guarantees to the users while the user log in to the server is in attack. If there are different keys for the encrypted data, then searching using keywords, Crypt DB does not support computation.

New approach is described in Shadow Crypt [21], in which users can switch transparently to encrypted data for text based web applications. It is to functioning for securing against the potentially malicious and web applications.
This techniques focuses to the privacy of data which is stored into servers is encrypted by key k is only visible to the principals with knowledge of the key k that means the authorized data owner or user. It is having a web browser extension, which replace input data with secure and isolated shadow data and encrypt text with ShadowCrypt. ShadowCrypt does not provide protection against DoS (denial-of-service) attacks by the application.

TABLE I. COMPARING PRIVACY PRESERVATION METHODS

S. No.	***Author***	***Proposed Technique***	***Drawbacks***
1.	Yun Pan et al.[9]	k-anonymity	Not prevent Attribute leakage attack
2.	Ninghui Li et al.[12]	*t*-closeness	Does not preserving the privacy against identity disclosure Attack
3.	Benjamin et al.[10]	ℓ-diversity	The privacy against skewness and similarity attacks can not be preserved
4.	Qiang Wang et al.[11]	(α,k)-Anonymity model	identity disclosure attack does not addressed
5.	A. J. Feldman et al.[18]	SPORC	Does not allow server side computation
6.	Raluca Ada Popa et al.[20]	Crypt DB	if different keys used for data encryption, it does not handle the request
7.	Warren He et al.[21]	Shadow Crypt	denial-of service Attacks by the Application does not resolved

IV. PROPOSED WORK

In Big Data, environment important task is to provide security and privacy of user's sensitive data with confidentiality, even the data is sharing and growing publically over network. For providing, the security against the leakage of the data following proposal is to be considered, which may prevent from the attackers.

A. Problem Statement

Big Data is the term, which refers to the very large amounts of heterogeneous data and information. Big data concept came from the growing and generating a great number of data stored from the different sources, and the internet. Because of these, large amount of data, security and privacy of sensitive data is crucial task.

Today is computing sensitive and confidential data may leak. Now days many of the platform stores the sensitive data on untrusted servers, from where the sensitive data and confidentiality of user may leak.

Upon the conclusion the previous approaches, there we can find two challenges in combating these threats.

In threat 1, an intrusive DBA (database administrator) having the full administrative access to DBMS server may reveal the sensitive and confidential data, for that we proposed a model which may prevent such DBA to gain full access to DBMS server for sensitive and confidential data.

In threat 2, an attacker and intruders can looks after for the full control over the software and hardware and hardware of applications and proxy, DBMS servers, for which we

proposed a model by which we can prevent from such attackers to get access to user's sensitive data.

B. Proposedl Security Model

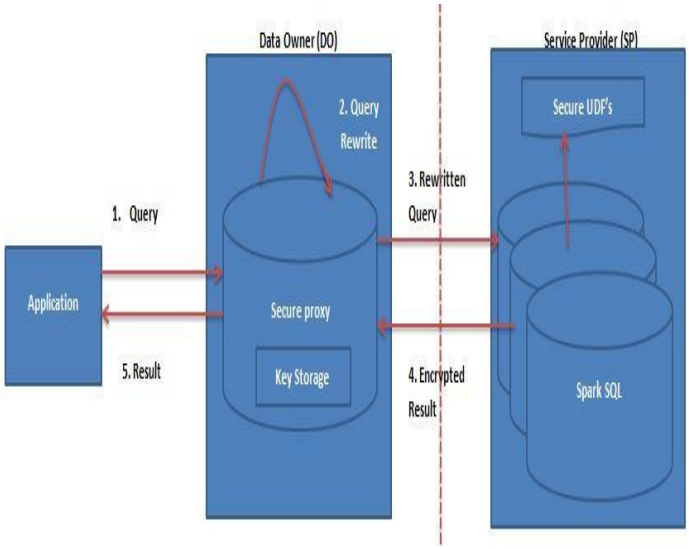

Fig 1. Proposed Security Model Architecture

Our proposed model architecture is implemented as a layer of software, which runs upon the top of Apache Spark SQL architecture. Apache Spark having main features like to manage fast and general-purpose engines for large amount of data processing, where memory primitives can enhance cluster computing. Here we use Apache Hadoop, which provide facility for cluster manager and provide massive amount of information spark's cluster computation. In addition, we use Apache Hive for large amount of data as data warehousing.

For DBMS servers we are using Spark SQL, which supports for structured data and SQL queries as a tool. It also supports for the different users defined functions, by which the user can extend the functionality of cluster database server by adding cryptographically methods, which can be computer in Spark SQL. Using this method the secure server is computed to spark computation engine and performed as user-defined functions.

There is a secure Proxy placed in the client side machine and all the secret keys are stored in the key storage. In the proposed model, there exist five stages of a query processing in this architecture:

a) A query is submitted through client's application to secure proxy.
b) Secure proxy's parses analyses, analyze the inputted query and rewrite the inputted query in terms of user-defined functions.
c) After rewritten query generates, the secure proxy submits the rewritten query for computation to Spark SQL
d) After processing the encrypted query in the spark SQL, the query result is returned to the secure proxy.
e) Secure proxy gets the result in encrypted form, and then it will be decrypted and send it to the user or applications.

V. CONCLUSION

For the above proposed model processing and computing with encrypted data, it will be one of the primary strategies for securing sensitive and confidential data of users in public. It stores confidential, sensitive data in the form of encrypted to the server, and it decrypts that sensitive data only in the users system. Our approach will find the solutions for the given problem statements as given two threats.

In conclusion, we have to define comprehensive description of query rewriting that supports multiple secure operations with data co-operations. In addition, we have to analysis the performance of the system, which is both practically efficient and secure for sensitive data.

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Dictionary Based Intra Prediction for Image Compression

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***Abstract*—Recently image coding has been important and in many field it is necessary. Recently various sparse algorithms have been developed for image compression. This paper presents a dictionary based block intra prediction for image compression with construction of an adaptive trained dictionary. The adaptive trained dictionary is prepared using K-SVD algorithm. K-SVD algorithm update the dictionary based on the sparse algorithms and given image. The prediction residuals selected from different image are used for dictionary training. The orthogonal matching pursuit (OMP) algorithm have employed for selection of dictionary elements and encoding. The proposed method is then integrated into 9 mode H.264 intra coding. Performance of proposed method compared with existing methods. Simulation result shows that proposed scheme has improved efficiency as compared to existing schemes.**

***Index Terms*—Sparse coding; Matching Pursuit; Orthogonal matching pursuit; K-SVD**

I. Introduction

Nowadays image coding [1-6] has become essential due to huge requirement of storage and transfer. By far different image compression standards like Joint Photographic Experts Group (JPEG) standards have been proposed [7-8]. These standards are based on block-based transform, which exploits the spatial redundancies of the image. In JPEG standards, orthogonal transform such as DCT or wavelets were used as dominant transform. Unfortunately such standards do not exploit the inter- block correlations. Recently, various sparse algorithms [9-12] using over-complete dictionaries have been used for image compression. Many strategies have been addressed using sparse approximation algorithms for image compression [13-21]. The over complete dictionary based image coding provides a competitive coding gains and visual perceptual quality as compared to popular transform based image coding. In dictionary based image coding several analytical functions like DCT, wavelets and DFT are used as dictionary elements, and for encoding the dictionary elements sparse coding is used. These analytical functions are unable to capture the complex characteristics of an image. The dictionary training method [18-21] is a recent approach in image coding, which are able to capture the complex characteristics of an image. The initial proposal towards over complete dictionary based image coding was proposed by Bryt and Elad [13]. They proposed an algorithm for image compression based on K-SVD algorithm [17]. Yuan [14] presented image compression via sparse reconstruction. Zapeda [18] have presented image coding using iteration tuned and aligned dictionary. Other intra prediction methods [19- 21] have presented a sparse coding with adaptive dictionary in image coding. In these schemes, an adaptive dictionary is trained and used to predict the neighboring blocks in an image. These methods do not use the prediction error during design of dictionary. To include more complex characteristics of an image it is important to introduce prediction error during design and training of dictionary.

In this paper, we introduce a new dictionary based block intra prediction method of image compression. We propose an efficient dictionary based intra block coding embedded in 9 mode H.264 directional intra prediction methods. The intra prediction of each block is performed in spatial domain based on the trained dictionary. The dictionary is trained adaptively using well known K-SVD algorithm. An over complete dictionary is trained using the residuals obtained from 9 mode directional intra prediction to represent complex characteristics of an image. The normal transform based image coding is replaced by a sparse representation of residual image blocks using trained dictionary. Well known OMP algorithm used for selection of dictionary elements and encoding.

The remainder of this paper is organized as follows. Section II presents back ground on sparse coding and K- SVD algorithm. In section III the proposed dictionary based block intra prediction for image compression is

introduced. Section IV illustrates results and discussion. Finally, conclusion is given in Section V.

II. SPARSE CODING AND K-SVD ALGORITHM

Sparse coding is the representation of a given signal by a combination of small number of standard signals from a large set of standard signals. To select those combinations various sparse approximation algorithms have been developed. Sparse approximation algorithms [9-12] solve system of linear equations which is under-determined. Mathematically this can be expressed as

$$Y = DX \tag{1}$$

Where D is a K x N matrices with $K < N$ called dictionary and each column of D is called atom. X is a column vector of size $Nx1$ and Y is a column vector of size $Kx1$. As $K < N$ the dictionary is called over complete dictionary. If Y and each atom of D are treated as a signal then Y can be represented as a linear combination of atoms of D. This linear combination can be expressed as solution vector X. Due to over complete nature of D, infinite number of solution exists for X. The Sparse approximation algorithm always aims to represent Y in terms of minimum number atoms. Mathematically this can be expressed as solving equation (1) such that the solution X contains minimum number of non-zero elements. The Sparse approximation problem is represented as

$$min\{||X||0: DX = Y\} \tag{2}$$

Where the l_0 norm represents the number of non-zero elements in solution vector X.
The Sparse approximation problem that allows some approximation error is represented as

$$min\{||X||0: ||DX - Y||p \leq \delta\} \tag{3}$$

for some $\delta \geq 0$ and p *is* the norm .

Matching pursuit (MP) [10], Orthogonal Matching Pursuit (OMP) [11] and Complimentary matching pursuit (CMP) [12] are some well known algorithms used to find out the sparse solution. These sparse algorithms using over-complete dictionaries have been used for image compression. In sparse coding, a set of N image block arranged as the columns of a matrix D, known as dictionary and each column is known as atoms. So given a column vector Y obtained from a image block, in sparse coding the problem is to find out the minimum number image blocks from D whose linear weighted sum will represent Y. Image compression takes place if the number of non zero elements in X is very less as compared to number of pixels in the image block Y. The efficiency of sparse coding also depends on the design of over complete dictionary. Various algorithms have been developed to train over complete dictionaries for sparse signal representation. The K-SVD algorithm [17] is very efficient and it works well with different sparse approximation algorithm. K-SVD algorithm iteratively updates the dictionary atoms to better fit the data. The high performance of this algorithm is due to an effective sparse coding.

III. PROPOSED METHOD

Initially, a set of 8 × 8 predictions residuals blocks are selected from different images using 9 modes H.264 intra prediction [6]**.** The residual blocks obtained from different images are rearranged in a column format to represent the atoms of the over complete dictionary. The number of columns or atoms of over complete dictionary are very large. The over complete dictionary represented as a K *x* N matrices with $K < N$, where K represent the number of pixel in a residual image block and N represent the number of dictionary atoms. K-SVD algorithm [17] is used to train the dictionary obtained from predictions residuals blocks and for sparse coding Orthogonal Matching Pursuit (OMP)[11] has employed. During dictionary training, in each iteration K-SVD algorithm updated the dictionary atoms. K-SVD algorithm iteratively updates the dictionary atoms to better fit the data and after certain iteration an updated dictionary is resulted. This updated dictionary is used for image coding. Fig.1 shows the proposed dictionary based intra block image coding scheme. In this scheme the images are divided into different blocks of size 8x8. 9 modes H.264 intra prediction used for each image block. Residual image or prediction error obtained for each image block. Then the proposed algorithm is used to code the residual image block obtained during intra prediction.

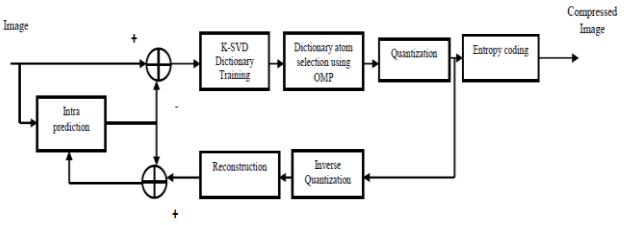


Figure1. Architecture of Proposed dictionary based intra prediction coding

A. Proposed algorithm

Proposed algorithm consists of two stages:
Stage I: Dictionary Training:

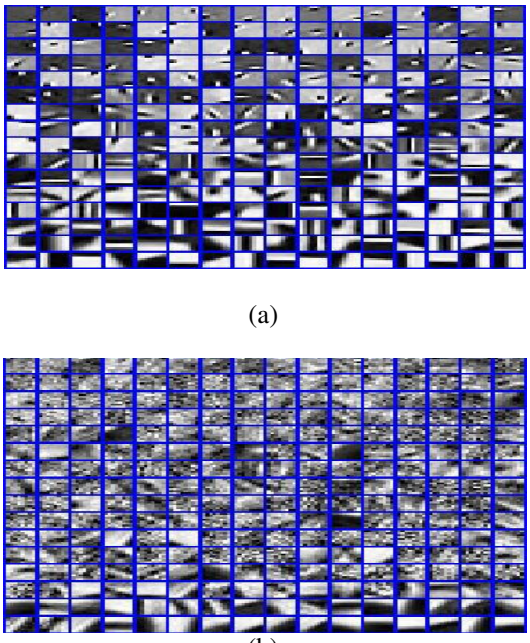
a) A set of 8 × 8 predictions residuals blocks are selected from different images using 9 modes H.264 intra prediction**.**
(b) The residual blocks are put in a column format to represent each atom of the dictionary and training is made using K-SVD algorithm.
(c) The trained dictionary is embedded with intra coding framework to encode the residual blocks obtained from intra prediction.

Stage II: Image Coding:

(a) Initially the image divided into different blocks of size 8×8.
(b) Each block is predicted from its neighboring block using 9 modes H.264 intra prediction. Residual image or error block for best prediction mode (M) is obtained. The best prediction mode used for encoding.
(c) Next OMP based dictionary intra coding method is used at the encoder side to encode residual image block. It selects the position (P) and coefficients (C) of the trained dictionary element which best match the residual image block and transmit those values to the encoder.
(d) The coefficients are uniformly quantized and entropy coded. The positions and best selected mode are encoded using fixed length codes.
(e) At the decoder side, position (P) and coefficients (C) of the dictionary elements, and best prediction mode (M) is applied to recover the reconstructed 8x8 image block.

IV. SIMULATION RESULTS

In our proposed scheme, we collect 100 different images and a set of 512 residuals blocks of size 8×8 are selected using 9 modes H.264 intra prediction. The over complete dictionary are constructed with respect to 512 residuals blocks and proposed algorithm implemented to train the dictionary. To train the dictionary we set 100 number iterations in K-SVD algorithm.



(a)

(b)

Figure 2. (a) Residual Blocks used for Dictionary training (b) Trained dictionary

In the simulation, the efficiency of proposed method is evaluated by taking different standard images such as "Lena", and "Barbara". The dimension of images was 512 X 512 pixels with 8-bit gray level. Initially the images divided into different blocks of size 8×8. The proposed algorithm is applied to obtain best prediction mode (M), position (P) and coefficients(C) of the dictionary elements. Position (P) and best prediction mode (M) are encoded with fixed length codes, and coefficients are uniformly quantized and entropy coded. To evaluate compression efficiency, the proposed method along with other existing methods i.e. JPEG, JPEG2000 were simulated using MATLAB. Figure 2 shows residual blocks used for Dictionary training and trained dictionary. Fig. 3 shows the Bit rate vs. PSNR (in dB) of the proposed scheme along with JPEG and JPEG 2000. The proposed method yields around 3 dB PSNR gain when compared to JPEG and 0.5 dB PSNR gain when compared to JPEG 2000.

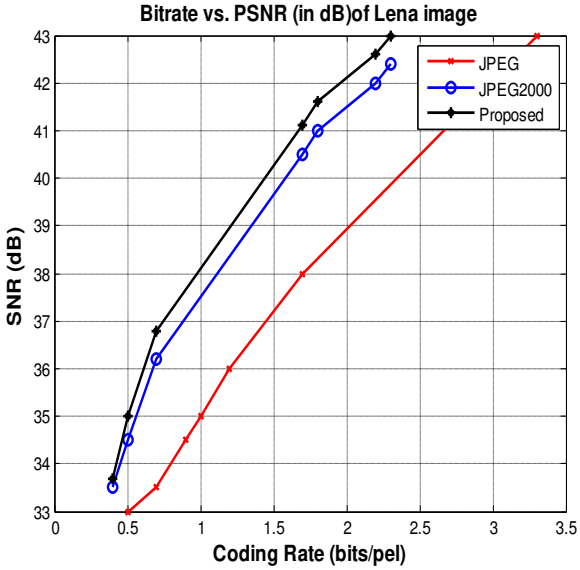


Figure 3. Bitrate vs. PSNR plot for Lena image

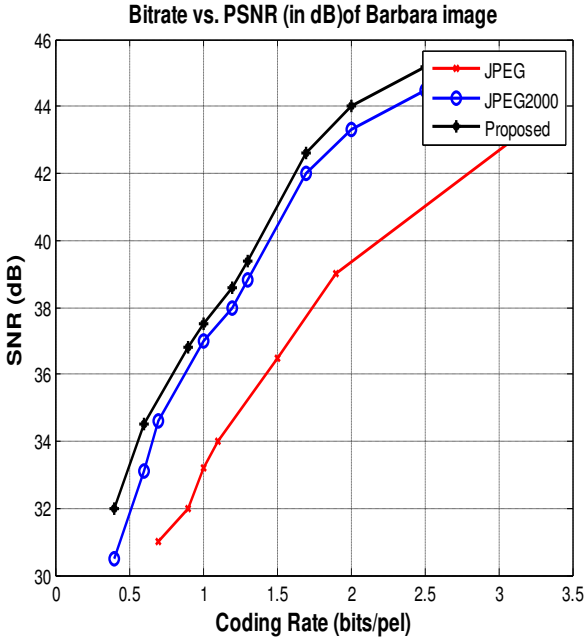


Figure 4. Bitrate vs. PSNR plot for Barbara image

VIII. Conclusion

In this paper, a dictionary based intra prediction for image compression is introduced. K-SVD algorithm is used to design the dictionary. OMP algorithm, fixed length coding and entropy coding have employed for encoding. Different coding results are presented to compare the compression efficiency of proposed method with the existing methods. Experimental result shows that our proposed method achieves significant PSNR gains compared to the existing JPEG and JPEG2000 standards.

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An Intrinsic Study on Routing Protocols in Mobile Ad-Hoc Network

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***Abstract*—Mobile Ad-Hoc Networks (MANET) are becoming an emanating technology among mobile devices. It is a structure less network of independent collection of wireless mobile nodes [Smart phones, Laptops, iPads, PDAs, Sensors etc.] connected by wireless links. Routing in Ad-hoc networks is challenging due to mobility of nodes and dynamically changing topology. The primary objective of the routing protocols is to establish an optimal and efficient route between the communicating nodes. Due to different network environments like varying number of nodes, speed, network load, it is difficult to figure out which routing protocol may perform well. This study investigates the performance and behavior of MANET routing protocols such as DSDV, AODV, NCPR and ZRP with a special focus on their comparison, functionality and issues. In this review, we analyzed about the protocols based on various quantitative parameters such as average throughput, packet delivery ratio, routing overhead and average end to end delay.**

***Index Terms*—MANET, Routing Protocols, DSDV, AODV, NCPR, ZRP, Performance Metrics.**

I. Introduction

Communication is essential for transferring information between peoples, computers at anywhere, any time. In general, wireless communication networks are implemented and managed using radio communication system. There are two types of wireless network [1]:

Infrastructured Wireless Networks

The communication between nodes are established and maintained through central controller. Any node can be joined to the network through wireless access point. Examples include the cellular network and wireless local network.

Structure less or Wireless Ad-Hoc Networks

Structure less networks are not depends up on the base station to manage the routing of packets to other nodes. In addition, each individual node establishes routing path to the destination by itself and forward packets in a multi-hop way through several gateways. This type of network used in emergency situations, disaster relief, military fields, WSN, video conferencing, etc.

Mobile Ad-Hoc Network (MANET)[2] is a infrastructure less network formed with wireless mobile hosts such as computers, cell phones, sensor nodes, etc.

Each node communicates with other through wireless links and the hosts can freely connect and disconnect from the network. Simultaneously, each mobile node acts as a router. Routers can easily and randomly move hence network topology can dynamically change. The transmission range of each node in MANET is limited, so packets are transmitted based on multi-hop, peer to peer manner from a source to a destination node or nodes. These networks have many constraints like available bandwidth, limited power, and limited physical security.

Routing in MANET

Routing is a process of finding a shortest, stable, and secure route from a source node to ultimate destination node through intermediate nodes in the network. MANET routing protocols consist of routing algorithm and software to establish optimal communication and data transfer path between nodes. Routing algorithms should act correctly in unusual or unforeseen circumstances, such as link breakage, hardware failures, high load conditions, and incorrect implementations to maintain the consistency of the network. The routing protocols must have the following key features [3]:

Dynamic nature : The routing protocol should not rely on central controlling point and.

It should support for topology change because the nodes may detach and attach to the network at any time.

On Demand routing: It should determine the route only when it is required by the source node for transmitting packets.

Loop freedom: Transmission of same route request message by multiple path leads to wastage of bandwidth and power. So routes should be free from loop.

Multiple routes: The protocol must determine more than one route to the destination node. If there is a problem in route , another route can be used without initiating route request.

Energy conservation: The routing protocols must reduce power consumption and support sleep mode because mobile nodes operate on battery power and nodes are having limited battery power.

Quality of service: To reduce overhead, some kind of Qos is needed in routing protocols.

Classification Of Routing Protocols

Routing protocols in MANET can be categorized [4] into three types depends on the routing strategy and network structure.

Proactive routing protocol or Table-driven

The proactive routing protocols maintain up-to-date routing information about all the nodes in every nodes routing table. Nodes transmit the packets to the other nodes in the network using the table. Whenever there is a change in the network topology, these protocols use two kinds of updates such as periodic and triggered update to update the routing table.

Example: Destination Sequenced Distance vector (DSDV), Cluster head Gateway Switching Protocol (CGSP), Global State Routing (GSR), Fisheye State Routing (FSR), Hierarchical State Routing (HSR) and Source Tree Adaptive Routing (STAR).

Reactive routing protocol or On-demand

In Reactive routing protocols, route is established only when it is required. This protocol periodically updates their routing table with latest routing information. This protocol contains two processes: route discovery and route maintenance. When a source node wants to communicate with destination node, it starts a route discovery process by broadcasting route request packet to its neighbors. The route maintenance process is used when source node detects any change in topology or route becomes unavailable or destination node is unreachable.

Example: Ad-hoc On Demand Distance Vector (AODV), Dynamic Source Routing (DSR), Temporary Ordered Routing Algorithm (TORA), Cluster Based Routing Protocols (CBRP), Neighbor coverage-based probabilistic rebroadcast protocol (NCPR).

Hybrid Routing Protocol

Hybrid protocol combines the feature of both proactive and reactive routing protocol. This protocol divides the nodes into number of zones and clusters. When number of nodes increased, the performance of the hybrid protocol is highly improved.

Example: Zone Routing Protocol (ZRP), Hazy Sighted Link State (HSLS) protocol, Secure Routing Protocol (SRP), Hybrid Ad hoc Routing Protocol (HARP).

The rest of the paper presents a brief survey on few of the MANET routing protocols. Section II discusses various routing protocols under consideration, Section III gives the literature review, Section IV presents simulation and comparative analysis using network simulator, Section V discusses open technical issues and finally, Section VI presents conclusion of this work.

II OVERVIEW OF ROUTING PROTOCOLS

DSDV (Destination Sequenced Distance Vector)

DSDV [5] is a proactive routing protocol and it is based on the idea of Bellman-Ford Routing algorithm to calculate path. Each node maintains a routing table which contains the next hop, cost metrics to reach the destination. The routing table is forwarded to next hop to select the shortest path. When route changes are propagated, looping in routing within the network occurs. To eliminate routing loops, latest destination sequence number is used. In DSDV, if the link is not present, the sequence number will be odd else even number is used. DSDV uses distance vector shortest path routing algorithm to find a single path from source node to a destination node.

AODV (Ad-Hoc On Demand Distance Vector)

AODV is a dynamic , unicast routing protocol. This protocol is designed to reduce the traffic of control and data packets there by increasing the performance of the network. It[6] is the combination of DSDV and DSR routing protocols. To discover and maintain the routes , AODV uses the demand based routing method of DSR protocol and sequence numbers, periodic beacons from DSDV. It uses hop-by-hop routing. When a node want to communicate with other node, it transmits route request (RREQ) packet to the neighbor until intended destination is reached. The destination node sends the most recent route as route reply packet (RREP) to the route requests [7]. This protocol uses the destination sequence number to find freshest route and also loop free routing.

The route maintenance phase of AODV is used to handle broken links. If the source node does not receive any reply with in the timeout , it rebroadcasts query message.

NCPR (Neighbor Coverage-based Probabilistic Rebroadcast protocol)

NCPR [8] protocol combines the approach of probabilistic method and neighbor knowledge method. Each node maintains their neighbor list. Rebroadcast probability is estimated by combining additional coverage ratio and connectivity factor. Additional coverage ratio is defined as the ratio between the number of nodes enclosed by single broadcast message to total number of neighbor nodes. Connectivity factor represents the relationship between the network connectivity and number of neighbors of the particular node. The rebroadcast traffic generated by this protocol is very less compared to other methods. This approach works better in sparse network rather than dense.

ZRP (Zone Routing Protocol)

ZRP [9] combines the advantages of both reactive and pro-active protocols. This protocol reduces the control overhead caused by proactive protocol and delay with in the zone caused by route discovery process of reactive protocol. This protocol is based on zone radius which is determined by hop count. The node may be present in more than one zone and the size of the zones are different. ZRP consists of several components like IARP, IERP and BRP which provides the full routing benefit to ZRP.

III LITERATURE REVIEW

DSDV [10] has simple routing table format, simple routing operation and guarantees loop free routes. Every node has to handle route request and route reply procedure. This decreases the performance of the individual mobile node. Broadcasting route updates cause large overhead and waste resources for finding all possible routes between nodes when the network is dense. So DSDV is highly suitable for the network with low density.

In DSDV [11], new sequence number is used when there is change in the network topology. This new sequence number in turn changes the route to the destination. DSDV uses two routing table. One table is used for forwarding the packets. Second table is used for storing updated routing information. DSDV uses the incremental route update strategy to avoid additional traffic. The regular update of routing table needs additional bandwidth and battery power even in the idle state.

AODV [12] is based on distance vector algorithm to find out the unicast routes to the destination. In AODV, the routing overhead caused by control message is considerably reduced, so it requires less bandwidth. It has minimal space complexity as stale routes are deleted. It requires less storage for storing route information.

AODV [13] protocol is based on minimum delay path as route selection criteria. It issues the control signal to establish and maintain paths, which could reduce the cost of producing the path, saving a certain amount of network resources. AODV [14] performs better in dense environment except packet loss. AODV protocol reduces control message overhead and also it consumes less bandwidth. AODV uses flooding mechanism in route discovery process which causes redundant retransmission, collision and contention called as broadcast storm problem.

In NCPR[15], probabilistic broadcasting is depending on coverage area and neighbor confirmation. Coverage area scheme is used to set a rebroadcast probability and neighbor confirmation scheme make sure that all nodes should receive the broadcasting packet. NCPR dynamically calculates the rebroadcast delay to determine the forwarding order and effectively utilize the neighbor coverage knowledge. NCPR replaced the random waiting time for subsequent broadcast by rebroadcast delay based on the number of covered neighbors.

In NCPR [16], probability based and area based methods are incorporated. In probability based method, all mobile nodes set fixed predefined probability. But in MANET, nodes can change their topology dynamically. So there is no use of fixed probability. In this approach, the rebroadcast probability is dynamically set. NCPR [17] is proposed to reduce the routing overhead caused by RREQ redundant packets based on self –punning scheme. Also it reduces end to end delay and increase packet delivery ratio. But the overall broadcasting delay is increased.

In ZRP [18], interior nodes are the nodes inside the zones, uses the intra zone routing protocol (IARP) for communication. Peripheral nodes are exist on the border of the zone. Nodes outside the nodes are exterior nodes which make use of inter zone routing protocol (IERP) for data transmission. The benefit of ZRP protocol is that it decreases the communication channel as compared to the table driven protocols. It also minimizes the delay of packet delivery as compared to the on demand protocols.

The performance of ZRP [19] protocol analyzed using various performance metrics. This analysis reveals that the performance of ZRP increase in terms of throughput and decreases with normalized routing overhead and end to end delay when the network size and transmission range is increased. The demerit of ZRP is that, routing outside the zone requires more energy and memory to store large amount of routing information.

IV SIMULATIONAND COMPARITIVE ANALYSIS

The comparative study of the routing protocols AODV, DSDV, NCPR and ZRP are performed based on different qualitative and quantitative parameters. The result of quantitative comparison has been presented in the form of table.

Table 1. Qualitative comparison of routing protocols

Metrics/Protocol	DSDV[5]	AODV[6]	NCPR[8]	ZRP[9]
Routing Type	Proactive	Reactive	Reactive	Hybrid
Loop Free	Yes	Yes	Yes	Yes
Routing Philosophy	Flat	Flat	Flat	Flat
Routing Scheme	Table driven	On demand	On demand	Both
Multicast Capability	No	Yes	Yes	Yes
Routing Metric	Shortest path	Freshest Shortest Path	Shortest path	Shortest path
Resource Consumption	High	Low	Less than AODV	Medium
Security	No	No	No	No
Route Discovery	Source node	Any node	Any node	Node inside t he zone
Periodic Update	Yes	No	No	Yes
Merit	Low latency, Count to infinity problem is removed	Low overhead, Adaptable to highly dynamic topologies,	Reduced routing overhead	Suitable for larger network ,Latency is low
Demerit	Does not support multipath Routing ,Does not scale well for larger and dense network	Inconsistent route, Latency is increased.	Poor reach ability in sparse network, Performance degradation due to excessive hello messages	Zone consumes large memory, Complexity increases

PERFORMANCE METRICS

The following quantitative parameters [20] are used to evaluate the MANET routing protocols performance with variable number of nodes:

Packet Delivery Ratio (PDR): It is the ratio of the data packets delivered to the destination successfully to those sent by the source nodes.

Average End to End Delay: It is the average time taken to transmit a data packet from source to destination node.

Average Throughput: It is defined as the average number of packets successfully reached to the destinations per unit time.

Normalized Routing Load (NRL): It is the ratio of average routing control packets send by sources node to number of received data packets at the destination node.

The simulation of AODV, DSDV, NCPR and ZRP has conducted using Network Simulator NS-2 [21][22]. NS-2 software provides support for simulating the routing protocols of network.

Table 2. Simulation Parameters

Simulation Parameter	Values
Simulator	NS-2
Environmental Size	750m*750m
Number of Nodes	20,40,60,80,100
Node Pause Time	2 sec
Mobility Model	Random Waypoint
Traffic Type	CBR
Number of connections	30
Size of the packet	512 byte
Packet Rate	4 Pkts/sec
MAC Layer Protocol	IEEE 802.11
Protocols	DSDV, AODV, NCPR, ZRP

When the number of nodes in the network varies, the selected quantitative parameters of the routing protocols shows major difference in their performance

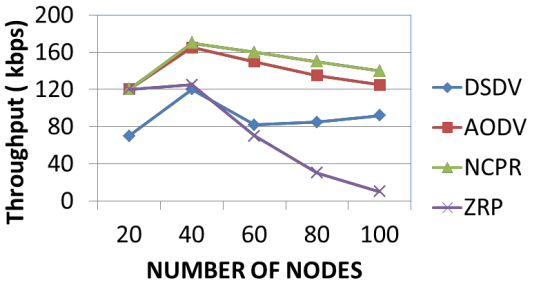

Fig.1. Throughput vs Number of nodes

Fig.1 reveals that throughput decreases when the density of the network increases due to congestion and collision in the networks. Increase in nodes deteriorates throughput of ZRP compared to other protocols under consideration. NCPR has better performance than AODV. AODV has second better performance than DSDV.

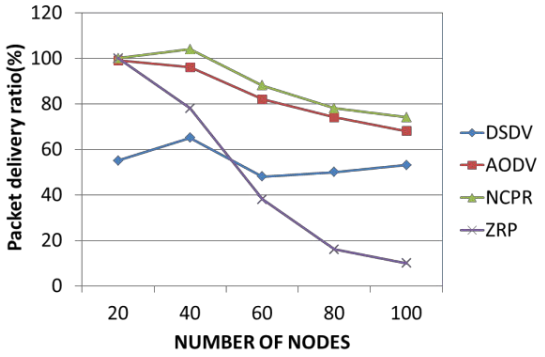

Fig.2.Packet Delivery Ratio vs Number of nodes

Fig.2 shows that PDR rises from 20 to 40 nodes afterwards its start decreasing. AODV exhibits more or less consistent PDR with different network densities. ZRP has larger variation with increase in number of nodes. DSDV has average PDR with increasing network size. NCPR has better PDR than AODV.

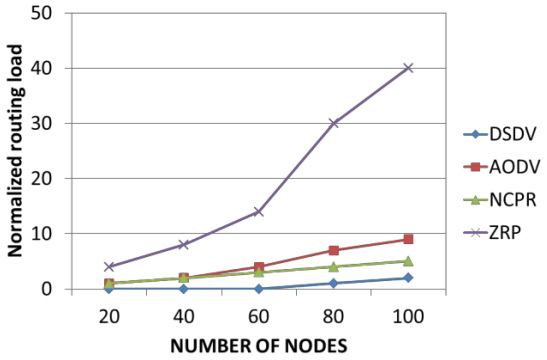

Fig.3. NRL vs Number of nodes

Fig.3 depicts that network routing load rises as number of nodes increased. DSDV maintains almost steady NRL in smaller networks. But the performance of DSDV degrades when the network size is increased. ZRP shows worst performance. AODV has increase in overhead than NCPR.

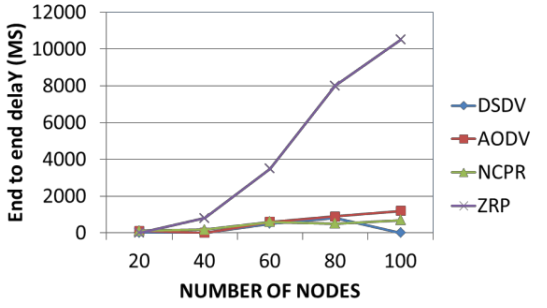

Fig.4. End to End Delay vs Number of nodes

Fig. 4 depicts that, DSDV has lesser end to end delay than NCPR and AODV. In ZRP, average end to end delay incrementally increases with increase in network density

DSDV shows nearly stable end to end delay with varying number of nodes.

From the above simulation and comparative analysis, the following table of result has been obtained.

Table 3: Comparative Analysis of Routing Protocols

Metrics/ Protocols	DSDV	AODV	NCPR	ZRP
Throughput	Low	Medium	High	Very Low
End to end delay	Lowest	Medium	Small	High
Routing Overhead	Low	High	Lowest	High
Packet Delivery Ratio	Medium	High	Better than AODV	Low

V OPEN TECHNICAL ISSUES

The comparison of various routing protocols reveals that there are several major issues in routing protocol. In DSDV [5] protocol, incremental update strategy is used to avoid extra traffic. But bandwidth wastage and larger network overhead occurs when transferring periodic route update messages. In AODV[6][7] , network overhead is increased by the transmission of several reply messages for single route request and inconsistent and stale routes are caused by intermediate nodes not having the freshest sequence numbers. While NCPR[8][15] reduces the overhead considerably, the excessive number of hello message will consume the nodes energy and introduce another overhead, which in turn negatively affects the overall system performance. Mobile networks are more vulnerable to physical security threats such as eavesdropping and jamming attacks. AODV [7][17] is vulnerable to various kinds of attacks like black hole attack. NCPR [15] also cannot provide security during communication. Nodes in MANET are typically battery powered as well as limited in storage and processing abilities. Even ZRP is suitable for dense network, energy is wasted when transmitting packets from source to destination node located in different zones. Another important issue in ZRP is the selection of zone radius on regular basis.

.

V CONCLUSION AND FUTURE WORK

Mobile ad-hoc networking is one of the more innovative and challenging areas of wireless networking. A comprehensive analysis of MANET routing protocols and comparison of DSDV, AODV, NCPR and ZRP have been performed. There are numerous technical aspects present in various routing protocols and it is difficult to choose a single

protocol that can adapt to the wide variety of network conditions. In future, extensive study has to be performed to provide better insight on routing overhead and security in MANET routing protocols.

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Simulation & Performance Comparison between DSR,FSR & HSR Routing Protocols in MANET Using NS2

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***Abstract*—Mobile Ad-hoc Networks (MANETs) are a combination of various mobile nodes where these mobile nodes are communicate to each other. These mobile nodes are controlled by without any central node. Mobile ad-hoc networks have various set of applications such as- it is diverse, ranging from small, mobility, high bandwidth and highly static & dynamic networks. A mobile ad-hoc network has some basic needs such as – a distributed algorithm to establish a structure & organization of a network, link scheduling between mobile nodes, and packet switching technique. Author proposed a comparison simulation work of different types of routing protocols such as Dynamic state routing(DSR), Fisheye State Routing(FSR) and Hierarchical State Routing(HSR) protocols by a network simulator (NS-2). In this paper, routing protocols (DSR, HSR & FSR) are discussed and compared in different points such as packets delivery technique, average routing head and throughput.**

***Index Terms*—Mobile ad-hoc network, DSR, FSR, & HSR routing protocol**

I. Introduction

Mobile Ad-hoc networks are a collection of various wireless mobile nodes, where these wireless mobile nodes are organized and configured by themselves. The structure of the network can change dynamically as shown in fig. 1 considering bus topology. A bus topology, all mobile nodes are connected via network and utilize the same wireless channel by randomly. In bus topology, every node works as a host node and routers, which routes the data from one node to other node. A mobile ad hoc network can transmit a data packet from sender to receiver node without using any fixed network like LAN, MAN and topologies. The main objective of MANET is, each mobile node works as a router and to search a best routing path between source nodes to destination node for a message transmission. Every mobile node in a MANET is free to move independently in any location, and change its links to other devices. MANET protocols provide an emerging, powerful and reliable technology for various areas such as civilian, military, education and communication applications. Basically mobile ad-hoc network is a Latin word where it means in networking "for this purpose".

The basic challenges in MANET is, each mobile node continuously maintain the information and properly route the traffic between sender and receiver. This network may be connected to the large network like internet and operated by them. A mobile ad-hoc network has a routable networking environment, where a link layer of OSI model is used on top of ad-hoc network [1].

A. Wireless Mobile Network Models

A wireless networks are divided into two parts, a first part is known as infrastructure networks, where every mobile node acts as a base station. In wireless communication system, every mobile node can transfers the message to neighbour mobile node with the fix range; this node is called base station. Wireless Local Area Networks (WLANs) is a best example of wireless network. In an infrastructure network, all mobile nodes can communicates to each other via any inter connection network such as bus & ring topology, LAN and WAN as shown in fig. 1. Infrastructure network means, any new node can join network, communication between two nodes can change with time, and any existing node can leave this network [2].

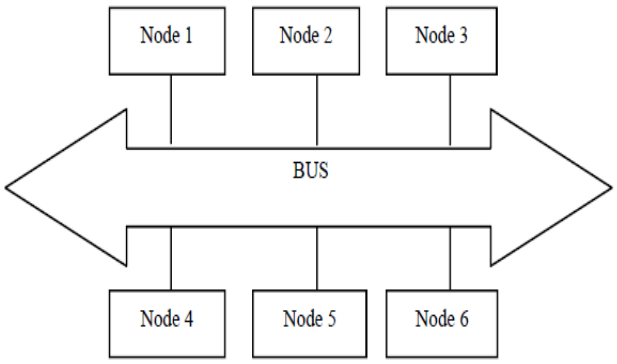

Fig.1 Infrastructure Network

The second part of Wireless network is called as infrastructure less mobile network, it is also known as an Ad hoc Network. Without any infrastructure or base network, all nodes can move freely from one place to another place. A topology may change the nodes dynamically over time and these nodes have their own infrastructure or base as shown in Fig. 2. Example of MANET applications widely used in various field such as, military applications, disaster relief applications, seminar or conferences, wireless communication, digital communication and logistics etc [10]. In ad-hoc network, it is a very difficult task to find a best route between two nodes using routing protocol due to their high dynamic topology and without any central node. Routing protocol structure depends upon various factors like throughput, mobility, high bandwidth, scheduling, and packet delivery etc. There are many purposes of a routing protocol such as fully distributed system, stable network, and a loop less transmission and reduced the collisions in network.

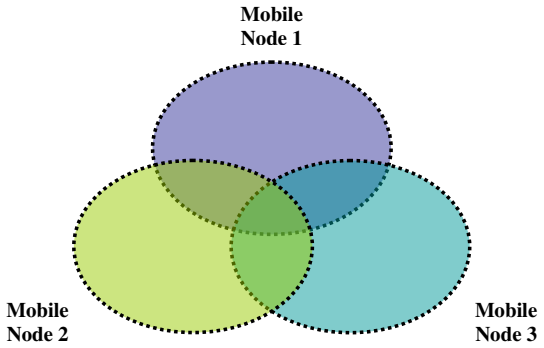

Fig.2. Infrastructure less Network

B. *Objective of this paper*

The objective of this paper is, to simulate the performance comparison between different routing protocols (DSR, FSR & HSR) based on their performance such as throughput, average routing head and packet delivery. This simulation work could be done through network simulator NS-2. This simulation work to implement a wireless network system, routing protocols and also to search the many problems during message routing such as packet delay, looping, link scheduling and minimum collissions. In ad hoc network, data packets may travel from one node to another node until they reach their destination. A routing protocols to perform a stable, correct and shortest routing path between two mobile nodes in ad-hoc network. A mobile ad-hoc network have some important areas [4]:

- Structure of a mobile ad-hoc network.
- Security purpose in mobile ad hoc network.
- Implementation and simulation of routing protocol.
- To proposed the performance comparison through simulation.

II. RELATED WORK

A. *MOBILE ADHOC NETWORK (MANET) ROUTING PROTOCOLS*

A routing protocol is to discover and maintain the minimum routing path from source to destination in ad-hoc network network. The main objective of ad-hoc network is, to perform a shortest, accurate and efficient connection between two mobile nodes and, it also to perform a correct and timely delivery of message between source node to destination. In ad-hoc network, a routing protocol finds a shortest path for data packet delivering and also delivers it to ccorrect destination. A routing protocol has following three types [2]:

- Table driven
- On-demand
- Hybrid

B. *TYPES OF MANET PROTOCOLS*

There are three main routing protocols used in mobile ad-hoc network (MANET) such as- **Table driven**, **On demand** & **Hybrid protocol**. But according to the network structure a routing protocol can be divided as- Flat routing, Hierarchical routing and Geographic routing [2].

1. Table driven (Proactive Protocol): This protocol is also known as proactive protocol, for ex. FSR and WRP protocols. These protocols are also known as linked state protocol, because every mobile node contains the routing information about any other network node using by a periodic routing technique. Proactive routing protocols are generally used with very high average overhead due to the routing. Some protocols are comes in this category for ex. - Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), and Optimized Link State Routing (OLSR) etc. [4].

i. Destination-Sequenced Distance-Vector (DSDV): DSDV protocol is a table-driven protocol. A modified version of the Distributed Bellman-Ford (DBF) Algorithm is known as DSDV protocol. DSDV protocol (DBF algorithm) is successfully used in data packet switching techniques. In DSDV, a mobile node must be send a series number to neighbour node and this serial number is continously incremented by two other mobile nodes and passed along with other routing update messages to all nearest mobile nodes.

ii. Wireless Routing Protocol (WRP): A wireless routing protocol is also known as distance vector protocol; it is used to send a message between two mobile nodes in wireless network system. Wireless protocol explain the distance routing system between source to destination by using three techniques- :

- WRP protocols transfer a message rather than interchange the entire routing table, when there is no link

changes. In wireless protocol, a distance, destination, and the predecessor node ID contains by the path-vector tuples.

- It can improve a reliability in data packet switching, where every nearest node must be send acknowledgments for received data packets. If any case acknowledgements are not received within the fixed time period then data packets will be retransmitted.
- A source to destination path is calculated recursively by the predecessor node by using ID information [7].

iii. Fisheye State Routing (FSR): FSR protocol is also known as link state proactive protocol. FSR protocol explain a netwok (topology or LAN) map or ad-hoc network at every node level. A netwok (topology) map is to used to decrease the overhead incurred process using control data packets. Fisheye routing protocol improves the algorithm of a link state routing techniques by using following methods- :

- In FSR, only nearest nodes can trasmit the link state information to next node.
- A link state information can transmit in time-triggered procees. And it can be transmits the all linked based information at every node level.
- It can be used different time slots in data transmission for the different accesses in the routing list.

iv. Hierarchical State Routing: Hierarchical State Routing (HSR) is a combination of logical partitioning and multilevel clustering of mobile nodes. In HSR protocol, a network is devided into various clusters where a cluster-head selected as in a cluster-based algorithm. A cluster-head contains its cluster's information and it can send the information to nearest cluster-heads by using interconnection network like gateway. Cluster-head is a member of cluster at a higher level and it can transmit their link information at the summarized lower-level.

2. On-demand (Reactive Protocol): On-demand Protocols are also called as reactive protocols. These types of protocols does not contain a permanent routing table in data routing techniques, because all data path are generated by the source node on demand. Reactive protocols are examine the routing paths, when data transmision techniques are required. Ex.– AODV, DSR.

i. Ad Hoc On-demand Distance Vector (AODV) protocols are also called as unicast reactive routing protocol for MANET. AODV protocol contains the routing information about the active paths as a reactive routing protocol. In AODV, routing tables used the routing information at each node level, where each node keeps the information to a next data routing table, it generates the information from source to destination for a route discovery operation[12]. If a routing table has not been used or reactivated for a pre-specified expiration, it will be expired. If a mobile node wants to send a message to the next node but a a path is not available on network, then it can perform a operation for data packet transmission called route discovery. [3].

Dynamic Source Routing (DSR) is followed by the source routing concept. Dynamic protocol is a pure reactive routing protocol. DSR protocols have two important phases: route discovery and route maintenance [8].
In DSR, when a sender node wants to transmit a data packet to receiver mobile node; at first this sender node performs a route cache operation for data transmission. If a route is available on the network, then data packets will be transmitted. Otherwise, sender node generates a routing process by using a broadcasting route request techniques called route discovery operation.

3. Hybrid Protocols: A hybrib routing protocol is a combination of active and passive routing protocols, and it is also known as hierarchical routing. Hybrid protocol is generally used in clustered network application. In HSR protocol, all nodes of a network are combined into various small clusters form a small network to large network. A cluster routing are used by two cluster methods intra cluster and inter-cluster. When all nodes of a network are usually used in proactive protocol called intra cluster routing. An inter-cluster routing is generally used by on-demand protocol for ex. Zone Routing Protocol (ZRP) [5].

Zone Routing Protocol (ZRP) is a common hybrid routing protocol. This protocol is a combination of two (proactive and reactive) routing protocols. In zone routing protocol, a network distributes into small networks called routing zones, where every switching device works like a central device. The whole network is a collection of various overlapping zones. An overlapping zone has two zones- IntrAzone Routing Protocol (IARP) and IntErzone Routing Protocol (IERP). IntrAzone Routing Protocol (IARP) is works as a proactive routing protocol and it's containing the information of the topology of zone. IntErzone Routing Protocol performs the responsibility and detects the universal data path with a destination node besides the routing. ZRP protocols reduce the latency caused in reactive protocols by using route discovery and also reduce the control overhead of proactive protocols [5]. A ZRP protocol has three routing zone protocols:

- BRP(Border cast Resolution Protocol)
- IARP
- IER

III.PROPOSED PROBLEM AND SOLUTION

Simulation Parameters

In this simulation, we have selected 10 nodes for 500x500 square meter with two dimensional (2D) rectangles areas. All mobile nodes are represented in 2D grid with X-axis and Y-axis, where X-axis and Y-axis is represented the range (0,500). In ad-hoc network, a mobile node can moves from one location to another location at a constant speed. And a

mobile node can moves from one location to another location at a constant speed. And a mobile node can also disconnect the data transmission with a fix pause time (.01 sec.). In a random destination point router node select the next transmission function of mobile node. The simulation parameters are shown below

TABLE 1 PARAMETERS FOR SIMULATION WORK

Simulation Parameter	Value
1. Mobile nodes	10
2. Simulation Timing	500 sec
3. Size of network	500*500
4. Pause Time	0.01 sec.
5. Traffic	Constant Bit
6. Data Packet Size	512 bytes
7. Routing Protocols	DSR, FSR, HSR

1) Numbers of nodes (10) – We have select 10 nodes for this simulations work where each node is constant
2) Total simulation time (500 sec.) –We have analyze the total simulation time 500 sec. between starting and ending of simulation .
3) Routing protocol – DSR, FSR & HSR.
4) Network size (500*500) – Network size represents number of nodes with the size of 500*500 square area that nodes are moving one place to another place. Network size defined the connectivity between two nodes.
5) Pause time (0.01 sec) – Node's pause time is .01 sec..
6) Traffic type – Constant Bit Rate.
7) Packet size- 512 bytes.

IV. COMPARISON BETWEEN DSR, FSR AND HSR PROTOCOLS

This simulation work is focusing on the performance comparison of DSR, FSR and HSR routing protocol. We simulates these protocols according to various data transmission factors such as- average overhead, best routing speed or throughput and data transmission ratio.

1. Average Routing Head (ARH): In average routing head, we have proposed a random direction model for routing to generate the highest routing average overhead as compared to other mobility model.
2. Packet Delivery Ratio: In data transmission ratio or (PDR), a Random data model performs a good performance in data switching technique from source to destination by using the given pause time (.01 sec), where this model (random) can change their location at every time.

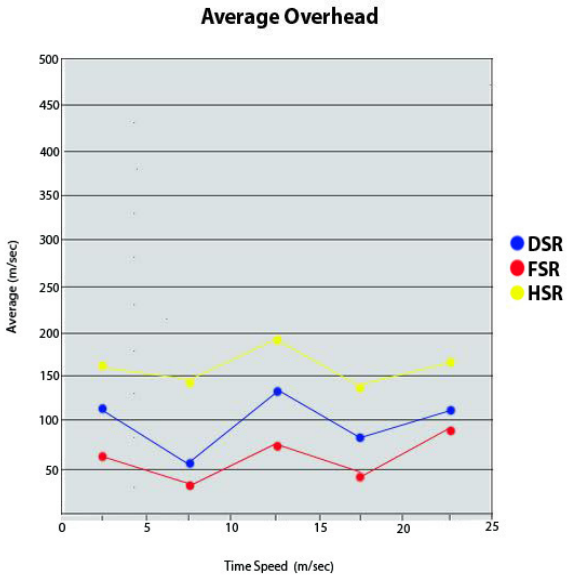

Fig.4. Average Routing Head

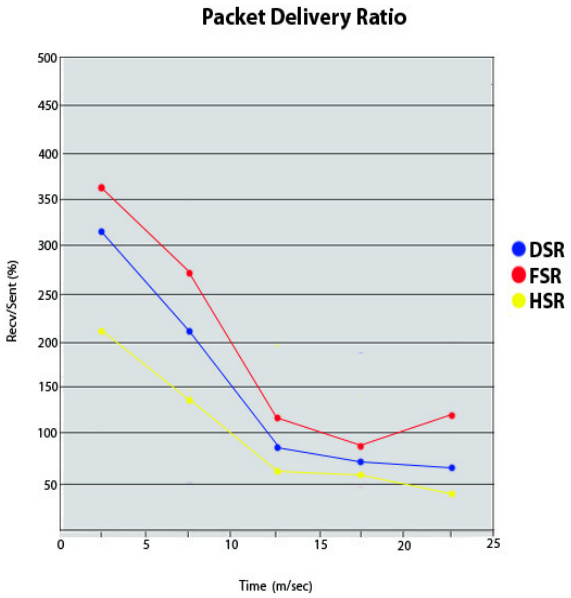

Fig.5. Packet Delivery Ratio (PDR)

3. Throughput: In throughput metrics, routing performance of DSR, FSR, and HSR routing protocols is related to the pause time parameter (0.01 sec.), where FSR protocols is gives best throughput as compared to other protocols (HSR & FSR).

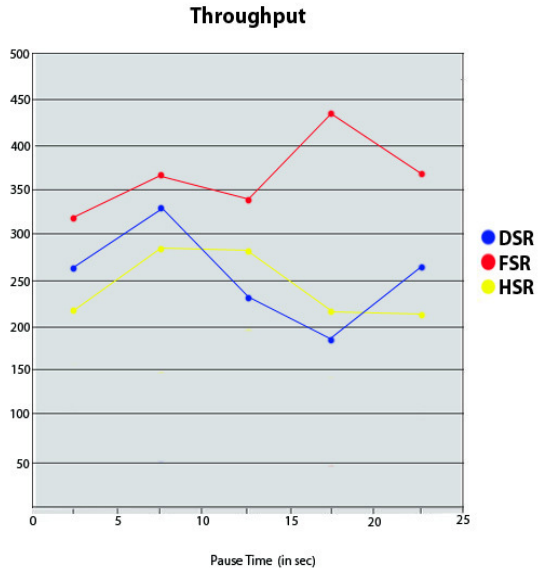

Fig.6. Throughput

V. Conclusions

In this paper, we have proposed a comparison among DSR, FSR and HSR routing protocols with various metrics such as- packet delivery ratio (PDR) between two nodes, throughput and average routing head (ARH). We have selected a scenario of 10 nodes. This simulation work of these protocols is done by NS2 simulator. We have observed that FSR protocol perform the better performance in throughput parameter than the DSR and HSR protocol and packet delivery ratio of HSR protocol is to be best in case of average routing head. We have analyzed that throughput and reliability are main parameters for selection and in this simulation FSR protocols gives the better outputs and results as compared to other protocols because its throughput is best among other protocols (HSR & FSR).

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Authentication scheme using novel chaff generation method in fuzzy vault

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Abstract: **Key Management is the critical issue of a cryptographic system and it requires a better security mechanism. Bio-cryptology provides a strong solution for the said critical issue. Fuzzy vault scheme is a popular scheme to design bio-cryptosystems. Key is secured with the biometric data mixed up with some noise points known as chaff points in a secure storage i.e. vault. Generation of chaff points is the important part of the fuzzy vault system. This work is mainly aims to present an authentication scheme (Key matching) with reducing the complexities of chaff generation. In chaff generation, circle packing, geometrical hashing etc. techniques are used to protect the real data from the noisy data, but these techniques are complex. Here a novel method of chaff generation is used where newly generated chaff point compared with genuine points (stored in a dataset) to assure that it is different, hence genuine points are protected. Experimental results shows that our method have less complexity and performs better than other existent methods.**

Keywords: ***Key management, cryptographic system, Bio-cryptology, fuzzy vault, chaff generation.***

I. INTRODUCTION

Now a day various services over the highly networked society require reliable means of personal authentication schemes. Preserving Integrity, Confidentiality and Availability of information is the major goals of the information security. There are different methods for user authentication, i.e. using password, smartcard or biometric traits based. For Information security various techniques like Cryptography Biometrics and Data hiding are used, but alone these solutions are not sufficient for the given issue. Mixing one technique with other gave a better solution in order to enhance the security level. Bio-cryptic system is one of those techniques where application of cryptography is mixed with biometrics. It provides better security for the critical issue of cryptography i.e. Key Management. Due to its good safety measures Biometric authentication is widely used as it provide better protection to avoid information theft and safety harassment [1]. Thus, for providing complete authentication mechanism or for securing the traditional cryptographic keys Biometrics-based authentication becomes an alternative of password-based authentication system in now a days. Biometric authentication systems also have many exploitable vulnerabilities, [8] especially in the networked infrastructure, like SQL injection attacks may cause a serious threat to the database. Hence combination of biometric property with cryptography may also have some exploitable vulnerability. We need to add some extra feature in it to enhance its architectural level security.

To design such bio-cryptosystem the application of a fuzzy vault scheme [7] is applied. For those applications where biometric based authentication and cryptography both are combined together fuzzy vault scheme is more suitable. As far as other practical cryptosystems is concerned where key management is the critical issue, fuzzy vault also overcomes this issue. Here in our work, this scheme is used to protect the key; key is mixed up with the user's biometric trait (fingerprint) and the generated chaff points [6]. Key from the user is encoded as the coefficients of a polynomial and mixed with the minutiae points extracted from the fingerprint and the generated chaff points. The generated chaff points are mixed with minutiae points which are used in user authentication to make it hard for an attacker to guess or extract the minutiae points. Combination of minutiae and chaff points make attacker harder to extract the polynomial coefficients i.e. the key. Bio-cryptosystems can include fingerprints, iris, face and palm-print. In fuzzy vault scheme the chaff generation module is the most computable heavy block. This module generates false minutiae points which is used to hide the genuine points from the attacker. A novel chaff generation method is used and compared with some existing chaff generation methods [4].

The remainder of this paper is organised as follows. In Section II Background work of the chaff generation is discussed. Section III deals the fuzzy vault scheme. In Section IV deals with our novel chaff point generation method. Experimental results are discussed in the Section V and Section VI concludes the paper.

II. BACKGROUND WORK

Our work focused on the authentication scheme and to propose a less complex chaff generation method. Fuzzy vault scheme is applied to secure the key that is used for the matching in order to process the authentication request of a user. In the fuzzy vault scheme different methods have been used to generate chaff points by different researchers. In [4] the concept of circle packing which is a theorem in geometrical mathematics is used. It is less computational heavy than the other existing methods. In [5] authors applied the geometric hashing to find geometric objects of the same or similar shape even though they may be rotated and/or translated. In [3] author proposed a method in which the fingerprint images are splits into the various segments which is known as image cells and each of these cells have eight adjacent image cells. There were two criteria for generation of a new chaff point: (i) points are just pixels with X-coordinate value not having similar X-coordinate value as the valid points and the existing chaff points, and (ii) The Y-coordinate value should not be equal to polynomial P(x).

Based on these approaches our novel method is proposed to reduce the complexities in the chaff generation process so that it takes less system execution time.

III. FUZZY VAULT SCHEME

Juels and Sudan proposed a scheme [9] termed as fuzzy vault. As discussed earlier fuzzy vault scheme aims to shield the important data like secret encryption key, with the help of biometric traits so that only the right user can access the secret by providing the valid biometric trait.

A. Encoding Phase

The encoding process of fuzzy vault is shown in the fig. 1.
In this phase the key from user is taken and mixed with user's own biometric trait i.e. his fingerprint in order to hide the key. The key and biometric traits are represented as points having coordinates values in a 2-D plane. Apart from these points some false points are added into the template to protect the genuine points.

The procedure is as follows:

1. A finite field size of order S lies on the quantised biometric features construct the fuzzy vault.
2. The secret key K (128 bits) is encoded and represented as the coefficients of an n^{th}-order polynomial P. For this CRC-32 function is used, which computes the CRC-32 checksum value of the data stored in a vector. Polynomial bit positions have been reversed, and the algorithm is modified to improve the performance. Fig 2 displays the polynomial coefficients in X-Y plain.

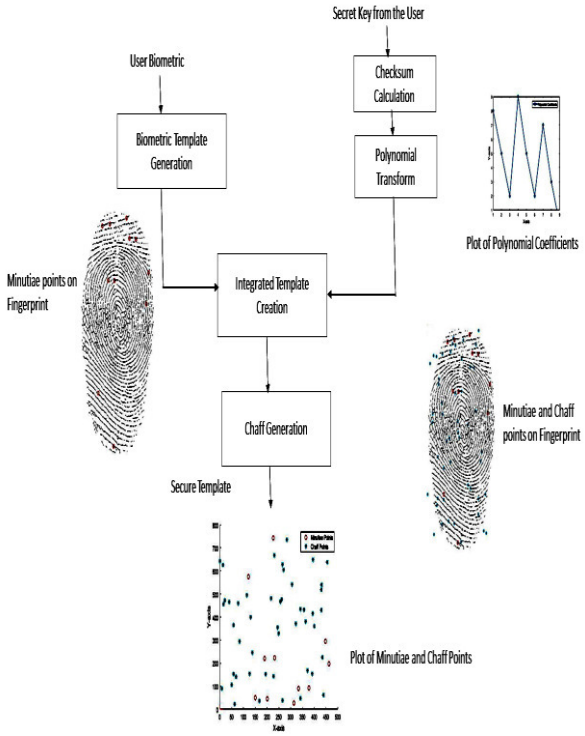

Fig 1: **Encoding Phase**

3. $M = \{m_i\}_{i=1}^{r}$, where $m_i \in Integers$ and r is the number of minutiae points is a user's fingerprint template. To obtain genuine points evaluations of P are computed on the elements of M, treating the elements of M as distinct x-coordinates. These points stored in a set. Initially a large number of minutiae will generate, a processing will require to extract useful minutiae. Based on the distance between a termination and a bifurcation and a threshold value number of minutiae can be adjust. If the distance between a termination and a bifurcation is smaller than the threshold value, those minutiae will be removed.
4. After getting the genuine points set some noise points (i.e. chaff points) will be added in it, in order to enhance the security level. Chaff points are also stored separately in a set.

The generated fuzzy vault template has the combination of valid and chaff points in x-y plain.

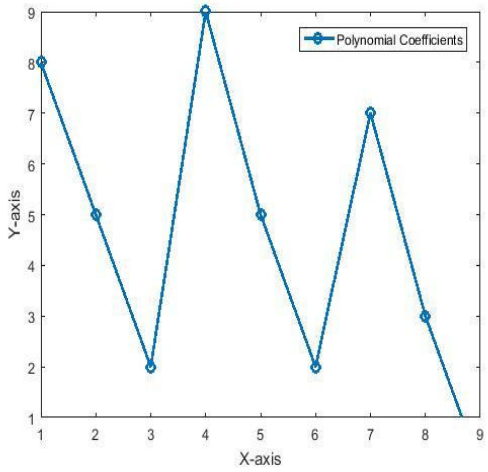

Fig 2: **Polynomial Coefficients**

B. Decoding Phase

Decoding of the fuzzy vault is shown in the figure 3, and its steps are described as follows

1. The user who needs validation or authentication will give his biometric trait (here fingerprint) and the secret key.
2. After getting the secret key again the key will be encoded as the coefficients of an n^{th}-order polynomial same as in encoding process and also generate required number of minutiae points (as in encoding phase) by user's taken biometric trait.
3. In Biometric Data Mapping process the new biometric feature is compared with the saved fuzzy vault members of the database. Those minutiae points which matched with the stored database minutiae points will be removed from the saved fuzzy vault member (temporarily for matching).
4. Load the saved chaff point set for that particular fuzzy vault member and remove chaff points from it to get the polynomial coefficients.
5. This polynomial coefficient is matched with the polynomial coefficients generated in step 2. If user is a registered person and given his right secret key, both the polynomial should produce same coefficients hence both two will get matched and user can be authenticated.

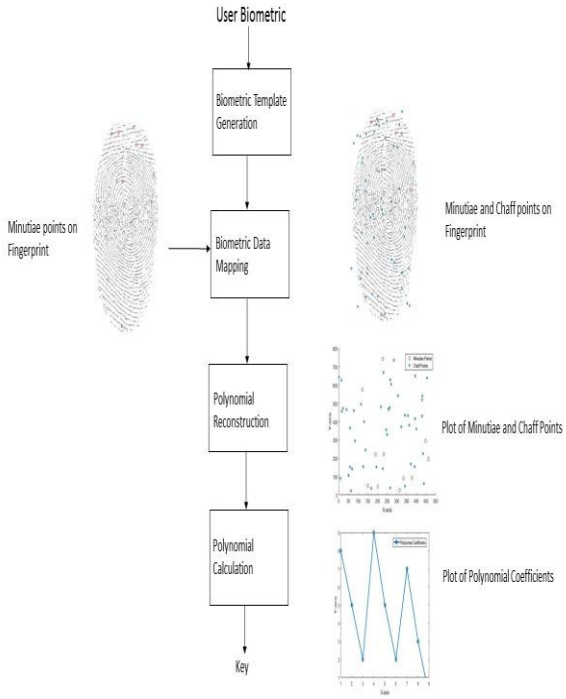

Fig. 3: **Decoding Phase**

IV. CHAFF GENERATION METHOD

To generate random noise or false points in the fuzzy vault encoding process, Chaff generation method is used. Chaff points generated and mixed with the real minutiae points and secret key to hide these points from the attacker, so it becomes very hard for an attacker to recognize the real points and the chaff points. These Chaff points are scattered over the fuzzy vault randomly and without any set pattern. Quantised biometric feature area should be taken into consideration while generating the chaff points and every chaff point should maintain a minimum distance with other chaff point. Clancy chaff generation algorithm [2] is very popular for this purpose.

A. Proposed Chaff Generation Algorithm

1. Calculate the feature area
FeatureArea (R) = del_X * del_Y;
Where, **del_X** = Xmax-Xmin and
del_Y = Ymax-Ymin
Xmax is maximum X-coordinate value for genuine points,
Xmin is minimum X-coordinate value for genuine points,
Ymax is maximum Y-coordinate value for genuine points and
Ymin is minimum Y-coordinate value for genuine points,

2. Generate random chaff point and insert with following conditions:

while(index < Number_of_chaff)
{
Generate Temporary random chaff_point;
Check_if(whether generated chaff points lie between R and does not belong to genuine points (stored in a data set))
{
Include chaff_pointff;
Increase the index;
}
else
ignore the Temporary chaff_point & continue;
}

Minimum number of iterations required to generate desired chaff points will be equals to number of chaff points we need.

V. RESULT OF THE PROPOSED CHAFF GENERATION ALGORITHM

Result of our chaff generation algorithm is shown in the following figures, Fig 4 and Fig 5. In the figures red dots are the minutiae points and blue points are the chaff points. Chaff points scattered all over the template region as allowed by the proposed Algorithm.

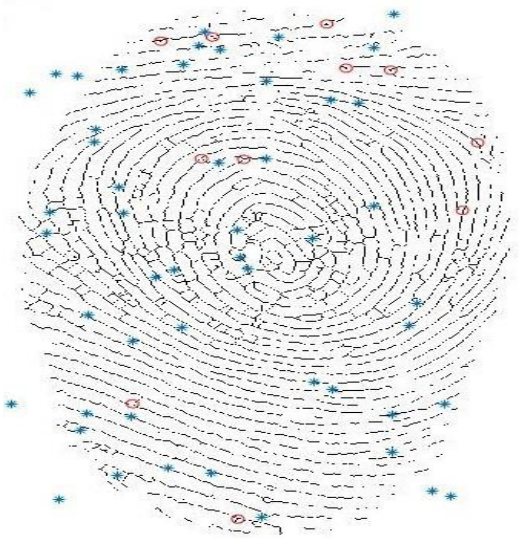

Fig 4: **Minutiae and chaff on fingerprint**

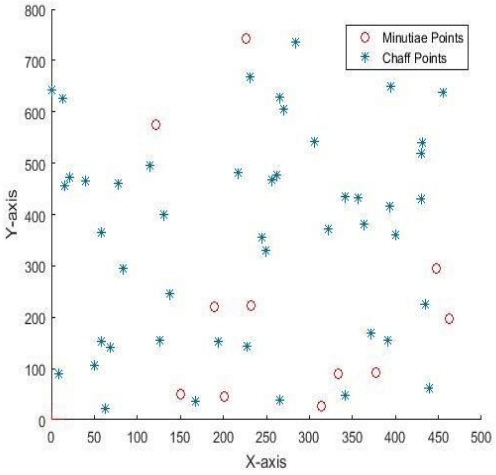

Fig. 5 **Minutiae and chaff on X-Y plain**

VI. RESULT AND ANALYSIS

Here secure key is taken from the user as an input and securing it by the means of bio-cryptic system. To generate polynomial coefficients CRC32 function is used. The CRC32 computes the CRC-32 checksum value of the data stored in the vector. The result is an unsigned 32-bit integer. Here the number of

polynomial coefficients is limited to 10, coefficients less than 10 allowed but not more than 10.

Performance of some chaff point generation methods are tabulated in the Table 1 with different number of minutiae and chaff points. Table 1 includes the Clancy method, a method published in a research paper [4] and our proposed method. The computation times of the Chaff point generation methods are recorded in the Table 1 for different cases based on the number of minutiae and chaff points. For the evaluation of performance gain, speed-up is calculated between our proposed method and referred method for each case. Table shows as the number of chaffs increased, the commutation time is also increased with a great margin. In our proposed method also system execution time increased as the chaff points increased, but the margin of increment is very less as compared to the referred method. Hence our method is getting a better performance gain as compared to other methods listed in the Table 1. The unit of the system execution time for each chaff generation method is taken in seconds.

Table 1. **Performance evaluation of chaff generation method**

Minutiae points	Chaff points	Clancy Method	Referred work method	Proposed Method	Speed-up with referred method
10	50	106.5	9.8	6.8	1.44
10	100	347.4	17.6	7.20	2.44
20	200	7098	50.4	7.80	6.46
30	400	17624	207.4	8.92	23.25
30	500	32697	310.0	9.47	32.73

Performance of the both proposed method and referred method are shown by the following plot. Following plot clearly displays how the system execution time increased with the increment in the chaff points.

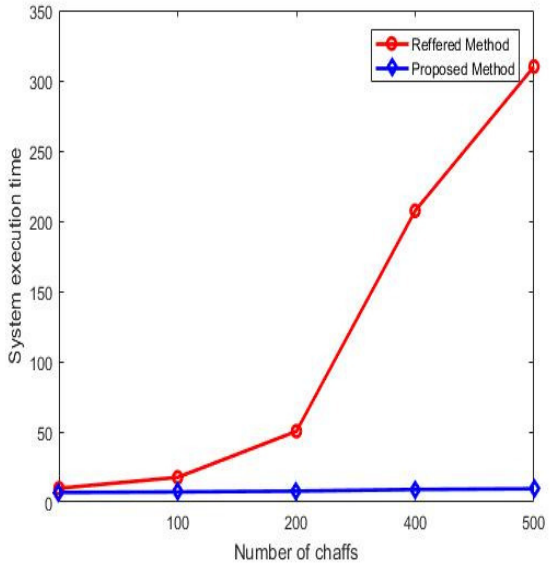

Fig 6. **Performance Analysis**

The above experiment is performed using MATLAB 2016 Software on a system with 64 bit Windows 10 Operating System, 4GB RAM, Intel Core i5-2430M Processor and CPU @ 2.40GHz.

VII. Conclusion

In this work as a Biometric feature fingerprint is taken to construct the fuzzy vault. Security level of the user's secret is increased by the addition of the Chaff points. If an attacker gets the saved fuzzy vault by any means it would be very hard for him to distinguish between the real minutiae points from the mixture of the minutiae and chaff points. Also if any attacker wants to authenticate himself falsely for a registered he will not get success because of the bio-cryptic combination. Result and analysis shows that our proposed method for chaff generation achieved a good performance gain.

We can add the features of multi-biometrics system to enhance the security of the existing system. It is also a future scope of our work.

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A Framework on botnet detection and forensics

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***Abstract*—The utilization of Internet on domestic and corporate front has been increasing at drastic rate. Each organization and enterprise exploits the internet to its fullest extent based on its requirements. In almost all areas, internet is proved to be a boon. But sometimes it lands the users into trouble because of unwanted and uninvited harmful software applications. There are so many types of threats and challenges that are faced by the internet users. Out of all the threats faced by internet users, botnets are at the top most position. Because of these prodigious threats botnets are the rising area of research. Botnet works as a coordinated or synchronized activity where different bots collectively participate to perform a malicious task. The botnet is different from other form of malware in its capability to compromise the computer systems or smartphones to set up a link with command and control(C&C) server controlled by bot controller. Because of the massive participation of compromised machines the losses caused by botnet attack are immeasurable. As a result, different researchers are showing keen interest in the field of botnets. The trend reflects that the number of researches in this field have gone up at tremendous rate in past 5 to 10 years. The present paper proposes a framework to systematically identify the presence of malicious bot, prevent it from spreading further and performing its forensic investigation.**

***Index Terms*—Bots, Botnet, Botnet detection, Forensics, Malware**

I. Introduction

Now a days , Botnets are becoming the first choice of hackers and crackers to take them to their very goal. These people perform their wicked activities through a Botnet. A Botnet is defined as a collection of interconnected clients that may be the Computer systems or mobile devices where each device is infected with malevolent piece of software called bot. The machine or host that is infected with bot is also sometimes referred to as a bot. A Botnet is created and controlled by humanware commonly known as botherder or botmaster.

A botmaster controls all the bots in his botnet by issuing them commands and instructions and instructions through a common meeting point on the internet and that is referred to as C & C (Command and Control) server. All bots directly or indirectly report to this C&C server and are controlled and coordinated by it.

Bots are used to perform an ample number of tasks that are marked by deep ill will. Bots are used to carry out the activities against hardware as well as software and such activities are deliberately harmful. Some examples of such vindictive tasks are DDOS(Distributed Denial of Service) attack. The impact of such attack is quite harmful. According of FBI, USA alone has faced the loss of around $20 million because of the bot attacks.

The main purpose of botherders behind the development and operation of botnets is the monetary benefit. The botherders reportedly earn huge profits by extending and rendering their services to different people and organizations. As per the available facts and figures many botnets have badly hampered the working of Internet and have definitely caused losses to world economy. These days, along with the botnets of computers, the botnets of mobile phones are extending their arms and are posing a big threat to safety and security of Internet. Because of the speedy expansion of botnets and their harmful impacts , many researchers and organizations are taking keen interest in studying botnets and developing solutions to find its existence, to reduce its impact, to make it stay apart and to eradicate it. So many security solution developers companies such as MCAfee, Symantec, TrendMicro have given some tools to fight against botnets and are still striving hard in direction of finding the whereabouts of botnets and also to freeze them. Botnets have major impact on the all categories of people who come under its influence. It is observed that a good number of researchers have shown their concern for the current problem of botnets , as there is a sharp increase in number of research articles on botnets from year 2005 to 2015.

The remaining part of the paper is organized as follows: Section 2 gives introduction of the botnet life cycle and architecture, Section 3 throws light upon research related studies, Section 4 defines architecture of botnet forensics, botnet defense mechanism which is required for investigation and reduction of botnet activity is detailed in Section 5, and some research challenges are presented in Section 6, and at the end we discuss conclusion and future prospects in Section 7.

II. RELATED WORK

Many researchers have worked in this field and tried to find out some solution to the problem of botnets. Many of them have suggested some solutions and shared their experimental experiences to mitigate the problem of Botnets. In literature review it is highlighted that the past researchers have deployed various tools and developed the techniques such as Signature and Anomaly-based Intrusion Detection Systems (IDS) to tackle the problem of network security and detection of threat.

In [1] a generic framework is presented that is related to botnet detection and is based on the approach of passive monitoring or observation of the network traffic. The authors have also tried their level best to present the approach through the use of a flow chart. Authors also stress upon the statement that, to apply or test the mitigation efforts, detection must be performed in real time. There must be low false positives to notice botnet action as in intrusion detection system. Escaping the detection need to be considered as one of the most crucial features for bot attackers.

In [2] the authors have build up the framework on the advancement of tools belonging to open source category, such tools include Hadoop, Hive and Mahout to render a measurable effectuation of semi-real-time intrusion detection system. The effectuation is used to observe Peer-to-Peer botnet attacks using machine learning methodology. The fpcus points of their paper are as follows: (1) Creating a distributed framework using Hive for catching and handling network traces which enables the pull out of dynamic network characteristics. (2) Utilising the parallel processing ability of Mahout to construct Random Forest supported Decision Tree model which is employed in the job of Peer-to-Peer Botnet detection in semi-real-time. The effectuation setup and performance measures are presented as first observations and future elongations are also proposed.

[3] shows an open framework named *Dorothy* that allows to check the activity of a botnet. The authors propose to describe a botnet behavior through a collection of parameters and a graphical representation. In a case study, the authors penetrated and observed a botnet named *siwa* and collected details about its operational structure, geographical distribution, communication techniques, command language and processes. The framework of *Dorothy* is composed of various software modules applying all different steps of the mechanical joining to an IRC channel, tracking, study and graphical representation of botnet activity.

In [4] the authors presented a new detection framework which lays stress upon P2P based botnets. This proposed framework is related to their definition of botnets. The proposed framework is based on inactive monitoring of network traffics. Accordingly this model is not suitable for detecting botnet at that particular moment when hosts are contaminated with bots. The authors identify a botnet as a collection of bots that will perform similar interaction and malicious activity patterns within the same botnet. In this detection framework, authors observe the group of hosts that present similar interaction pattern in one stage and also performing malicious activities in another stage, and searching for the common hosts in them.

In [5] the researchers show the facts required to create a system capable of reducing the botnet problem in financial scenario. The projected arrangement stands on a new design that has been authenticated by one of the largest savings banks of Spain. The authors present that it is possible to *plot* financial botnet networks and to give a non-deterministic *grade* to its connected bots. The planned arrangement also encourages intelligence data sharing and distribution to concerned organizations such as law enforcement agencies, Internet Service Providers and financial establishments.

In [7] present an organized botnet framework to facilitate researchers to put together benevolent botnets with changing command and control (C&C) arrangements to allow researchers to produce imitated base for the intentions of illustrating existing and probable forthcoming botnet C&C structures in order to assist the practical expansion of efficient botnet security. This allows researchers to imitate recent and possible upcoming botnet traffic, illustrate it, and sketch valuable defense processes. In this paper, the authors portray the SLINGbot model and how it can be helpful for the positive improvement of botnet defense mechanisms.

In [8] the authors proposed the structure of IRC client nature in a route in order to differentiate between regular and botnet-linked action. The projected system for spotting botnet activity is based on a structure of IRC client performance. The suggested structure spots and interprets IRC movement within unprocessed network traffic and, by examining a group of expressive factors, enables an organizer to group and segregate regular activity occurrences from botnet-associated ones.

In [12] suggests a novel methodology to spot botnet movement relying on traffic performance investigation by grouping network traffic manners applying machine learning techniques. Traffic activities investigation techniques do not rely upon the packets consignment, which signifies that they can operate with encrypted network interaction protocols. Network traffic data can generally be conveniently extracted from multiple network

tools without influencing major network operation or service accessibility. The researchers learn the possibility of spotting botnet movement without having seen an entire network stream by grouping actions build on time gaps. Examining the available information, the authors demonstrate practically that it is feasible to spot the occurence of identified and strange botnets activity with maximum correctness even with quite little time gaps.

In [13] presented a distinctive, bottom-up concept. That is, to deprecate botnet techniques and tools by dejecting or putting on trial the customers of the embezzled records. To make the idea tangible, the researchers put forward a case study of relating the concept to a well known botnet toolkit, *Zeus*, along with two techniques, called, reverse engineering and behavioural analysis. The benefit of this concept is that it points at the fragile point of a botnet food chain (the customers). The pouring effect will ultimately influence the peak level of the chain (the toolkit creator) by reducing his/her earnings when trading latest data to existing customers and new customers. In accumulation, since the assault is on the business prototype, malware developers would require to modify how they do trading to avoid our attack, which is additionally tough than changing the application of their tools and techniques.

In [14] an arrangement located at the network border is set up with the ability to spot rapidly changing domains via DNS interrogation. Numerous domain characteristics were investigated to ascertain which of them would be highly successful in the grouping of domains. This is attained applying a C5.0 decision tree classifier along with Bayesian statistics, with affirmative illustrations being labeled as possibly malicious and pessimistic illustrations as genuine domains. The approach spots harmful domain names with a maximum probability of accuracy, mitigating the requirement of blacklists. Some of the statistical tools, such as Variation distance and Probability distribution, Naive Bayesian, Bayesian are employed to spot harmful domain names. The spotting methods are tried out against modeled traffic and it is highlighted that the harmful traffic can be spotted with low false positive rates.

In [15] Demonstrates the study and examination done to describe or identify an effective set of traffic factors capable of depecting both usual and unusual working of networks, throwing light upon botnet activity spotting through abnormal and supportive behavior. An identification framework model is also suggested and examined through real data traffic.

In [17] analyze the potential threat of botnets based on mobile networks. The author discusses about mobile botnets.
The term mobile botnet refers to a group of compromised smartphones that are remotely controlled by botmasters via C&C channels. The author also gives brief account of Waledac and challenges involved in the study of mobile botnets and tracing their activities. A light is also thrown upon the defence mechanisms for mobile botnets.

In [18] authors suggest methodologies to spot botnets by examining network data traffic movement or flood. The authors constructed patterns for catching traffic data movement with extra pertinent features for botnet spotting. The researchers or authors have made use of the IPFIX standard for the specification of the patterns. Hence their methods can be applied to find the presence of various bot families with minimum outlay and are dealer impartial.

III. BOTNET FRAMEWORK AND LIFE CYCLE

The actual strength of a botnet is present in its architecture. It it's the skeleton which provides a backbone to the entire botnet. The botnet architecture involves the formation of botnet and who and who involved in it.

A. BOTNET ARCHITECTURE

Under the given heading we are going to throw some light upon the key features of Botnets and rest of the paper will be based on such features. As already mentioned a botnet is a network of compromised machines under the direct control of an individual operator called botherder or botmaster. A botnet may be thought of as melding of many threats into one. A botnet usually consists of bot server, bot clients or bots and botmaster. There can be small as well as large botnets. It means the botnets formed with the network of several hundred or thousands of botnets are regarded as small botnets whereas the botnets with millions of botclients are called large botnets.
The term botnet is derived from Robot Network. It reflects the fact that the botclients will act as Robots and server the botmaster who quietly sits at one central location to send them the commands and fulfill his goal of launching the attacks such as DDOS, sending Spam mails, phishing attacks, identity thefts, stealing credit card credentials etc. In modern days one botmaster handles or tackles a collection of bot servers by creating several divisions. In this way if somehow any communication channel is hampered by security people then only one particular division is lost and rest of the divisions are still active, The other divisions are very well used for launching the illegal activities. A botmaster normally establishes communication with bots using IRC (Internet Relay Chat) on a remote Command and Control (C&C) Server. The five main

stages that are performed in this communication from joining of a new bot to launching an attack are as follows:-

(i) A new vulnerable machine is attacked and compromised by copying into it a malicious piece of code. On execution of the malicious code the machine searches out for the C&C server, attaches itself to the server and becomes part of botnet. Using the rallying mechanism it informs about its presence to the botmaster that it is now ready to receive the commands.

(ii) It then receives commands from the botmaster to perform some malicious activity or task.

(iii) The commands received by the machine from the botmaster are then executed by the bot client.

(iv) The attack is initiated as per the given commands.

(v) The bot client communicates back with the botmaster to inform him about the success of the attack.

There are some more people who are directly or indirectly related to the botnets and they are:-

(1) Bot Creator:- This person is responsible for the development, design and implementation of a botnet. A bot creator may be a botmaster or some other person or group of persons. These people develop special kits called botkit and sell it to those people who are of malicious intent and want to build up and maintain their own botnet.

(2) Bot Users:- These are those people who either avail the services of any botnet by paying some amount of money or they themselves become botmasters by purchasing the botkits or developing the code for bots and form botnets. In this entire process an illegal monetary transaction is also involved.

(3) Dupe:- A dupe is the one who is victimized by a bot. It is that machine which is compromised by exploiting its one or more vulnerabilities. Such machines or people associated with these systems may receive spam mails or be the part of various attacks constituted by bots.

(4) Inactive player:- He or she may be the possessor of a host machine which has been exploited or victimized and hence becomes a part of botnet without any acceptance. It starts doing illegal activities on behalf of the botmaster or as per his indications.

B. BOTNET LIFECYCLE

A life cycle may be thought of as a process starting from the formation of a bot to fulfilling its very purpose. Many papers presented by different authors throw light upon the life cycle of botnets. Most of the authors have presented the various process sequences but the detailed overview is not provided. we have tried our level best to analyse its stps and presentedit in detailed form, clearly stating the purpose of its each stage. The various steps in botnet life cycle are interrelated. In order to vindicate our statement, we are dividing the life cycle of a botnet into 5 steps or stages. A small overview of each stage is given in figure 1.

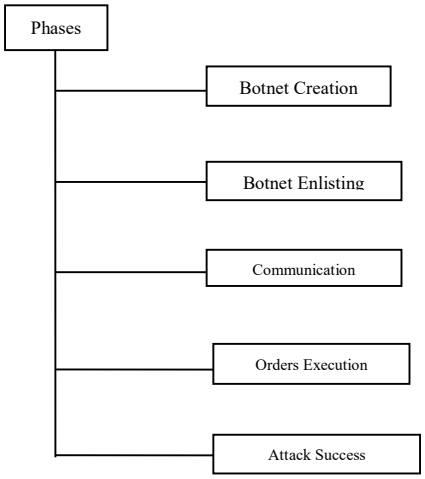

Figure 1: Phases of botnet lifecycle

(a) Botnet Creation:- It is the very first level in the life cycle of a botnet. In this phase the birth of a botnet takes place. The person behind the creation of botnet gives a physical shape to his intentions by framing the initial structure and framework.

(b) Botnet Enlisting:- It is also referred to as bonet recruitment. Once a botnet is created, then arises the need to find out other hosts and if the botmaster locates any vulnerable host through an existing client, then it is compromised and that particular host becomes a member of the botnet.

(c) Botnet communication:- In this stage a process called rallying is taken place. In this process the botnet client setup its first interaction with the botmaster through C&C channel or any other mechanism. At this point or stage a botclient informs the botmaster about its presence in the botnet and it also may request updates. The updates may include the names of various C&C servers, the list of IP addresses, channel names etc. The botclient also takes orders from the botmaster to

initiate an attack or gets information about the location of current antivirus and ensure its removal or making it passive.

(d) Orders Execution:-On getting the commands or Orders from the botherder to perform an attack, the bot client execute such commands. A bot client may perform various actions on the basis of instructions obtained from the botmaster. Such actions may be to launch Distributed Denial of Service attack, sending bulk amount of spam mails, doing click fraud, launching phishing attack, performing identity theft, compromising othet systems or recruit the systems to become part of the botnet, password guessing and installation of adaware etc to the other machines. In some cases the bot clients have special capability to sniff the running network traffic for passwords. According to C A Schiller, the botclients use little but able softwares to grab the usernames and passwords and also use other softwares to creck them. There are various tools available for password breaking or cracking.

(e) Attack Success:- The main goal of any botnet's conception is to successfully carry out the orders of the botmaster and earn desired amount of monetary profit. On successful execution of the attack the bot informs about the success to the bot master.

C. BOTNET TOPOLOGIES

The word topology means the configuration or design in which different bot clients are connected together and form a massive network called botnet. As per the Command and Control(C&C) Channel, the botnet topologies are divided into two categories or models, and that are:

(1) Centralized model
(2) Decentralized model

Both, centralized model and Decentralized model have their own pros and cons. The detailed discussion of both the models is provided here.

1) Centralized model

In centralized model there is one central server or central point that is responsible for setting up communication between the Botherder and Botclients. Using this channel the exchange of messages and commands is taken place. The central server is referred to as Command and Control (C& C) server. Many available Botnets such as SDBot , AgoBot, RBot etc use C&C for the purpose of communication. The central computer or server is usually a powerful computer system because it has to handle the entire Botnet whose size may vary from a few thousands to many millions. It must have a high bandwidth since at any single point it may require to serve many bots. Even though the central server is a powerful one but it is regarded as a weak point of this model. If someone is able to locate and launch an attack on C&C server then the entire Botnet will be deactivated and will no more be able to send to receive messages to the server. The figure 2 gives diagrammatic representation of command and control architecture of centralized model.

There are two protocols which are frequently used by C&C to perform communication and that are HTTP (Hyper Text Transfer protocol) and IRC(Internet Relay Chat).

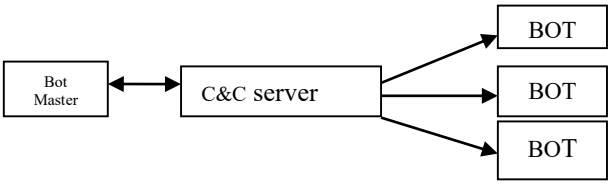

Figure 2: Centralized C&C botnet

1.1 IRC based Botnets

IRC is a protocol for real time Internet text messaging (chatting) or synchronous conferencing based on TCP that may also use secure socket layer. IRC offers various useful features. It helps in transferring files between users and the programs running on systems. IRC based botnets use centralized Command and Control structure in which infected machines try to establish connection to the IRC server and join the same channel.In these botnets the C&C server works on IRC service. The IRC protocol is based on client- server model. It Offers flexibility in communication and is quite simple to setup. It is regarded one of the most popular protocols to setting communication among Botnets.

1.2 HTTP based Botnets

IRC may be thought of as an originating protocol for botnets. IRC gained a lot of popularity and most of the botnets operated on IRC, so many researchers started focusing on IRC based communication. IRC also had some demerits. As IRC contains information about the port number before initiating an attack, the attack can be smoothly detected. So the hackers switched to HTTP protocol. This protocol is generally used in any category of network. It offers various advantages. It has the capability to hide malicious botnet traffic in normal web traffic which could not even be detected by firewall. The HTTP based botnets are easy to easy to form and implemented. There are some botnets

which use HTTP protocol and they are Rustock, Clickbot, Zeus, There are two types of HTTP based botnets:

1. Echo based HTTP botnets
2. Command based HTTP botnets

2) Decentralized model

A decentralized model is a model in which there is no central command and control. The protocols used by centralized botnets are IRC and HTTP but this type of botnet works with different types of protocols. Example of decentralized model is Peer to Peer (P2P). The P2P network of compromised machines is much harder to detect and destroy. P2P systems normally make use of file sharing networks. In decentralized models the botherder has freedom to choose any bot to distribute commands in the botnet. All bots can act as clients as well as servers. This type of botnet cannot be taken down by simply attacking at one point because there is no central server to control entire botnet. If one bot is attacked and taken down then other bots of the botnet will keep on working. P2P botnet is more dynamic and robust than the centralized one. Each bot maintains some collaboration to the other bots of the botnet. The P2P botnet is quite hard to be monitored, taken down and hacked.

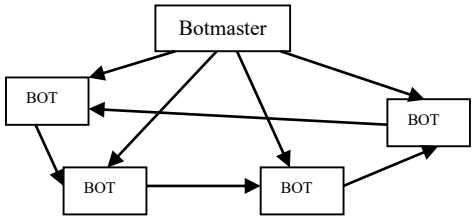

Figure.3: Peer to Peer bonet architecture

IV. BOTNET DETECTION

Many researchers have worked on the detection techniques of botnets and followed various approaches to identify C&C channels or analysis of the network traffic. Various techniques have been designed for Botnet detection from time to time. As per the researchers there are three major techniques of botnet detection:-

a) Host based detection
b) Honeynets based detection
c) Network based detection

A. Host based detection

In hosts based detection techniques the analysis of machine responses is done on the basis of certain terms. The general behavior of the machine is observed and tried to locate any type of abnormality. System taking too long to respond to even small actions, taking too long to resolve the call sequences, any suspicious entry in the registry, abnormal changes in the file systems, antivirus not responding or turning off on its own, changes observed in network connections etc may point fingers in the direction of presence of bot. Host based detection methods are not treated as very successful methods because such methods are capable for only one machine and may vary machine to machine.

B. Honeynets based Detection

Honeynets are sometimes referred to as Honeypots . Honeynets are mainly used to study and understand botnet features and techniques but are not always useful in detecting bot infection. Honey nets are normally employed to discover the intentions of botmasters or attackers. This technique is useful for detecting the known bots. The unknown bots and even known bots with slight change in the bot binaries are not detected by this method.

C. Network based detection

The network based detection technique is based on monitoring and analyzing the passive network traffic. This approach is quite helpful in identifying the presence of botnets in the networks. In this approach the network data is continuously monitored, network based communications are observed. Any abnormal trace may indicate the presence of some malicious activity. Now a days the botmasters are very smart and apply multitude of code obfuscation techniques. Even though the malicious code is obfuscated and bypassed by malware detection software, the packets are still present in the network that can be further traced by applying other techniques. The network based detection technique can be classified into four categories:-

a) Signature based detection
b) Anomaly based detection
c) DNS based detection
d) Mining based detection

a) Signature based detection

For signature based botnet detection technique there must be a dataset containing information about existing botnets. Using the bot binaries of existing botnets the bots behavior can be studied. A very good example of an Intrusion detection system that is based on signature based detection is Snort. In [21] it is being discussed about Snort and it is openly available for anyone on Internet. It has the capability of tracing out the signs of malicious activity when it is placed to monitor the network traffic. But we may consider its limitation that it can only detect the bots with known signatures and is proved to be useless for newly introduced bots.

b) Anomaly based detection

Anomaly based botnet detection techniques work on the basis of some flaws found in networks and such flaws may be high amount of network latency(High reaction time), sudden flow of massive amount of network traffic, presence of data traffic on unusual ports, abnormal behavior of computer system or network devices. All these reasons sufficiently give indication of bot activity. Even though it has the capability to detect unknown botnets but is incapable to detect that IRC network which has not yet been used for attack purpose. In [25] the author mentions about Botsniffer software which works on the basis of anomaly detection.

c) DNS based detection

The DNS based approach is a kind of passive detection technique. In such techniques there is full transparency but are not known to botherders. DNS based approach is based on the property that in order to access the C&C server, bots carry out DNS queries to locate the particular C&C server that is typically hosted by DDNS(Dynamic DNS) provider. So DNS monitoring will be easy approach to detect Botnet DNS traffic and detect DNS traffic anomalies. This is most famous and easy technique of botnet detection [22].

d) Mining based detection

The data mining based technique helps in recognizing the useful patterns to find out certain type of regularities and irregularities in available datasets. Data mining techniques can be used for the purpose of optimization. In this method the sufficient amount of data is obtained from the network log file to work upon and analyse. The various data mining methods are correlation, classification, clustering, statistical analysis and aggregation for extracting the useful information from the available data[22].

V. PROPOSED BOTNET ANALYSIS FRAMEWORK

The meaning of the word detection is to detect any abnormal activity and take measures to prevent it. The proposed framework presents the comparative analysis of the models presented by different researchers and suggests the useful measures in the direction of botnet detection.

The proposed model divides the process of bot detection into series of steps which starts from pre identification phase.

There are three major steps involved in the proposed model :-

5.1 Pre Identification

The pre Identification means the steps that can be taken before starting the botnet detection process. It includes :

- Security tools Preprocessing
- Reorganization
- Collection
- Preservation
- Retention

In security tools preprocessing the installed security tools are analysed and the problem is identified. In reorganization step, a setup is prepared, various networking tools are arranged and organized to make an environment ready to generate the network traffic. An available tool may be used to collect the network packets from the traffic flown in the network. The packet or dataset collection is done and the dataset is preserved safely. Once the dataset preservation is performed, it must be retained in the form of backup and its safety is ensured so that no one should tamper or harm the collected data. The various steps are shown through figure 4.

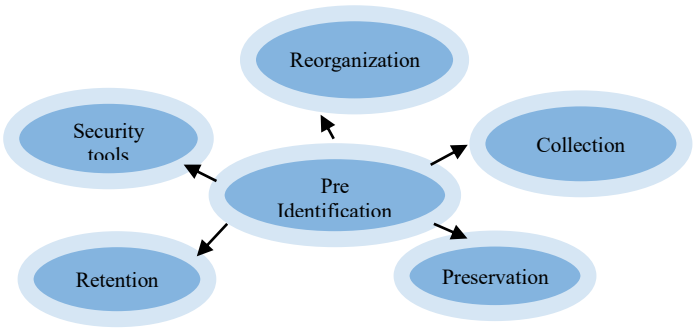

Figure 4. Pre Identification Phase

5.2 Identification Phase

In identification phase or process the data is identified and captured by using the available tools. The figure 5 shows identification phase.The various tools that may be used for data capturing may be Wireshark, NS2, Tcpdump, Botnet Simulator(BoNeSi). Then begins the detection phase in which the classification of data is performed. The different types of methods are employed such as machine learning, clustering, regression and association etc and then the next step is for mitigation of the problem and forensics analysis. Machine learning focuses on the development of such computer applications that can train themselves to grow and change when exposed to new form of information. Clustering is the unsupervised classification of patterns (observations, data items, or feature vectors) into groups (clusters). The regression analysis is used to find the relationship between the dependent variable (target field) and one or more independent variables. The dependent variable is the one whose values you want to predict, whereas the independent variables are the variables that you base your prediction on. *Association* rules are those

statements that help unveil relationships between seemingly unrelated *data* in a relational database or other information datasets.

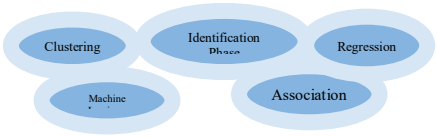

Figure 5.I dentification Phase

VI. CONCLUSION AND FUTURE CHALLENGES

In this paper we have tried to review the current state of botnets and to understand how botnet works and propose a detection framework to develop the efficient botnet detection system. The proposed process model or framework is a complete model that can be used for detecting the bots and analyzing them. The test bed environment consists of series of steps that can be easily implemented and fruitful result may be obtained from them. The method is quite simple and useful.

Several botnet studies are based on botnets detection techniques. There is hardly any methodical study about botnet anticipation and alleviation. More studies on botnet prevention are required that can extend support to spot botnets in their early stages. On the other hand, more studies about how to mitigate and respond after finding trails of an infection. Therefore, prevention and mitigation are striking challenges in this field.

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Plant Disease Detection Using Different Algorithms

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***Abstract*—This paper discussing the technique based on digital image processing, which has been utilized for the detection and classification of leaf disease that is present on different agriculture plants. This will help to design different disease control strategy which will be beneficial in agriculture field. Automatic detection and analysis of disease are established on their particular symptoms and the cost intensity is very helpful for farmers. It is a major challenge for the early detection of diseases in agriculture science. An organism like fungi, bacteria, virus etc is the major causes of plant diseases so the enhancement of proper approach in certain areas is very necessary. All these studies are focused on the early detection and classification of the plant lesion diseases.**

***Index Terms*—Plant Disease, Image processing, Threshold algorithm, K-means cluster, Artificial neural network.**

I. Introduction

The external appearance is the most important quality character of agriculture. This outer appearance greatly affects the sale value and consumer behavior in buying any product. Therefore the inspection of quality and grading system are essential in agriculture field to cultivate good healthy plants. Agriculture industry can go through a major production and economic losses which is caused by the plant diseases. This disease management is a challenging task. Usually, the diseases or its symptoms such as colored spots or streaks can be seen on the leaves or on the stem of the plants. In plants, most of the leaf diseases are caused by fungi, bacteria, and viruses. The disease caused due to these organisms is characterized by different visual symptoms that could be observed in the leaves or stem of a plant. Usually, these symptoms are detected manually. Automatic detection of various diseases can be detected with the help of image processing. A crucial role is played by the image processing in detection of plant disease since it provides best results and reduces the human efforts. The image processing could be used in the field of agriculture for several applications. It includes detection of diseased fruit, leaf or stem, to measure the infected area by the disease, to determine the color of the affected area. The degradation of the quantity and quality of the product is affected due to the plant disease. The naked eye observation is done by the experts for the detection and identification of the plants. This detection and identification is time-consuming in huge farms or land areas. In this paper importance of image processing techniques in detection and analysis of plant diseases in the earlier stages and thereby the quality of the product can be increased was discussed.

II. Litrature Review

Many research papers are describing the advancement of image processing for a variety of methodologies. In medical field [1] has been presented an automated system based on Artificial Neural Network for detecting skin diseases. Whereas EK-Means Clustering, Gray Level Co occurrence Matrix, Back Propagation Network is used to detect Lung Tumor [5]. In agriculture field image processing has certain impact threshold value with help of random forest classifier apple fruit diseases are detected by K-Mean cluster technique and features are extracted by color and texture [2], for identification of the presence of diseases by observing the visual symptoms seen on the leaves of the plant [3] has been done with the use of soft computing approach. Reference [4] has been reviewed and summarized techniques of the image processing and machine learning that have been used in disease identification.

III. Methodology

The methodology is used in this paper are two different segmentation techniques such as thresholding and K-means clustering algorithm and classification technique such as Artificial neural network (feed forward back propagation). First the digital images of plant leaves are acquired form field using camera. Then image pre processing is done. After that two different segmentation processes are done to segment the original image and extract useful features to identify the infected parts of the plant leaf. After that classification technique was done using nf toolbox in MATLAB software. Image processing block diagram is shown in Figure1.

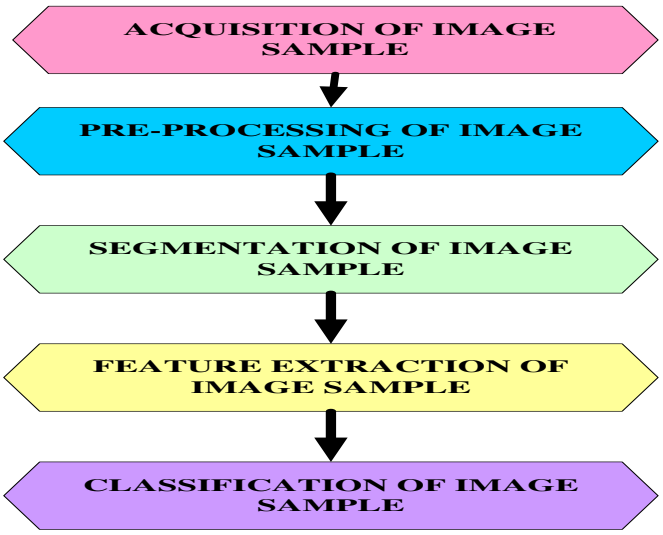

Fig. 1: ***Basic block diagram of Image Processing***

The proposed approach of the image segmentation such as thresholding algorithm, K- means cluster algorithm and classification technique based on ANN (feed forward back propagation) algorithms are illustrated below.
The RGB image of infected leaves was picked up. Figure 2 shows the sample of infected leaves. Figure 2 shows the different types of diseases in plant leaves such as Early Blight in potato leaf, Anthracnose in Custard apple leaf and Shoot blight in Mango leaf.

A. Acquisition of sample image
Image of contaminated plant leaves are collected using a camera. These images are in the form of RGB (Red, Green, and Blue).

B. Pre-processing of sample image
Per-processing is a progress of the image data that overcome non essential distortions or enhances some image feature necessary for another processing. Image cropping is done to get the interested region. Image enrichment is done for increasing the contrast of the image. Colour conversion of RGB to Gray image is done using following equation:

$$f(x) = r*0.2989 + g*0.5870 + b*0.114$$

After that histogram comparison is done which allots the intensities of image is activated on the image to improve the infected leaf image.

C. Segmentation of sample image
Partition of image into different parts of same features is called segmentation. The segmentation can be done using Thresholding, K-mean cluster, Otsu's method, converting RGB to HIS model etc.
a)Thresholding technique:
Image thresholding is an effortless and efficient way of distribute an image into a foreground and background.

Plant name: Potato leaf
Plant disease: Early Blight

Plant name: custard apple leaf
Plant disease: anthracnose

Plant name: Mango leaf
Plant disease: Shoot blight

Fig. 2: ***Sample images of Infected Leaves***

This is a type of image segmentation technique that segregates objects by transforming grayscale images into binary images. This is most efficient in images with high levels of variation. Choice of threshold value is the key parameter in the thresholding process.

The procedure for Thresholding Algorithm is given below:
Step 1: Initial estimation of threshold value (T).
Step 2: Segmentation using threshold value (T):
a.) A1, if pixels are brighter than threshold value (T).
b.) A2, if pixels are darker or equal than threshold value (T).
Step 3: Calculation of m_1 and m_2 of A1 and A2 which are the average intensities.
Step 4: $T_{new} = (m_1 + m_2)/2$; where, T_{new} is new threshold value.

Step 5: If difference of threshold value and new threshold value is greater than ΔT then go back to step 2 or else stop the iteration.

$$|T - T_{new}| > \Delta T$$

Where, T = Threshold value

T_{new} = New threshold value

b) K means cluster technique:

In this analysis, for the distance measure, Standard Euclidean distance is used. Mathematically, given a dataset $(x_1, x_2, ..., x_N)$ where, N= number of elements, the K means clustering algorithm assemble the data into K clusters. Analysis of the Euclidean distance has been done as the distance measure; it is then given as:

$$d = (\sum_{j=1}^{N} \sum_{i=C_j} (x_i - z_j)^2)^{1/2} \quad (1)$$

Where, $C_j = jth$ cluster

z_j = centroids of the cluster

C_j and x_i = input pattern.

The procedure for K-Means Clustering Algorithm is given below:

Step 1: Put K points into the space represented by the elements $(x_1, x_2, ..., x_N)$ that are being clustered. These positions signify initial cluster centroids $(z_1, z_2, ..., z_K)$

Step 2:

IF $|x_i - z_p| > |x_i - z_j|$

$j \neq p$ and $p = 1,2,\ldots,K$

then appoint each element $(x_i, i = 1,2,..., N)$ to the group that has the closest centroids to cluster $C_j, j \in (1,2,..., K)$ can found.

Step 3: When all elements have been appointed, again calculate the positions of the K centroids.

As follows:

$$z_i^* = (1/N_i) \sum_{j=1}^{C_i} x_i \qquad i = 1,2,\ldots,K$$

z_i^* indicates new centroids, for N_i no. of elements belongs to C_i cluster.

Step 4: If $z_i^* = z_i, \qquad i = 1,2,..., K$

then stop or else continues from step 2 until the centroids will not move. This produces a partition of the elements into cluster from which the metric to be minimized can be calculated.

D. Feature Extraction

For identification of an object feature extraction plays an important role. Feature extraction is used in many applications. To detect plant disease colour, texture, edges and morphology can be used.

E. Classification

a) Artificial neural network:

After completing feature extraction technique, then neural network is used to classify learning database image. Neurons in ANN are feature vectors. The weighted sum of the inputs is the output of the neuron in the function.

b) Back propagation:

To train the artificial neural network back propagation is the one of the method which is combined with gradient descent optimization technique. This method analyzes the gradient of a loss function with respects to all the weights in the network. In a recurrent network Back propagation algorithm artificial neural network is used. Once it trained, the neural network weights are fixed and it can be used to calculate output values for new test images which are not present in the learning dataset.

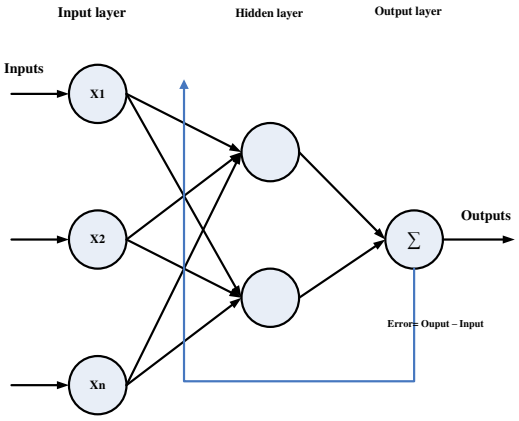

Fig. 3: ***Basic diagram of Back propagation neural network***

IV. RESULT

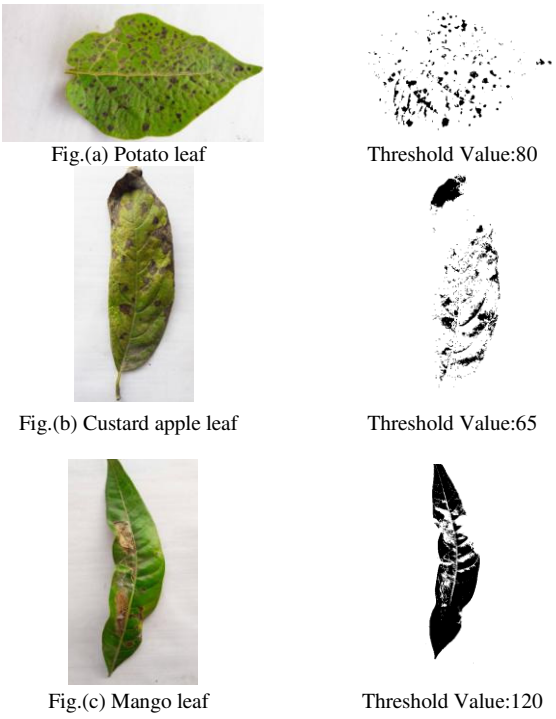

Fig.(a) Potato leaf — Threshold Value:80

Fig.(b) Custard apple leaf — Threshold Value:65

Fig.(c) Mango leaf — Threshold Value:120

Fig. 4. ***Output of Thresholding method***

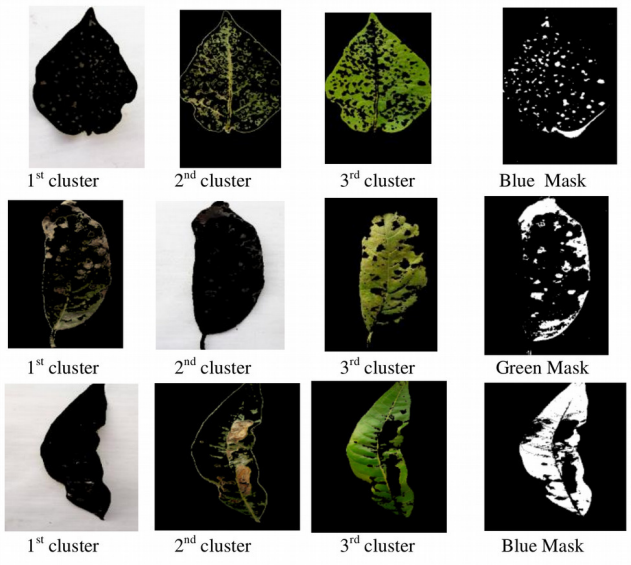

Fig. 5: ***Output for K-Mean cluster algorithm***

TABLE 2: PERFORMANCE ESTIMATION OF K-MEANS CLUSTER USING EUCLIDEAN DISTANCE METRIC

Dataset	Recognition speed (%)				
	Number of clusters				
	3	**6**	**10**	**14**	**20**
Potato	33.33	36.66	41	44.28	46
Custard apple	70	78.33	82	89.28	89.50
Mango	50	58.33	65	67.85	68

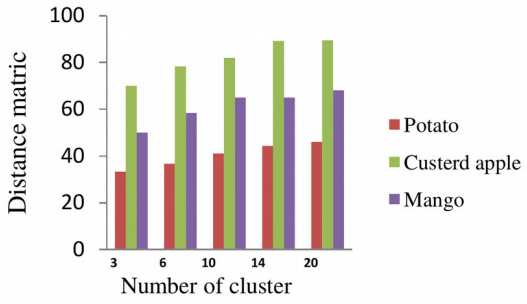

Fig. 6: ***Distance metric of infected plant sample***

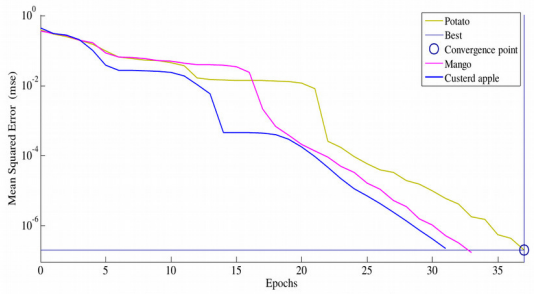

Fig 7: ***Mean square error (MSE) plot***

V. CONCLUSION

Paper presenting identification of the disease is main the purpose of proposed work. Different segmentation technique has been used for identification of plant leaf disease. Clustering and classification of plant leaf diseases have been formulated by the applications of image thresholding, K-means clustering and Neural Networks (NN). The different algorithm was tested on different diseases influence on the plants. With the experimental results which significantly support an accurate result in less computing time is neural network which give best accurate result compared to others.

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Analysis of SQL Injection Using DVWA Tool

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***Abstract*—As the World Wide Web has been constantly evolving, many industrial sectors, such as social networking online shopping, e-government and e-banking, they have made their services available on the web. However, this causes malicious attackers makes a main target on Web. SQL Injection is one of the most vulnerable attack. With the help of authenticated user input parameters to change the query's logic hacker insert some SQL character in SQL Statement. When request is produced from client end query is produced. Query have to handle before execution, because client input originates from external as well as it is malicious. Currently security researchers proposed different types of solutions to defeat SQL injection attack. One of the very dangerous web application is Damn Vulnerable Web application (DVWA). There is numerous data inside DVWA to learn beginner. DVWA likewise utilized as a kind of perspective to secure coding, application against SQL Injection is secured if developer is not exactly beyond any doubt about it.**

***Index Terms*—DVWA tool; SQL Injection; vulnerabilities;**

I. Introduction

Now a days Life is very easy with the help of web application. For activities, need to have some client contribution in web application. In a client function of web application, there are different malicious action. With the help of free access of web application, it is conceivable to attempt mischievous activity. By injection malicious code the attack is performed by abuse of input vulnerabilities. [9]. Right now, SQL Injection (SQLI) attack exploit most hazardous security vulnerabilities in different well known web applications i.e. Google eBay, Twitter, Facebook and so forth [10]. SQL Injection is one of the most vulnerable attack. With the help of authenticated user input parameters to change the query's logic hacker insert some SQL character in SQL Statement. When request is produced from client end query is produced. Query have to handle before execution, because client input originates from external as well as it is malicious. [2].

Steps for DVWA tool with connection of XAMPP.

1. Install XAMPP and DVWA
2. Copy DVWA Folder to XAMPP/htdocs
3. Open xampp control panel and start Apache, MySQL and Tomcat services
4. Open localhost/dvwa in any web browser
5. Login and do the procedure as flowchart

Figure 1 shows the proper flowchart of the result which gives the collection of malicious queries.

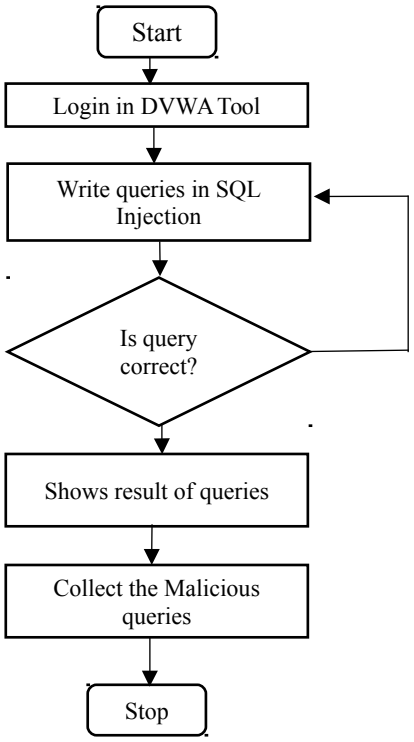

Fig1: Flow chart of malicious queries with the help of DVWA

A. *Types of SQL Injection Attack*

1) Tautologies based Attack

Attack Intent: Bypassing verification, finding insertable variables, separating information.

Description: when statement appears as true, malicious code at least contain one conditional statement, it is the main reason of tautology attack. Behavior of resultant query used in web application gives the outcome of these attack. The most general uses are to extract data with the help of bypass verification pages. In this sort of injection, WHERE condition is utilized by the hacker is to exploits an injectable field. Hacker need to know all coding development and vulnerable parameter to get the vulnerable result. Commonly at least one record to be returned so that the attack is effective.

Example: SELECT userDetails FROM person
WHERE loginId= 'or 1=1 -- AND pass= AND pin= '';

To activate tautology attack, we need to complete Conditional (or 1=1) logic in the SQL statement ,because it shows true result, then whatever query is written after that may have true result and attack is generated. [1].

2) Illegal Queries/Logically Incorrect Queries

Attack Intent: finding insertable variable, performing database finger-printing, separating information.
Description: This attack is used to get essential information from back end database. It shows error pages returned in application server.in simple fact hacker shows vulnerable parameters and error messages are created. Hacker tries to insert syntax conversion, type conversion and logical error into database.
Example: This attack is used to bring out the important data with the help of type conversion error.
Hacker insert some vulnerable parameter to existing code as follows:

"convert(int,(select top 1 name from sysobjects where xtype='u'))". The resulting query is:

SELECT accounts FROM users WHERE login='' AND pass='' AND pin= convert (int,(select top 1 name from sysobjects where xtype='u'));

In this attack hacker tries to extract first user table with the help of select query from the database.
The query tries to convert this table name into an integer. Since this is not a legitimate sort conversion, the database throws an error. In this attack there are two propose, with the help of error message hacker can see the database and the type conversion to occur caused by the error message which shows the value of string. [1].

3) Union Query

Attack Intent: Bypassing verification, separating information.
Description: In this attack we can use Union select query and try to convert normal query into vulnerable query. In this section hacker can do the vulnerabilities with the help of UNION SELECT <Malicious code>. This gives the vulnerable query and we can able to add the malicious code in normal query with the help of union select. One can also use query to recover data from predetermined table. The consequences of these attack is dataset is returned from database is the union of the resultant of original query and malicious query.
Example: The example shows how hacker uses Union select statement in normal query and tries to get data.

SELECT accounts FROM users WHERE Login = ''UNION SELECT Pass from UserDetails WHERE account No=120420''

With the help of this example we can able to get the password from user details, so query is vulnerable and having the best way to extract data. Here hacker can get the information from user whose account no is 120420.UNION query is much vulnerable than tautology based attack. In may different application Pass from userDetails is shown alongside of the account information.

4) PiggyBacked Queries

Attack Intent: Executing remote command; select, extract and modifying data; performing DOS
Description: we can able to change or modify the intended query and tries to replace it with new vulnerable query in this attack. Hacker cannot alter the original query instead he uses new query to develop vulnerabilities called "PiggyBacked Queries ".In database there are two types of queries available, first the original intended queries and others are dangerous malicious queries as Piggybacked queries. Vulnerabilities to this type of attack is much more cause it having the change in data or modifying data.
Example: Hacker has many option to edit query like to drop certain important table or to add some new information detail of unauthorized person. Here Hacker is dropping table " '; drop table user- -" into pass field:

SELECT accounts FROM users WHERE login= 'raj AND pass='';
drop table users -- ' AND pin=4444;

Here hacker is dropping the table whose login is raj and his pin is 4444 so the data of user raj is vanished. If that person is tries to login the account, he can unable to login the existing user. With the help of PiggyBacked Query user can able to do this kind of vulnerabilities [1].

B. DVWA Tool

There is constantly an approach to catch the thief if one can think like thief, this is also the same If anybody needs to recognize the attack then one must need to know that how attack can be happened. SQL Injection attack can be happened anywhere where database is available[5].

Moreover, the person should know Database Languages like MYSQL, Oracle, SQL Lite etc. The Normal SQL queries can get the data from the database, same as that of SQL Injection However for the bad purpose, Normal SQL queries can only get related information which is straightforward, where as SQLI queries can get the genuine data which are hidden and private[6].

The point of DVWA is to test various regular web vulnerability, with various difficultly levels, with a basic clear interface.

DVWA also includes a Web Application Firewall (WAF), PHPIDS, which can be enabled at any stage to further increase the difficulty. This will illustrate how adding another layer of security to block certain malicious actions. There are also many public methods to bypassing these protections[7].

II. VULNERABILITIES

A. *OWASP Vulnerabilities*

DVWA is one of the most vulnerable tool in web application. OWASP top vulnerabilities are incorporated in DVWA.

In 2010,OWASPs top web application security risk:

- Insecure Cryptographic Storage
- Injection
- Cross-Site Scripting (XSS)
- Unvalidated Redirects and Forwards
- Insecure Direct Object References

Some of the web application vulnerabilities which DVWA contains;

1) *Insecure File Upload:* Enables a 'Hacker' to transfer malicious files on to the web server
2) *SQL Injection*: Allows a 'hacker' in which nefarious SQL statements are inserted into an entry field for execution.
3) *Easter eggs:* Full way Disclosure, verification bypass and some others
4) *Command Execution:* This performs orders on the hidden operating system.
5) *File Inclusion:* The vulnerability occurs due to the use of user-supplied input without proper validation.
6) *Cross Site Scripting (XSS):* A cross-site scripting vulnerability may be used by attackers to bypass access controls such as the same-origin policy.

B. *DVWA Security*

The point of DVWA is to test various regular web vulnerability, with various difficultly levels, with a basic clear interface. There are two types of DVWA one is security level and other is PHP-IDS. In first security level section there are three levels as low, medium and high. Each section converts the condition of DVWA vulnerability. Naturally, the security level is set to High due to DVWA is stacked. Three different levels of Security in DVWA.

Low – This level contain no security i.e most vulnerable level.Programmer gives bad coding practice.

Medium – This security level is basically to a case for the user having awful coding practices, where the developer is attempt but neglect to secure an application. It is also used to test the skills of client to refine their vulnerable techniques.

High – This level is most secured level as the programmer is expert in coding and it uses vulnerable code to secured source code.

III. RESULT

In this paper work, DVWA Tool had SQL Injection Tab, figure 2 show user id and submit button. It contain 5 user Ids and their information. One should write a malicious code like

1' and 1=1# which gives first information of id and 1=1 gives that the query is true.

1' and 1=1 union select null,table_name from information_schema.tables# which gives information of first id and show all table name from the database().

Result will show in figure 2.

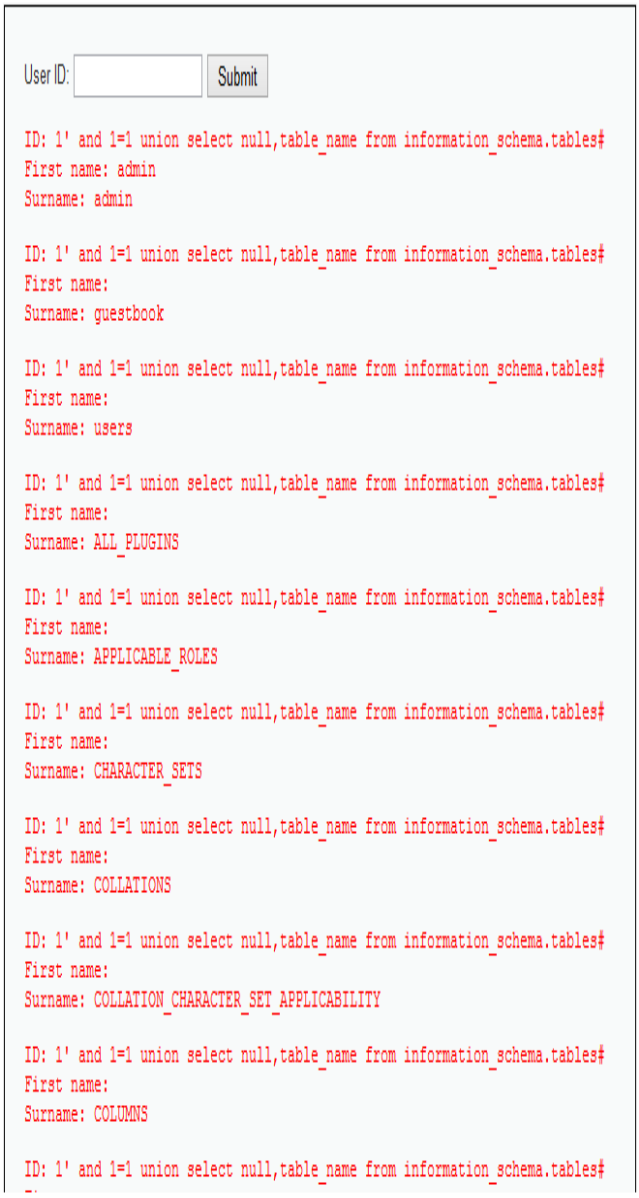

Fig 2: Malicious Query in DVWA tool

Henceforth one can write a malicious code and try to collect malicious SQL Injection queries.

IV. CONCLUSION

DVWA can be used in a number of ways. By showing practical examples and setting challenges is used to teach security in web application for the students. It is used as just a learning tool, DVWA is planned all things considered to be as simple as conceivable to set up and utilize. There is numerous data inside DVWA to learn beginner. DVWA likewise utilized as a kind of perspective to secure coding, application against SQL Injection is secured if developer is not exactly beyond any doubt about it, So DVWA is one such tool to use to understand the SQL injection.

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RSSI Algorithm Based Interference Reduction Technique For LTE Networks

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***Abstract*—Wireless communications networks require 3GPP (Long Term Evolution) technique for gaining highly efficient spectrum and data rates with flexible bandwidth and spectrum allocation. Femtocell is an approach of LTE networks for reducing indoor coverage problems. While, locating macro-cells and femto-cells may found a situation of interference. For reducing this problem, in this paper we propose a Modified Fractional Frequency Reuse (MFFR) technique with Received Signal Strength Indication (RSSI) algorithm. This technique would effectively mitigate the co-channel interference from both interference techniques that is of co tier and cross tier, thus get higher throughput of system.**

***Keywords*—Femtocell; Interference Mitigation; MFFR; Co-Channel Interference**

I. INTRODUCTION

To change the traditional communication method of cellular network LTE technology with heterogeneous cellular network is one of the most favorable standards. For improving spectral efficiency and getting high statics rates the Orthogonal Frequency Division Multiple Access (OFDMA) technique is utilized. Orthogonal sequence is used for resource allocation. A technique to remove coverage holes in combined network of small and large cells based co channel deployment is known as heterogeneous cellular networks. In heterogeneous network small cell coverage is used to provide better quality of services and good cell boundary coverage for dissimilar mobile devices. Small cells are nothing but low power nodes such as micro/pico/femto base stations deployed in macro cell [1] [2]. For future improvement the network capacity is very important. And LTE is a good approach for this improvement.

Femtocell is approach of LTE network for reducing indoor coverage problems. Femtocell is a small range, flat power, sealing type user installed home base station toiling on licensed spectrum better utilized by mobile users. Femtocell connection with primary network is via guided medium and cord medium. The femtocell brings various merits to both consumers and operators, such as expanded indoor coverage, increased the system capacity, QoS and reduced wealth and operational cost [4]. Both cells are deployed on same frequency band because of high cost. Because of insufficient macrocell coverage, growth in data services and indoor coverage, the femtocell could be an appealing solution.

The macro and femtocell based interference problem should be resolved, femtocell is basically located under macrocells, and also utilizes the macrocell frequency. Channel devotion is old and simple technique to overcome interference problem, but resource utilization is not proper. Same carrier utilization among various users may cause interference at the cell boundary. The heterogeneous network deployment is based on co-channel [2] [3]. Femtocell is controlled by single user not by the head of network so usually it is on and off or sometime fixed at one location. So, to mitigate co channel interferences problem must have to adjust different operations.

The paper is organized as, In section II describe interference scenarios in heterogeneous based femtocell network, section III, related work, section IV describe the introduction of FFR technique, section V proposed work and in VI will conclude the paper.

II. INTERFERENCE SCHEME IN HETEROGENEOUS NETWORKS

In wireless networks various interference schemes requiring Home Node Base station, macro node base stations, mobile user resources and home user resources. When any node that is restricted with user resources if it is connected with another node base station by downlink then it is downlink interference, if one user resource is getting interfere with another user resource it is known as uplink interference. Figure 1.3.1 and 1.3.2 shows different schemes of cross layer and downlink based interference particularly. Basically, Co-tier and Cross-tier are the types of interferences.

- Cross-tier
  Macro-Femto Interference
  Users of two different cells are working on the same frequency band may cause restriction for others it links macro and femto interference.

- Co-tier
  Femto-Femto Interference
  If one user of femtocell is trying to expand signal may cause interference with other neighbouring femto cells.

The downlink layer based interference framework consists of various causes. The macro cell base station is located as per the femtocell coverage capacity. Another reason is that macro and femto base station are working on the same frequencies also this structure is based on co channel deployment. And main cause is macro base station is able to cover the inner area but in outer area leakage of radiation may cause interference.

Because of glass window and little open space the leakage grows. Because of close group configuration of macrocells interference may occur. Handover of mobile users and macro base station may occur if user gets powerful signal from macro base station.

III. RELATED WORK

Generally, the interference is occurs because of two or many more devices while communicating are very near to each other. The wireless networks faces lot many interference issues. For example, when the same channel is utilized by two different users then interference occurs which is Co-channel interference (CCI). Co-tier and cross-tier interferences come further when mobile station send data on the channel which is already in use by near user. Heterogeneous Cellular Networks are high density networks that will have co-tier and cross-tier interference because of high and advance technology.

Frequency and spectrum partitioning based ALOHA (F-ALOHA) [5] strategy were applied, it use to discard interference among femtocells and macrocells by assigning OFDMA spectrum. For sub channels utilization all the femtocells in the network are works in arbitrary manner. Femtocell can resolute an optimal spectrum portion. Though, this is a devoted frequency based approach. In this technique the whole bands are not worked directly with macrocells if the spectrum utilization is adaptive.

Dynamic Frequency Planning (DFP) [6] was one of another technique for reduction of interference. When same frequency transmission is done in the sector the sector calculation is necessary. Femtocell which is organized by the self-owner does not have optimization function but here to reduce the overall network system optimization function is run.

There are various algorithm available for frequency allocation one of them is Least Interference Power (LIP) [7] algorithm is suggested for reducing interference to selects the frequency section one powered-up femto base station was established. In this algorithm frequency assignment is based on femtocell on and off time management. So femtocell location is not arbitrary manner but it is in sequential manner. Estimation of interference between femtocells and macrocells are not possible.

Private and coupled model technique [8] was proposed for user location which was not able to perform by OFDMA techniques under femtocells, in this technique for resource allocation femto and macro users are divides based on time and frequencies. Femtocell reused the cell boundary based macro users resources in coupled replica on the other side the femtocells located on centre area reused the orthogonal macrocell based resources. So for OFDMA structure no other FFR technique is utilized by this scheme.

FFR-3 (Fractional Frequency Reuse with 3 frequency sub bands) [9][10] suggested as femto macro network suited technique. This strategy splits the cell into three parts with adding one middle region to utilize the user's diversity among macro and femtocell. Where macrocells used the fractional frequency reuse scheme by dividing into three parts and femtocells are allotted with orthogonal sub-bands varying from macro users in one cell. This strategy gives positive result in reducing cross tier interference, but sometimes it may happen at the border linked cell.

Spectrum Swapping [11] [12] is one of the technique used for the upgrading the performance of macrocell and solving the near and far problems that typically occur. Orthogonal frequency band is used for frequency carrier allocation and divided into three parts. But received SINR resulted that an outer coverage problem will occurs with high probability because of near far problem. In one macrocell number of femtocell are able to create and each and every femto cell have different frequency sub bands from macrocell. When macrocell and femtocell orthogonally handle by each other than interference reduction between them must be performed. Received signal are best to joints the femtocells and also upgrade the performances of global and local networks. It requires higher complexity.

The Optimal frequency partitioning [13] [14] that maximize the frequency sum-capacity and split frequencies into macro devoted shared and femto devoted resources. A fractional spectrum splitting scheme for only femto-cell edge area and establish a resource allocations optimization problem to maximize the system rate. But it decline spatial reuse and spectral efficiency.

For co channel interference reduction pilot sensing [15] technique was proposed. The FRF strategies are assigned to macrocells, and remaining frequency sub bands are used by the femtocells. Consider here, three reuse elements factors for macro cell, from three if I is used by the macrocell and II and III are selected by femtocell. So the system capacity is increased and the throughput of macrocell is minimizes. The macrocell based reuse elements conflicts the other LTE and Wi-MAX network where only one is able to reuse element. For cell boundary interference reduction best option is FFR based on macrocell structure. At this state in network, as per femtocell evolution the macro user interference must be reduced. So the focus is on FFR based interference reduction technique.

TABLE I COMPARISON AMONG METHODS OF INTERFERENCE REDUCTION BASED ON PARAMETERS

Schemes	Throughput	SINR
F-ALOHA[5]	17	5dB
DFP [6]	16	5.5 dB
LIP [7]	16.5	6 dB
PCM [8]	15	7.9 dB
FFR-3 [9][10]	18.0	9 dB

The above table shows the comparison among various methods of interference reduction based on parameters like SINR, throughput. The methods described above are divided as FFR based and without FFR method. For the above given techniques SINR is calculated as 9.5dB for the FFR based technique and for NoFFR the value is 0.60. The throughput is based on the size of femto users if the users are increasing then throughput get decrease if user is less than throughput is more [5] [6] [7] [8]. When the femtocell is 300 then for without FFR technique throughput is 16.5 Mbps, similarly for the FFR based technique the throughput is 18.0 Mbps.

In beginning works they utilized FFR based and NoFFR techniques. For the NoFFR based technique only one frequency band is allocated which result in high interference. Another side for the FFR technique 3 frequency bands are allocated but divided into another sub bands. The macro and femto users utilize these sub bands. This method provide better results than without FFR technique. Interference issue between femto and macro cells reduced here but the co channel problem remains constant. This will be reducing by our proposed method as described below with the help of utilizing the more frequency sub-bands and also improving the SINR, throughput ratio.

IV. FRACTIONAL FREQUENCY REUSE TECHNIQUE

The frequency organization is a superb option to reduce adjacent macrocell based interference; it is an uneconomical employment based on system bandwidth capacity. Frequency spectrum is very expensive resource, so it must be optimally utilized. Because of huge number of wireless devices increasing the frequency spectrum is becoming rare resource. Some new techniques are used to utilize the spectrum carefully so that today's bandwidth requirement is able to fulfill. For bandwidth enhancement and proper consumption over the network easy and useful method is FFR technique [16].

The basic concept of FFR technique is to divide the frequency band so that adjacent cells does not try to interfere with each other, so that adjacent cell based interference will reduced, though utilizing whole spectrum band as compare to the conventional frequency method [16] [17]. This method divides the one single cell into two parts; so that one part is at the center area means near to the base station and other is at the boundary region. Like this total considered band of frequency is divided into different parts as sub bands and some are assigned for the inner area and some are for the outer area.

Two types of FFR is available; one is Hard FFR and other is Soft FFR. For hard FFR scheme combine cells use the definite frequency while at the boundary area only unused frequency bands are utilized. Soft FFR also work as similar to hard FFR but advantage of soft is it utilize bandwidth better than hard FFR, but have some disadvantage inter-cell interference scenario occurs more than hard FFR [18].

V. PROPOSED WORK

Basic focus of paper is mitigating the interference, for this purpose four sub bands are used by the network. Cell is divided into two parts, center area and boundary area. This work is able to provide more number of frequency bands to the femtocells which are located at the boundary area. With the help of this interference at the boundary area are able to reduce and so the throughput will increased. So the performance will better.

The macro and femto cell based frequency sub bands are differentiated as shown in the below figure 5.1. Middle and boundary area are the two components of macrocell coverage, three sectors are allocated for each cell, these sectors and areas are indicated by A1, A2 A3 and S1, S2, S3. One frequency band is spitted into components, and each component is classified into three parts, which are signified as P, Q, R and S. For macrocell, different sub bands are assigned to the macrocell areas to use the modified fractional frequency reuse (MFFR). The reuse element is registered for middle region, and the other three elements are assigned to boundary region. The P is used by the center area for A1, A2 and A3 and sub bands Q, R, S are registered in the different sectors S1, S2 and S3 respectively.

Femtocell utilized all the sub bands which are not used by the macro users for the above considered situation. Especially, when the femtocell is located at the middle area, this does not allow the sub bands in the edge sector S1 which is already utilized by the macrocell, it utilizes sub-bands P, Q, or S, while sub-band Q employs for the macrocell. For area A1 based femtocells the R and S sub bands are already registered. The sub band P is avoided by the femtocell because it is utilized by the macrocell for sector S1. It also avoids the sub band Q, which is already utilized by the macrocell. The Q sub band received the contrast signal strength power as shown in sector S1.

The OFDMA technique causes the macrocell interfered with inter cells, this interference are going to reduce by the proposed Modified Fractional Frequency (MFFR). For interference avoidance among femto and macro users the femtocells utilize the different sub bands. As per the accessibility macrocell utilized the sub bands, because transmission power of femtocell is low. Because of this the interference among femto and macro cells avoidance is significant. For the superior output of boundary users, more number of sub carriers need to be allotted to the inside boundaries.

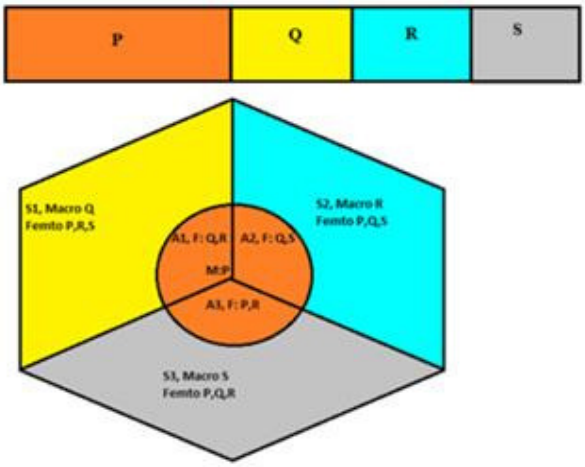

Fig: Proposed Interference Management scheme using FFR

A. Proposed Algorithm

As shown in the figure above according to the FFRE technique the users of macro cells are splitting among sub carriers of sub bands. Spitted frequency sub bands are used by the center and boundary areas of the cells.

Macrocell signal is identified by the adjacent femtocells when network is working. The received signal strength indication algorithm is used for finding signal strength of all the sub bands P, Q, R and S. At the center area if the signal strength of the P sub band is powerful then based on signal strength the femtocell is detected in the center. If the Q sub band is having strong signal, then at the area A1 femtocell is detected. The sub carriers selection are depend on the sub bands R and S. The strong signal power are used for the macro users, the sub band P and Q are prohibits. This is similar for A2 and A3.

Another side, boundary area is based on the femtocell, if the signal strength of P area is poor. If Q sub bands have strong signal then in area A1the femtocell is placed. From sub bands P, Q, and S sub carriers are selected for femtocell. Based on the signal strength J sub band is selected.

Algorithm for Localization

Checking Received Signal

If (a sending node is already in locating table && sending node is at the bottom)

{

Calculate delay time (Pr-RSSI) Wait for as much as delay time

}

If (a node receive didn't receive signal from other node) When finishing waiting time && node is not yet found

OR

If is back anchor node

{

Node which has shortest delay time will broadcast RSSI (Strongest=Node-ID)

}

Else

Other nodes save the RSSI info to its own location table;

For strongest node

Strongest_Node .Is it bottom = true;

Stongest_Node. X axis = Sending_Node.X;

Strongest-Node. Y axis = Sending_Node.Y-1;

Strongest-Node. Z axis = Sending_Node.Z;

Sending_Node = Strongest_Node;

CONCLUSION

Femtocell technology is an original investment for the user and subscriber, since it allows low cost and better spectral usage and Quality of service. This paper is basically focused on the macrocell and femtocell based interference reduction. Different technologies were discussed in this paper, based on their results we concluded that they are not able to provide better service at cell edge region. Hence, we proposed an efficient and simple MFFR with RSSI algorithm based interference reduction technique in the LTE femtocell systems. The macrocell coverage is spitted into boundary and center region with three sectors for each parts.

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An Overview on Thermal Image Processing

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***Abstract*—Entire world is accentuated on inanition health certainty and food safety. Mostly, for fruit ripening the fruit seller uses calcium carbide and for human body the calcium carbide is exceptionally dangerous as it accommodates the phosphorous and arsenic traces. In many countries it is prohibited but in Pakistan, India, Nepal, and Bangladesh and in another country it is directly used. Quality assessment of banana fruit can be concluded by either human inspectors or instrumental tools. This paper presents a method of Thermal Imaging Technology for detection of banana fruit whether it is ripened by calcium carbide or naturally ripened. This paper also presents image preprocessing, image segmentation and feature extraction steps for processing of an image. For classifying these images the Neural Network is used.**

***Index Terms*—Thermal Image; Banana Fruit; Neural Network; Feature Extraction; Segmentation.**

I. Introduction

In the world bananas are the forth almost essential crops, India is the superior country for banana manufacturer. For food artifacts of high grade with increased assumptions and welfare standards, the requirement for correct, fast and equitable grade resolution of these attributes in food artifacts ongoing to grow [1]. Presently the fruits bananas are intentionally by chemicals being contaminated effecting health hazards. Randomly Toxic chemicals are used to ripen, grow and make banana fruits which act smooth fresher or last longer, especially during off season. Among the pretreatments, those are mainly resulted for banana fruits deliberated acceptance for best purchaser and ease better marketing, is synthetic banana fruit ripening [2].

The fruit seller of banana uses Calcium carbide for fruits ripening process. For human body the calcium carbide is really dangerous as it includes the arsenic and phosphorus traces. In numerous country of the world the calcium carbide is prohibited, but in India, Pakistan, Nepal, and Bangladesh it is directly used. Thus there is the short-term and long-term possibility of health effects eating banana fruits directly which are persuade to ripen. Calcium carbide has innumerable uses in steel industries, agriculture and chemical. It is colorless when unadulterated, but grayish-white in color otherwise, small like-garlic fragrance. Undiscriminating pesticides on dissimilar variety of fruits conduct to effects of poisonous. Calcium carbide is indiscriminately used in partially to another advance practice of influencing fruit ripening like the banana fruits dipped in a solution of subjection of fruits to ethylene gas or the solution of ethrel/ethephon. The human health infects by using calcium carbide. The effect influences insensibility in the hands and legs, cold and damp skin, weakness and low blood pressure. The chemical remains inside the fruit could conduct miscarriage. Fruits which look delightful from upper coating may not be healthy for health. Fruits which have uniformly color, example, a dozen of bananas having a uniformly color, are further have been ripened artificially [2].

It is an exacting problem to detect contamination in fruit that are generally take place underneath the skin of fruit. Detection defects furthermore considerably affected by numerous factors like time, contamination type, contamination extremity, fruit difference, and fruit pre- and postharvest states [3]. The fruits which are ripened naturally are not yellow uniformly; preferably, they are of green and yellow. Whenever mango and papaya are constantly orange/yellow or tomatoes are red, then fruit sellers may have been used Calcium carbide; banana fruits can be identified if the stem is dark green where the remaining portion of banana fruits are yellow [2]. To determine such kind of problem in fruits Thermal imaging Technique is used.

A. Thermal Imaging

The thermal imaging technology detects the heat given off by an object or a person. The use of thermal imaging is to detecting infrared radiation means the heat source and generates the electrical signals from these laser signals, and provides the images in the form of heat. In medical imaging this technology has been widely used, this technique also used in, fault diagnosis, non-destructive testing and structure defect detection. This type of technology can instantly diagnostic target envision, rapid hot spots points, and also thermal profile verification, to regulate the problem condition [4]. Now this technique will be used to detect whether the banana fruit is contaminated or de-contaminated by toxic chemicals (Calcium carbide) or not. Because for ripening a fruit calcium carbide have been extensively used.

The rest of the paper is organized as follows. Section II describes the related work, section III presents the proposed work and in section IV we conclude our paper.

II. Related Work

In [4] the thermal imaging is used for observing and fault diagnosis in electrical equipment. They used thermal camera for images of electrical equipment in experiments of non-identical conditions, after that contacting with noise denoising, for image processing the segmentation and feature extraction is used, and then finally the analysis of image is generalized by using algorithms of artificial intelligence and check whether there is fault or not. In this the threshold segmentation technology is most widely used as compared to the detection edge segmentation or the segmentation method based on region. In electrical equipment's image they detect the abnormal heating condition. In feature extraction they extricate the images which were considered as fault, features those indicates the important characteristics and ancient. Ancient characteristics refers an image characteristics which is perfectly not weak and does not depend on environment conditions. In Intelligent fault diagnosis methods they used neural network methods.

In [5] they used an Electronic based nose system, which recruit an array of in exorbitant trading tin-oxide fragrance sensors, have been used to analyze ripeness state of banana fruit. To define seven different regions in multisensory space according to the ripeness state of bananas an investigatory techniques and principal component analysis were used, to estimate the banana-skin colors from classification. In equipment of electronic-nose, the signals generated by sensors are organized such a pattern-recognition engine that permits system to analyze multiplex aroma. Neural Network has been used extensively to perform pattern-recognition. Today back-propagation-trained multilayer perceptron (MLP) paradigm is the more accepted pattern-recognition step in aroma inspection. Although, there is problem in aroma classification, because in some instance the Fuzzy ARTMAP paradigm outperforms MLP. Optimistic technique is another learning vector quantization (LVQ) technique, it is supervised technique which is based on (SOM) self-organizing paradigm.

In [6] a thermal imaging technique is used for (PCB) Printed Circuit Board and their analysis is done using MATLAB. They have been taken a series of 20 thermal images which are stored in form of .png. These images are of the identical PCB in various conditions of thermal load. Particularly each image corresponds electrical operation. To aid the different characteristics of image analysis they also develop a tool based on MATLAB. Maximum area of peak temperature and the peak temperature variables are used for analysis those corresponds the regions with heat dissipation. MATLAB based tool is used to analyze all the images which are related to PCB and on the basis of that they also drawn useful conclusion accurately in much lesser time. On the basis of MATLAB the Graphical User Interface (GUI) is used for designer to choose censorious image to see temperature jump in between two images which are appreciably various temperature profiles. They used clustering based segmentation methods to select the region of interest should be permitted. For processing of thermal image of PCB's the standard methodologies of image processing are uses like color-based segmentation, histogram thresholding technique, image production difference, image into video conversion and histogram comparisons.

In [7] they discuss about the Infrared thermography or thermal imaging which is very appropriate, flexible and non-contact method used for many types of manual benefit like as electronic component, building surveys, and mechanical component but this technology nowadays used in machine conditioning observing such as fault detection, identification and resemblance for fault diagnosis. This paper represents a survey on various thermal imaging techniques for fault diagnosis and detection is based on the temperature of object. Image Histogram and Image Filtering techniques are used for thermal image inspection. The method for contrast enhancement and actual edge filtering is based on statistical differencing, where each pixel value is ascend by standard deviation and by using this they classify different machine conditions of thermal image. Feature such as standard deviation, mean, energy, and entropy are extracted from an image. The method used for classification of an image and machine condition diagnosis is Artificial Neural Network.

In [8] they discussed about the external grade of vegetables and fruits by different system of computer vision. The most common system of computer vision for externally grade assessment is the system of traditional computer vision on the basis of video cameras in the form of RGB which emulate the human eye vision which capture images by filters concentrate at RGB wavelengths. By using the traditional computer vision system most external grade attributes like size, color, shape, texture, and other obvious defects which can be deliberated, sometimes for unobvious defects the detection done by traditional computer vision system is unsustainable /demanding in normal color images because of insufficiency of multi-constituent information and spectral information. By using the devices of dispersive of wavelength, the cameras of high resolution, and recently approach in software computer and hardware computer , the computer vision system like hyper spectral and multispectral have been evolved and well organized examination equipment of agriculture artifacts for the safety and grade of diversity. For external grade feature of vegetable and fruit, Plenty of prosperous applications have proven that hyper spectral and multispectral computer vision systems are excellent equipments and also for bruise, unobvious defect and chilling injury assessment.

In [1] they discussed that bananas is retailed in bunch of dozen so it is essential to analyze grade in bunch. The convenient algorithm can measure systematically the grade of one banana but if it is apply on dozen of banana the setup for acquisition of an image are not train of algorithm for interpretations are undignified. On the basis of review they can say that acquisition of an image is an essential method all over another method. The texture and color features integration provides leading result in the process of classification of banana. They choose selected features those can be associated with attributes of purchaser, and attributes

of bananas. To recognize levels of bananas they evolved statistical model and also contraption the system for processing of an image for bananas classification by extracting feature.

In [9] Image processing technique is used to calculating the ethylene gas for ripening of fruits. In practice they also survey on existing methods for fruits ripening. From this it is recognized that exact concentration of ethylene gas under supervised temperature and pressure can be used for ripening process which is contemplated as a secure process. The color image processing is used to find the application in this area to calculate the carbon dioxide gas levels and ethylene gas levels with respect to the color of fruit.

In [10] they use Neural Network for classification and identification of various varieties of bulk fruit images. For feature extraction the texture and color features are extricated contemplating the entire image. The features which are extricated are saved in knowledge based form. If new image is experienced they extricated feature from the sample of fruit image. Neural Network is used to classify and identify the features which are extricated.

In [11], [12], and [13] they used different machine learning technique such as ANN, SVM, KNN, and DNN for classification of data after selecting the feature extraction. In this paper the Artificial Neural Network technique is used for classifying the images and features are extricated to identify the images.

From above literature, it is concluded that the thermal imaging is used to detect the fault diagnosis and machine conditioning observations. Thermal imaging techniques for fault diagnosis and detection are based on the temperature of object [3], [4], [6] and [8]. In [5] the system based on Electronic nose, which recruit an array of in exorbitant trading fragrance sensors for tin-oxide, used to analyze the ripeness state of banana fruit. In [8] the computer vision system like multispectral and hyper spectral computer vision systems are excellent equipments in vegetable and fruit external grade feature, particularly for bruise, unobvious defect and chilling injury assessment as compare to system like traditional vision computer. In [1] banana classification and quality analysis is done using image processing technique and quality relates to ripening stages of banana but not for the quality for contamination or de-contamination with toxic chemicals. In [9] they conclude that ripening process by using exact concentration of ethylene gas is considered as a safe process. Image processing is used for ethylene gas measurement for fruit ripening. For ripening process the Calcium carbide is also used but the detection of Calcium carbide in fruit was not identified.

III. Proposed Work

This paper presents an overview on Thermal Imaging Technique for detection of fruit whether it is contaminated or de-contaminated by toxic chemicals (Calcium carbide) or not. The image is captured by Thermal Imaging Camera FLIR (ThermaCam E45). Thermal camera detects the defects in fruits. If fruit is ripened by calcium carbide means it is contaminated by calcium carbide and when image of that banana fruit is taken by thermal camera then it represents the information of an image in terms of temperature. The different temperature profile for each sample will be generated by thermal camera and classification of an image is done by using artificial neural network. Image is processing mainly in five steps as follow

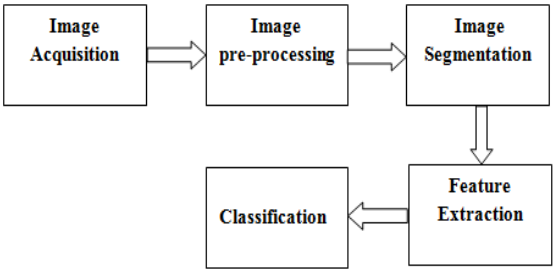

Fig. 1 Process of Classification of Banana

Pre-processing, Classification, and feature extraction are the three main processes in image processing.

Step 1: Pre-processing

Pre-processing is the first step for the conversion of thermal image into gray scale image which is followed by filtering process and resizing of image to eliminate unwanted part of the banana fruit.

A. Image Filtering

In this paper for filtering of images the wiener and median filter is used. Median filter produces good result as compared to wiener filter. So median filter is use for filtering process.

B. Median Filter

Nonlinear median filtering is used to eliminate noise from an image. It is very productive so it is used to eliminating noise to conserving edges. It is extremely productive to eliminating noise like pepper and salt. The working of median filter is done by affecting across the pixel image through pixel, exchanging each value with neighboring median pixels value. The design of neighbors is known as “window”, which glides, pixel by pixel overall the whole image. Image median is estimated by firstly categorize all pixel values into numerical sequence from window and after that pixel value which is actually accounted with the median pixel value. The input pixel which is exchanged by middle of the pixel is incorporate around the pixel in the window.

The median filtering algorithm instructs in window arrange the pixel values in increasing or decreasing sequence and selecting the median value of the image. Median is calculated by in the middle by two average values. Typical windows are 5x5, 7x7, 3x3, or the 5 point window is reviewed for special type of averaging.

C. Image Enhancement

To highlighting, or improving, the feature of an image like contrast or boundaries, detection of an edge an image enhancement is used to make a visual display which is most applicable for analysis and analysis. The process of enhancement increases the vital range of selecting feature so that they can be easily detected. Image enhancement included contrast manipulation and gray level, crispening edge and noise depletion, improving, psudocoloring, filtering, magnification insertion etc. image enhancement is a very important topic because of its usefulness essentially in all image processing application. There are some much techniques for image enhancement such as contrast enhancement restricted adaptive histogram equalization. In this paper for image enhancement of banana fruit the histogram equalization is used.

Step 2: Image Segmentation

In image processing the important step is the image segmentation and it is exacting step position to separate the image constituent regions of interest or area. Segmentation methods are of four types namely classification-based segmentation, edge-based segmentation, threshold-based segmentation and region-based segmentation. The analysis and processing of an image depends on segmentation of an image. In this paper the color based segmentation is used to segment the contaminated portion in banana fruit. It is attainable to segment image on the basis of color. This can be done by situating of object based on color in an image is attainable. Analysis of image can be accomplished either straightly on the true image or either across individual color of plane. On the basis of intensity value of color to segment the image the threshold is set because intensity values are sustained in homogeneous color region. Specific color range with an object can be detected easily from whole image. The mean value of necessitate color is calculated and it is compared with each RGB pixels values of an image using either Mahalanobis distance measure or the Euclidian distance measure. The particle swam optimization (PSO) algorithm is used for color based segmentation.

Step 3: Feature Extraction

It is the important step in image processing. The most important aim is to extricate the feature from an image. For feature extraction we evaluate the area of an object (i.e. area of banana fruit) in binary image. An input images either a numeric or logical. If an input is numeric then nonzero pixels are appraised like Area, Mean, Standard Deviation, min and max values of RGB. These features are calculated from the images because all the extricated features having different values for different thermal images and on the basis of these parameters the normal and contaminated images can also be classified.

Step 4: Classification

After feature extraction the images will be classified by using Artificial Neural Network. The determined features from an image used as inputs, i.e. number of inputs nodes are identical to required number of features. In the first hidden layer number of neurons can be uniform or lesser than number of characteristics in classification. Artificial neural network can also have user-defined following hidden layers and these permit the nonlinear additional organizing of input attributes. The artificial neural network is not the linear system, like the method permits extra decoration correlate and data diminution. Bananas are classified based on all factors values and parts.

IV. Conclusion

The accurately identification and classification of banana fruit whether it is ripened by calcium carbide or naturally ripened is very important for human body as calcium carbide accommodates traces of arsenic and phosphorous. This paper presents a method of Thermal Imaging Technology for detecting such kind of problem because different techniques are used to detect the quality of fruits and in this paper, we focused on the contamination of fruit by toxic chemicals or not. Different steps for image processing are also discussed and Neural Network is used for classification purpose for image.

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A Survey on Mac Protocols for Wireless Sensor Networks

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***Abstract*—Wireless Sensor Network (WSN) is an infrastructure-less wireless network of nodes that can sense the environment or physical conditions and relay the data to a sink or a gateway possibly through multiple hops. The primary task of Medium Access Control (MAC) protocols in such a network is to synchronize the task of data communication between the nodes with energy efficiency being the prime consideration due to power constraints in sensor nodes. So the most significant performance specifications for MAC protocols in WSN are throughput, efficiency, stability, fairness, low access delay, low transmission delay and low overhead. In this paper we have surveyed significant classes of MAC protocols used in WSN and reviewed the merits and demerits of those protocols based on the aforementioned specifications.**

***Index Terms*—WSN, MAC Protocols, Throughput, Efficiency, Stability, Fairness, Low Access Delay, Low Transmission Delay, Low Overhead, Surve**

I. Introduction

Wireless Sensor Network is a collection of sensor nodes or motes which is used to sense the data and forward it to base station(BS) [1], [2]. WSN is widely used in many applications like Military, Environmental, Forest fire detection, Flood detection, Health applications Etc. [6]. Nodes in WSN has limited resources, memory and energy. Hence, energy efficiency is an important factor in WSN sensor nodes and it must be achieved at both node level and network level [1], [4].

MAC protocols are one of the primary protocols in a network where the participating systems/nodes share a common communication medium. Conventional MAC protocols are designed to provide high throughput and QoS through better utilisation of the medium. In WSN, energy consumption of the resource constraint nodes is a key design factor but the MAC protocols designed for conventional networks are less energy efficient due to one or more of the following factors [5].

- Idle listening : A node is ready to receive but is not being sent with data
- Collisions : When two or more source nodes transfer data to the same node
- Overhearing : Wasted effort in receiving a packet destined for another node
- Protocol Overhead : MAC related control frame structure which are non-application bytes

To counter the above factors, in WSN specific MAC protocols, researchers have proposed different variations of active/sleep mechanism combined with other techniques aimed at improving the following key attributes [7].

- Energy efficiency: Sensor nodes are mostly battery operated and are difficult to charge/change
- Latency: Time between detection of an event by sensor nodes till it reaches sink node
- Throughput: Requirement of throughput depends on specific application

Such MAC protocols can be broadly classified as follows.

Contention Based

The Contention based protocols manage the shared medium access by defining the events that must occur when two or more nodes attempt to simultaneously access the medium and by implementing rules by which a transmitting node provides scope for other nodes to transmit. They also define methods for initiating new transmissions, determining the state of the medium and managing retransmissions in the event of occupied medium. Carrier Sense Multiple Access (CSMA)/ (CSMA/CA)[3] are most common contention based MAC protocols. In CSMA/CA, the transmitter sends an RTS packet and the receiver, upon receiving it, replies with a CTS packet which refrains other nodes in the receiver's vicinity from transmitting. Although this method efficiently reduces collisions in traditional networks, in WSN, the use of RTS/CTS increases the energy consumption and supports only unicast transmissions. Hence, several variants of these contention based protocols like T-MAC[10], S-MAC[8], WiseMAC[15] were proposed for WSN.

Reservation Based

In Reservation based protocols, each node is given a guaranteed periodic access to the shared medium by segmenting the channel into superframes and a global synchronization between nodes is assumed. A slot is reserved to each real-time node and the node uses the same slot in subsequent superframes. Time division multiple access (TDMA)[3] is a well known reservation based MAC protocol. They are more energy efficient since nodes in the network can be inactive until their allocated time slots. But the latency is directly proportional to the number of time slots and networks with large number of nodes like WSN requires a higher data rate and higher energy consumption to satisfy a deadline. Hence, several WSN specific TDMA-based MAC protocols like W-MAC[20], D-MAC[13], LL-MAC[16] were proposed.

Hybrid

The Hybrid MAC protocols combine the advantages of the TDMA and CSMA. Control packets are transmitted by random access and the data packets are transmitted in the scheduled channel. In comparison to CSMA and TDMA, the hybrid MAC protocols are energy efficient, has better scalability and improves flexibility. Some of the hybrid MAC protocols are A-MAC, IHMAC[22], IEEE 802.15.4 and Z-MAC[19].

Cross Layer

The Cross Layer MAC protocols exploits the potential synergies of the interaction among different network layers to improve the energy consumption. The B-MAC[11] and CLMAC are few examples of such protocols.

The rest of the paper presents a brief survey on few of the WSN specific MAC protocols. Section II discusses various protocols, Section III presents analysis and comparative study, Section IV discusses open issues and finally, Section V concludes the paper.

II LITERATURE REVIEW

The Sensor-MAC (S-MAC) [8] is a CSMA based protocol in which every node follows a periodic sleep and listen time for energy efficiency. Neighboring nodes within a virtual clusters follow the same sleep/listen schedule and the neighboring nodes in two different virtual clusters follow the periods of both clusters.

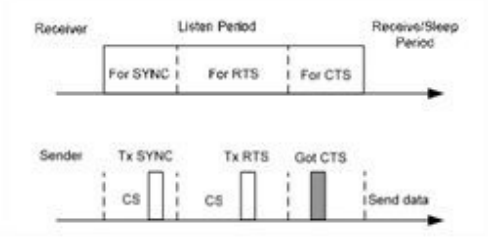

Fig 1: S-MAC with periodic sleep/listen time

Dynamic Sensor MAC (DSMAC) [9] aims to improve the latency time of S-MAC by adjusting the duty cycle of node based on the traffic and energy conditions dynamically. In DSMAC all nodes have the same duty cycle value and shared one-hop latency values in the SYNC period. When a receiver node detects the average one-hop latency value to be high, it shortens its sleep time and announces it within the SYNC period. And the sender node doubles its duty cycle after receiving this sleep period decrement signal. The latency observed with DSMAC is better than S-MAC.

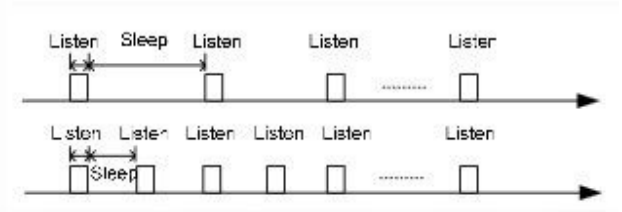

Fig 2: DSMAC with duty-cycle doubling

Timeout MAC (T-MAC) [10] improves the energy efficiency of S-MAC by reducing the listening period of sensor node during variable traffic conditions, as the nodes closer to the sink must relay more traffic. Accordingly, a node ends its listen period when no activation event has occurred for a time threshold TA.

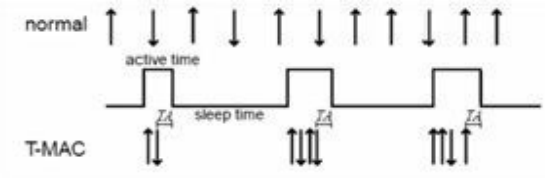

Fig 3: T-MAC with adaptive active times

In Berkeley Media Access Control (B-MAC) [11] a node self-regulates the wakeup and sleep time. The sum of awake and sleep time period is called a check interval. The sender node sends a wake-up preamble, which is not a packet but a physical layer RF pulse, greater than the check interval followed by data packet. When the receiver node wakes up, it senses the medium and if it detects the preamble, it waits for the preamble to end. If the data packet is for the node itself, it receives it otherwise goes to sleep.

Pattern MAC (PMAC) [12] is CSMA based protocol. In PMAC the wakeup and sleep time of nodes are changed dynamically based on the its own traffic pattern and that of the neighbor's.

X-MAC [14] uses the technique of strobed preamble where the sender node sends a series of short preamble packets which contain the receiver node`s address. This allows the target node to interrupt the short preambles by sending acknowledgement, thus saving energy and reducing latency.

Data gathering MAC (D-MAC)[13] is a TDMA based protocol. It is an improved Slotted Aloha protocol where slots are assigned to the nodes based on a data gathering tree. During the receive period of a node, all of its child nodes has transmit periods and subsequent slots are assigned to the nodes that are successive in the data transmission path resulting in low latency. It also uses MTS (more to send) control packets to avoid interference between different branches.

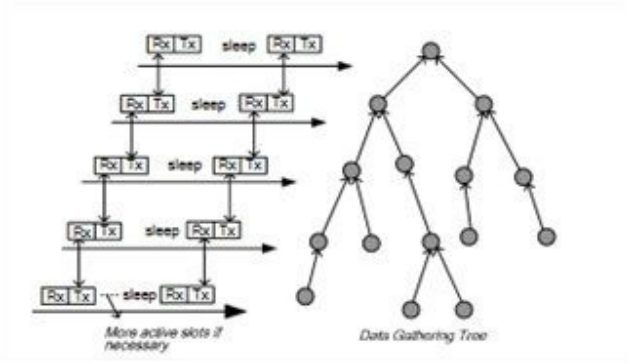

Fig 4: D-MAC and data gathering tree

Low Latency MAC (LL-MAC) [16] is TDMA based protocol designed with low latency as the primary goal. The data interval is divided into X divisions which in turn is divided into Y time slot subdivisions. Each node communicates to its parent in the time slot subdivision within the assigned division corresponding to the hop number it is in and the parent aggregates the data until its turn to communicate.

WiseMAC [15] proposes a short wakeup preamble by using the knowledge of sampling schedule of direct neighbours of the sender node.

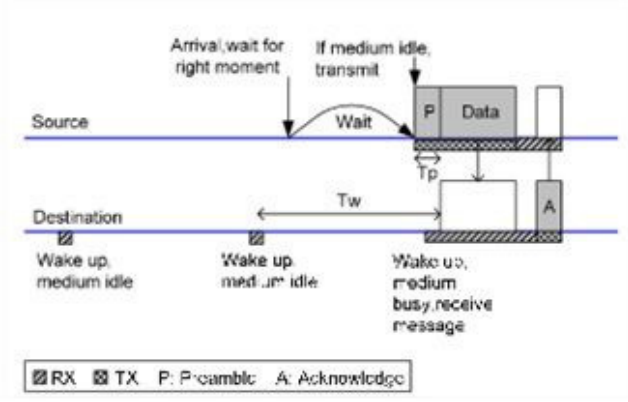

Fig 5: WiseMac

Funneling MAC [17] is a hybrid TDMA/CSMA scheme proposed to be used in the intensity region, under the control of the sink for small intensity region depths of one or two hops.

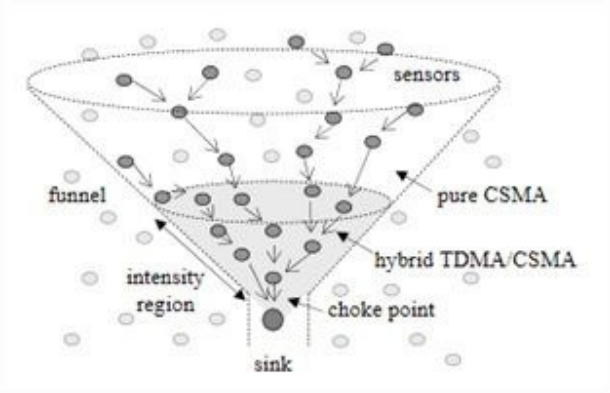

Fig 6: Concept of Funneling MAC

Traffic-adaptive MAC protocol (TRAMA) [18] is a TDMA based protocol and it uses an election algorithm to select one sender within two-hop neighborhood. In TRAMA time is divided into random-access and scheduled-access periods. The random-access period is used to establish two-hop topology information. In scheduled-access period, each node exchange its transmission schedule to its neighbours. The election algorithm is used to select the sender and receiver for the current time slot.

Zebra MAC(Z-MAC) [19] is a hybrid MAC protocol. It is a traffic adaptive protocol; in low contention it behaves like CSMA to achieve high channel utilisation and low delay, and in high contention it behaves like TDMA to achieve high channel utilisation and less collision. The efficient scheduling adjustment method is used to tolerate the network topology and data traffic variation.

Energy efficient and Quality of service aware MAC (EQ-MAC)[21] is a Hybrid MAC protocol. It differentiates the long and short messages and it uses the priority techniques for higher priority data.It uses schedule and non schedule techniques for data transmission for greater performance.

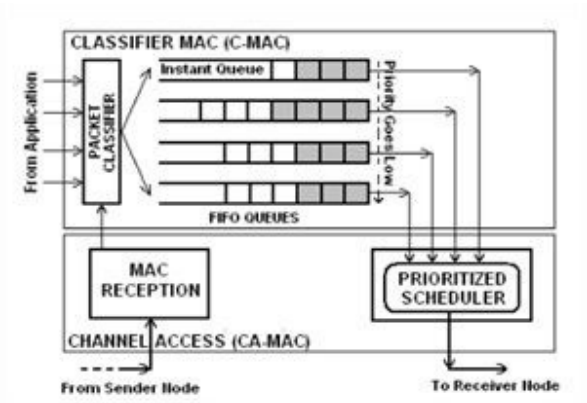

Fig 7: EQ-MAC

III ANALYSIS

In this section we have analysed some of the MAC protocols discussed in the previous section for their merits and demerits.

In S-MAC[8], idle listening is reduced by periodic sleep. Bus neighboring nodes across two different clusters suffer from overhearing as they follow the sleep/wakeup cycle of both the clusters. Also the periodic sleep increases latency as most WSN routing algorithms are multi hop. Figure 8 shows the effect of number of hops on latency and throughput with and without sleep cycles.

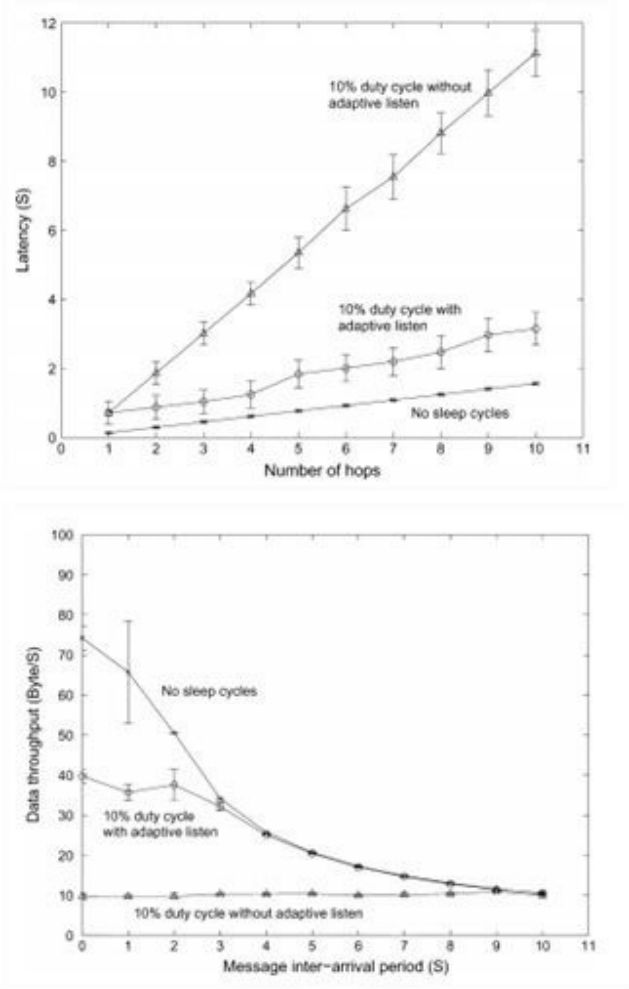

Fig 8: Latency and Throughput in S-MAC

This was based on a simple linear topology network with 11 nodes which are put in a 1-m space and are configured to send in the minimum transmission power with the source generating 20 messages, each of 100 bytes.

Although T-MAC[10] improves energy efficiency under variable traffic conditions, the synchronization of the listen periods within a virtual cluster is broken resulting in early sleeping problem. Figure 9 shows that T-MAC uses less energy than S-MAC for linear topology network

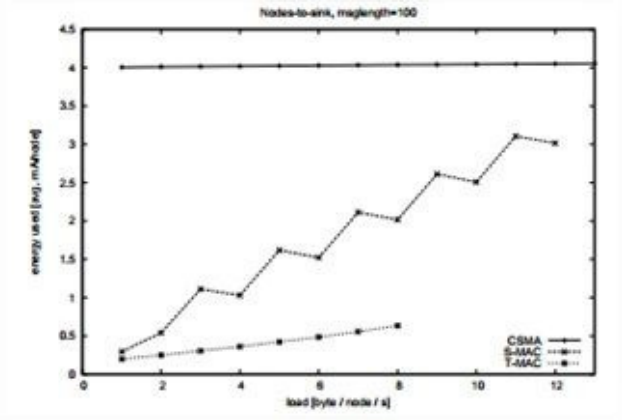

Fig 9: Energy use of T-MAC and S-MAC

D-MAC[13] fares better in terms of latency. But no collision avoidance methods were proposed for scenarios where the nodes have same schedule time.

PMAC[12] is good for relatively stable traffic conditions and performs better than S-MAC. But it is not suitable for convergecast,broadcast and point-to-point network.

B-MAC[11] is efficient at both low and high data rates and is reconfigurable by upper layers. It is also scalable to large number of nodes. But hidden terminal and multi-packet mechanisms are not provided and should be implemented by higher layers. Figure 10 shows the throughput of B-MAC against S-MAC with increased number of nodes.

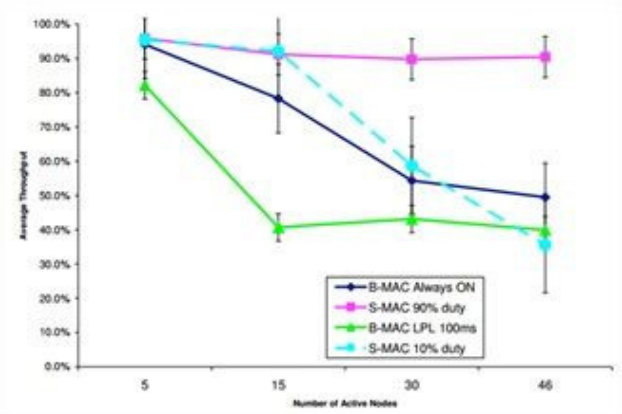

Fig 10: Throughput of B-MAC and S-MAC with different network size

For B-MAC, with a data rate of 60 seconds per packet, the average throughput was 78% for 15 nodes and 49% for 46 nodes whereas for S-MAC with 10% duty cycle and more than 15 nodes in the network, the performance degraded.

The following table lists the comparison of various key attributes of each of the protocols discussed above along with its key merits and demerits.

Protocol	Type	Energy	Latency	Through -put	Merits	Demerits
S-MAC[8]	CSMA	Low	High	High	Reduced idle listening	Predefined listen period results in over-hearing during variable traffic conditions
T-MAC [10]	CSMA	Low	High	Low	Handles variable traffic load well	Early sleeping affects throughput
B-MAC [11]	CSMA	Low	Low	High	Good adaptability to changes	Suffers from overhearing
WiseMAC [15]	np-CSMA	Low	High	High	Performs better in variable traffic conditions	Prone to hidden terminal problem
D-MAC [13]	TDMA	Low	Low	Low	Low latency	Increased chances for collision
LL-MAC [16]	TDMA	Low	Low	Low	Avoids hidden terminal problem.	High memory usage
TRAMA [18]	Hybrid	Low	Low	Low	Performs better in multicast/broadcast scenario	High duty cycle value
W-MAC [20]	TDMA	Low	Low	Low	Tolerates traffic variation	Does not support concurrent transmission

IV OPEN ISSUES

While TDMA[3] based protocols has the main advantage of collision-free medium access, clock drift problem and decreased throughput at low traffic loads are open issues which are being addressed by researchers. In WSN, these TDMA protocols have the additional challenge of adaptation to topology changes caused by broken links due to battery exhaustion, insertion of new nodes, sleep/wakeup schedules of relay nodes and clustering algorithms. While CSMA[3] methods offer lower delay and good throughput at lower traffic loads, additional collision avoidance or collision detection are required to handle the collision possibilities. CDMA based protocols offers collision-free medium, but they require high computational power which virtually rules them out of consideration for energy sensitive systems like WSN. There are open issues to prove that the collision-free medium offered by these protocols can be a tradeoff for energy consumption caused by high computational power. And comparison of CSMA, TDMA and other MAC protocols under a common framework is still an open research area. Also, rating these protocols based on not just the layer 2 performance but the overall system performance is still lacking or insufficient, which can provide a greater push for multi-layer protocols.

With respect to specific protocols discussed in this paper, in S-MAC[8], adaptability to the changes in network topology requires more work. TMAC discusses virtual clustering but it is not clearly described. PMAC[12] is not suitable for point to point converge gate and broadcast based network. In D-MAC[13] the sensor nodes are fixed based on assumption and strength of sensor nodes are not considered. In X-MAC[14] only few number of nodes can be used but latency can be measured with more data points, so the research can be carried out with more number of nodes. In W-MAC[20] transmissions are not carried-out simultaneously, but if we reuse the same time slot again we can support concurrent transmissions.

V CONCLUSION

This paper presents the study of various WSN specific MAC protocols based on various design factors. It must be highlighted that there is no one protocol accepted as a universal standard. The prime reason is that the choice of the MAC protocol in WSN will be application specific based on the requirement of the key attributes specific to that application. Another reason is that the lower layers lack standardisation and similar conclusion can be drawn for upper layers as well. Hence, a cross-layer design approach is still feasible as attempted in few of the protocols discussed in this paper and it seems to be a promising research area which has to be studied more extensively.

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Lossless and Reversible Data Hiding in Encrypted Images With Public Key Cryptography

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***Abstract*—The Lossless data hiding provides the embedding of data in a host image without any loss of data. This research explain a lossless data hiding and image cryptography method based on Choas - Block to image encryption the lossless means if the marked image is considered reliable, the embedding distortion can be totally removed from marked image afterward the embedded data has been extract. This procedure uses features of the pixel difference to embed more data than other randomly partition using Block based Sharpness Index Filtering and refine with single level wavelet decomposition shifting technique to prevent image distortion problems. In this work also manages reversible data hiding based on chaotic technique. In which initially image histogram processes to perceive the pixels which is chosen for hiding each bit of secret data, then by the logistic chaotic map compute an order of hiding each bit stream. Performances differentiate with other exist lossless data hiding plan providing show the superiority of the research. In this proposed research PSNR is found nearly 5.5*103 and existing 4.8*103 at 100 embedding rate which enhance for our existing technique that simulated in MATLAB 2014Ra.**

***Index Terms*—chaotic S-block, reversible data hiding, Lossless data hiding, encryption, cryptography, SSI, BSSI.**

I. Introduction

In present always new devotion is funded to reversible data hiding in encoded images. meanwhile it protect the outstanding assets that the original cover can be losslessly improved afterward embedded data is deleted while defending the image content privacy. with the broad, universal use of the Internet, it is currently required to encrypt delicate data earlier transmission to defend those data. Reversible data-hiding methods can confirm that the receiver which can receive hidden messages and get well needed data without distortion. Reversible data-hiding has established wide attention since recoverable media are more valuable when protecting the security and privacy of sensitive information. For example, assume that the particular information of a persevering is personal information and the patient's X-ray image is used as cover media. It is very important to recover X-ray image without any loss of detail after recovering the patient's personal information. Presently, there are three useful domains used in reversible data-hiding systems (1) spatial domain, (2) distorted area and the (3) density compression field. In spatial domain pixels of the cover image convert directly to hide the data and in the distorted area the cover image is process through a transform process to reach frequency coefficients. Afterward frequency coefficient is enhanced to hide data. In the compression domain for changed to hide the data compression code is used.

A. Lossless Data Hiding and Reversible Data Hiding Scheme

Reversible data hiding (RDH) is a method which covers data and recovered original data afterward the embedded data is removed. It is an imperative method which broadly used in medical, military and law forensics imagery. where no distortion of the unique cover is acceptable. meanwhile first presented, RDH has involved substantial investigation attention.

B. Cryptography

Cryptography is a technique which is used to secure the data and safe data from several attacks. It gives encryption techniques for completely forms of data, documented and image data or software data for secured communication. The secret message is revised the data in a particular system. For the

purpose of data privacy presently we have drawn together encryption and decryption. In cryptography there are three kinds of encryption are implemented.

C. Image encryption in Lossless data hiding

Generation of Encryption Image

There are three approaches for concept of the encrypted image

a) Image division
b) Self-reversible inserting
c) Image encryption

The first step is image division, the innovative uncompressed image is separated into two fragments A and B; and monitored through the LSBs. A is reversibly embedded into B, using self-reversible inserting and reversible data hiding technique. LSBs of A can be used to put up extra data. Afterward self-embedded data reorganized the encodes image using stream cipher. the values are 0 to 255 and signified by 8 bits.

D. Data embedding

Afterward the encryption process, the data hider put up the encoded image, and insert a limited data into it. The data hider can´t change the original image and only can manage the access to the embedded data.

E. Data extraction and image decryption

The data mining and data extraction entirely differs from image decryption. Two different case are taking to show.

Case 1: Extracting data from encoded images: The database management merely becomes the privileges to have the data hiding key and manage data in encoded area. It can decrypt the LSB-planes and removes the extra data. The evidence of encrypted images can be efficient complete LSB replacement. The entire process is done by the encrypted image, where it avoids the escape of original data.

Case 2: Removing data from decrypted images:

The inserting and removal of data can be complete through the encrypted area. But the image decrypted by operator and the data extracts from decrypted area.

F. Histogram shrinks and image encryption

The information hiding technique has been formed in two sets of data, a set of inserted data and shield broadcasting. In the data hiding techniques, shield media become distorted and it does not revert back the original data. The shield media created by stable distortion after the deduction of hidden data. Figure 1 show the data hiding technique to insert the data in host image and recover the image/data from receiver side.

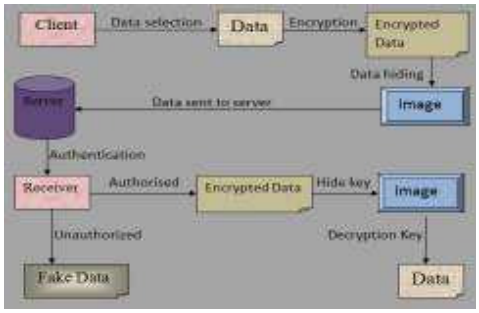

Figure (1) System architecture

In medical diagnosis, law application and military infrastructures reversing data hiding technique are uses at small level and it is significant to improve the innovative cover and it will private. It defends the encrypted data and actual technique for data communications.

G. Combined Data Hiding Scheme Embedding Process

This stage comprises all the actions that must be transmits obtainable to hide and defend the secret data secret the cover image. The sender usages certain algorithms to encode and compress the data and formerly inserts the bit stream into the image. The directing procedure involves of subsequent processes:

1. **Encryption** – In the initial stage of the inserting segment, the plan text will be encoded using different Encryption algorithms.

2. Compression – Compression technique is working efficiently to reduce the size of the message. Wavelet generates a table to exchange the repetitive following characters with binary code. This table, which is recognized as dictionary, will be shown to the recipient the end of the compression procedure to be used for extracting unique secret message.

II. USE OF CHAOTIC MODEL

In the recommended technique at the tip of the histogram diagram record gray surfaces for hiding the bits of the encrypted data. In the process of hiding data, initially numerous gray surfaces with 0 (zero) occurrences are originated. For an assumed image Fig. 2 (a) shows matrix and Fig. 2 (b) shows the histograms for assumed image in where several gray surface with zero occurrence are presented.

4	0	5	2	6
5	6	4	2	0
7	1	0	6	6
6	**5**	**6**	**4**	**7**
0	**0**	**2**	**5**	**6**

Figure (2) (a) image with gray surface for interval [0, 7],

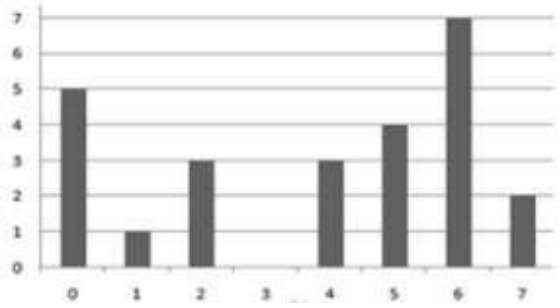

Figure (2) (b) image histogram in 2 (a)

In Fig. 2 (a) shows the gray surface has 6 extreme occurrences, and three has zero occurrences. Initially the value of each pixels of image has three different position can be expected. In plot shows the gray surface with zero frequency (set one pixels) and gray surfaces between them are the most frequent gray surface. And outside the interval of most frequent gray surfaces and devising zero incidence (assembly two pixels), whose gray surfaces equal to pixel which has maximum normal gray surface (collection three pixels). Afterward arranging pixels in process, for hiding the bit sequence subsequent stages are occupied.

Set one pixel

In this set pixel has zero frequency.

Set two pixels

In this set pixel collections are not change.

Set three pixels

On finding set one pixel initially zero is assigned the position of every pixel.

$6_{1,5}$	$6_{2,2}$	$6_{3,4}$	$6_{3,5}$	$6_{4,1}$	$6_{4,3}$	$6_{5,5}$
0	1	2	3	4	5	6

Figure (3): for most frequent pixel assigning number

For chaotic model we need a initial value to compute and construct to start the process through applying an eighty (80) bit key.

$$K= K_o, k1...K9 \text{ (ASCII)} \qquad (2)$$

And declared key transformed into binary (Equ. 3). This key, K i shows 8-bit block.

$$K=\left\{\begin{matrix} K_{01}, K_{02}, K_{03}, K_{04}, K_{05}, K_{06}, K_{07}, \\ K_{08}, ...K_{91}, K_{92}, K_{93}, \\ K_{94}, K_{95}, K_{96}, K_{97}, K_{98}(Binary) \end{matrix}\right\} \qquad (3)$$

Equ.3 shows j^{th} bit of the i^{th}block and Equ.4 shows the value of X_o obtained in the interval [0, 1].

$$X_0=\left\{\begin{matrix} B_{01}\times 2^{79}+B_{02}\times 2^{78}+ \\ ..... \\ B_{11}\times 2^{71}+B_{12}\times 2^{70}+ \\ ..... \\ +B_{n7}\times 2^{1}+B_{r8}\times 2^{0} \end{matrix}\right\}/2^{80} \qquad (4)$$

Value of (X_1) in the interval [0, 1] is obtained after computing primary value of Logistic Map chaotic function.

$$Position = round\left(X_n \times (n-1)\right) \qquad (5)$$

In equation 5, n shows length of array. On computing first or initial gray surface to hiding encrypted data and remaining encrypted data is hidden on the basis of the behind of two rules

1) If significance of encrypted data is one through the chaos model the gray surface originates not change.
2) If cost of encrypted data is 0 (zero), by using chaos classic methods the gray surface originate. Where gray surface having zero frequency

For enhancing process hide 1 (one) encrypted data to the iteration of 10 (ten) shows in Fig 2.

First initial bit of encrypted data does not change which value is equal to 1 (one). And second bit of process is hidden as below.

$$X_2 = 3.99 \times 0.987525 \times (1-0.987525) = 0.0491543,$$

$$\text{Position} = \text{round}\,(0.0491543 \times (7-1)) = 0 \qquad (6)$$

For this module, value of the array of gray surface in first element is $6_{1,5}$.

3	0	4	2	5
4	6	3	2	0
7	1	0	6	6
6	4	6	3	7
0	0	2	4	6

Figure (4). Image after hiding encrypted bit series.

In this technique zero frequency of the gray surface is from 6 to 5 and the number of the element $6_{1,5}$ changes. If we consider rules which considered three groups of pixels, final matrix transform as shown in Fig. 4.

III. SYSTEM MODEL (CHAOTIC MODEL)

Chaotic pixels behavior look like noise, but totally definite. In the initial values and mapping function same value exactly produced again. Following are the three advantages of these pixels.

A. Sensitivity to the Primary Conditions

We can produces a huge changes in the resulting standards of the process through a minor change in initial value. The subsequent pixel will be very different from the early one.

B. Random Behavior

Chaotic simulations are the procedures which are used in producing arbitrary numbers in algorithms and allow the original of the related random statistics.

C. Definite Procedure

Chaotic models is entirely positive but seem to be arbitrary, A set of values can be prepared if the plotting purpose and the original values are recognized and instruction to be used in the imitation of those same initial values.

The Logistic Map is well-known pixels which has chaotic behavior shown in Equ.7

$$Xn+1= rx_n (1-x_n) \qquad (7)$$

Where X_n is a value in the interval (0, 1). In this pixel the r separated into three different intervals and shows three chaotic performances

1. For the value of r [0, 3] pixel behaves slightly chaotically for main ten values and develops constant afterwards the tenth iterations shown in Fig.5 (a).
2. For the value of r [3, 3.57] pixel behave slightly chaotically for initial twenty values and after twentieth values, be different among two unchangeable values shown in Fig. 5 (b).
3. For the value of r [3.57, 4] pixel usually is chaotic showing Fig. 5 (c). From above statement, object is a totally chaotic model and the chaotic pixel Logistic Map with initial values $X_0 = 0.3$ & r [3.57,4] is used.

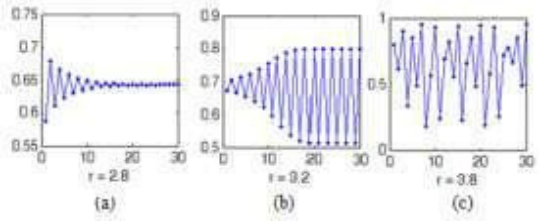

Figure (5) Logistic Map pixel for X_0= 0.3. (a) r [0, 3] , (b) r [3,3.57], (c) r [3.57,4]

IV. METHOD

In an image by using the redundancy used a key of reversible data embedding for finding an embedding area. To enlarge the other space the current techniques decrease the redundancy by the execution of pixel value calculation and make use of image histogram. The modern techniques show unlimited embedding volume without severely demeaning the visual excellence of embedded consequence. The focus of this part of the present paper is on the proposed algorithm which is used to encrypt and decrypt color images in different sizes as will be described in detail. It includes four major parts as follows:

Part One: this part is suitable for the diffusion of the image pixels. It is done by applying the forward Exclusive X-or and Backward Exclusive as follows:

1.Decompose the Red (R), Green (G), Blue (B) components of the image and store them in three arrays with size N*M, where N and M are rows and columns of the image.

2. Apply the following eq.(8) for forward Exclusive Xor on each of the image components respectively. C1(1)=P(1) where P(1) is the first pixel of the plain image which is used as seed.

$$C1(i)=C1(i-1)\oplus P(i) \qquad (8)$$

Where i =2…N*M where P(i), C1(i) are the present pixels in the plain and cipher images respectively and C1(i-1) is the previous cipher pixel . While the

backward Exclusive X-or is applied on the resulted image as follows using eq.(9)

$$C2\ (i-1)= C2(i) \oplus C1(i-1) \qquad (9)$$

Where K=N*M, i =K…2, C2 (K)=C1(K) as seed.

In Result Fig.1 illustrates the plain image as input image.

Part Two: this part is suitable for disturbing the relationships between the neighboring pixels by altering their position but not making any change to the pixel value so the histogram of the image is stable. Scrambling of image pixels is done in the following steps.

1. Decompose each component into 16 16 sizes blocks

2. Initialize the secret parameters of 3D logistic map to generate secrets keys separately for R, G, and B components and each block in the component as follows:

3. Where x for Red, y for Green, and z for Blue. x0=0.976, y0=0.677 , z0=0.973 λ=3.8414991 , β=0.024, α=0.017.

4. Convert the secret keys to decimal number using the following eq.(10) as

$$Xi = floor\ (Xi, * 10^4) \qquad (10)$$

5. Exclusive X-or between the digits of the number.

6. Rotate each of the components (R, G, and B) left or right on the basis of the first bit of the number in step 5. Hence, Rotate is right if the first bit is 1 otherwise Rotate is left.

7. Rotate each block (16x16) of components right or left based on the first bit of the number in step 5; hence rotate right when the first bit is 1 otherwise Rotate left. In the decryption part the rotation process is done in reverse order hence rotat4MJe left when the first bit is 1, otherwise rotate right.

Part Three: it is suited to the diffusion of the relation between the plain and cipher mages by changing the pixel values. This part has the steps as indicated below:

1. Initialization of the three secret parameters to generate individual secret keys for R, G, and B of the scrambled image as follows: Where x for R, y for G, z for B and x0=0.234; y0=- 0.398; z0=-0.88

2. Convert them to values between 0…255 using the following eq.(13)

$$Xi, = \text{floor}\ (Xi, * 10_{10}\ m\text{od}\ 256) \qquad (11)$$

Algorithm (1): For Data encryption and embedding

1. Take input image or Selection of cover image.
2. Convert RGB Program into gray
3. RGB image has been converted to Gray scale
4. Program is Converting Image to type Double
5. Gray Image Has been Converted to type Double
6. Decompose the image by wavelet transform first and second level of Decomposition
7. Detail coefficient extracted to embedded data & approximation coefficient used for Image encryption.
8. use Block based SSI asymmetric key algorithm for secret data encryption
9. Data covered using S-block.
10. for Image encryption using chaos encryption.
11. lapsed time is calculated for checking efficiency through Performance Analysis like PSNR,

Process for Image and text decryption:-

Image and data can be recovered in two ways:

Case (1): First of all image is decrypted – Text is extracted - Text is decrypted - Original image is recovered.

Case (2): First of all Text is extracted- Text is decrypted - Image is decrypted - Original image is recovered

Algorithm (2): For image and data extraction

1: First encrypted image is extracted from encrypted image and then it decrypted

2: Then encrypted data is extracted from the decrypted image

3: And finally the encrypted data is decrypted using the related key.

V. RESULTS

Data Used

In this paper digital color image of JPEG format and other formats like bmp, png are used as cover image. The data files used for embedding are of txt, docx, pdf format. The size of image depends on the data size.

Process of work implementation

1. Select the key for Image Encryption using Chos-S Block based Technique

Figure (6): Input image

The input color image (.jpg, .tiff, .bmp,) is selected. Image is used in the form of carrier where the secret text can be inserted. Proposed technique has used different format and different types of images. After selection of images it proceeds to further process.

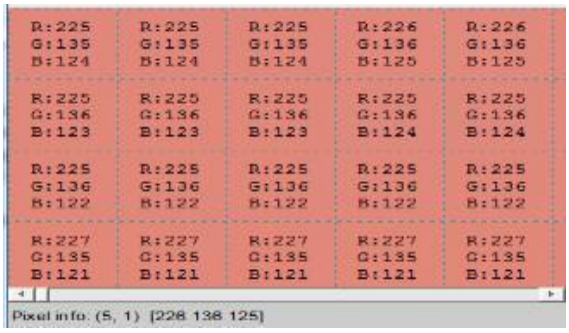

Figure (7): Matrix generation of input image

The Pixel Area tool opens a separate window containing a great close-up view of a small region of pixels in target image

.

Figure (8): RGB Image transformed into Gray Scale

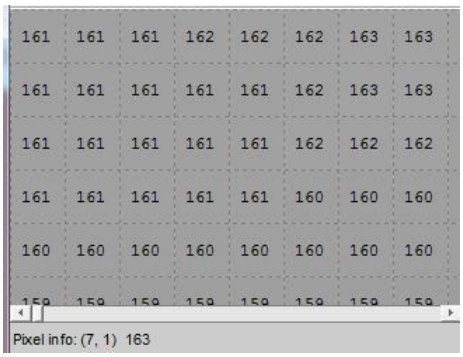

Figure 9: Matrix generation of gray image

Gray Image has been converted to type double

Figure (10): Double converted image

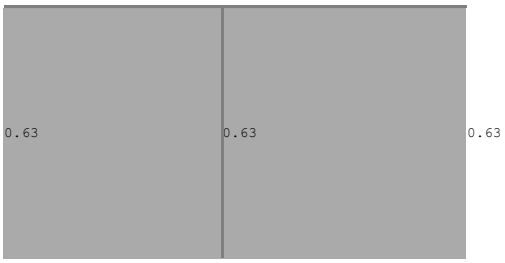

Figure (11): pixel region of Double converted image (Pixel region ((1,1) (0.63))

Figure (12): Image after 1st level of Decomposition

Figure (7), shows the fused image which we have browsed in figure 6 and 8 as first and second image respectively. In storage of image and image transfer image compression is more advantageous. Discrete Wavelet Transform image compression procedure is used for compressing the image in this research.

The effectiveness of altered wavelets with numerous decomposition stages are examined built on the standards of Peak signal to Noise Ratio (PSNR), Compression ratio (CR).

Figure (13): Image after 2nd level of Decomposition

Figure (14): Image after block based (SSI) filtering to double converted image

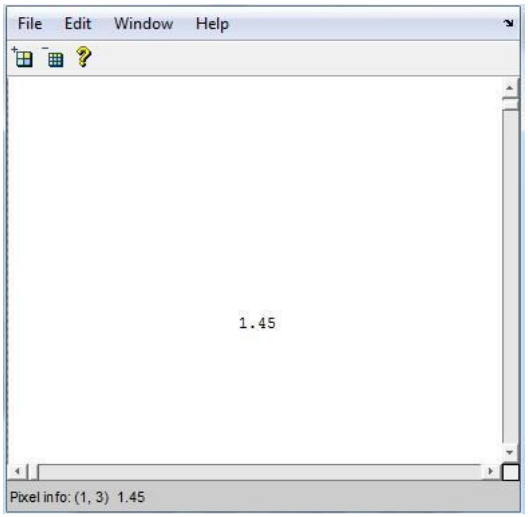

Figure 15: Pixel information of Image after block based (SSI) filtering to double converted image

Enter the key for Decryption: 2

Figure (16): Final image after encryption

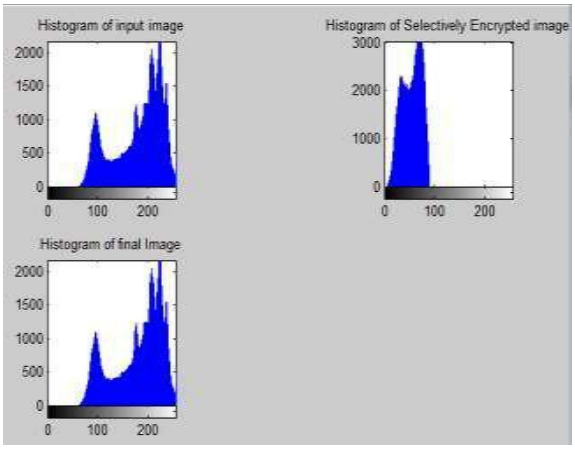

Figure (17): Histogram of the final image

Histogram operation can be used efficiently for image improvement. The histogram of a digital image in the interval [0, L_k-1] with gray surfaces has a discrete function $h(r_k) = n_k$, where r represent is the k^{th} gray close and n represents the number of pixels in image taking gray surfaces or level r_k. To control a histogram dividing each values to the total number of pixels in the image is a common preparation represent by *n*. and standardized histogram is supposed by $p(rk) = \frac{n_k}{n} fork = 0,1$ and p (r_k) gives an approximation of occurrence of gray level is r_k.

Embedding rate	Base [1]	Chaoas-Sblock (Proposed)
0	0	0
50	0.01	0.05
100	0	0.23
150	0.01	0.056
200	0	0.74
250	0	0.89
300	--	1

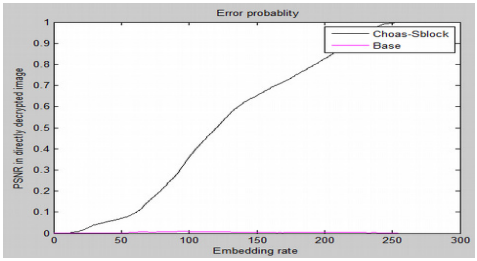

Figure (18): PSNR in density decrypted image for existing [1] and proposed technique over embedding rate and error probability

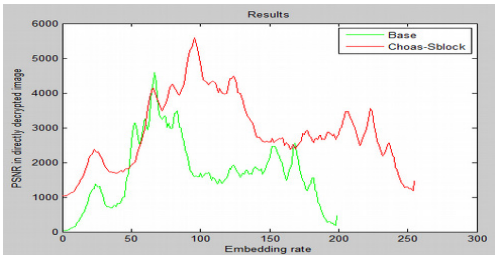

Figure (19): PSNR value over embedding rate

In above plot PSNR of the proposed technique is nearly $5.5x10^3$ and existing $4.8x10^3$ at hundred embedding rate which develop for existing technique. Total Elapsed time is 6.795790 seconds in execution program.

VI. Conclusion

Comparison of results make between conventional algorithms and the proposed algorithm. Proposed algorithm produces individually advanced embedded quality of images provided with a same embedding capacity. In proposed research a Symmetric image encryption algorithm based upon SSI S-Block and chaotic sequence is proposed. The unique BSSI s-block performs the change on the chaotic encoded image initially and then pixel matrix is completed by shuffling columns and rows of cipher. After simulation of the algorithm it shows that faster execution time. The proposed technique is studied in terms of key space analysis, statistical analysis, brute-force attack. in future the technique can be verified on various attacks. And this proposed work also explore the use of dynamic S- box for improved computing security.

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Metadata based Text Mining for Generation of Side Information

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***Abstract*—Text mining is knowledge analyzing technique to find a pattern. The side information is also called as metadata in most of the metadata based text mining applications. The side information consisting of large data in terms of weblogs, metadata, and non-textual data i.e. image/video, etc. This large data present in the unprocessed form which cannot be used for further text mining. Therefore, metadata based text mining algorithms are used to mine the useful information. In this paper, the proposed approach uses the different kind of pre-processing steps i.e. splitting, tokenize, steaming, parsing and chunking. For generating the side information i.e. title, name, affiliation, email address, place etc. a natural language processing (NLP) is used. To achieve the effective clustering, the proposed approach uses a classical partitioning method with a probabilistic model. The proposed approach is compared in terms of time required for mining of words, accuracy, and efficiency. The presented result shows that, the proposed approach performs better in terms of accuracy and running time. In future, a Security is provided for metadata based side information generation using Intrusion Detection System (IDS).**

***Index Terms*—Text Mining; Metadata; Text Mining; Side Information; Natural Language Processing; Classical Partitioning; Clustering**

I. Introduction

The metadata based text mining means to retrieve the useful information from the large dataset. How to analyze the knowledge from unstructured texts [1-2] is the main research component present in text mining called as text data mining (TDM) [3-4]. The process of text mining is similar to data mining process; difference is that the data mining tools are used to handle structured data whereas text mining tools are used to handle unstructured data sets ex. HTML files or any full-text documents etc. [5]. Text Mining is useful for creating new or unknown information from different available resources i.e. from different databases available on www/internet media. Text Mining is the research area of computer science which consists tough links with NLP, data mining, machine learning, information retrieval and knowledge. To find and examine an interesting mining request to extract use full information from shapeless textual data through the patterns. The Preprocessing in Text Mining is as shown in Figure 1.

A. Side Information

The text clustering occurs indifferent domains such as the internet media/www, social networking site, etc. [6-8]. A more research work has already been presented on the problem of clustering in text data and retrieve the same information. Still there is a scope in improvisation on problem of clustering text data. The examples of side-information generation are as follows:

(a) Text Document Contains Links: Text document contains some helpful information for mining [9]. It also provides relationships among measurement and others are deliberate. By using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document.

(b) Meta-data: Web documents contains data of data [10] consists of different kinds of information about the document. For example, ownership, locality, or any temporary information which is useful for mining techniques. In some user or knowledge sharing information contains user tag, which is also very important. This is quite informative.

B. Natural language Processing

NLP is a recent research domain in a computer science and engineering. NLP discovers and analyze that, how the computer system can be used to understand and manipulate natural language text. The aim of researchers is how to collect the information, understand the information by user and use language in specific domain. Therefore, the methodologies are used to develop computer systems to understand and manipulate natural languages for text mining [11-14]. NLP provide large scale disciplines and responsibilities for achieving and expanding the capabilities of text mining, or the extraction of knowledge from shapeless, example is machine-learning paradigm of language processing. NLP [3, 15] algorithms should meet some success in structured or unstructured fields examples are medicine and biochemistry. The various methods of NLP are [12]: Part-of-speech tagging (POS); Tokenization; Splitting; Parsing, and Text chunking aims at grouping adjacent words in a Sentence. The basics of NLP consists of several categories like computer and information sciences, mathematics, linguistics,

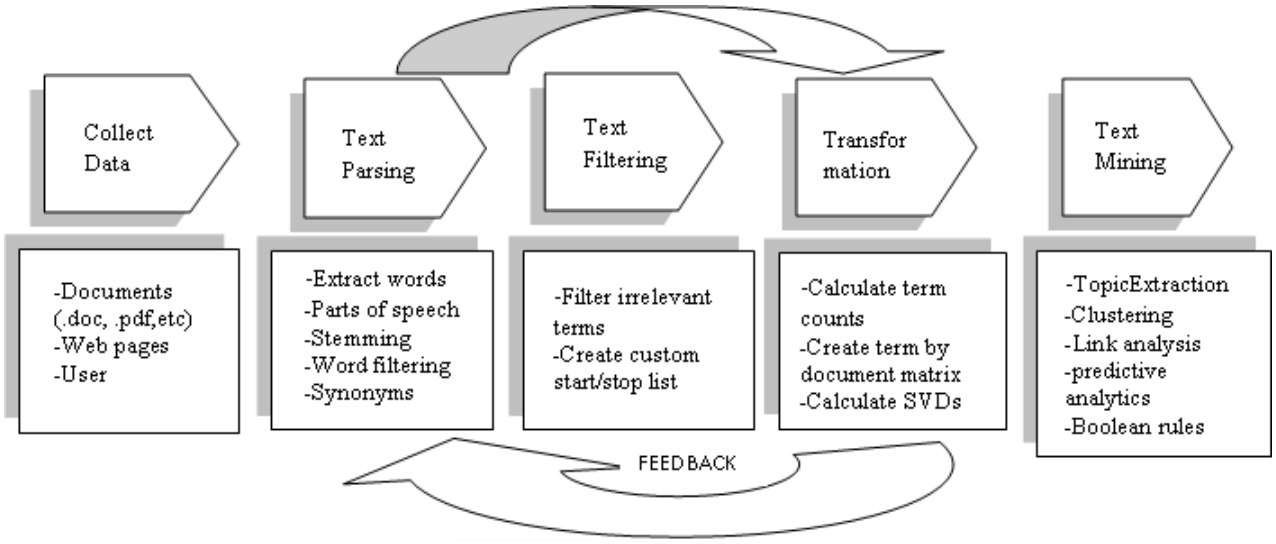

Fig.1. Preprocessing in Text Mining

and electronic engineering, fuzzy logic, robotics and artificial intelligence, psychology, etc. Applications of NLP's are language text processing and summarization, machine intelligence, user interfaces, and cross-language information retrieval (CLIR), artificial intelligence systems, speech recognition, and so on [16-17].

The remainder of this paper is organized as follows: Section II describes the related work on metadata based text mining for side information generation. Section III elaborates the proposed approach for side information generation. Section IV summarizes the experimental results of a proposed approach. Finally, this paper ends with the conclusion and future scope in Section V followed by the references section.

II. RELATED WORK

In metadata based text mining, huge web online collection is the main reason to develop a mechanism to create effective and scalable clustering algorithms used for generating side information [1-3]. The current proposed approaches focus on data processing to maximize the clustering advantage to generate side information. Jain and Dubes [18] proposed an approach for clustering text data with side information. It provides an idea to perform mining process a way to perform the mining process as to maximize the benefits of side information. It uses an algorithm which is a combination of traditional partitioning algorithms with the probabilistic models [1]. The stemming is the process in mining, to reduce different grammatical or word forms of a word like its noun, adjective, verb, adverb etc. Stemming is used for reducing inflectional forms. This paper discusses different methods of stemming and their comparisons in terms of usage, advantages as well as limitations. The basic difference between stemming and lemmatization is also discussed. Yang et al. [9] discussed in the methodologies for developing computing applications that will be flexible and adaptable for users. In this context, however, information retrieval (IR) system used to find location and delivery documents to satisfy user's need. The stemmer's effectively used such as spelling checker, and may vary language to languages. The working of typical simple stemmer algorithm is removing suffixes using a list of frequent suffixes is discussed in [12].One more complex thing is to use morphological knowledge to derive a stem from the words. The proposed approach gives a detailed view of common stemming techniques.

There are many problems in clustering: first, for large clustering, process is too slow and second, that retrieval information as per user's requirement is not improved by classification and clustering techniques. Basically clustering is used to improve predictive search and analysis. The initial browsing technique is nothing but the Document clustering [19-20]. Always there is strong association rule between clustering and its technique. Metadata based text mining is used for feature compression and extraction of reducing dimensionality. Clustering is main challenge when data is in heterogeneous form. We have different types of algorithm and techniques for classification and clustering. In text mining, data pre-processing plays very important role. Aggarwal et al. [8] presented a survey on text data classification and clustering algorithm. For classification and clustering, data is extracted or used from metadata for generating side information. Guha et al. [4] suggested the unknown discovery pattern or identifying interesting pattern in terms of data clustering is used in data mining.

The clustering algorithm CURE which is more accurate to outliers, and identifies clusters [21]. Because cluster having non-spherical shapes. They are wide variances in size and shape. Zhong et al. [22] proposed an effective pattern discovery technique which includes the processes of pattern deploying and pattern evolving. To enhance the effectiveness of modifying the discovered patterns to find an appropriate unknown pattern, Franz et al.[23] proposed an unsupervised and supervised learning, will help to improve the quality of the

clustering effects of both the text metadata and side information.The proposed approach shows the extension of the clustering approach to the metadata based text classification using the side information or generating side information of the text documents. Jivani [24] discussed the purpose of stemming is to reduce different grammatical forms or word forms of a word like its noun, adjective, verb, adverb etc. The goal of stemming is to minimize inflectional forms and sometimes derivationally related forms of a word to a common base form. This paper discusses different methods of stemming and their comparisons in terms of usage, advantages as well as limitations. The basic difference between stemming and lemmatization is also discussed.

III. Proposed Work

The proposed work consists of various steps like preprocessing, extraction,and stemming, etc. these are depicted in the work flow of the proposed work in Figure 2.

- Collection of datasets for data mining- Selecting an appropriate dataset for comparing results and analysis. After selecting dataset some operations can be carried out Example- crawling, filtering, etc.
- Preprocessing can be performed with natural language processing-In which we would be applying natural language processing techniques like splitting the document, tokenizing, part of speech tagging and chunking. The aim of natural language processing (NLP) is to convert human language into a machine understanding form, is easy for computers manipulate data and its meaning.
- The general goal of NLP is to achieve a better and understanding of natural language by use of computers. It is very simple and fast technique for data mining.
- For demonstration of text mining approach, proposed approach develops a mining algorithm with Natural Language for processing-preprocessing of text. Use of Word Net-It is a collection of words in a dictionary form language where dictionary of language containing combination of mining with natural language processing-meanings, senses, etc of words. In this step we will be showing the meaning of searched data.

In Figure 2 all the above work would be important for pre-processing. Text mining uses NLP for demonstration. This would help for better and real understanding of text mining. Proposed approach gives efficient output with the help of NLP. Open NLP tools are freely available. Tools included in the C# port are: examples are a sentence splitter, a tokenizer, a part-of-speech tagger, a chunker used to ("find non-recursive syntactic annotations such as noun phrase chunks"), a parser, and a name finder.The sample text input file from CORA dataset is shown in Figure 3. Open NLP tool is used for pre-processing. The Figure 4 shows the screenshot of Open NLP tool.

A. Spilt

Splitting is the term used for detecting the end of sentences. If we have input as a text paragraph in a string format, a simple way dividing paragraph into sentences. It uses syntax input. Split ('.') to obtain an array of strings. Extending this to input. Split ('.', '!', '?'), whenever punctuation mark is occurs, sentences are splitting. But this technique does not recognize that punctuation mark can appear in the middle of sentences too. Figure 5 shows a screenshot of sentence splitting.

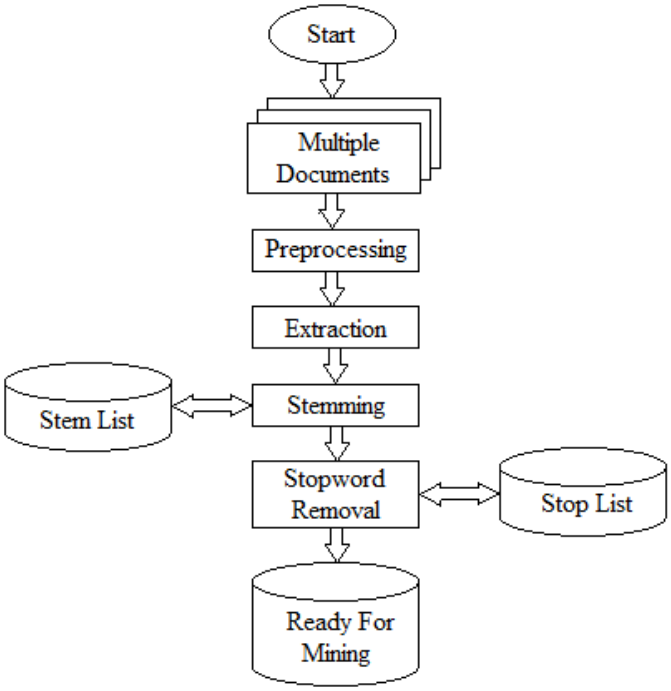

Fig.2. Work Flow of Proposed Work


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Side Information Gathering for Mining Text Data

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ABSTRACT: In many text mining applications, side-information is available along with the text documents. Such side-information may be of different kinds, such as document provenance information, the links in the document, user-access behavior from b logs, or other non-textual attributes which are embedded into the text document. Such attributes may contain a tremendous amount of information for clustering purposes. Hover, the relative importance of this side-information may be difficult to estimate, especially when some of the information is noisy. In such cases, it can be risky to incorporate side-information into the mining process, because it can either improve the quality of the representation for the mining process, or can add noise to the process. Therefore, need a principled way to perform the mining process, so as to maximize the advantages from using this side information. In this paper, design an algorithm which combines classical partitioning algorithms with probabilistic models in order to create an effective clustering approach. then show how to extend the approach to the classification problem. present experimental results on a number of real data sets in order to illustrate the advantages of using such an approach.

KEYWORDS: Text mining, clustering, Report Generation

Fig.3. Text Input File from CORA Dataset

B. Tokenizing sentences:

Apply some NLP technique to it - part-of-speech tagging, or full parsing, perhaps. The first step in this process is to split the sentence into "tokens" - that is, words and punctuations.The "Tokenize" button in the tools example splits text in the top textbox into sentences, and then tokenizes each sentence. The output, in the lower textbox, places pipe characters between the tokens. Tokenization separated by bar symbol. Figure 6 shows a screen shot of sentence tokenization.

C. Part-of-speech (POS) tagging

Part-of-speech (POS) tagging use for providing a part of speech to each word in a sentence. Input is an array of tokens from the tokenization process, proposed shows word is noun or pronoun. Figure 7 shows part-of-speech tagging from tokenization array.

D. Chunking (Finding phrases)

The OpenNLPtool will group the tokens of a sentence into larger chunks. And each of chunk corresponding to a syntactic unit such as a noun phrase or a verb phrase.This is the next step on the way to full parsing, but it could also be useful in itself when meaning in a sentence larger than the individual words.A POS tagged set of tokens is used for chunking. Figure 8 shows a parsing of stream of tokens.

E. Name Finding

"Name finding" is the term used by the OpenNLP library for identification of author's name (as per our CORA dataset) - for example, people's names, locations, dates, date, day, time, money. The proposed approach works on the use of training data, and tokens.Figure 9 shows a screen shot of name finding.

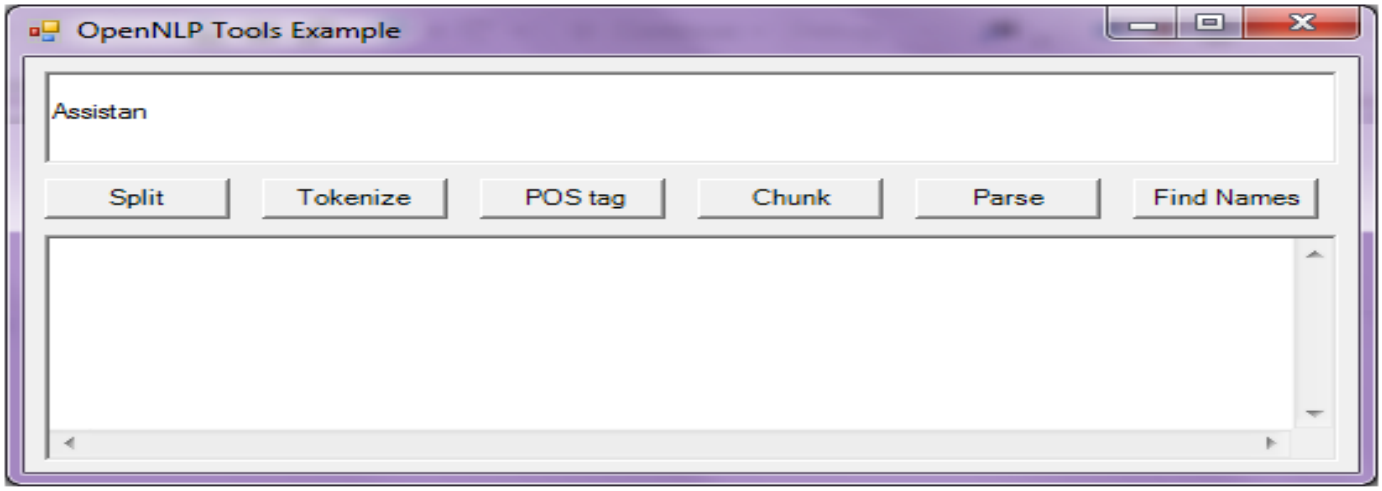

Fig.4. Screenshot of Open NLP tool

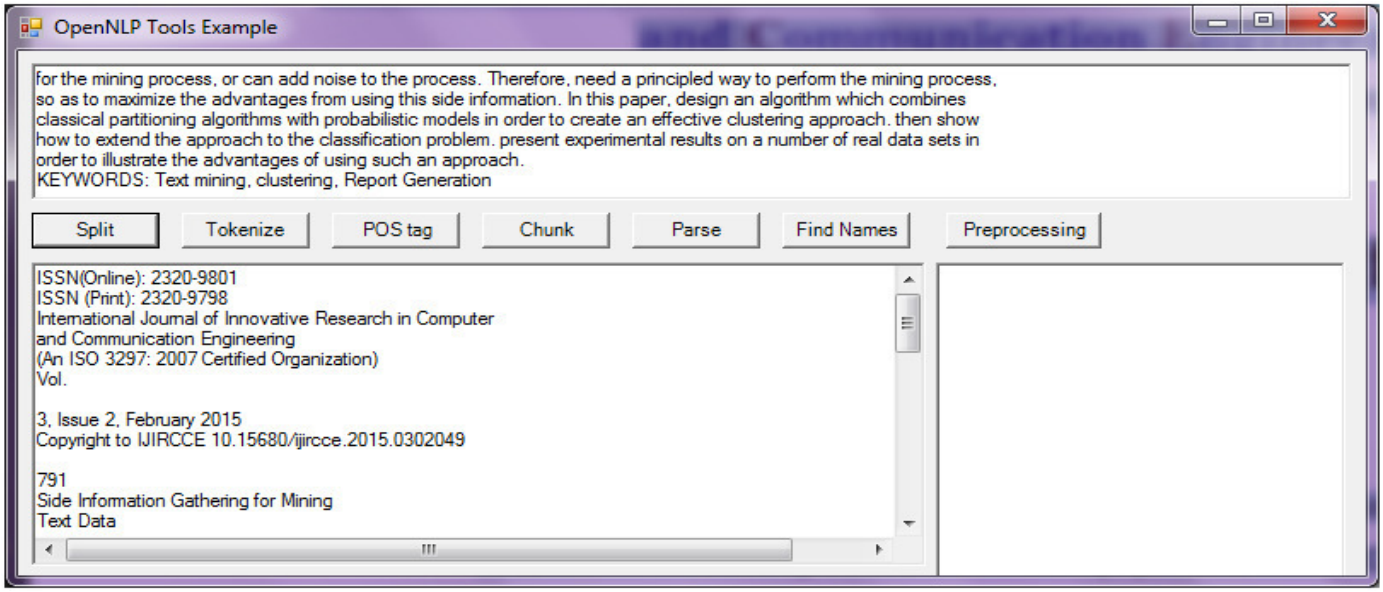

Fig.5. Splitting Sentences

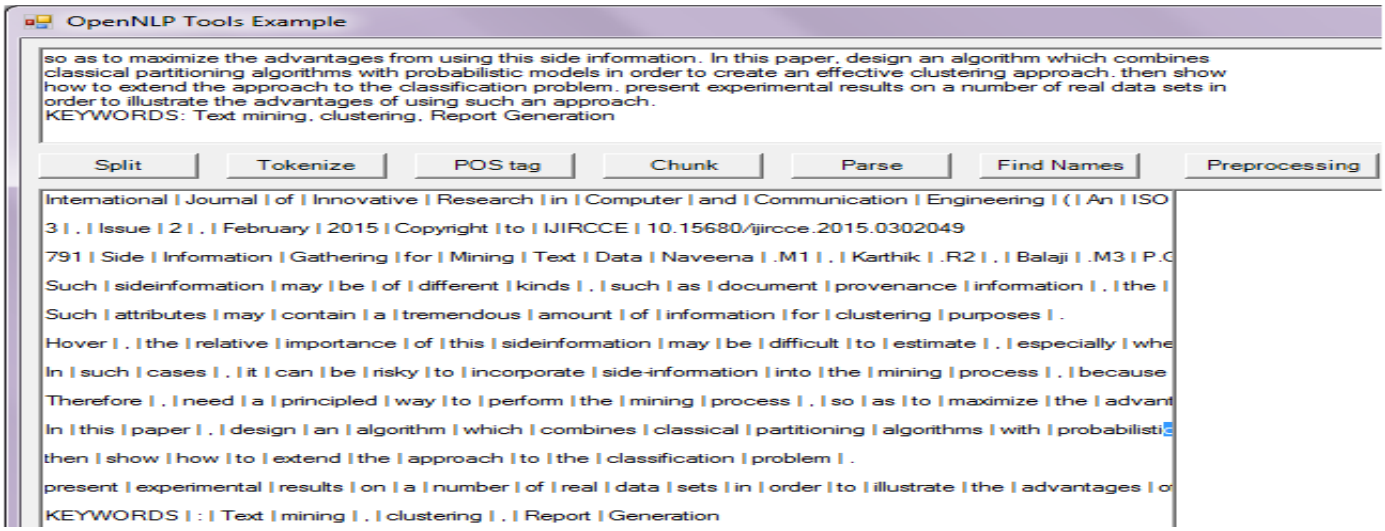

Fig.6. Tokenization

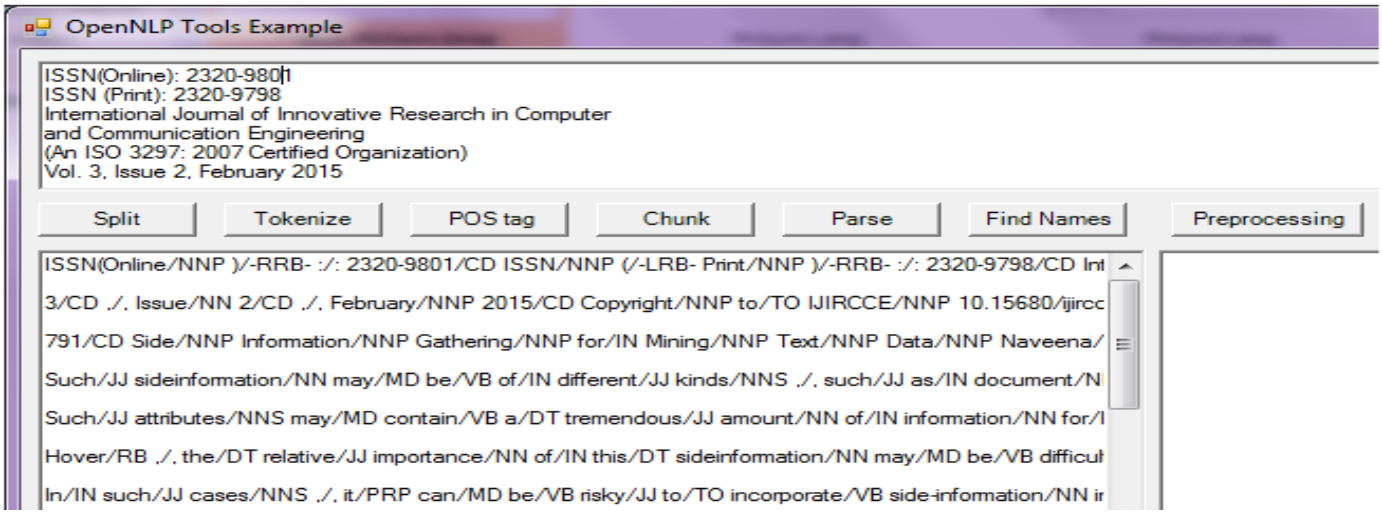

Fig.7. POS Tagging

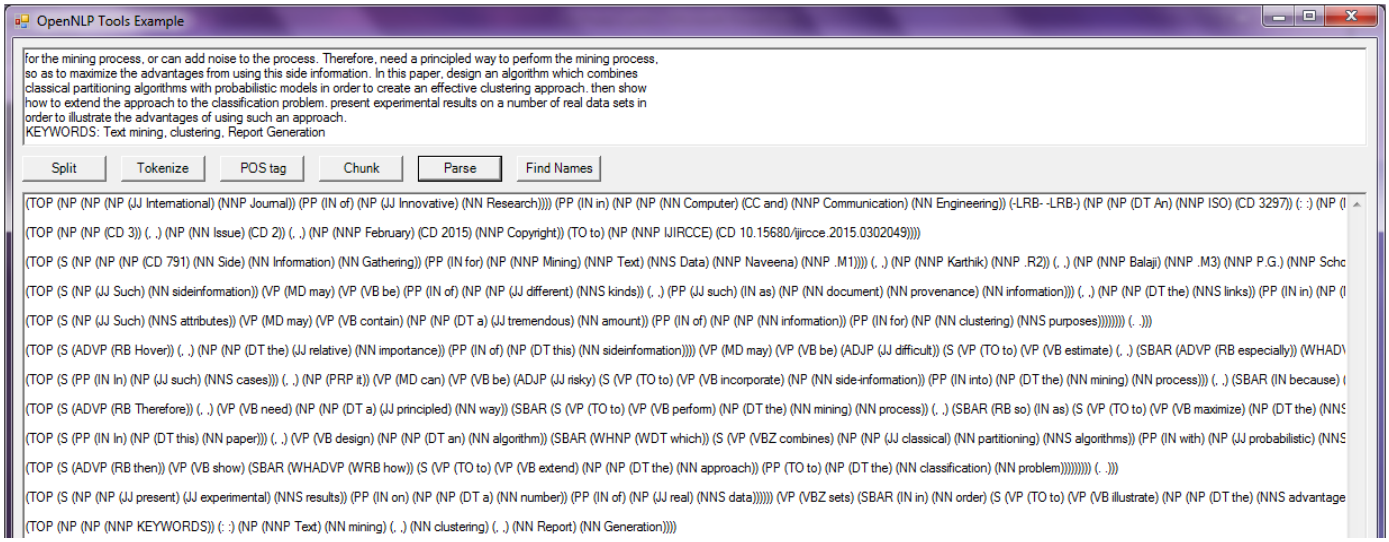

Fig.8. Parsing

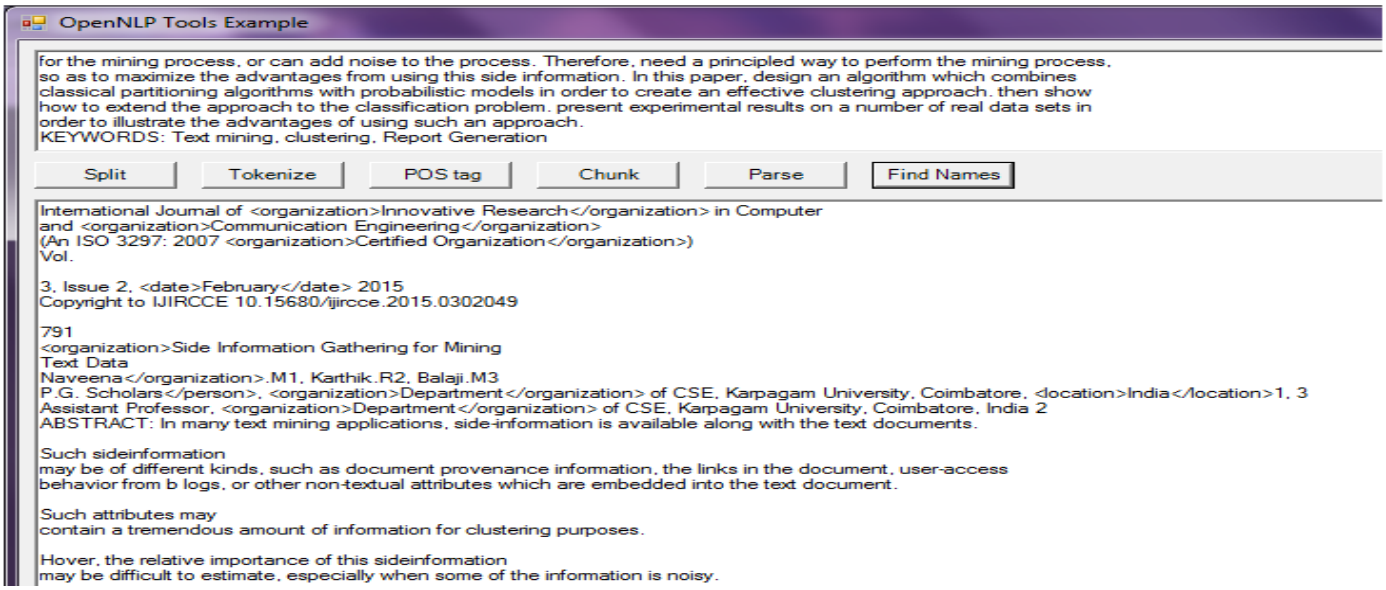

Fig.9. Find Naming

IV. Experimental Results

Figure 10 shows the graph for comparison of time required for mining different number of words. The time required for mining 2 words and 4 words are 55 ms and 360 ms, respectively. The time increased, it depends on the number of filtered words from the input document. It is natural that as the input increases the time required to mine input dataalso increases but not exponentially. Table I shows the time required for mining words with the count of filtered words.

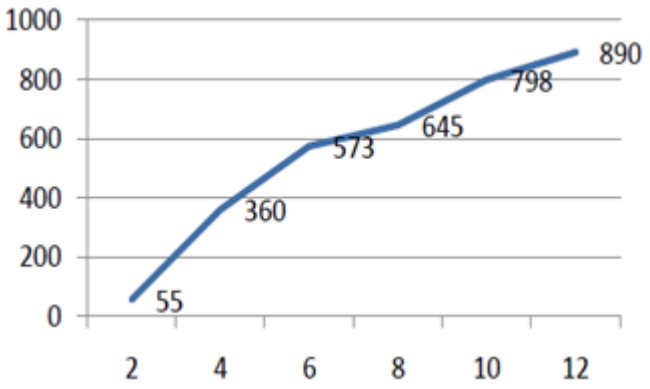

Fig.10. Comparison of Time Required for Mining Words

Table I: Time Required for Mining Words with the Count of Filtered Words for Different Number of Inputs

Input	*No. of Words*	*Filtered words*	*Time in ms*
File 1	2	292	55ms
File 2	4	1235	360ms
File 3	6	3128	573ms
File 4	8	4128	645ms
File 5	10	4450	798ms
File 6	12	4437	890ms

Proposed approach uses dictionary keywords comparing with input text file with dictionary words and matched keywords added to the process of side information generation. Figure 11 shows the graphical representation of word set and time required to generate side information.

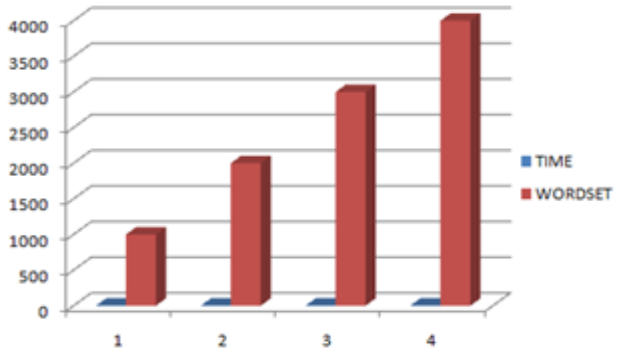

Fig.11. Comparison of Time Required to Generate Side Information for Different Wordset

Figure 12 shows the accuracy of input data. As the input data increases the accuracy remains constant i.e. number of words are more but also accuracy is high. The efficiency of side information generated is shown in Figure 13.

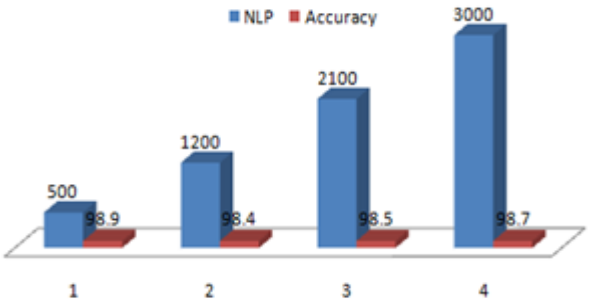

Fig.12. Accuracy of Input Data

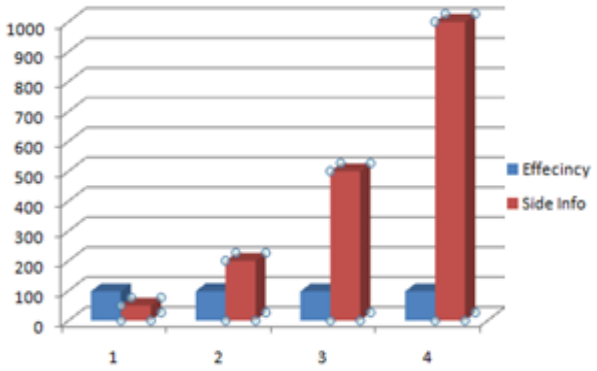

Fig.13. Efficiency of Side Information Generated

V. Conclusion and Future Scope

This paper presented the metadata based text mining for side information generation. The time required to mine input data depends on the size of input data. As the input data increases, the accuracy remains constant for generating the side information. Still, there is an improvement in designing a clustering based probabilistic approach for side information generation. Also, there is a scope for providing a security for side information generation and exploring the filter approaches. In future, a Security is provided for metadata based side information generation using Intrusion Detection System (IDS).

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OTRA Based Second Order Universal Filter and its optimization like Butterworth, Chebyshev and Bessel

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***Abstract*—This research work brings operational transresistance amplifier (OTRA) based second order universal filter, with three main filter optimizations like Butterworth, Chebyshev and Bessel. The universal filter offers all five sections of filter responses likes: Low-Pass, High-Pass, Band-Pass, Band-Rejection and All-Pass. Design is based on the RC-RC decomposition technique. Finally, simulation results are performed to verify the theoretical results using ORCAD 10.5 circuit simulator.**

***Index Terms*—Operational Transresistance Amplifiers (OTRA), Second Order Universal Filter, Butterworth, Chebyshev and Bessel Filter.**

I. Introduction

A number of voltage-mode (VM) and current-mode (CM) filtering circuits have been designed using different active elements such as operational amplifiers [1], operational transconductance amplifiers [2], current conveyors [3], current differencing buffered amplifier [4] etc, which have the low power consumption, high slew rate, wide bandwidth etc. Now days the operational transresistance amplifier (OTRA) has acts as an substitutional analog building block [5] that posses all the advantages of current mode techniques. OTRA eliminate parasitic capacitances throw input grounded terminals[6-8]. Presently OTRA manufactured commercially as norton amplifiers or differencing amplifiers for several integrated circuit. Manufactures observed that CMOS OTRA is more simpler and more efficient than the commercially available another building blocks. Other useful applications of OTRA have been reported in literature [9-11]. These reports include, designing of universal filter [9], single- resistance-controlled oscillators [10], and all-pass filters [11]. On the other hand, a literature study enhance our knowledge that both Kerwin-Huelsman-Newcomb (KHN) and Tow-Thomas (TT) biquads designed by using current conveyors, operational amplifier or OTAs [12-15]. On the basis of literature study we found that although Fleischer-Tow biquad, is an improved version of the Tow-Thomas configuration, offers the realization of all five different second-order filtering functions, namely low-pass, high-pass, band-pass, notch, and all-pass. But as per the author knowledge not a single paper that includes all filter optimization like Butterworth, Chebyshev and Bessel are reported in a single paper.

The purpose of this work is to analyse second order universal filter structure with its all optimizations like Butterworth, Chebyshev and Bessel, that exhibits all responses of filter like Band-Pass (BP), Band-Reject (BR), Low-Pass (LP), High-Pass (HP) and All-Pass (AP) functions from the same configuration. Also, a comparative study for the second order universal filter is reported in this paper.

II. Circuit Description

A 0.5 μm Complementary metal oxide semiconductor technology based internal circuit of operational transresistance amplifier is shown in Figure 1 [5], and the schematic circuit symbol of OTRA is shown in Figure 2. Corresponding input/ output - relationship is characterized as:

$$V_p = V_n = 0 \text{ and } V_0 = R_m(I_p - I_n) \qquad (1)$$

where, V_p and V_n is the input voltage respectively at terminal p and n, with the transresistance gain R_m which approaches infinity for ideal one.

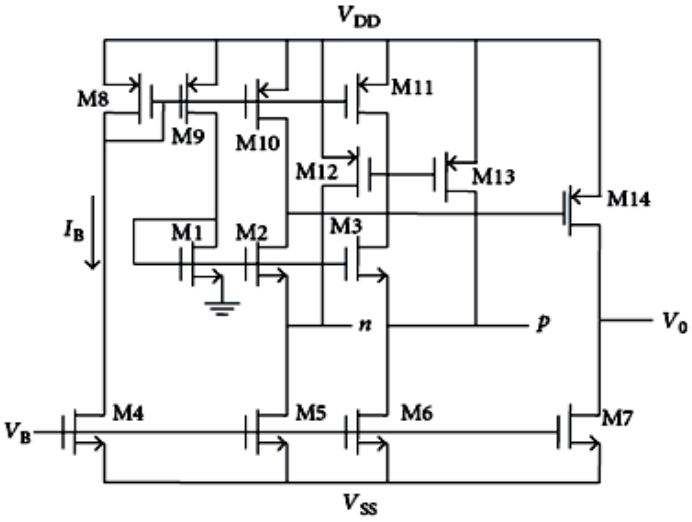

Fig. 1. Internal circuit of OTRA [5]

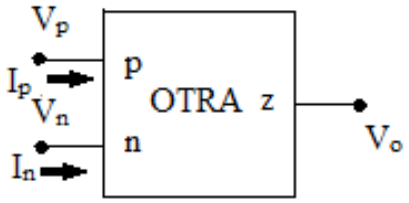

Fig. 2. The schematic circuit symbol of an OTRA

The proposed work uses generalized filter structure using eight admittance term shown in Figure 3. The corresponding transfer function may be obtained by the routine analysis as:

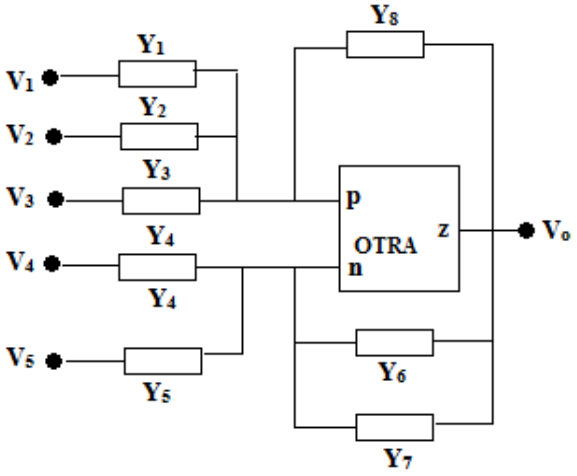

Fig.3. Generalized OTRA based filter structure

$$\frac{N(s)}{D(s)} = \frac{Y_1V_1 + Y_2V_2 + Y_3V_3 - Y_4V_4 - Y_5V5}{Y_6 + Y_7 - Y_8} \quad (2)$$

where, Y_1 , Y_2 , Y_3 Y_4 , Y_5 , Y_6 , Y_7 and Y_8 are positive admittance terms. The generalized structure can be used for design different type of filter optimization like Butterworth, Chebyshev and Bessel filter. The general transfer function of second order low-pass filter can be expressed as:

$$T(s) = \frac{A_0}{\left(1 + A_1 s + B_1 s^2\right)} \quad (3)$$

Here the design part is done with unity gain (A_0=1) and the filter coefficients A_1 and B_1 must be different for different types of filter transfer function, which is given in Table 1.

TABLE.1
SECOND ORDER FILTER COEFFICIENTS

Types of Filter	Filter Coefficients
Butterworth Filter	$A_1 = 1.4142$ $B_1 = 1.0000$
Chebyshev Filter	$A_1 = 1.3022$ $B_1 = 1.5515$
Bessel Filter	$A_1 = 1.3617$ $B_1 = 0.6180$

The transfer function is decomposing by RC-RC decomposition technique [14] as below:
The general transfer function of second order low pass filter is

$$T(s) = \frac{A_0}{\left(1 + A_1 s + B_1 s^2\right)} \quad (4)$$

Rearrange the equation as [14]:

$$T(s) = \frac{N(s)}{D(s)} = \frac{\frac{1}{(s+1)}}{\frac{D(s)}{(s+1)}} \quad (5)$$

There after second order low pass Butterworth filter having numerator and denominator must be decomposed as [14]

$$N(s) = \frac{1}{(s+1)} = -\frac{s}{(s+1)} + 1 \quad (6)$$

$$D(s) = \frac{1 + 1.4142s + 1.0000s^2}{(s+1)}$$

$$= s + 0.4142 + \frac{0.5858}{(s+1)}$$

$$= s - \frac{0.5858s}{(s+1)} + 1 \quad (7)$$

Similarly for second order low pass chebyshev having numerator and denominator must be decomposed as [14]

$$N(s) = \frac{1}{(s+1)} = -\frac{s}{(s+1)} + 1 \quad (8)$$

$$D(s) = \frac{1 + 1.3022s + 1.5515s^2}{(s+1)}$$

$$= 1.5515s + 0.2493 + \frac{1.2493}{(s+1)}$$

$$= 1.5515s - \frac{1.2493s}{(s+1)} + 1 \quad (9)$$

Again for second order low pass Bessel filter having numerator and denominator must be decomposed as [14]

$$N(s) = \frac{1}{(s+1)} = -\frac{s}{(s+1)} + 1 \quad (10)$$

$$D(s) = \frac{1 + 1.3617s + 0.6180s^2}{(s+1)}$$

$$= 0.6180s + 0.7437 + \frac{0.2563}{(s+1)}$$

$$= 0.6180s - \frac{0.2563s}{(s+1)} + 1 \quad (11)$$

Finally, all other filter response like high pass, band pass, band reject and all pass response like Butterworth, Chebyshev and Bessel filters are summarized with their transfer function and decomposed as per the above discussion which is summarized in Table 2.

TABLE 2. TRANSFER FUNCTION DECOMPOSITION

Optimization	Types	Transfer function Decomposition
Butterworth	Low pass	$N(s)=\frac{1}{(s+1)}=-\frac{s}{(s+1)}+1\ ,\ D(s)=\frac{1+1.4142s+1.0000s^2}{(s+1)}\ =s-\frac{0.5858s}{(s+1)}+1$
	High pass	$N(s)=\frac{s^2}{(s+1)}=s-1+\frac{s}{(s+1)},\ D(s)=\frac{1+1.4142s+1.0000s^2}{(s+1)}\ =s-\frac{0.5858s}{(s+1)}+1$
	Band pass	$N(s)=\frac{s}{(s+1)}=\frac{s}{(s+1)}+1-1,\ D(s)=\frac{1+1.4142s+1.0000s^2}{(s+1)}\ =s-\frac{0.5858s}{(s+1)}+1$
	Band reject	$N(s)=\frac{s^2+1}{(s+1)}=s+1-\frac{2s}{(s+1)}\ D(s)=\frac{1+1.4142s+1.0000s^2}{(s+1)}\ =s-\frac{0.5858s}{(s+1)}+1$
	All pass	$N(s)=\frac{1-1.4142s+1.0000s^2}{(s+1)}=s+1-\frac{3.4142s}{(s+1)}\ ,D(s)=\frac{1+1.4142s+1.0000s^2}{(s+1)}$ $=s-\frac{0.5858s}{(s+1)}+1$
Chebyshev	Low pass	$N(s)=\frac{1}{(s+1)}=-\frac{s}{(s+1)}+1\ ,\ D(s)=\frac{1+1.3022s+1.5515s^2}{(s+1)}\ =1.5515s-\frac{1.2493s}{(s+1)}+1$
	High pass	$N(s)=\frac{s^2}{(s+1)}=s-1+\frac{s}{(s+1)},D(s)=\frac{1+1.3022s+1.5515s^2}{(s+1)}\ =1.5515s-\frac{1.2493s}{(s+1)}+1$
	Band pass	$N(s)=\frac{s}{(s+1)}=\frac{s}{(s+1)}+1-1,D(s)=\frac{1+1.3022s+1.5515s^2}{(s+1)}\ =1.5515s-\frac{1.2493s}{(s+1)}+1$
	Band reject	$N(s)=\frac{s^2+1}{(s+1)}=s+1-\frac{2s}{(s+1)}\ D(s)=\frac{1+1.3022s+1.5515s^2}{(s+1)}\ =1.5515s-\frac{1.2493s}{(s+1)}+1$
	All pass	$N(s)=\frac{1-1.3022s+1.5515s^2}{(s+1)}=1.5515s+1-\frac{3.8537s}{(s+1)}\ ,D(s)=\frac{1+1.3022s+1.5515s^2}{(s+1)}$ $=1.5515s-\frac{1.2493s}{(s+1)}+1$
Bessel	Low pass	$N(s)=\frac{1}{(s+1)}=-\frac{s}{(s+1)}+1,D(s)=\frac{1+1.3617s+0.6180s^2}{(s+1)}=0.6180s-\frac{0.2563s}{(s+1)}+1$
	High pass	$N(s)=\frac{s^2}{(s+1)}=s-1+\frac{s}{(s+1)},D(s)=\frac{1+1.3617s+0.6180s^2}{(s+1)}=0.6180s-\frac{0.2563s}{(s+1)}+1$
	Band pass	$N(s)=\frac{s}{(s+1)}=\frac{s}{(s+1)}+1-1,D(s)=\frac{1+1.3617s+0.6180s^2}{(s+1)}=0.6180s-\frac{0.2563s}{(s+1)}+1$
	Band reject	$N(s)=\frac{s^2+1}{(s+1)}\ =s+1-\frac{2s}{(s+1)}\ D(s)=\frac{1+1.3617s+0.6180s^2}{(s+1)}=0.6180s-\frac{0.2563s}{(s+1)}+1$
	All pass	$N(s)=\frac{1-1.3617s+0.6180s^2}{(s+1)}=0.6180s+1-\frac{2.9797s}{(s+1)}\ D(s)=\frac{1+1.3617s+0.6180s^2}{(s+1)}$ $=0.6180s-\frac{0.2563s}{(s+1)}+1$

The obtained transfer function for Butterworth, Chebyshev and Bessel are nothing but simply the combination of R and C or simply R and C. Normalized value of passive components of different optimization computed by above analysis and actual value of passive component scaled by using impedance scaling factor (ZSF) =80×10^3 and frequency scaling factor (FSF) =$2\pi \times100\times 10^3$ (100KHz desired cut off frequency), which is given in Table 3.This analysis is made with the help of paper [16].

TABLE 3: ACTUAL VALUE OF PASSIVE ELEMENTS.

Filter Responses	Types	Component value										
		R_{a1}(kΩ)	C_{a1}(pf)	R_{a2}(kΩ)	C_{a2}(pf)	R_{b1}(kΩ)	C_{b1}(pf)	R_{b2}(kΩ)	R_c(kΩ)	C_c(pf)	R_d(kΩ)	C_d(pf)
Butterworth	Low pass	80	-	-	-	80	19.89	-	80	19.89	136.57	11.65
	High pass	-	19.89	-	-	80	19.89	-	80	19.89	136.57	11.65
	Band pass	80	-	80	19.89	-	-	80	80	19.89	136.57	11.65
	Band reject	80	19.89	-	-	40	39.78	-	80	19.89	136.57	11.65
	All pass	80	19.89	-	-	23.43	67.91	-	80	19.89	136.57	11.65
Tschebyscheff	Low pass	80	-	-	-	80	19.89	-	80	30.85	64.036	24.85
	High pass	-	19.89	-	-	80	19.89	-	80	30.85	64.036	24.85
	Band pass	80	-	80	19.89	-	-	80	80	30.85	64.036	24.85
	Band reject	80	19.89	-	-	40.76	39.78	-	80	30.85	64.036	24.85
	All pass	80	30.85	-	-	20.76	39.78	-	80	30.85	64.036	24.85
Bessel	Low pass	80	-	-	-	80	19.89	-	80	12.29	312.13	5.098
	High pass	-	19.89	-	-	80	19.89	-	80	12.29	312.13	5.098
	Band pass	80	-	80	19.89	-	-	80	80	12.29	312.13	5.098
	Band reject	80	19.89	-	-	40	39.78	-	80	12.29	312.13	5.098
	All pass	80	12.29	-	-	26.85	59.26	-	80	12.29	312.13	5.098

From above discussion we may modify the generalized equation (2) to equation (12). Here the proposed second order filter structure which is shown in Figure 3 is modified as Figure 4 and the corresponding transfer function can be written as equation (12) for Butterworth, Chebyshev and Bessel second order universal filter.

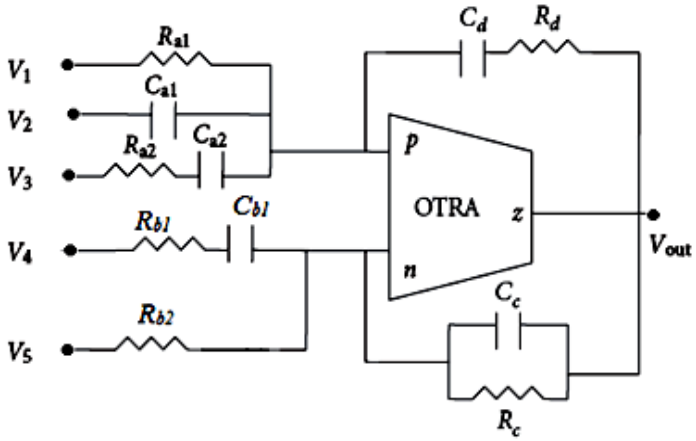

Fig.4. proposed second order universal filter

$$\frac{N(s)}{D(s)}=\frac{\frac{1}{R_{a1}}V_1+C_{a1}sV_2+\frac{C_{a2}s}{R_{a2}C_{a2}s+1}V_3-\frac{C_{b1}s}{R_{b1}C_{b1}s+1}V_4-\frac{1}{R_{b2}}V_5}{\frac{1}{R_c}+C_cs-\frac{C_ds}{R_dC_ds+1}} \quad (12)$$

Finally to obtain the various filter response, a proper input selection is required, Table 4 shown the corresponding selection of V_1, V_2, V_3, V_4 and V_5 to achieve different filter response.

TABLE 4. THE V_1, V_2, V_3, V_4 AND V_5 VALUES SELECTION FOR EACH FILTER FUNCTION RESPONSE

Filter Types	Input v_{in}				
V_{out}	V_1	V_2	V_3	V_4	V_5
Low pass	1	0	0	1	0
High pass	0	1	0	1	0
Band pass	1	0	1	0	1
Band reject	1	1	0	1	0
All pass	1	1	0	1	0

Table 4, results the transfer function of Low-Pass (LP), High-Pass (HP) Band-Pass (BP), Band-Reject (BR) and All-Pass (AP) functions. From equation (12) we can realize a different filtering function which is summarized as.

2.1 Universal second order Low Pass Filter

From equation (12) transfer function of Low Pass filter is obtained by selecting input V_1 and V_4.

$$\frac{V_{out}}{V_{LP}} = \frac{\frac{1}{R_{a1}} - \frac{C_{b1}s}{R_{b1}C_{b1}s+1}}{\frac{1}{R_c} + C_c s - \frac{C_d s}{R_d C_d s+1}} \tag{13}$$

$$N(s) = \{(R_{b1}C_{b1}s+1) - R_{a1}C_{b1}s\} \times R_c \times (R_d C_d s+1)$$
$$D(s) = \{(R_d C_d s+1) + R_c C_c s \times (R_d C_d s+1) - R_c C_d s\} \times R_{a1} \times (R_{b1}C_{b1}s+1)$$

If $R_{b1}C_{b1} = R_d C_d$, then

$$N(s) = (R_{b1}R_c C_{b1} - R_{a1}R_c C_{b1})s + R_c \tag{14}$$

$$D(s) = R_{a1}R_c R_d C_c C_d s^2 + (R_{a1}R_d C_d + R_{a1}R_c C_c - R_{a1}R_c C_d)s + R_{a1} \tag{15}$$

2.2 Universal second order High Pass Filter

From equation (12) transfer function of High Pass filter is obtained by selecting input V_2 and V_4.

$$\frac{V_{out}}{V_{HP}} = \frac{C_{a1}s - \frac{C_{b1}s}{R_{b1}C_{b1}s+1}}{\frac{1}{R_c} + C_c s - \frac{C_d s}{R_d C_d s+1}} \tag{16}$$

$$N(s) = \{(C_{a1}s) \times (R_{b1}C_{b1}s+1) - C_{b1}s\} \times R_c \times (R_d C_d s+1)$$
$$D(s) = \{(R_d C_d s+1) + R_c C_c s \times (R_d C_d s+1) - R_c C_d s\} \times (R_{b1}C_{b1}s+1)$$

If $R_{b1}C_{b1} = R_d C_d$, then

$$N(s) = R_c R_{b1} C_{b1} C_{a1} s^2 + (R_c C_{a1} - R_c C_{b1})s \tag{17}$$

$$D(s) = R_c R_d C_c C_d s^2 + (R_d C_d + R_c C_c - R_c C_d)s + 1 \tag{18}$$

2.3 Universal second order Band Pass Filter

From equation (12) transfer function of Band Pass filter is obtained by selecting input V_1, V_3 and V_5.

$$\frac{V_{out}}{V_{BP}} = \frac{\frac{1}{R_{a1}} + \frac{C_{a2}s}{R_{a2}C_{a2}s+1} - \frac{1}{R_{b2}}}{\frac{1}{R_c} + C_c s - \frac{C_d s}{R_d C_d s+1}} \tag{19}$$

$$N(s) = \{R_{b2} \times (R_{a2}C_{a2}s+1) + R_{a1}R_{b2}C_{a2}s - R_{a1}R_{a2}C_{a2}s - R_{a1}\} \times Rc \times (R_d C_d s+1)$$
$$D(s) = \{(R_d C_d s+1) + R_c C_c s \times (R_d C_d s+1) - R_c C_d s\} \times R_{a1}R_{b2} \times (R_{a2}C_{a2}s+1)$$

If $R_{a2}C_{a2} = R_d C_d$, then

$$N(s) = (R_c R_{b2} R_{a2} C_{a2} + R_c R_{a1} R_{b2} C_{a2} - R_c R_{a1} R_{a2} C_{a2})s + (R_c R_{b2} - R_c R_{a1}) \tag{20}$$

$$D(s) = R_{a1}R_{b2}R_c R_d C_c C_d s^2 + (R_{a1}R_{b2}R_d C_d + R_{a1}R_{b2}R_c C_c - R_{a1}R_{b2}R_c C_d)s + R_{a1}R_{b2} \tag{21}$$

2.4 Universal second order Band Reject Filter

From equation (12) transfer function of Band Reject filter is obtained by selecting input V_1, V_2 and V_4.

$$\frac{V_{out}}{V_{BRF}} = \frac{\frac{1}{R_{a1}} + C_{a1}s - \frac{C_{b1}s}{R_{b1}C_{b1}s+1}}{\frac{1}{R_c} + C_c s - \frac{C_d s}{R_d C_d s+1}} \tag{22}$$

$$N(s) = \{(R_{b1}C_{b1}s+1) + R_{a1}C_{a1}s \times (R_{b1}C_{a1}s+1) - R_{a1}C_{b1}s\} \times R_c \times (R_d C_d s+1) \tag{23}$$
$$D(s) = \{(R_d C_d s+1) + R_c C_c s \times (R_d C_d s+1) - R_c C_d s\} \times R_{a1} \times (R_{b1}C_{b1}s+1)$$

If $R_{b1}C_{b1} = R_d C_d$, then

$$N(s) = R_{a1}R_c R_{b1} C_{b1} s^2 + (R_c R_{b1} C_{b1} + R_c R_{a1} C_{a1} - R_c R_{a1} C_{b1})s + R_c \tag{24}$$

$$D(s) = R_{a1}R_c R_d C_c C_d s^2 + (R_{a1}R_d C_d + R_{a1}R_c C_c - R_{a1}R_c C_d)s + R_{a1} \tag{25}$$

2.5 Universal second order All Pass Filter

From equation (12) transfer function of All Pass filter is obtained by selecting input V_1, V_2 and V_4.

$$\frac{V_{out}}{V_{AP}} = \frac{\frac{1}{R_{a1}} + C_{a1}s - \frac{C_{b1}s}{R_{b1}C_{b1}s+1}}{\frac{1}{R_c} + C_c s - \frac{C_d s}{R_d C_d s+1}} \tag{26}$$

$$N(s) = \{(R_{b1}C_{b1}s+1) + R_{a1}C_{a1}s \times (R_{b1}C_{a1}s+1) - R_{a1}C_{b1}s\} \times R_c \times (R_d C_d s+1)$$
$$D(s) = \{(R_d C_d s+1) + R_c C_c s \times (R_d C_d s+1) - R_c C_d s\} \times R_{a1} \times (R_{b1}C_{b1}s+1)$$

If $R_{b1}C_{b1} = R_d C_d$, then

$$N(s) = R_{a1}R_c R_{b1} C_{b1} s^2 + (R_c R_{b1} C_{b1} + R_c R_{a1} C_{a1} - R_c R_{a1} C_{b1})s + R_c \tag{27}$$

$$D(s) = R_{a1}R_c R_d C_c C_d s^2 + (R_{a1}R_d C_d + R_{a1}R_c C_c - R_{a1}R_c C_d)s + R_{a1} \tag{28}$$

All filter realization must have some condition. The condition for realization of low pass, high pass, band pass, band reject and all pass filters are summarised in Table 5.

The natural frequency and quality factor of the designed circuit for low pass, high pass, band pass, band reject and all pass filter can be obtained as

$$\omega_0 = \frac{1}{\sqrt{R_c R_d C_c C_d}} \tag{29}$$

$$Q_o = \frac{\sqrt{R_c R_d C_c C_d}}{(R_d C_d + R_c C_c + R_c C_d)} \tag{30}$$

and the sensitivity of ω_0 and Q_0 with respect to passive elements may be expressed as

$$S_{R_c}^{\omega_o} = S_{R_d}^{\omega_o} = S_{Cc}^{\omega_o} = S_{C_d}^{\omega_o} = -\frac{1}{2} \text{ and}$$

$$S_{R_c}^{Q} = S_{R_d}^{Q} = S_{Cc}^{Q} = S_{C_d}^{Q} = -\frac{1}{2}$$

It proclaims that the designed circuit gives low sensitivity.

TABLE 5: CONDITION OF REALIZATION OF EACH FILTER.

Filter response	**Condition**
Low Pass	$R_{b1}C_{b1}=R_d C_d$, $R_{b1}C_{b1}R_c=R_{a1}C_{b1}R_c$
High Pass	$R_{b1}C_{b1}=R_d C_d$, $R_cCa1=R_cC_{b1}$
Band Pass	$R_{a2}C_{a2}=R_d C_d$, $R_cR_{b2}=R_cR_{a1}$
Band Reject	$R_{b1}C_{b1}=R_d C_d$, R_c $R_{b1}C_{b1}+R_cR_{a1}C_{a1}=R_cR_{a1}C_{b1}$
All pass	$R_{b1}C_{b1}=R_d C_d$, $R_{a1}R_cC_{a1}R_{b1}=R_{a1}R_cC_cR_dC_d$, $-(R_cR_dC_d+R_cR_{a1}C_{a1}-R_cR_{a1}C_{b1})$ $=(R_{a1}R_dC_d+R_{a1}R_cC_c-R_{a1}R_cC_d)$, $R_c=R_{a1}$

III. NON-IDEALITY ANALYSIS OF OTRA

Normally the trans-resistance gain is assumed to infinity for filter designing. However, practically trans-resistance gain (R_m) is a frequency dependent finite value. Considering a single pole model for the trans-resistance gain can be approximately given in terms of high frequencies as

$$R_m \approx \frac{1}{C_p s} \tag{31}$$

where,

$$Cp = \frac{1}{\omega_o R_o} \tag{32}$$

where, ω_o is the pole frequency and R_o is dc trans-resistance gain.

Taking non- ideality effect of OTRA the transfer function in equation (2) modifies to

$$\frac{N(s)}{D(s)} = \frac{Y_1V_1 + Y_2V_2 + Y_3V_3 - Y_4V_4 - Y_5V5}{Y_6 + Y_7 - Y_8 + sC_p} \tag{33}$$

If the denominator of equation(2) modifies as equation(33) or in other words admittances Y_6 Y_7 and Y_8 contain a parallel capacitor, this result a complete self compensation [10]. In our designed circuits, Y_7 contains a parallel capacitor branch , hence the designed filters taking the magnitude of Cp into consideration. In this way, the effect of Cp can be absorbed in capacitance Y_7 without using additional elements and achieving complete self compensation [10].

IV. SIMULATION RESULT

The designed 0.5 μm Complementary metal oxide semiconductor technology based internal circuit of operational trans-resistance amplifier as shown in Figure 1[5], with dc power supply voltages $V_{DD} = -V_{SS} = 1.5$volt and bias voltage $V_B = -0.5$volt. The simulations are performed using ORCAD 10.5 circuit simulator based on 0.5 μm Complementary metal oxide semiconductor technology. The filter is designed for a natural frequency (3dB frequency) of f_0 = 100 kHz. Comparative simulated and theoretical result of the Butterworth, Chebyshev and Bessel filters, followed by five sections describing the most common filter response: low pass, high pass, band pass, band reject and all pass filters are shown in Figure 5. The Butterworth gives flat frequency response in the pass band and its stop band attenuates with –40 dB/decade as given in Figure 5. The Chebyshev gives a sharper roll off with comparison to Butterworth and Bessel filters, but allowing distortion in form of ripple in the frequency response shown in Figure 5. As the roll-off more sharper, the ripple become increases, so trade-off between these two parameters observed in the Chebyshev response. The Bessel filters gives constant group delay for wide frequency range because it shows a linear phase response over a wide frequency range with comparison to Butterworth and Chebyshev filters. Figure 6 shown the comparison result of phase response of Butterworth, Chebyshev and Bessel all pass filter.

To verify the output quality, total harmonic distortion is obtained for low pass Butterworth, Chebyshev and Bessel filters as shown in Figure 7. It is found that the output distortion is very small and it is 5 % up to 4 volt[1]. It proclaim that the output of filters are very good quality and dynamic range is high. The simulated results verify with the theoretical results, shown in Figure 5. A comparative study for the second order universal filter is shown in Table 6.

TABLE 6. COMPARISION OF AVAILABLE SECOND ORDER UNIVERSAL FILTERS

Reference Number	**Active element**	**Required active elements**	**Required capacitors**	**Required resistors**	**Requirement of Inbuilt tunability**	**Requirement of change the hardware to change filter types**
17	DVCCTA	1	2	1	Yes	Yes
18	CCCII	4	2	No	Yes	No
19	CDTA	2	2	2	Yes	Yes
20	CCII	3	2	2	No	Yes
Proposed	OTRA	1	4	4	No	Yes

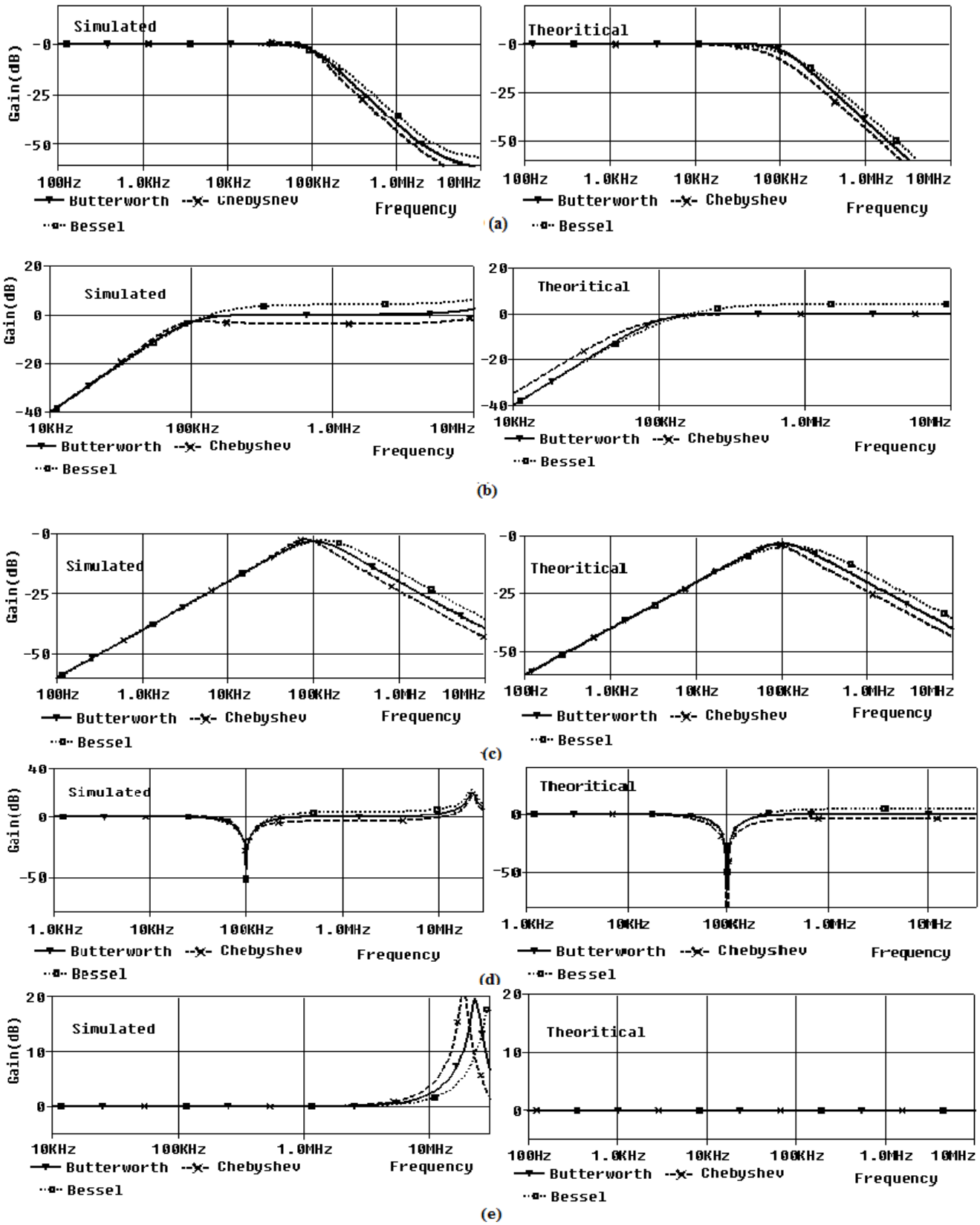

Fig.5. Comprative simulated and theoritical result of universal second order Butterworth, Chebyshev and Bessel Filters .(a) low pass (b) high pass (c) band pass (d) band Reject (e) all pass.

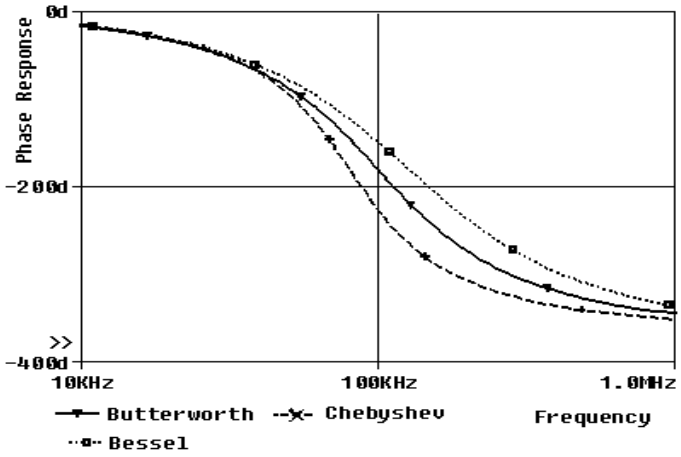

Fig.6. Comparison result of phase response of Butterworth, Chebyshev and Bessel all pass filter.

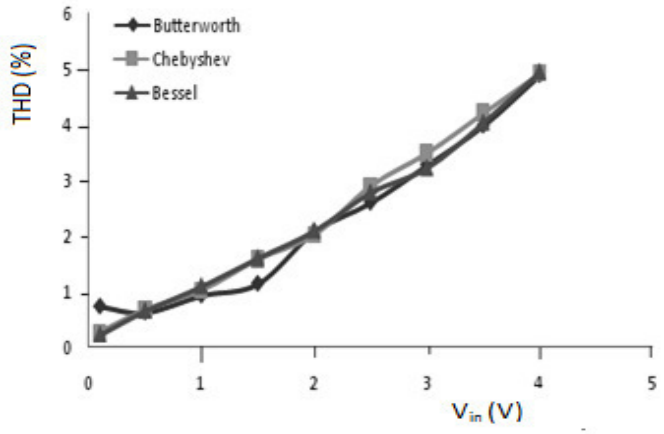

Fig.7. THD Variation with respect to input voltage.

III. CONCLUSION

In this paper, a New 0.5 μm CMOS-Based OTRA Based voltage mode second-order universal Butterworth, Chebyshev and Bessel filters Structure is presented, the proposed filter structure uses a single OTRA as an active component, It makes this designed work economical one. Also it have not required in built tunability of filter parameters. The proposed circuit offers low sensitivity. The theoretical result is quite agreed with simulated result.

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Comparative Study of Vector Control of Induction Motor by Using PI Controller and Fuzzy Controller

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***Abstract*—Induction Motors have wide kind of functions for the reason that of their advantages likes rugged progress, low rate and strong performance. In latest years, various sides are investigated concerning controlling induction motor. In prior yr's scalar control is use for controlling purpose it is also referred to as V/F control. It is vitally easy procedure but the foremost hazards of this procedure are terrible dynamic performance and likewise it takes extra time to come in steady position. After this system vector control is used. Vector control process is more intricate as evaluate to scalar control. The VCIM power includes the decoupling of stator current factor which produces flux and torque of induction motor. It has servable advantages like excellent transient and dynamic performance. However it has some risks like massive ripple in torque within the time of beginning of IM. On this paper, an induction motor (IM) velocity control utilizing, PI controller system and vector control with fuzzy good judgment has been simulated and developed. The comparative be trained of VCIM with fuzzy logic and VCIM with PI is done on MATLAB/SIMULINK program. Results show the effectiveness of vector control with fuzzy logic controller over natural PI established vector control process.**

***Index Terms*—component; Induction motor, vector control, mathematic modeling, Fuzzy logic controller.**

I. Introduction

Induction motors are used in many industrial functions due less maintenance, robustness and simple building. Maximum torque and effectively may also be got by way of correct controlling of induction machine. In today's years, the control of the induction motor vigor is an energetic is taught self-discipline for engineers. Most of the time, the control and estimation of ac machines is difficult within the compression of dc drives, and this predicament develop if high performance is demanded. In V/F manipulate required suggestions sign but because of presence of harmonic quandary comes within the processing of suggestions signal. Probably the most long-established approach for controlling of induction motor use in industries is vector control or field oriented control. There are virtually two original approaches of vector control. One called the direct or suggestions approach, and the other, the oblique or feed ahead system. Indirect vector controlled (IVC) induction motor (IM) drives utilized in excessive efficiency programs could be very modern day in industrial purposes consequently of their relative convenient configuration, as in evaluation with the direct approach which requires flux and torque estimator. The main benefits of oblique vector manipulate are the decoupling of torque and flux without difficulty. Vector control is often referred to as decoupling, orthogonal or Tran's vector manage. Vector manipulate provide more accurate outcome as compare to scalar manage due to this advantages it become commonplace control of ac machines [1]. Conventionally PI controller used for controlling motive and it offers good outcome. But in some software like ac drives it's now not provide fascinating effect. So we required an enhance system akin to fuzzy good judgment for reaching desirable effect. On this paper comparative be taught between the fuzzy based vector control and traditional vector control is finished

II. Vector Control Or Field Oriented Control: Selecting a Template

The other title of Vector control is Field-oriented control (FOC), is a frequency control system where the stator currents of a 3-section AC laptop are divided as two

orthogonal add-ons that may be visualized with a vector. One factor defines the magnetic flux of the laptop, the opposite the torque. The manipulate approach of the force calculates from the flux and torque references given by way of utilizing the force's pace manage the corresponding present facet references. Conventionally used proportional-integral (PI) controllers for evaluating measured current with their reference values. In keeping with PI controller output transistor switch and the stator voltage of motor produce in accordance transistor switching. Vector manipulate induction motor can be manage like individually excited DC motor. Vector manipulate is suitable for both the synchronous and induction desktop drives. In DC machine, subject flux is perpendicular (Ninety Degree) to the armature flux. These two fluxes don't produces any interaction with each other. By using and adjusting the subject current will manage the DC commutator flux, and the torque might also be manage severally of flux by means that of utilizing adjusting the armature current. The development of AC computing device just isn't simple like DC computing device ,in AC computing device both stator and rotor flux intersect each other and flux linking of stator and rotor exchange in line with jogging situation we're ready to receive DC laptop like efficiency in protecting a orthogonal and consistent orientation between the armature fields and area. In AC devices through dimensioning the current of the stator with admire to the flux of the rotor to be competent to acquire independently managed torque and flux [3]. Vector manipulate is suitable to each synchronous and induction motor drives. The cage of induction motor powered with the vector manipulate offers a excessive stage of dynamics efficiency and the closed-loop manage provide fast and correct response of approach. Induction Motor drives are being utilized in the numbers of many procedure and commercial manipulate functions which are requires the immoderate performances [4]. In excessive performance pressure approaches, the motor velocity ought to closely accommodates a specific reference mechanical phenomenon prevailing any load disturbances, parameter variants, and mannequin uncertainties. In order to accumulate excessive performance, area-oriented control of induction motor (IM) drive is utilized. However, the controller design of this type of procedure performs a imperative perform in strategy effectively. Due to parameter exchange decoupling traits of vector controlled IM are associate affected. So the vector management is additionally referred to as associate freelance or decoupled management.

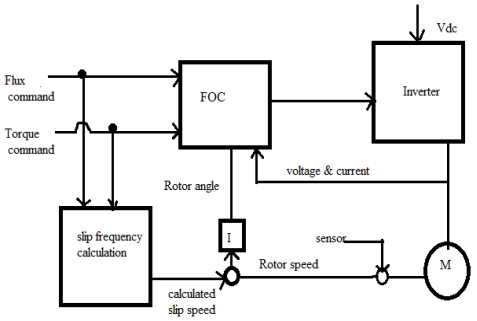


Fig: 1 Field Oriented Control

III. INDUCTION MOTOR MODELLING:

With the intention to lower the complexity of the modeling the 3 section parts reborn to two section method. The modified voltage equations (1) for the rotor and mechanical device on the synchronously rotating reference body ar as follows:-

$$Vds = RsIds + D\Psi ds \quad (1)$$

$$Vqs = RsIqs + D\Psi qs \quad (2)$$

$$Vdr = RrIdr + wr\,\Psi dr + D\Psi dr \quad (3)$$

$$Vqr = RrIqr - wr\,\Psi qr + D\Psi qr \quad (4)$$

$$\Psi ds = \int (Hds - RsIds) \quad (5)$$

$$\Psi qs = \int (Hqs - RsIqs) \quad (6)$$

$$ET = p\,\Psi dsIqs - \Psi qs\,Ids \quad (7)$$

Where, Vdr = rotor d-axis voltage, Vqs = stator q-axis voltage, Vqr = rotor q-axis voltage, Ψqs = stator q-axis flux, Vds = stator d-axis voltage, Ψds = stator d-axis flux, ET = Electromagnetic torque.

IV. PI CONTROLLER DESIGN

The normal PI controller output is given along with the help of the below equation:

$$U = k\,e(t) + k \int e(t).\,dt \quad (8)$$

Where, e = error (difference between actual speed and reference speed), k = proportional gain, k = Integral gain.

V. FUZZY LOGIC CONTROLLER:

Fuzzy logic controller consist three parts.

- Fuzzification
- Inference
- Defuzzification
- In fuzzification covert crisp value in fuzzy set that is lie between (0, 1). Inside the fuzzification step the error and modification in error signals area unit normalized to values that belong between -1 to one. The triangular and trapezoidal membership operate makes the calculations easier and controller to be straightforward [2].

- In inference engine all rule are utilized to the approach and manage output in step with requirement.
- In defuzzification fuzzy set convert into crisp value.

Fuzzy logic control (FLC) is a manipulate calculation taking into consideration an etymological control methodology which tries to account the human's finding out about methods to control a procedure without requiring a numerical model [9]. Normal block diagram of FLC proven in fig 2.

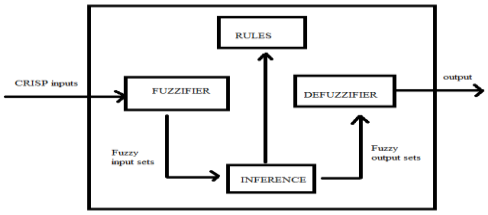
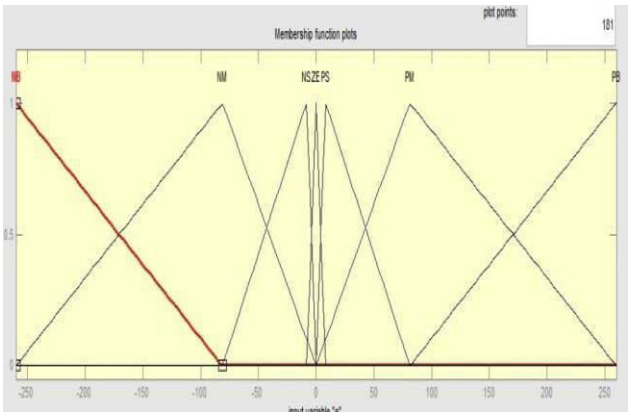


Fig 2: Block diagram of fuzzy logic controller

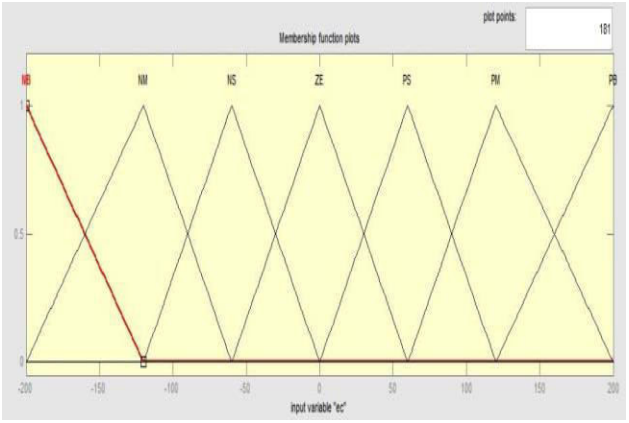
VI. FLC DESIGN:

Membership functions required for designing of a fuzzy common sense controller. The membership services should be picked such that they cover the entire universe of talk. Membership functions should be overlapping every different. This is executed in order to restrict any type of brokenness related to the minor changes in the inputs. For better manipulate, the membership perform close the zero areas must be made tight. Broader member operate works far from the zero areas offers speedier response to the system. Therefore, the membership function will have to be adjusted as standards are. After settling on compatible membership capabilities, a rule base must be made. It comprises exceptional Fuzzy If-Then chooses that entirely painting the behavior of the structure. These rules all that so much takes after the human standpoint, on this method giving electronic pondering to the approach [5, 6, 7and 8].

PLOT OF MEMBERSHIP FUNCTION



INPUT VARIABLE ERROR & CHANGE IN ERROR



OUTPUT VARIABLE

FLC RULE BASE TABLE

e/de	NB	NM	NS	ZE	PS	PM	PB
NB	NB	NB	NM	NM	NS	NS	ZE
NM	NL	NM	NM	NS	NS	ZE	PS
NS	NM	NM	NS	NS	ZE	PS	PS
ZE	NM	NS	NS	ZE	PS	PS	PM
PS	NS	NS	ZE	PS	PS	PM	PM
PM	NS	ZE	PS	PS	PM	PM	PL
PB	ZE	PS	PS	PM	PM	PB	PB

VII. SIMULATION RESULTS:

A. Circuit Description:

The induction motor is hooked up by way of a present-managed PWM inverter which consist block of common Bridge. The motor drives having a mechanical load is characterised by inertia J, friction coefficient B, and cargo torsion metallic element. For velocity manage loop makes use of a PI and Fuzzy common sense controller. Q Axis present (iq*) manage motor torque and motor flux is control by means of d axis present (id*). Identification* and iq* convert into current references ia*, ib*, and ic*with the aid of utilizing block dq-abc for the regulating of present. Current and Voltage dimension blocks are used to for sign visualization motive. Motor present, pace, and torque alerts are to be had at the output of the 'Asynchronous computer' block supply sign of motor torque, present and pace.

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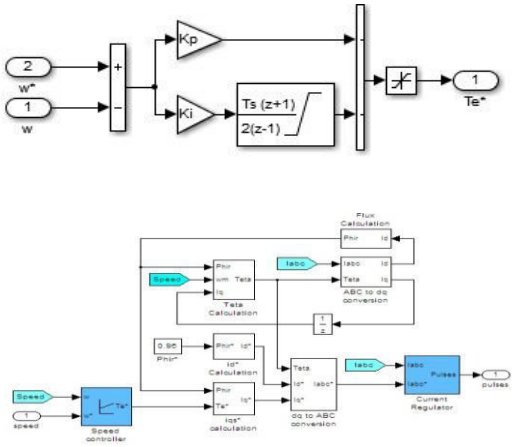

Fig 3 PI based vector control

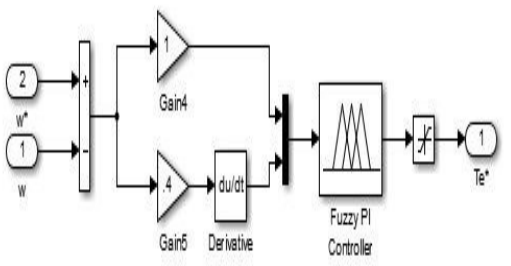

Fig 4 Fuzzy based vector control

B. At no Load:

The results shows that, When a pace reference step from zero to at least one hundred twenty rpm is utilized at t = 0 sec, the speed set point doesn't go immediately at one hundred twenty rpm nevertheless follows the acceleration ramp as tested in fig 3 and fig 4. Motor reached at stable state at 2.5 sec in conventional PI base vector manipulate but in fuzzy established vector manage motor reached steady state in 1.5 sec.

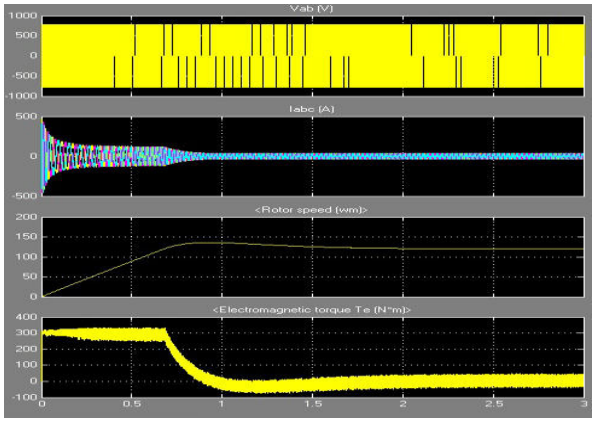

Fig 5: PI base vector control

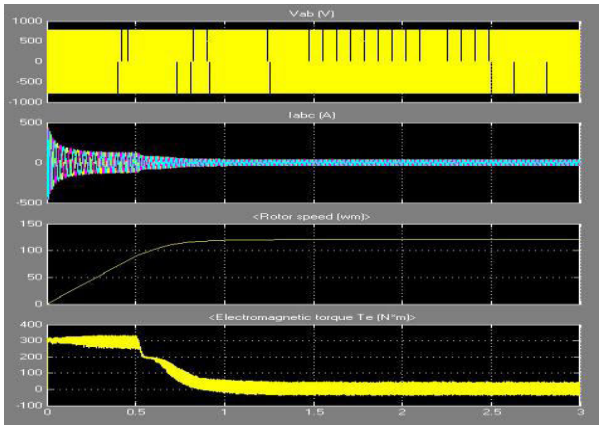

Fig 6: Fuzzy base vector control

AT Load

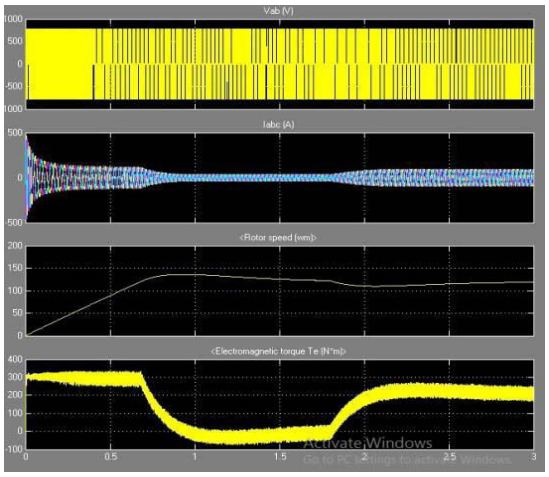

Fig 7: PI base vector control

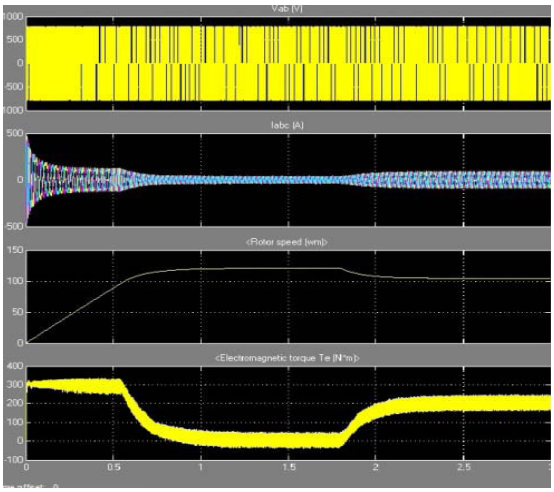

Fig 8: Fuzzy base vector control

VIII. Conclusion

On this paper we determined that standard PI has additional sinking time than fuzzy controller, so fuzzy controller makes the procedure turbo. The highest overshoot moreover within the normal PI controller is found larger than fuzzy controller. Once more the variant within the strategy parameters so of load disturbances is additionally a lot of less with fuzzy controller, which proves that the fuzzy controller is higher than the traditional PI controller. So it is typically terminated that the fuzzy controller improves the procedure performance and is best appropriate to excessive potency drives.

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Nature Inspired Techniques For Interference Management In Femtocells : A Survey

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***Abstract*—In the wireless communication system the transmitter and receiver close to each other to improve the data rates and capacity. Therefore, the wireless networks are more popular than the traditional wired services. In the wireless networks, to cover cells the low power nodes such as macrocells, picocells, femtocells base stations (BSs) deployed to improve the indoor coverage. The femtocell base station reduces operators operational cost, maintainance and infrastructure. At the time of femtocell deployment, the femtocell base station deal with a number of technical challenges, among those all the interference management is more important. In femtocell network, one femtocell creates the interference to its neighboring femtocells.To deal with interference management challenge number of researchers have suggested different types of solutions. The survey shows that nature inspired metaheuristic algorithm has the powerful impact on interference cancellation and avoidance.This survey paper focuses on bat algorithm for the resource allocation problem in a femtocell.**

***Index Terms*—Femtocell, Interference Management, Bat Algorithm, Differential Evolution.**

I. Introduction

The growth in the mobile device users the data traffic demands will be automatically increased, indirectly network operators will also have to significantly increase the capacity of networks. For this cellular network, the small cells have a number of nodes with low power such as macrocells, picocells, femtocells base stations (BSs) and these cells are combined in only one architecture called heterogeneous networks (HetNet). In that way, area spectral efficiency enhanced due to reduced distance in between transmitter and receiver. In heterogeneous network (HetNet) deployment provides coverage in such manner to cover the dead that time think out the transmitter not cause interference to users or user equipment's (UEs) by transmitting high power signals. By providing large number of channel per cell can improve the networking capacity.This means that adding number of channel per cells reduces the actual area of cells and thus increases the channel reuse. Drawback of outdoor cells who serving for indoor users such as: Indoor users require high power from an outdoor base station but base station fails to serve to the indoor users, Lower channel conditions of outdoor network cause the lower data rates for indoor users and the less number of outdoor BS in the densely populated area which raises the dead zones. To solve above all problems the indoor solution is Distributed Antenna System (DAS) and picocells. But these both solutions are not cost effective for some indoor users. A recent indoor solution is a femtocell, it can be easily deployed by users without any operator. Femtocells, also for indoor small coverage areas such as home base station and it is known as Femtocell Base Station (FBS) and it is connected the mobile user to network operator via wired and wireless technologies. Indoor base station consist of two different tiers or sometimes is called layers. The first tier is macrocell tier and femtocell tier, this architecture is known as two-tier architecture. The unplanned and random deployment of femtocells are in the femtocell tier. This has the advantage of capacity and coverage. The femtocell uses the same frequency band as of macrocells for better capacity. Because of this situation, the interference problem arises.

II. Interference Management In Femtocell

In this section, the different two types of interference faced by two-tier network are explained and detail about uplink interference and downlink interference problem are also explained. The femtocells are deployed in mainly CDMA and OFDMA technologies, so also briefly explained the problem faced by these two technologies.Femtocell has the challenge in the case of dense deployment tracking the neighbors and handover the user is not possible. Femtocells deployed in ad-hoc manner. So it is diffficult to manage the neighboring femtocells. Self-Configuration: Femtocell deployed by users and any time they get on and off hence the deployment of the femtocell is completely random and unplanned. Self-Configuration: Femtocell can configure itself whenever situation needed to add and remove user or location of femtocells get changed. The deployment of an indoor base station has two layers or tiers, conventional macrocell network is one of network and the second network is femtocell network. The femtocells are deployed in the Macrocell network in co-channel manner, suing the same frequency band. In this network, the interference problem is faced by both uplink and downlink.

A. Types of Interference

1) Co-tier Interference

Co-tier interference caused by the network element that belongs to the same tier or layer. To establish

Fig.1 Uplink Transmission

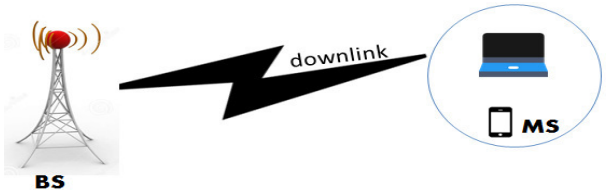

Fig.2 Downlink Transmission

communication link it would depend on the SINR, if SINR is higher than the threshold value then there is a communication gap and this gap is called Dead zone. Close access mode has major issue of co-tier interference as compare to open access mode. Femtocell user equipment(FUE) is the main cause of co-tier interference. In CDMA, the neighboring FUE is transmitting more power it will causes interference to the respective femtocell performance. In this situation, FBS states the power limits on FUE. In OFDMA, FBS sense the surrounding environment for sub channels depending on the quality of service(QOS) the FUE require a number of sub-channels. Then FAP allocates sub channels that address the lower level of interference. The downlink interference is caused by Femtocell Access Point (FAP), it causes the interference to the neighboring FUE. Due to close access of femtocells, the power exudes through doors, balconies, windows. From this, the exude power causes the interference to the neighboring FUE. In CDMA, the downlink interference creates dead zones. 3G system uses adaptive power control techniques at FAP to avoid above kind of interference. In OFDMA, if the allocation of sub-channels is different for each and every user in femtocell then the interference would be avoided.

2) ii. Cross-tier Interference

The element which belongs to different tier or layer which causes the cross-tier interference. For example, In downlink FBS will cause interference to neighboring MUE and in uplink interference the MUE will cause interference to its neighboring FBS. Macrocell indoor users interfered by the neighboring femtocells. Normally the femtocells are isolated, due to wall pentration, but sometimes the MUE creates sufficient interference to the femtocells. When the FUE act as a source of interference to MBS then the uplink cross-tier interference occur[5]. In CDMA, power control used to control the FUE from generating interference to the MBS. When MUE transmits high power to the nearer femtocells this creates interference to the FBS[5]. In the next case, FBS sense environment and do not ask for high power. Sometimes for MUE, closed access mode area of femtocells are dead zones.

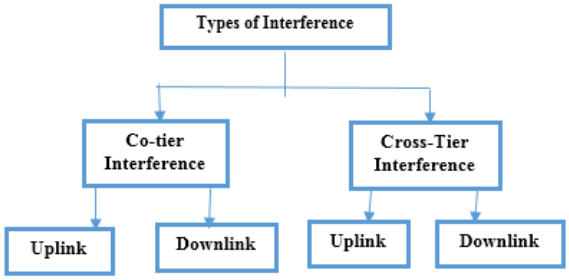

Fig.3 Types of interference

In CDMA, adaptive power control is needed because every time the changing environment is there. When FUE is close to a window having indoor station FAP, automatically FUE connects to MBS instead of FAP. In OFDMA, if MUE uses the different sub-channles then FBS do not cause downlink interference to MUE.

B. Interference Management Techniques

The technologies use many techniques to handle the co-tier and cross-tier interference. Many schemes have been proposed by the researcher and also research is still going on. Some main technique would be summarized in this section. Nature Inspired Algorithms introduced the different classes of methods: those that develop problem-solving techniques from nature and those whose employ natural materials to determine solutions. Nature inspired algorithm has developed to solve the optimization problems. Following are two concepts in nature inspired computation: The Evolutionary Algorithm (EA) and the Swarm Intelligence Algorithm (SIA).

1) Evolutionary Algorithm (EA):

EA are optimization techniques and subset of evolutionary computations based on Darwin's principle. This principle says that in nature the fittest individual has the greater chance to survive. Following are the disciplines of EA: Genetic programming, Genetic algorithm, Evolution strategies, Evolutionary programming, and Differential evolution. All the algorithm has been developing to share the same characteristics such as selection operators, variation operators while solving the optimization problemGenetic Algorithm (GA) is used to reduce the coverage hole problems and balance user's power distribution. Genetic Algorithm(GA) has been mainly used in the macrocell-femtocell networks and also to increase coverage and reduce femtocell-femtocell interference. The work in [16] showed that the GA performed better at satisfying QOS in OFDMA system. GA proved to be a good candidate to solve resource allocation problem and advantage of a faster optimization process.

2) Swarm Intelligence Algorithm(SIA):

Swarm Intelligence Algorithm (SIA) introduced by Being in 1989. SIA is a collection behavior of self-organizes and decentralized system. Swarm intelligence applied on

Table.1 : Comparison of Di erent Interference Management Technique

Technique	Transmission Mode	Access Mode	Complexity	Efficiency	Types of Interferenc e
Power Control	Downlink	Closed	Medium	High	Cross-tier
Spectrum splitting	Downlink	Closed	Medium	High	Cross-tierCo-tier
Fractional Frequency Reuse	Downlink	Open and Close	Medium	High	Cross-tier
Cognitive Radio	Downlink	Open and Closed	Medium	Medium	Cross-tier
Parallel Interference Cancellation	Uplink/ Downlink	Open and Closed	Medium	High	Cross-tier
Successive Interference Cancellation	Uplink/ Downlink	Open and Closed	More	Medium	Cross-tier
Multiuser Successive Interference Cancellation	Uplink	Open and Closed	Medium	High	Cross-tier
Multiuser Detection	Uplink	Closed	More	Low	Cross-tier
Particle Swarm Optimization	Downlink	Closed	Medium	Medium	Co-tier/Cross-tier
Cuckoo Search	Downlink	Closed	More	High	Cross-tier
Bat Algorithm	Uplink/ Downlink	Closed	Medium	High	Co-tier/Cross tier

combinatorial and continuous optimization problems. Following is the classes of SIA: Particle Swarm Optimization, Cuckoo search, artificial bee colony, Firefly algorithm, Ant colony optimization, Bat Algorithm.

I. Particle Swarm Optimization(PSO) based on social behavior of birds and it's a stochastic optimization method. PSO based on population-based search approach and depending on information sharing through population members. The search process is done using the probabilistic rules and combination of deterministic. Velocity and positon are the two vectors of the particle of each round that are uses in PSO algorithm.These vectors are updated on the basis of memory gained by the particle. In this method, the results quality depends on the value of scaling parameter.PSO algorithm determine the best serving Base stations(BSs) for users and records their location. So these maximize the network throughput [13].

II. Chaotic Bat Swarm Optimization (CBSO) is used for solving the different global optimization problem. CBSO algorithm includes into Bat Swarm Optimization (BSO) to minimize the premature coverage problem with the help of ergodicity and non-repetitious nature of chaotic functions of bat minimize the premature convergence problem. It is applied to high dimension problem and decreasing loudness in the signal.

III. Cuckoo Search is based on social rivet out the attention of their belligerent reproduction technique. Cuckoo Search Algorithm (CSA) based on stochastic global search metaheuristic methods. CSA is used for interference mitigation for the full frequency reuse. Base Station(BS) utilizes valid bandwidth which means full frequency reuse to connect without any interference from neighboring BS. Finding and allocating the proper bandwidth for all users the CSA is an efficient algorithm. The algorithm is canceled if given threshold value is less than the calculated interference on each subcarrier.

IV. Ant Colony Optimization(ACO) is based on the behavior of ants. This Algorithm uses for the throughtput system optimization which shows maximum and minimum throughput of the femtocell. Using this ACO we can discover the total rate of maximization but from the MUE interference not be considered[26].

V. Bat Algorithm(BA) uses for the resource allocation scheme on closed access mode in femtocell network. This algorithm focuses on mitigating the co-tier and cross-tier interference in macrocell-femtocell network by selecting the best resource blocks for FUE[17]. There are two important components of bat that affect the search characteristic of the algorithm: First is the diversification also called as exploration and other characteristic is intensification also called as exploitation. Diversification is to find solutions by

exploring various different unknown spaces. This increses the convergence speed of algorithm.

III. Future Direction For Research

The heterogeneous network has resource allocation techniques which can be divided into: Splitting Frequency and Sharing Frequency. Sharing Frequency has subcarriers which shared among different layers that can maximize the resources. Splitting frequency is the resource is split to each layer. This frequency is widly used in the macrocell-femtocell network.Bat algorithm has the echolocation characteristics. They automatically adjust the wavelength of their transmitted pulses and adjust the rate of pulse transmission depending on the proximity of the target. The BA obtained the better result from when they dealing with lower dimensional optimization problem. BA coverage covered very quickly at an early stage and then the rate of convergence will go-slows down. The BA also find the better solution when there is a large number of population within a limited range. On the other hand, Differential Evolution solves the optimization problem over the continuous domain. DE gives the effective solution to problems without any expert knowledge or complex design. DE always order to keep track of the progress during the optimization process. Giving the direction and distance information from the population member to generate a result in adaptive technique with the better convergence properties. The DE has advantages of speed, robustness, and simple structure. DE always starts with the best solution and the continuous convergence is achieved in the higher dimensional optimization problem. DE gives better result when there is less number of population with no coverage limitation.

To improve BA characteristics for the higher dimensional problem, the standard bat algorithm is hybridized with differential evolution algorithm, in [23]. Hybrid Bat Algorithm(HBA) slightly improve the performance of standard bat algorithm, which can be used for mitigate the interference in femtocell and improve the area spectral efficiency.

VIII. Conclusion

This survey paper gives basic overview of femtocell starts from history and background. It gives a motivation for research areas of femtocell which can be explored. It states the requirement, need and research efforts of the researcher in this area till date. This survey provides different Nature inspired algorithm to manage the co-tier and cross-tier interference in femtocell networks. The future research direction of femtocells has theoretically explained for researcher to improving spectral efficiency. The area spectral efficiency can be increased that is advantageous to both operators and subscribers.

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An approach for smart parking system based on cloud using IoT

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***Abstract*— in the most of the modern cities it is difficult and expensive to create more parking spaces for vehicles since the numbers of vehicles are running on the road are increasing day by day and the count of the free spaces in the cities are the same. This problem leads to congestion for parking seekers and drivers. To develop an IoT framework that targets Parking Management which is biggest challenges in modern cities. Using embedded systems, there is a chance to develop an application which can solve these problems. The proposed smart parking solution gives an on-site deployment in which, IoT application monitors and indicate the availability of each parking space. This system helps in improvising the management of parking system by following rules of the government, for example handling different parking spaces in the city. The intuition of presenting this paper is to reduce smart city issue such as the traffic on road and reduces the pollution in the city and the parking.**

Keywords*— *Cloud; Internet of Things; MQTT; Raspberry pi; Parking

I. Introduction

Currently, the IoT applications in our daily life are blooming, and there is also a growing trend in the applications of smart cities which can help in improving to reduce smart cities issues. In Smart City we faces many difficulties while developing, to solve smart city issues we have to develop such system which is combination of the new technology also of low cost and based on the different network combination of the Internet, such as a telecommunications, broadcast, wireless and sensor networks where Internet of Things (IoT) is base technology. One of the major issues in a smart city is the Parking. A parking lot should provide customers enough spaces to park their car since car plays a huge role in transportation, there is need of finding out parking area to park the vehicles. By creating a new system, it can help manage and reducing the road traffic. A new system helps customers to save time in finding a parking spot. The Internet of Things is about installing different sensors like ultrasonic sensors; active and passive RFID, IR, etc. connect to the internet through different protocols for exchanging information and to communicate, in order to achieve monitoring, management. Using IoT, Smart City can be established by integrating these features for IoT development. The Internet of Things (IoT) uses devices which are connected to each other and systems to collect the data by using embedding sensors, actuators and other physical objects. Rest this paper is organized as follows. Section II shows related work on smart parking system. Section III contains the proposed smart parking system and Section IV contains conclusion followed by references.

II. RELATED WORK

There are a number of applications that give information about free parking slot to users. All the currently running application gives an interface through a mobile phone, and desktops applications. They mainly focus on finding the cheapest and nearest parking lot through Google maps and they do not provide information about spot availability (Gupte & Younis, 2015; Rico, Sancho, Cendón, & Camus, 2013) There are different models for parking management developed per year, mostly they consist of RFID-based, and wireless sensor based methods. These methods track the free space. The RFID tags are put on vehicles to take down the in-out time of the vehicle based on that cost for parking is decided. However, a disadvantage of such RFID method is it is a bit expensive to keeping track of RFID tags, and in cases of wireless sensors, various sensors are used are like weight, motion which is difficult to maintain (Gupte & Younis, 2015). The cloud system used to store the data from each sensor on a daily basis, thus cloud provides unlimited storage capacity, which is low in cost and it has on-demand storage capacity (Khanna, 2016). In a traditional way we have to install wired infrastructure for vehicle detection, but now a day's using wireless sensor network through Zigbee networks we can install an infrastructure. Zigbee network wirelessly communicates with a central server that has all information about the sensor's data (Grodi & Rios-gutierrez, 2016). In this paper, they implement a parking guidance system using RTOS and PIC32 controller. In that one microcontroller controls the three sensors at a time (Yosafat, 2014) they have used Free RTOS and RS485 communication protocol for transmitting and receiving data. Raspberry pi board contains System on a Chip (SoC) it means it is a method of grouping all the useful electronics to run on the individual chip and it also uses processor Broadcom BCM2837 for various interfaces. Raspberry pi is flexible; it can use for general purpose computing. (Vujović & Maksimović, 2014). In this paper, they have created parking system based on the wireless communication network which efficiently manages time to find out parking space in less time [7]. In this paper, they have created zone area to control over each parking lane and all zones are connected

through central control unit [9] this paper they have proposed parking system using magnetic sensors[10]

III. PROPOSED SYSTEM

The proposed system consists of three main phases:
A. On-Field Network
B. Cloud Platform
C. User side Platform

A. On-Field Network

As shown in figure 1, On-Field Network section there will be one ultrasonic sensor for individual parking slot is allotted, which will be ultimately collect the data from each parking slot. Following are the devices we are going to used on field network.

Ultrasonic sensor:

A basic ultrasonic sensor consists of a transmitter, a receiver, and a control circuit. The transmitter emits a high-frequency ultrasonic sound, which bounces off any nearest solid objects. The ultrasonic sound has detected the obstacle which is within the range and reflects the signal to the sensor. That reflected signal is then processed by the control circuit to calculate the time interval between the signal transmitted and received. Ultrasonic sensors are designed to sense range using ultrasound reflection, like the radar system, which calculates the time interval between the sensor and a solid object by passing ultrasonic waves. Ultrasonic sound is mainly used since it is inaudible to the human ear and it gives almost accurate results within short distances.

ESP8266 Chip:

An ESP8266 chip is the Wi-Fi chip, which is low in cost. It is a small module which allows microcontrollers to connect to the WiFi network.

Raspberry Pi:

Raspberry pi 3 model B is a single board computer which is of credit card sized. the system on chip It has several versions model A, A+, B, B+, zero. Raspberry pi board contains System on a Chip (SoC) it means it is a method of grouping all the useful electronics to run on the individual chip and it also uses processor Broadcom BCM2837 for various interfaces, a program memory (RAM) is of 1GB. Raspberry pi used as a computer requires a keyboard for entering commands, display as well as the power supply of 2.5A. The Raspberry pi 3 model b is most efficient board.

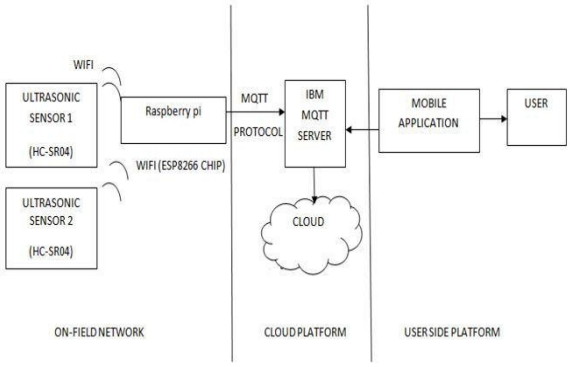

Figure 1: Proposed Smart Parking System

B. Cloud Platform

MQTT MQ Telemetry Transport:

MQTT described as Machine to Machine (M2M)/ IoT connectivity protocol. This protocol is light weighted; the protocol can be supported by smallest measuring and monitoring device. MQTT is publish-subscribe messaging transport protocol that helps to connect physical devices to the servers. There are many challenges of connecting sensors, actuators, mobile phones, tablets and desktops with established software technologies, MQTT designed to overcome these problems. The MQTT messages are delivered asynchronously through publish-subscribe architecture. It works by exchanging a series of MQTT control packets in a defined way. The control packet sent over the network has a specific purpose and every bit in the packet is carefully crafted to reduce the data transmission an MQTT topology has an MQTT server and an MQTT client. MQTT client and server are communicating through different control packets. MQTT control packet headers are kept as small as possible. An individual MQTT control packet divides into three parts, a fixed header, a variable header, and the payload. Fixed header for each MQTT control packet is 2 bytes. Some of the control packets have variable headers and payload. A variable header contains packet identifier when it is used by the control packet. The packets can be attached payload up to 256MB.

C. User Side Platform

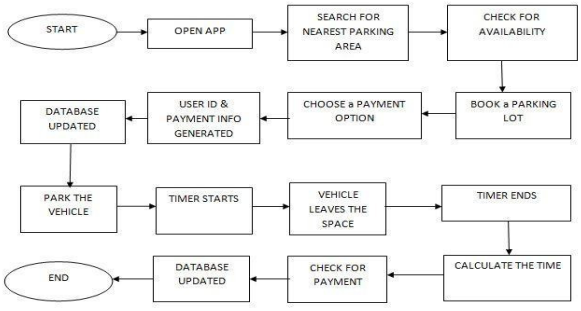

Figure 2: Data flow diagram of User Side Platform

As shown in figure 2, in User Side Platform section, the user will open the app, he will search for the nearest parking area, it checks for availability of free parking lot.

If the parking lot is empty, the user will book the lot. After that he chooses for payment option then user id and payment information will be generated. The information about user and payment is updated in the database. The user will park the vehicle, and the timer will start when the user leaves the space timer will be stopped. The time is calculated, if the time exceeds than allotted time then the user have to pay once again and the database is updated that slot is free for parking.

IV. Conclusion

In the smart cities, mainly people face problems like parking issue, traffic congestion, this paper analyses different smart parking system available in literature and also proposes a solution based on the cloud. Using internet of things in a smart parking system it helps in reduction in consumption of fuel, it reduces traffic congestion in cities and cloud used for storing the information which is collected from the sensors.

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Four Dimensional Security and Vulnerability Matrix for Cloud (4-SVM)

On the arena of Cloud ERP

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***Abstract*—Cloud computing is a catchphrase for today's ICT world. The emerging trend of "Everything as a service" has made this rapid growing technology a very admired and highly demanding technology for a must adapted one. With the virtues of 24x7 service availability, multi tenancy, utility, speed, high productivity, agility, scalability of this technology, it has been proved as an emerging trend for the ICT industry as well as the academia. Today the rapid data analytics is changing the way companies try to win, and hence enabling them to generate instantaneous insights for supporting their most important business processes.**

In present technological era, cloud combining with IOT or Big Data, or highly popular commercial ERP solutions, namely SAP cloud, has touched the height of technological growth but one of the major reasons for the trepidation of its widespread adaptability is the security and authentication breach in cloud technology. Being used in highly commercial solutions, the security issues play a major role.

Threat or vulnerability is more important to qualify rather than being quantified only. This paper is a proposal showing a quantifiable approach, focuses on several threats and security breaches and countermeasures their impact concentrating on a cloud based solutions, with the philosophy of the inevitability of testing on cloud security.

***Index Terms*—Alpha Reliability, Cloud ERP, Distributed DOS, ICC, ROTA, SLA.**

I. Introduction

As per the NIST draft, Cloud computing is a unique model for enabling ubiquitous, suitable, on-demand network access to a common pool of configurable resources for computing (such as networks, printers, servers, storage devices , applications, and other services), that can be hastily provisioned and can be released with nominal management effort or communication with the service providers [9].

There are mainly three basic cloud service types – Public cloud, private cloud and Hybrid cloud and several deployment models for cloud namely mobile cloud, community cloud etc.

This highly emerging technology has so many dimension that industry as well as the academia personnel can never vacillate to approve this technology. But the main concern about cloud service is when users reposition their services from their own IT infrastructure and the services are being prohibited by a third party cloud vendor, the vendor should be a dependable and trustworthy one. There is no such checkpoint in that area which can individually determine the efficiency and productivity of the cloud service that the company want to adopt.

This paper focuses on some significant threats and vulnerabilities of cloud with an analytical approach.

II. Recent Attacks On Cloud

Several attacks in cloud is the most noteworthy matter of concern today, which are coming using some attack vectors, which is known as a route or path using which the invader can be able to make a malicious entry into the system. They take advantage of some known weak spots for entering into the system [5-6].

According to a report from Cloud Security Alliances, the top thirteen threats for cloud in 2016 are as following [5]:

1. Data Breaches
2. Weak Identity, Credential
3. Access Management
4. Account Hijacking
5.System and Application Vulnerabilities
6. Insecure APIs
7. Data Loss
8. Advanced Persistent Threats (APT)
9. Nefarious Insiders
10. Insufficient Due meticulousness
11. Denial of Services
12. Abuse and Nefarious Use of Cloud Services
13. Shared Technology Issues

Many intruders are willing to take benefit of the human elements in the system, because they are generally the weakest link. Emails and their attachments via emails can cause the deception. Even though some intruder doesn't make an attack directly, lack of knowledge and credulity , due to which the system is being attacked by multiple nefarious people.

i) Denial of Service (DoS) attacks: This popular attack is a widespread network level attack launched by a harmful intruder in which the hackers intentionally flood a network server with recurrent request of services with an idea to injure the network; make the server so much busy that it

could not legitimate clients' normal requests of the services and become unavailable. In cloud computing, the attacks on the server happen by sending a huge number of requests to the server, and hence the server becomes unable to respond to the standard clients. The server will be disrupted from working normally. In Figure 1, a picture for the Denial of service attack has been illustrated; using a zombie network the attacker spreads attacks to the further level.

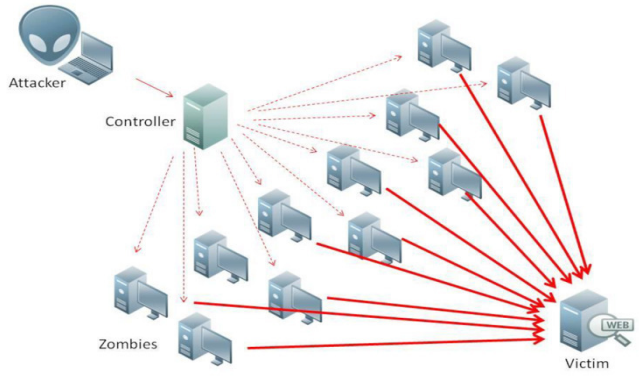

Figure 1: Denial of Service Attack

ii) Cloud Malware Injection Attack – This attack happens when a client opens an account under a cloud vendor, the cloud service provider generates an image of the customer's Virtual System in the cloud image repository system. In case of this attack, the invader takes several challenging attempts. Actually the attacker inserts malevolent service or code, which appears as one of the applicable instance services running in the cloud. If the attacker will be successful, then the cloud service will suffer from the problem of eavesdropping [12-14]. The key idea of this attack is that an invader uploads a manipulated copy of victim's service by injecting their own malicious codes and this attack is a major ambassador to exploit the service-to-cloud environment [12-15].

iii) Distributed Denial of Service Attack (DDOS Attack) -This is an extended DoS attack in distributed platform where several systems are compromised and used to build the zombie network, they are generally contaminated with a Trojan Horse and used to target a single system declaring a Denial in the Services. Victims of a Distributed DoS attack may face attack from both end compromised network behaving as a zombie as well as from the master attacker.[14]. The eavesdropper act as a master component, he launches rigorous attacks on the victim, via a compromised distributed network which is again separated into different compromised layers of network .

iv) Side Channel Attack – This happens within a piece of hardware having numerous virtual resources , which in turn are shared and they can act as a side channel data from one virtual system to another. Those attacks are based on the shared resource victimized by the attackers.

v) Cross Site Scripting Attacks –This is also known as XSS attack, which may be treated as a security breach, where the eavesdropper inserts malevolent codes into a link

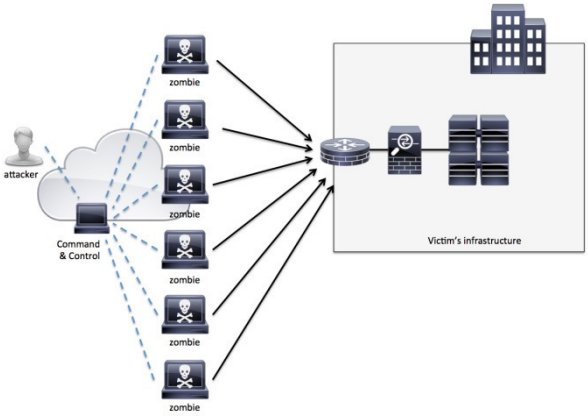

Figure 2:Distributed Denial of Service Attack

which appears to be from a dependable and trustworthy source. After clicking on the link by the victim, the entrenched programming will be submitted as a part of the client's request and the whole thing will be executed on the user's computer, This kind of attack allows the attackers to take information without the awareness of the user. So, as an alternative, it will be directed to the harmful site instead of going to the original site. This attack has a major impact on cloud services. [14-15].

vi) v) Insecure API-Now days**,** Attackers have begun to aggressively target the digital keys which are being used to secure the internet infrastructure. The unidentified attackers can steal important information on RSA's SecureID token, making the API unreliable.

III. Related Background Study

There are many significant contributions in this area. For a few years scientists are working on this emerging field. Dr G. N. Purohit and et al, in their study, entitled as "Challenges Involved in Implementation of ERP on demand solution : Cloud Computing ", has highlighted the special issues related to Cloud ERP solutions as this is the highly commercialized one and important on account of Business perspective[8]. In another study, "Competition and Challenge on Adopting Cloud ERP", the authors Fumei Weng and Ming-Chien Hung has clearly stated how beneficial cloud is for ERP system and why the professional services like ERP needs Cloud is willing to adapt the ERP service[9]. The ontology of cloud computing has been defined very ornately in their study. The particular structure of security risk has been made prominent and there are many methods for avoidance of those attacks upon cloud. The target can use diverse methods to intercept data sent by a malicious user. In an another survey paper entitled as, "Study of Cloud based ERP service for small and medium enterprises", author Rajeev Sharma and Bright Keshwani have confirmed significance of the several security issues faced by Cloud ERP, specially for small and medium scale industry[10][14-15]. The security guidelines for Cloud ERP

service, provided by SAP, have been clearly formed out. The General Terms and Conditions (GTC) for SAP Hana cloud shows a clear discrimination with other SAP models which are not using cloud. The distributive nature of the system has made it more attack-prone[19].What are the major terms for handling SAP and the main responsibilities has been pointed out in that article, which in turn works as a support for the proposal to establish a relation.

IV. Proposed Work : 4-Svm Matrix For Cloud

Today cloud security is being treated as an elementary issue for adaptability of different cloud service , from both end, from the viewpoint of providers as well as the users. In this paper, an innovative concept of four Dimensional Security and Vulnerability Matrix (4-SVM) has been proposed keeping several network aspects in mind, where the authors have proposed a neutralize quantization of quality of cloud services, with respect to four aspects- availability, reliability , Integrity and confidentiality- a multidimensional and mathematical matrix model have been formalized for computational easiness and strictly based on some cloud security measuring points as parameters of the matrices. Most important objective of the proposal is primarily identifying different types of possible attacks including traditional as well as specialized attacks, then it will measure the impact of different types of attacks with suitable and reasonable metrics with some mathematical formulas and questionaries.

Cloud combined with ERP tends to a less secure one causing some extra headache for the developers and service providers. The proposed model can measure the impacts of those attacks, for a special case, Cloud ERP system has been considered. The strategic goal of this system is to convert weakness into strength by measuring the impact of various threats on cloud and quantifying the quality of Services[6-9][14-16]. The proposed four matrices are as follows :

1. Confidentiality Matrix(CM)
2. Integrity Matrix(IM)
3. Availability Matrix(AM)
4. Reliability Matrix (RM)

Loss of Confidentiality in cloud may straightly be related with the Asset in term of both tangible as well as intangible.

In financial accounting, **assets** are known as mainly the economic resources, which may be tangible or intangible, competent enough of being owned or prohibited to construct value and held to have positive economic value. In case of cloud ,especially when people consider the SAP Cloud which is a highly commercialized service , the asset loss can be measured by Return on Total Asset (ROTA), TA index measurable in terms of finance management, the formula of which is quite common for the commercial persons.[1].

Here, TA means Tangible Asset.

Lost TA Index=ROTA of Company / Loss of TA of company due to attacks against confidentiality

Confidentiality Matrix=

$$\begin{pmatrix} \text{Lost TA Index} & \text{Strength of Identity Provisioning} \\ \text{NROSI Index} & \text{Strength of Communication Security} \end{pmatrix} = \begin{pmatrix} wf1 & wf2 \\ wf3 & wf4 \end{pmatrix}$$

Figure 3: Confidentiality Matrix

Where, ROTA is Return on Total Tangible Asset. It is a ratio to measure a company's earnings before interest and taxes (EBIT) against its total net assets.

To measure this ROTA we have to do the following,

ROTA=EBIT/Total Net Asset, where EBIT=Net Income+ Interest Expense +Taxes

After measuring the value using those parameters, we can apply fuzzy logic to determine the probability of the ranges of value, which will be known as a weight factor. This weight factor can be a significant value for the scalability with response to asset loss due to some threats. Suppose, for a cloud ERP, you have imposed a security investment , then you can expect which return and how much return should be exempted due to certain vulnerabilities in the system, this can be measured by Non ROSI[21].

Security investment risk can be measured as :

Non-ROSI (NROSI) Index=1/ROSI

Non-ROSI (NROSI) Index=1/ROSI

$$\text{Where, Return on security investment (ROSI)} = \frac{\text{Risk}}{\text{Exposure x \%of risk mitigated – solution cost}}$$

Figure 4: Non-ROSI Determination

Strength of Identity Provisioning checks how system generates Identities while accessing data. The strength of the password is measured, whether It is an encrypted password or graphically encrypted password or single one[5].

While measuring the **Strength of the communication Security**, the system mainly has to measure the strength of the Encryption Key used. The strength of encryption algorithm will develop this factor. Complexity of the encryption algo that has been used to encrypt could be measured and again this can be put in a range.

Though the work is still in the proposal stage and not being populated with sample analysis , but the process is ongoing.

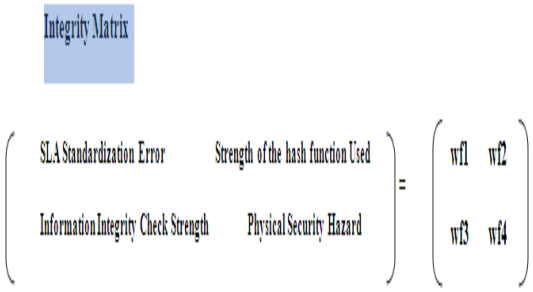

Figure 5: Integrity Matrix

SLA Standardization Error: The Service Level Agreements for cloud are very important. Therefore, it is a parameter, which can measure errors with respect to rate the Service Level Agreements(SLA). A cloud system should retort the agreements in time, unless it will be a vulnerable one. This parameter will measure the service level agreement conditions in terms of their acceptability or avoidance or deviation and again using fuzzy set it the model can be able to determine the impact factor for this standardization error [12].

Strength of Hash Function Used- This parameter could be able to take count on violation in the encryption algorithm has been used by the service providers and check the strengths for the hash functions used, whether it is MD5,SHA1 or SHA3. It will check the bit length and with known formula can be able to determine the type of hash function and hence it's strength. In case of SAP Hana Cloud generic hash functions with minimum 512 bits key length are being used nowadays. So this parameter will take the bit length as input and determine the effectiveness of the hash function, which is an important part in security.

Physical Security Hazard This parameter shows the difficulty faced by the placement of a physical server. It will take some questionnaires like in which location the server may be present probably, how many layers of security has been imposed to protect the server etc. and on the basis of those data it can determine the hazard a SAP Cloud user may have to face due to lack of physical security of a server.

The Availability Matrix is nothing but calculation of the availability of a service which has been measured by a very popular and well known method as follows :[Source- Rajib Mall, Software Engineering, 6th Edition]. The uptime and downtime may be taken as inputs.

$$\text{Availability} = \frac{MTTF}{MTTF+MTTR}$$

Where, MTTF=Mean time to failure and MTTR=Mean time to recovery

In case of ERP combined with Cloud, the availability is a very significant point. The clients have to give there input as uptime and downtime on a scheduled basis and hence this parameter will be able to count on a measure for service availability. Again applying the probability, we can determine the availability.

Reliability is the degree to which an assessment tool produces stable and consistent results. Poor reliability reduces the accuracy of a single measurement and it also decreases your ability to make a roadway for measurements.

The Reliability Matrix can be determined as:

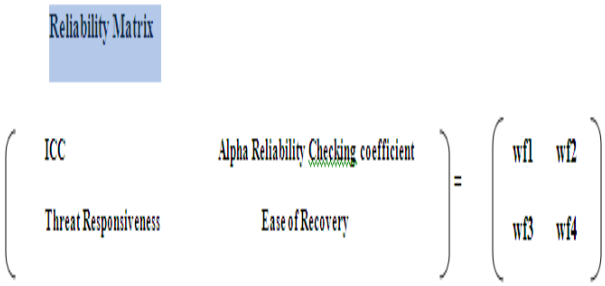

Figure 6: ReliabilityMatri

ICC (Intra class correlation coefficient) is a measure of the reliability of measurements . Suppose the vendor has rated a cloud service. This parameter will crosscheck the rating. Two or more rater will rate this and the statistical probability of their rating will be taken for granted. Different rater will rate a service. Using soft computing, their confidence for a poll and reliability range will be determined.

Alpha Reliability Checking Coefficient is a new approach which is consequent and determined by assuming each item represents an acceptability of the reliability test. If there are five items, then five scores are the retest scores for one single item. However, the reliability is calculated with mean of the After getting the datasets, using SPSS analysis the alpha reliability can be rechecked.

Threat responsiveness This parameter shows how quick a system could be intelligent enough to response to a threat. These will be listed and will be used as an input to determine how much attack prone a system could be. A Cloud ERP can be traceable in terms of its responsiveness.

Ease of recovery This proves the criticalness of the threat. This factor can be determined by calculating maximum tolerable downtime(MTD), Recovery Time objective(RTO) and work recovery Time(WRT) as follows :

$$MTD = RTO + WRT$$

Depending upon the calculation the recovery easiness can be under the following categories :

- **Mission-Critical —from 0 to 12 hours**
- **Vital — from 13 to 24 hours**
- **Important — from 1 to 3 days**

- **Minor — more than 3 days**

In this way they can rank the reliability of a service.

From the above factors we can come to a solution about the trustworthiness of the system.

V. Conclusions And Future Works

Though cloud is not a latest technology for nowadays and researches in this field has become more mature in these days, still it leaves a plenty scope for the cloud researchers in this area as the independent tools for quantitative measurement of the impact of different security aspects are not quantified still now. Threats could be determined proactively and suitable countermeasures could be also taken. Due to lack of data required to analysis, this proposal is still now at the beginning stage, but the survey has been started and questioniaries have been formed for practical projection of the proposal and further research is going on to establish relation among the parameters. The prerequisite for identification, classification and accurate measurement of the maliciousness of those threats is primarily essential for the cloud providers using appropriate parameters which can analysis the effectiveness and trustworthiness of a cloud Service, specially highly commercialize service like Cloud ERP, which is a quite new one in these fields.

A lot of research scopes is still there in the specified field and our future goal is to give more focus on the parameters of the matrices which will develop a decision making tool using which could make the system more adaptable, smart and approachable.

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Designing Graceful Degradation in Software Systems

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***Abstract*— Graceful degradation is an aspect of a fault tolerant software system, where in case of some failures, system functionality is reduced to a smaller set of services/functionalities that can be performed by the system. During the period of graceful degradation, system runs and offers only the minimal set of critical services, thus avoiding total outages. This paper discusses some design approaches which can be used in a software system to handle graceful degradation. It also proposes and discusses the design of the 'Capability Determination Model' (CDM), and how this model can be used to build and implement an IT software system with graceful degradation. This paper presents a high level design of the CDM and how different aspects of graceful degradation can be built into a software system using this model (CDM).Working of different components of CDM is also discussed. In the end, this paper talks about some of the alternatives of graceful degradation design and challenges associated with designing software systems with graceful degradation.**

Keywords- Graceful Degradation, Performance Engineering, Fault tolerannt system Design, System Dependability, Graceful Degradation Design.

I. WHAT IS GRACEFUL DEGRADATION?

With software systems becoming more and more complex and performing some of the most critical operations of an organization, one thing which hasn't changed at all is the possibility of occurrence of an event, which can prevent the system from performing all its expected functionalities. This event or exception scenario can prevent the system from performing its overall responsibilities and can cause a huge loss to the businesses, which are becoming more and more dependent on the IT systems.

To minimize the risks associated with errors scenarios/outages, multiple techniques are used to make a system fault tolerance. E.g. business may decide to have a failover/HA components or to have a complete DR site at an alternate physical location, data replication and so on. But as the system becomes more complex (more subcomponents, more external integrations and so on), having a failover for complete system can turn out to be very costly in terms of money or effort, needed to build a such failover instance.

Graceful degradation refers to an aspect of fault tolerant system design, where during the occurrence of an exceptional event, system capability is gracefully lowered in terms of the services it offer or perform(in terms of number of business use cases it support or the NFRs like throughput, response time etc.).Thus a gracefully degraded system will not be providing complete set of functionality, which it generally provides in a fully functional state.

Concept of graceful degradation design is used in a wide variety of systems and its meaning can vary from system to system. For example, one system can consider graceful degradation as offering a smaller set of UI features, depending upon the capabilities offered by the browser being used by the end user, another system can consider graceful degradation as rendering a lower resolution image, a telecom system switching from 4G to 3G or 2G services, while some systems may consider graceful degradation as offering only a limited subset of critical services while making other less critical services unavailable in case of an error event. This paper considers all such cases as design aspects of graceful degradation.

Fig. 1 summarizes the concept of graceful degradation. The chart on the left side shows a system, working with 100% capabilities in a normal scenario. The chart on the right side, shows a system, which is now offering 80% of the overall capabilities, in case of an event. The system handles this degradation gracefully, by stopping the offering of certain less critical services, so that other critical services can still continue to perform. Note that this graceful degradation can also happen in the form of degradation of performance, throughput, response time and other such aspects of the system.

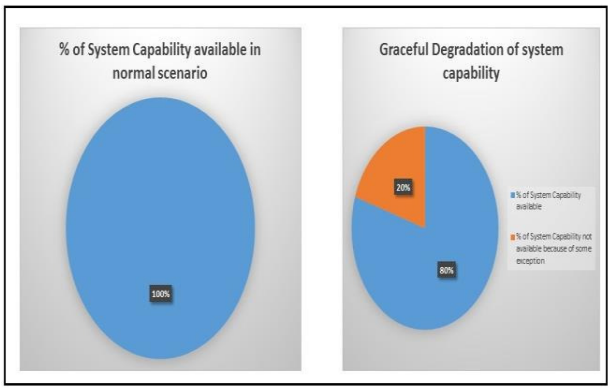

Figure 1 : Graceful Degradation

II. What issues Graceful Degradation solve

Graceful Degradation design can help solve multiple issues associated with unexpected events like an error/failure scenarios and how the system behaves and interacts with end-users in such scenarios. Some of the issues it addresses are

- Avoids high costs associated with setting up failover/HA instances of all service components, instead only most critical flows/service paths are supported
- System can still remain responsive , albeit with a lower state of services it offers
- System can communicate with end users, providing them updates on the failures and limited functionality, which still can be carried out

Note that Graceful degradation design doesn't rule out other requirements and methods to achieve a fault tolerant system, e.g. having a DR site etc., but adds on to these features. With the help of Graceful degradation design, a smaller subset of services are still continued to be offered from the main site or DR site. This paper doesn't necessarily differentiate between these aspects/instances etc., unless stated otherwise.

III. Handling Graceful Degradation

Graceful Degradation system design can vary from system to system. But at high level, common steps or patterns can be identified, which are critical for a system to degrade gracefully in case of an exception scenario. Figure 2 present a high level design approach of building graceful degradation in the system. Some of the important aspects of such systems are considered and explained how these can be used to achieve graceful degradation. High level flow to achieve graceful degradation can be summarized as follow

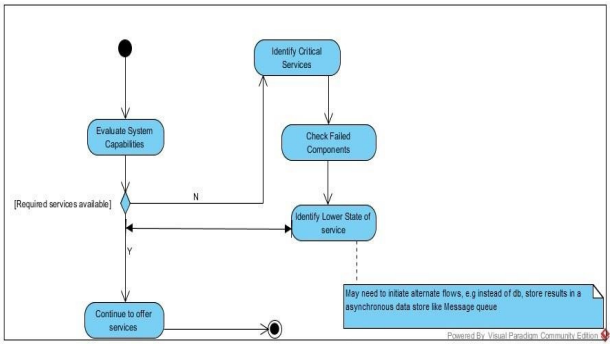

Figure 2 High Level Flow of Graceful Degradation

- System Analyzes and evaluates if all capabilities are fully functional
- If all required capabilities are available, continue to offer a full set of services to end consumers
- If all required capabilities are not available, identify the critical services, which should continue to be offered (with degraded performance/functionality)
- Check the components which have failed capabilities, e.g. it can check whether database or other subcomponent is available and working fine or not (based on predefined health check routine, response times, response codes, scheduled outages etc.)
- Once failed components are identified, evaluate and identify the set of services, which can continue to be offered with degraded set of functionality
- Note that to offer degraded set of services, some alternate/exception flows may need to be invoked for individual service/use case.
- For example, if some database service is not available, for query, data can be referenced from local cache or for writes, records/transactions can be written to some temporary message stores like message queues etc. Once database services are restored, these transaction details can be updated in the db
- Note that, a system handling graceful degradation, will also have a check to see if services are back up and running again. As more and more components start coming up, more and more services will continue to be offered to the end consumer.
- Also, note that in some scenarios, offering a subset of services can have cascading effect on the overall system. E.g. offering only one subset of functionality can have an impact on other service's functionality, which in turn can impact another set of services. This can bring down the whole system. This scenario is very common in today's business applications, where one service is integrated with multiple services to achieve a common business goal.

IV. Real life implementation of Graceful Degradation

In this section, we will see how Graceful Degradation can be built into the design of a telecom company's IT applications. Consider an imaginary telecom operator "UserComm Limited", which has a huge subscriber base of Prepaid and Postpaid customers. In this paper, we will focus on prepaid subscribers and applications related to prepaid subscribers. Figure 3 shows the high level context diagram of some of the most commonly used applications by a prepaid subscriber. For simplicity, we will not be discussing other applications, which may be there in IT eco-system of a telecom operator.

As shown in the context diagram in Figure 3, a prepaid subscriber can use the following set of applications to perform various operations:

- Use Prepaid Balance Enquiry service to check the current balance/talktime available
- Perform a top-up/recharge to get additional talktime
- Perform various operations like enrolling for new services/user profile management, setting preferred language etc. using SelfCare channel application
- And get in touch with Customer care over web/call etc. to solve certain service related issues/inquiries

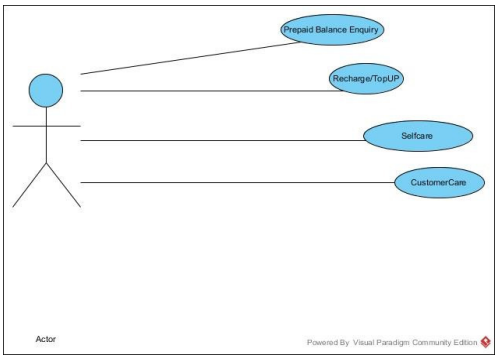

Figure 3 Context Diagram for a Prepaid Mobile IT system

Note that it may happen that in certain scenarios, it may be decided to completely stop offering one or more services, while continuing to offer other services. That is also an aspect of graceful degradation. But in this section, we will talk about how, for a particular application, small set of functionality can be offered to handle graceful degradation. The techniques presented can be used to cover the first scenario also.

The rest of this paper explains how graceful degradation aspect can be built into one of the applications shown above. This paper will talk about one of the service 'Prepaid Balance Enquiry' in detail, and also discuss how this service can be designed to handle graceful degradation in the event of exception/outages caused by various factors.

V. Working of Prepaid Balance Enquiry service

Figure 4 shows the high level working of Prepaid Balance Enquiry Service. Note that this is a simplified working of the actual service and many details are omitted to avoid complexity and to keep the focus only on the graceful degradation design aspect.

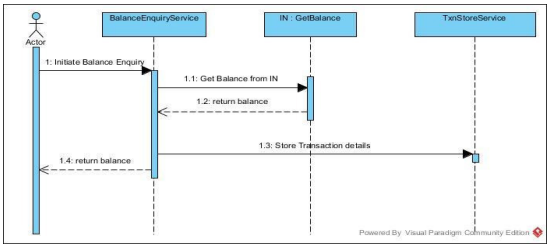

Figure 4 Sequence diagram of Prepaid Balance Enquiry service

Working of Prepaid Balance Enquiry can be summarized as:

- Prepaid subscriber sends request to get his balance
- Once request is received by the BalanceEnquiry Service, after performing necessary validations/authentication (not shows in the sequence diagram to avoid unnecessary complexity) , balance is retrieved from system knows as Intelligent Network(IN)
- IN system in a telecom environment are used for a wide variety of functions, one of which is to maintain the current balance of a prepaid subscriber (details of IN system can be found in the links given in the reference section)
- Once balance is retrieved from the IN system, the transaction details are stored in database , with the help of TxnStoreService
- Transaction details needed to be stored for various reporting, analytics and regulatory requirements.

VI. Working of Prepaid Balance Enquiry service

There are some high level issues in the above mentioned working of Prepaid Balance Enquiry service w.r.t. availability and reliability aspects.

- IN can be a single point of failure .In case IN is not available, balance cannot be retrieved
- In case of database services are not available, TxnStoreService will not be able to store the transaction details, thus there can be a challenge in meeting reporting , analytics and regulatory requirements

VII. Handling graceful degradation of Prepaid Balance Enquiry service in case of failure of IN system instances with 'Capability Determination Model' (CDM)

To handle the failures of IN system instances gracefully, a 'Capability Determination Model' (CDM) can be used. Figure 5 summarizes, how CDM can be used to handle IN system related exception scenarios.

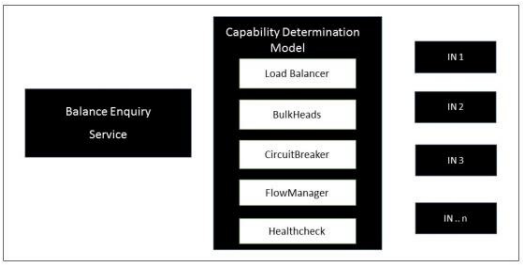

Figure 5 Model to gracefully degradation of services being offered in case of IN failure

Working of 'Capability Determination Model' (CDM), as shown in figure 5, can be explained as follows:

- To avoid IN as single point of failure, and also because IN systems are used by multiple applications in a telecom environment, sufficient redundancy is generally built for a given IN instance, by having active-active nodes working in tandem to serve requests (shown as IN1, IN2 and so on in the figure 5)
- CDM will use the services of Load Balancer to round robin the requests to the set of IN servers
- Concurrency to a particular IN server is throttled by use of Bulkheads. Bulkhead is a dedicated connection pool to individual IN server, using which max concurrent hits on a given IN server can be controlled. It can help in avoiding the overloading of any given IN server instance.
- In case an IN server instance is not available, because of some outages etc., Circuit breaker will mark that instance of the IN server as down, and will remove it from the Bulkhead and load balancer lists, so that no requests can be sent to the 'out of service' instance
- The FlowManager component of CDM will control the flows in various scenarios. For example, in case of none of the active IN instance is available, FlowManager will activate the alternate flow to handle this scenario
- Finally, there will be a Healthcheck module, which will keep on monitoring different IN server instances, and inform circuit breaker if any IN server instance is down or if any IN instance , which was not available earlier, has come up again

Figure 6 explains, how services offered are gracefully degraded for Prepaid balance enquiry service, in the scenario of one or more IN server instance going down because of expected or unexpected reasons.

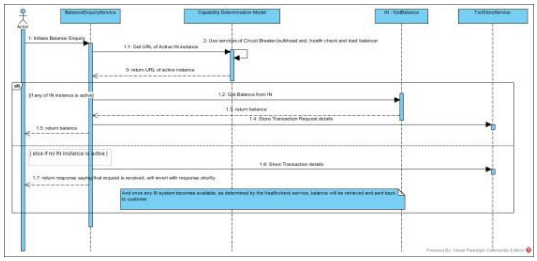

Figure 6 Sequence diagram of graceful degradation of services offered by Prepaid balance enquiry

Above sequence diagram of the flow of working of Prepaid balance enquiry service, and how it handles the exception scenario gracefully and lowers down the level of services it offers, is explained below.

- Prepaid subscriber sends request to get his balance
- Once request is received by the BalanceEnquiry Service, after performing necessary validations/authentication (not shows in the sequence diagram to avoid unnecessary complexity) , it gets the URL of active instance of the IN system from 'Capability Determination Model'(CDM)
- 'Capability Determination Model' (CDM) will use the services of circuit breakers, bulkheads modules to figure out the active IN server instance and to get hold of a connection to one of the active IN instance using Load Balancer.
- If an active instance of IN server is available, balance will be retrieved, transaction details stored in the datastore and the balance will be returned to the subscriber. This behavior is exactly like the flow in figure 4, as this is the happy path.
- The only difference is that here IN is no longer a single point of failure and a suitable redundancy is built for IN server instances, by providing a set of active-active instances
- In case none of the instance of the IN server is available, then there will not be any URL available for serving the request
- CDM will determine this with the help of circuit breakers and bulk heads, as explained in description of figure 5.
- Once it is observed that no active instance of the IN server is available to serve the request, CDM will also trigger an alternate flow,with the help of FlowManager component, which will be offering degraded services
- Now, instead of sending a balance amount as a response to the customer in real time, request details would be stored in the transactional datastore
- A response to subscriber will be sent that "his request has been received and the system will revert with the details".
- This ensures that system continues to be responsive and keeps on communicating with users, instead of dying out completely
- Once IN server instance is available, all the pending requests can be retrieved from transactional data store , processed and final response sent to the subscriber
- Thus, in the case failure of IN instances ,system was still able to accept requests, and communicate with end user, thus providing better user experience and satisfaction
- Although, the system capability was degraded from 'sharing the current balance in real time' to 'sharing the current balance after some time window (offline mode)', still system was able to perform the services.
- Similarly, in a scenario, where one out of two IN server instances was down, the system should still be able to handle 50% requests in real time and the rest of the requests in offline mode

Table 1 summarizes the scenarios of the failures of the IN server instances, how much system functionality or

capability is degraded, and how system degrades gracefully to handle the requests in offline mode.

Table 1 Summary of graceful degradation from real time to offline fulfillment of requests

Sr. No	Component Name	# of Instances Available	Mode of Services offered	Capability	Comment
1	IN Instance	3	Real Time	100%	System working with full capacity in real time
2	IN Instance	2	Real Time and offline	66 % real time, 33 % offline	33 % requests will be handled offline , after graceful degradation to offline mode
3	IN Instance	1	Real Time and offline	33 % real time, 66 % offline	66 % requests will be handled offline , after graceful degradation to offline mode
4	IN Instance	0	Offline Mode	100 % offline	100 % requests will be handled offline , after graceful degradation to offline mode

VIII. Handling Graceful Degradation of Prepaid Balance Enquiry Service in Case of Failure of Database Services with 'Capability Determination Model' (CDM)

To handle the failures of database services gracefully, 'Capability Determination Model' (CDM) can be used. Figure 7 summarizes, how CDM can be used to handle

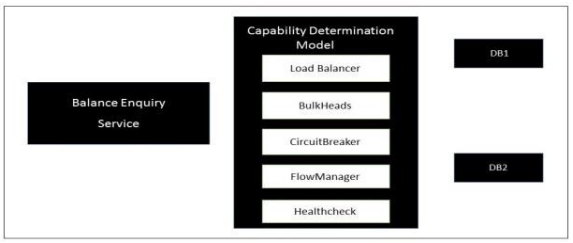

Figure 7 Model to gracefully degradation of services being offered in case of Database failure

database services related exception scenarios. Working of 'Capability Determination Model' (CDM) as shown in figure 7, can be explained as follows:

- To avoid the database as single point of failure, , sufficient redundancy is generally built for a given database instance, by having active-active nodes working in tandem to serve requests (shown as DB1 , DB2 in the figure 5)
- CDM will use the services of Load Balancer to round robin the requests to the set of DB servers
- Concurrency to a particular Database server is throttled by use of Bulkheads. Bulkhead is a dedicated connection pool to individual database server, using which max concurrent hits on a given database server can be controlled. It can help in avoiding the overloading of any given database server instance.
- In case a database server instance is not available, because of some outages etc., Circuit breaker will mark that instance of the database server as down, and will remove it from the Bulkhead and load balancer lists, so that no requests can be sent to the 'out of service' instance
- The FlowManager component of CDM will control the flows in various scenarios. For example, in case of none of the active database instance is available, FlowManager will activate the alternate flow to handle this scenario
- Finally, there will be a Healthcheck module, which will keep on monitoring different database server instances, and inform circuit breaker if any database server instance is down or if any database instance , which was not available earlier, has come up again

Figure 8 explains, how services offered are gracefully degraded for Prepaid balance enquiry service, in the scenario of one or more database server instances going down because of expected or unexpected reasons.

Note that for simplicity, following sequence diagram only shows the database operation of storing transaction details in the database store. Other operations like getting balance from the IN servers and how graceful degradation is handled in those scenarios have been omitted from this figure, as these have already been explained in detail, in the last section.

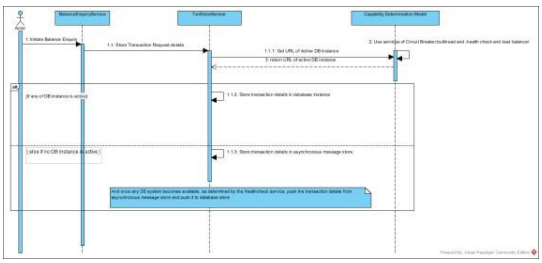

Figure 8 Graceful degradation in case of database failure

Above sequence diagram (Figure 8) of the flow of working of database operations of Prepaid balance enquiry service, and how it handles the database server exception scenario gracefully and lowers down the level of services it offers, is explained below.

- Prepaid subscriber sends request to get his balance
- Once request is received by the BalanceEnquiry Service, after performing necessary validations/authentication (not shows in the sequence diagram to avoid unnecessary complexity), further steps are explained in detail, while explaining figure 6 in the last section.
- Once steps to get the balance from the IN system, as explained in figure 6, are completed, transaction details need to be stored in database server (in case of none of the active IN server instance is available, as explained in figure 6, requests details are also stored in the database. Hence, next set of steps are also applicable to this scenario, when requests details are needed to be stored in the database)
- TxnStoreService , the service which handles the database related operations to store transaction details, get the URL of the active database instance from 'Capability Determination Model'(CDM)
- 'Capability Determination Model' (CDM) will use the services of circuit breakers, bulkheads modules to figure out the active database server instance and to get hold of a connection to one of the active database instance using Load Balancer.
- If an active instance of database server is available, transaction details stored in the datastore and the balance returned to the subscriber. This behavior is exactly like the flow in figure 4, as this is the happy path.
- Only difference is that here database is no longer a single point of failure and a suitable redundancy is built for database server instances, by providing a set of active-active instances
- In case none of the instance of the database server is available, then there will not be any URL available for serving the request
- CDM will determine this with the help of circuit breakers and bulkheads, as explained in description of figure 5.
- Once it is observed that no active instance of the database server is available to store the transaction details , CDM will also trigger an alternate flow, which will be offering degraded services
- Now, instead of storing the transaction details in the database, all requests will be stored in a asynchronous messaging system like ActiveMQ or IBM WebSphere MQ
- Similarly, read operations can happen from a cached copy of some of the database tables, or from a read only replica of the database
- This way, the system will be able to continue with its working, but reduced and degraded capabilities like analytical and reporting might now happen on this new set of data, till the time the database server becomes active again and transaction details in the messaging system are committed to the database server
- This ensures that system continues to be responsive and keeps on communicating with users, instead of dying out completely
- Once the database server instance is available, all the transaction details can be retrieved from messaging system and pushed to the transactional data store
- Although, the system capability was degraded from 'sharing the current balance in real time' to 'sharing the current balance after some time window (offline mode)', or 'not able to support analytical and reporting requirements' , in case all database instances were down, still system was able to perform the other critical services.

Table 2 summarizes the scenarios of the failures of the database server instances, how much system functionality or capability is degraded, and how system degrades gracefully to handle the requests in offline mode, or stops offering analytical and reporting requirements, in case none of the database instance is available.

Table 2 Summary of graceful degradation (real time & offline mode, reporting & analytical requirements)

Sr. No	Component Name	# of Instances Available	Mode of Services offered	Capability	Comment
1	DB Instance	2	Real Time	100%	System working with full capacity in real time
2	DB Instance	1	Real Time and offline	50 % real time, 50 % offline	50 % requests will be handled offline , after graceful degradation to offline mode
3	DB Instance	0	Offline Mode	100% offline	100 % requests will be handled offline, after graceful degradation to offline mode. Analytical and reporting services also gracefully downgraded and no longer will be available, till database server comes up again.

IX. HIGH LEVEL WORKING OF COMPONENTS OF CAPABILITY DETERMINATION MODEL (CDM)

This section discusses about the high level working of critical components of the proposed CDM. It will give very good idea and insights into the working of these components.

A. *Working of BulkHeads*

Figure 9, summarizes the high level working of bulkheads. Critical details of the working of bulkheads are also explained in this section.

- Any application, which needs to connect to a component

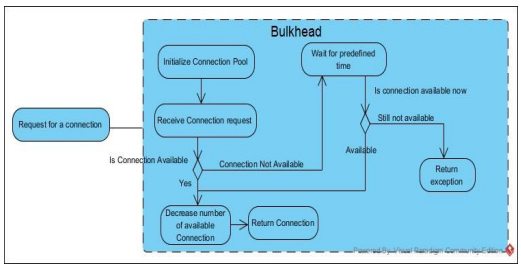

Figure 9 Working of Bulkhead component of CDM

(say database or IN server instance, as per scenario explained in this paper), will request for the connection to the component
- Connection to each of the components is controlled by individual bulkhead
- During startup, each of the bulkhead will initialize the respective connection pool
- When a request for a new connection is made, the bulkhead will check if the connection to the requested component is available to serve the request
- If the connection is available, it will allocate this connection to serve the request and decrease the number of active connections by one. This is needed to keep track of free and allocated connections
- In case, no free connection is available, bulkhead will wait for a pre-defined time interval.
- If any connection becomes available during this wait period, it will be allocated to serve the requests, else an exception can be returned , indicating no connection is available

B. *Working of CircuitBreaker*

Figure 10, summarizes the high level working of circuit breakers. Critical details of the working of circuit breakers are also explained in this section.

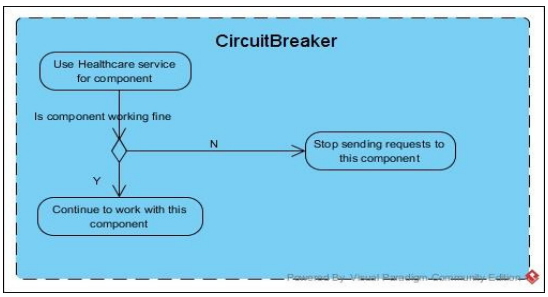

Figure 10 Working of CircuitBreaker component of CDM

- Circuit-breaker will use the service of the Healthcheck component, to see if a given component is working fine
- If Healthcheck of this component is turned out to be fine, based on policies defined in Healthcheck component, circuit breaker will continue to work with this component by sending the requests to this component, with the help of bulkheads
- In case, this component is not working fine, based on policies defined in Healthcheck component, the circuit breaker will stop sending requests to this component all together

C. *Working of Healthcheck*

Figure 11 summarizes the high level working of Healthcheck. Critical details of the working of Healthcheck is also explained in this section.

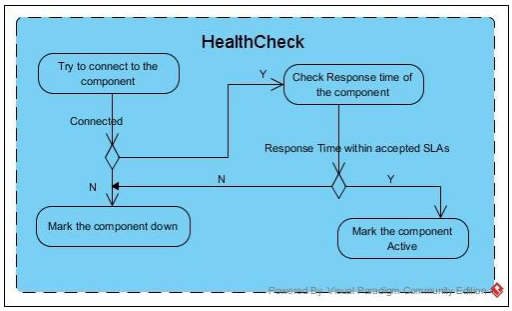

Figure 11 Working of HealthCheck component of CDM

- Healthcheck component will try to connect to each instance of the component, defined in external configurations of Healthcheck component
- In case connection is not successful, Healthcheck component will mark this instance of the component as down
- Any instance, which will be marked down by the Healthcheck component, Bulkheads will not try to connect to that instance of the component
- When all the instances of a component are marked down by the Healthcheck component, CircuitBreaker will come into action and will stop accessing the component all together
- CDM's Flow manager will kick in, and initiate an alternate flow, in the event of all instances of a component are marked down
- However, if the connection to the instance of component was successful, the Healthcheck component will also check the response time from this instance
- If response time from this instance was beyond SLAs, even in this case, instance will be marked as down
- If the response time and other policies, defined in the Healthcheck component are met, this instance will be marked as active, and will continue to be in use by Bulkheads

D. Working of Flow Manager

Figure 12 summarizes the high level working of Flow Manager. Critical details of the working of Workflow Manager is also explained in this section.

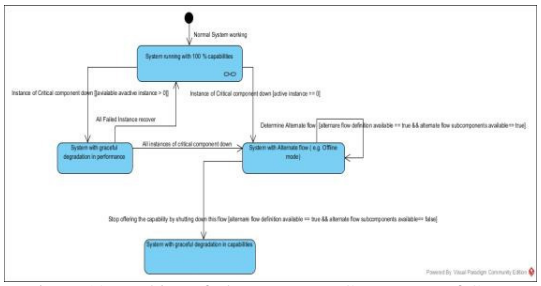

Figure 12 Working of Flow Manager Component of CDM

- Initially, the system is in a normal working state with full capabilities on offer
- During the execution cycle, one or more instances of one of the critical component go down(e.g. one of the database instance)
- If one or more active instance of the critical component is still available, the system will continue to offer the full capabilities , but the graceful degradation in performance (e.g. now instead of two instances, only one of the database instance is available and handling load)
- In case, none of the instance of the critical component is active, workflow manager, with the help of configured flow definition, will initiate the alternate flow (e.g. switching the flow from online to offline mode, by storing the transaction details in a message oriented middleware)
- Thus the system will shut down the capability, and start offering some of the gracefully degraded capabilities with the help of alternate flows.
- Note that there can be additional state transitions as well, but not shown here for simplicity. These transitions could be the system with degraded performance switching back to normal state, in case the instance which was marked down, comes up again, or after all components are available, the system starts offering the complete functionalities , by switching to fully normal working state

X. FURTHER RESEARCH AND DESIGN IMPROVEMENTS IN CAPABILITY DETERMINATION MODEL (CDM)

The proposed design and working of CDM can be improved further by doing more research around the following areas:

- One of the emerging software architecture pattern "Microservices based software system architecture" has inherent quality of "low coupling" between different components. This feature of microservices based system can allow simpler and much cleaner graceful degradation. So, microservice architecture should be explored further to identify design approaches for handling graceful degradation in microservices based software system
- Currently, CDM and all the building blocks of CDM like circuit-breakers and bulkheads are reactive in nature
- It means, these components only detect and take action for the failures and exception scenarios, which have already occurred
- CDM can be further improved by having a component called 'CorrelationManager',which will correlate all the historical failure and exception scenarios, determine the causes and outcome/impact of all such failure events
- It will also perform predictive analytics on this historical data (collected from application and server logs etc.) and determine when the next failure event is likely to occur
- Similarly, planned outage details like rollout, maintenance and upgrade schedules can be fed to this new component of CDM
- Based on the outcome of the predictive analytics on the historical failure scenario logs and planned outage details, CDM can trigger the alternate flows pro-actively, without any manual intervention
- Thus, the systems can be more pro-active in predicting and handling failure scenarios, instead of taking corrective actions, only after the failure event has already occurred

XI. ALTERNATIVES OF GRACEFUL DEGRADATION SYSTEM DESIGN

Table 3 lists down a couple of alternatives to graceful degradation system design. Both the advantages and disadvantages of each of this approach are also discussed.

Table 3 Advantages and disadvantages of alternatives of Graceful Degradation

Sr. No.	Alternative Approach	Advantages	Disadvantages
1	Not handling exception and failure scenarios gracefully (no capability degradation, no failover etc.)	➢ No extra effort required to design and implement ➢ Costs of designing and setting up	➢ One exception/ failure event can cause complete system outage ➢ Cost of outages can

		alternate flows can be avoided	be very high to business ➢ User experience can be impacted because of non-responsive system
2	Providing failover/alternate instances of all subcomponents of the system, to handle failure scenarios	➢ Provides 'always available' system ➢ Complete system functionality and capabilities will always be available, even in case of a disaster	➢ Setting up failover and alternate instances of all subcomponent can be a costly effort ➢ In today's world of integrated application environment, providing failover for all sub-components may not be feasible, as some applications may lie outside the scope of a single organization, e.g. vendor applications, COTS etc.

XII. Challenges in designing software systems with Graceful degradation

Designing and implementing software systems with graceful degradation has its own challenges. But the benefits it provides, in terms of availability and fault tolerance of critical services, it is an effort worth taking to try to mitigate the challenges of designing such systems. Some of the challenges in graceful degradation system design are listed below

- Determining the impact of an failure scenario in complex business flows can be difficult
- Failures in any part of the system, with multiple integrations, can have cascading effect on the working of overall system. Determining the services capabilities , which can still function, can be a challenging task
- Extra effort is needed to design and implement strategies for handling graceful degradation , which can have impact on the project budget, in terms of cost and schedule

XIII. Conclusion

Handling exception and failure scenarios gracefully is an aspect of IT system, which if handled well, can increase the system availability and user experience. By handling such scenarios gracefully and lowering the capabilities the system offer, in case of failure scenarios, is called graceful degradation. This paper talked about the concept of graceful degradation, and presented a high level approach of how graceful degradation can be designed into a system. This paper further elaborated how graceful degradation was designed and implemented in a real world application for a telecom operator. It talked about the "Capability Determination Model" (CDM), which can be designed and built to handle couple of such failure scenarios and gracefully degrade the system capabilities.
In the end, this paper also presented the high level approach of working of components of CDM. This approach can be used to build and design such models in other IT systems as well. Finally, this paper talked about some of the challenges, which can make designing systems with graceful degradation, difficult.

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Hurdles For Designing Flowcharting Process

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***Abstract*—To develop programming language skills, there are many tools available which have been developed to introduce the basics of programming to new-comers in the area of programming. Whatever tools are there for the programming environment of flow chart based notation depends on the interference of user with the system. The flowchart-based Environment depends on the intermediate code generated but every time human intervention is needed. The development of the environment for teaching aids can be other area where the flowcharts can be used. The main animus of the contemplate research work is to enroot a framework which not only automatically converts the process text but also to deploy it as software to create training materials. That is to automate the flowchart drawing activity based on the text inputs given by the end users hence; this research proposes a strategy that will be used to draw flowcharts without human intervention. It can also be used to represent the basics of programming problems to new users. The feature applied in the system not only automatically converts the text into flowchart but also builds up the critical thinking abilities of new software engineers. It also improves solution designing skill of new software engineers. Otherwise also the system is useful to represent the any given process text into the graphical form using the standard flowcharting symbols.**

***Index Terms*—Text to flowchart conversion, Computer Based Teaching (CBT), keyword extraction, teaching aids, Natural Language Processing (NLP).**

I. Introduction

Importance to generate the flow chart has been on the rise due to the need to solve problems which can be readily used in creating Teaching aids for the teachers. In today's busy life, most of the teachers had to create more teaching material in less time. The teachers do not have enough time to devote for the preparation of new teaching aids. Simiarly a novice programmer can be made to understand a solution easily by using a graphical representation. For his easy understanding, there are many difficult problems which can be shown using the flowcharts [1]. Basically, there are some challenges in solving and designing flowcharting, the common flowchart-based Environments highlighted on creation of flowcharts as well as feature of generating code but no one has focused on spontaneous change in the input given to system.Reserch gap is found when the process text contents in plain English is converted to its flowchart without human mediation. To fill aforementioned gap and to improve the teaching skill of the teacher new system has been proposed. The software tools can be developed, as the procedure of constructing a flowchart till generation of coding, etc. has previously established [2]. In several fields associated with Knowledge and Engineering (e.g. mechanics, Elementary level geometry). To reduce the efforts required to create a teaching aid, the proposed automatic conversion of text to a flowchart will help in reduction of time required in preparation of teaching aids.

II. Related Previous Work

A. Semantic & Syntactic Analysis

In this technique, they used the iconic based surroundings and flowchart based representation to improve the logical intellectual skills for the development of the new programmers [1]. The research in [2] mainly exposed the absence of problem-solving skill in the programming languages of new software users. By considering this as research gap basic algorithmic programming problems skills required by the new programmers and the need of human intervention they [1, 2] proposed text-to-flowchart conversion methodology. There are multiple techniques which are used for the knowledge-based system to draw the flowcharts and dialogue-based tutoring system. The techniques are Semantic & syntactic analysis is done Maintaining the Integrity of the Specifications.

B. Knowledge base FlowchartNet

This technique is applied for searching of common programming problems faced by new programmers, ActionNet, the knowledge base is applied to expand the query by finding a synonym. In [1] a methodology has been developed as an outline to provide solution in developing designing and skills of solving problem by a new systems users with the help of a programmed English text into flowchart translation [2].This technique has been used to produce flowchart for both sighted and blind users.

C. Stanford POS Tagger.

In [3] the method to generate an activity and sequence diagram from given set of specification has been proposed. This method uses the intermediate structured representation for the possible automated generation of UML. Illustrations were proved from industries. They also proposed a solution for the textual representation which is accepted by the users also. This can be considered as a limitation which is restricted to UML diagrams based on simple statements having a length less than four sentences.[3]There are multiple techniques which uses the knowledge-based system to draw the flowcharts and dialogue-based systems which works as tutoring system. The technique which is comely used is to use

Stanford POS Tagger. The Problem statement is broken down into compact chunks which are differentiated on their functional aspect, it incorporate the use of grammatical regulations. Uses preposition to identify interactions. The accuracy of above approaches is limited.

In [4] UML and behavioral diagrams are drawn without considering any repetition in data. However, repeated data and ambiguity are, often, present in the documents of requirements specifications and not considering them is one of the limitations [4]

D. PoS tagger and NP chunking

Considering the work in [5] which is restricted to Keyword Extraction only. Techniques which are used are PoS tagger and NP chunking (parsing technique) to achieve keyword extraction.

E. XML tag set

Very huge time needs to be invested in reading documents hence in [6] they introduce a method of generating a diagram by presenting the given text as XML tags and used techniques to generate XML tag set which uses semantic structure of a text and applies Structural classification which uses a linguistic functions of a diagram (like inclusion, arrangement, indication & order.

F. NLP(Natural language processing)

The research in [9] generates geomatric diagram by conversion of text but the research is restricted to geometry problems stated in English language which generally appeers in text books used by schools [9], For the implementation they used techniques which uses NLP for syntactic and semantic analysis then Knowledge base of generic mathematics is used which they termed as "GeometryNet", after that Diagram generation Module is created[7,9].

III. SYSTEM MODEL

The overall outline of the paper is graphically exhibited in figure.1 the process text is given to the system as input pre-handling steps are performed on the content with a specific goal to discover improved catch phrase. This works importance can be justified if following points are considered which talks more about why automatic generation of flowcharts is need of the day. if used judiciously it can be used to effectively solve following aspects i.e.

- In creation of Training Materials,
- Workflow Management and
- In Continuous Improvement and Troubleshooting Guides.

Firstly we will focus on selection of the Input Text. Following are some of the sample input text used to test the roubustness of the system. working of the system. Basically they are collected from diverse domains ranging from industrial process ,reparing process to simple day-to-day activitie like preparation of tea.Table 1 can be refered.

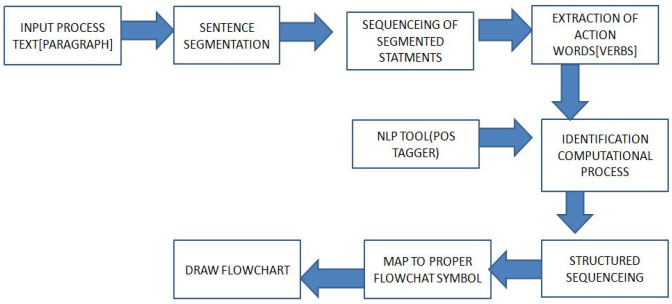


Fig 1 :The Proposed Framework Of Process Text To Flowchart Conversion

The main work which will be done is a generation of the framework which will show the path to how to convert the English language sentences into the flowchart. This framework i.e. proposed framework may be utilized in many ways to generate diagrams, problem-solving and much more[3].By many techniques, the keywords or keyphrase are extracted. The natural language processing methods are then applied to the text as shown in fig.1.

Table 1: Sample Input Text used to test the System

Sr.no	Domain	Sample Input Text
1	Real Estate	Start Your Research Early.Determine How Much House You Can Afford. Get Prequalified and Preapproved for credit for Your Mortgage. Find the Right Real Estate Agent.Shop for Your Home and Make an Offer. Get a Home Inspection.
2	Call Center	Complaint can be delt by remaining calm - even if the customer becomes angry. As quickly as possible the complaint should be solved. Keep corrsponding records of all complaints of customer. Begning from the first problem to the last solution.
3	Operating System Installations	Enter your computer's BIOS. Find your BIOS's boot options menu. CD-ROM drive should be starting boot device of your System. Save the changes of the settings. Shut off your computer.Start the PC and put the Windows 7 CD-ROM into your CD/DVD drive. Boot your system from the disc.
4	Finance	Open a stock broker account in XYZ Pvt.Ltd Brokrage Firm. Find a good stock broker and open an account. Read books. Read articles. Find a mentor. Study the greats. Read and follow the market.Consider paid subscriptions. Go to seminars, take classes.

The next major task is to separate out the statements from the given input text. There are many challenges in finding the correct position where to chuck the specific statement. The challenge includes the decision as to which full stop (.) be considered as a end-of-statement as can be seen from Table 1 Sr.no.4.

As the basis of chucking is to find out the full stop (.) but as can be seen from the Sr.no 4 (table 1) the full stop appears twice creating a ambiguity for sentence chunking process.

The next step is to identify the majorly used action words (verbs).So the proposed system finds the correct statements which includes the action words (Verbs).

Next step is to properly sequencing these statements so that they can further be mapped with proper Flowcharting symbols.

Extraction of keywords is next logical step which helps in selection of proper flowcharting symbol.

Using the Graphics drawing tools the Flowchart in drawn.

IV. Keyphrase Eradication Method (KEM) for Keyphrase regeneration

A key expression enhances the essence of intended flowchart [1]. This approach chooses significant expressions from the input. Following steps of is utilized to concentrate phrases from info content

i. Input text gets pre-processed and keepsake gets isolated for further handling.
ii. POS badges are utilized to identify meaningful key phrases
iii. The key phrases thus identified from every sentence.
iv. Then key phrases of suitable length will be used to map with the suitable flowcharting symbols.

V. POS Tagging to Classify Grammatical form of Words

Any word in the speech like a noun, adverb, pronoun, verbs, adjective tags by the POS tagger [5, 6] and denote that output word of speech by using this technique [3]. The steps for POS tagging are mention below:

1. POS tags N,V,Adj,Adv, will be inputted to the system.
2. Specified tags are searched.
3. Probability is found by using following Formula

$$P(ti \mid w) = c(w,ti)/(c(w,t1) + \ldots + c(w,tk))$$

Where
w represents inputted word M,
ti is the tag
c(w,ti) it is the number which represents occurrences

4. The Maximum probability word is tagged

Some tags and their clarification are illuliastrated in the accompanying table 2.

Table 2 Representation of different POS labels

Label Name	Label Description
CC	Conjunction(Coordinating)
CD	Fundamental Number
DT	Clincher
IN	Preposition / Conjuction (Subordinating)
JJ	Adjective

VI. Procedure For Decomposed Term Formation

A exceptional amongst the most utilized procedures of the parsing is natural language processing [5, 7]. In parsed sentence generation an input sentence is transformed into classified organization and grammatical form of term is allotted to every word. Given input sentence will analyze by considering every word from their input and gives the structural format. Grammar and parser are two main components of parsing [8]. It uses the various algorithms and rules for the determining tree structure of the sentence.

Example: I will getup in Morning when alarm and will go to college, if it is raining I will go to college by Four-wheeler, otherwise I will go to college by two-wheeler

1) Tagging

I/PRP will/MD getup/VB in/IN Morning/NN when/WRB alarm/NN and/CC will/MD go/VB to/TO college/NN ,/, If/IN it/PRP is/VBZ raining/VBG I/PRP will/MD go/VB to/TO college/NN by/IN Four-wheeler/NNP ,/, otherwise/RB I/PRP will/MD go/VB to/TO college/NN by/IN two-wheeler/NN

2) Parse

```
ROOT
 (S
  (NP (PRP I))
  (VP
   (VP (MD will)
    (VP (VB getup)
     (PP (IN in)
      (NP (NN Morning)))
     (SBAR
      (WHADVP (WRB when))
      (FRAG
       (NP (NN alarm))))))
```

```
(CC and)
(VP (MD will)
 (VP (VB go)
  (PP (TO to)
   (NP (NN college)))
  (, ,)
  (S
   (SBAR (IN If)
    (S
     (NP (PRP it))
     (VP (VBZ is)
      (VP (VBG raining)
       (SBAR
        (S
         (NP (PRP I))
         (VP (MD will)
          (VP (VB go)
                (PP (TO to)
                 (NP (NN college)))
                (PP (IN by)
                 (NP (NNP Four-
wheeler)))))))))))
        (, ,)
        (ADVP (RB otherwise))
        (NP (PRP I))
        (VP (MD will)
         (VP (VB go)
          (PP (TO to)
           (NP (NN college)))
          (PP (IN by)
           (NP (NN two-wheeler)))))))))
```

Fig.2. Parse of a sentence

General Steps for parser are mentioned below:

1. Parser will begin with a sentence
2. Dictionary is checked to look up every word
3. Corpus is used to identify POS tags fir every word
4. A tree is Built with POS tags of every word

VII. SENTENCE CONDENSATION ALGORITHM FOR SENTENCE GENERATION

Whatever the input statement we take for input that selected words from the paragraph they are parsed into the phase. By implementing above method [7], entire annoying arguments from parsed statements are removed that outcomes into a smaller variety about statements There are many methods feasible for creation of parsed sentence to wanted length.

The steps of algorithm elaborate in sentence condensation are specified as under [11]:

1. Choose S which is most left sided in parsing phase.
2. The Expressions which indicates Time should be eliminated
3. Apart from Time following contents should be removed
    a. words whose reference depends on the circumstances of its use
    b. genitive Pronouns
    c. Words indicating Quantity
4. All words which are not required should also be removed.

VIII. CREATION OF DATABASE TO STORE EXTRACTED KEYWORDS AND RELEVANT FLOWCHART SYMBOLS

The Extracted Keywords[12] (Verbs / Action Words are stored in a database where they are linked with Proper Flowcharting Symbols.Following Diagram shows the set of standard Flowcharting symbols which will be used by the system to generate the output

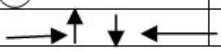
Sr.No	Symbol	Purpose
A.		Start / End
B.		Process
C.		Input/output
D.		Making Decision
E.		Connector
F.		Flow lines

Fig.2: Set of Standard Flowchart Symbols

IX. EXPECTED RESULT

The desired from of the framework is well ordered pre-processing of the steps for the given input English text to find out the correct keywords. To solve the problems regarding creating Training Materials, managing Workflows and for the preparation of Continuous Improvement and Troubleshooting Guides aspects this framework can be used.

A. Case Study

As Discussed in section VI, after parsing the appropriate Flowchart Symbol will be used (depending upon tag the decision making symbol D will be used as shown in fig 2 if the tag comes out to be VB).

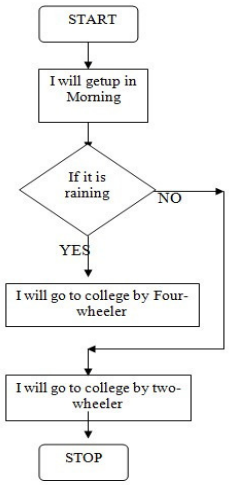


Fig.3: Expected Resultant flowchart

B. Role of Flowcharts in Teaching / Learning Process

A flowchart plays a important role in teaching learning process. If used judiciously they can help in

- Saving paper (paperless)
- Enrich the quality teaching
- Enhance understanding & ideas will be more simplified
- Will improve the learners participation in teaching / learning process
- Students will brace learning
- Save both time & money.

By using the Flowcharts at school level Programming problems can be solved .Following Table 2 shows some of the sample statements & the relevant flowchart symbol use. The other use of the flowcharts can be in demonstrating the logic of a particular competing problem. The other purpose of using the flowchart can be to use it to show some process.

Table 2 Tabular representation of Example of mapping of symbols

Purpose	Use
Calculate total of A, B, C	Process
Indicate that the problem has been solved.	Stop
Find if a number is greater than the other	Decision
Read a number and calculate the factorial of the number.	Loop
Read three numbers	Input
Print the total	Output
Indicate beginning of a problem solving flow.	Start

1) Control Structures

a) Sequence

It is the direct advancing execution of one step of processing step after the other. The global sequence form is as follows

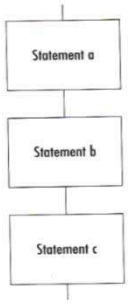


Fig 3: The Sequence form

b) Selection

A condition suggests that selection structure should and the choice in two actions depends upon whether the condition is right or not. The general pattern of the selection construct is as follows

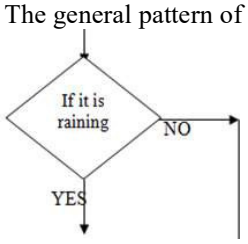


Fig 4: The Selection

X. CONCLUSION

The main attention of this study is to understand the approaches of converting the process text into flowchart and understanding the basic concepts. This paper gives the insight about the project plan and the systems required to construct the experiments. The previous studies and the literature reviews are used to find out the research gaps. It is also helpful to understand the workflow of the newly designed system in creating good teaching aids

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Evaluation of Apriori Algorithm on Retail Market Transactional Database to get Frequent Itemsets

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Abstract* – *In Data mining the concept of association rule mining (ARM) is used to identify the frequent itemsets from large datasets. It defines frequent pattern mining from larger datasets using Apriori algorithm & FP-growth algorithm. The Apriori algorithm is a classic traditional algorithm for the mining all frequent itemsets and association rules. But, the traditional Apriori algorithm have some limitations i.e. there are more candidate sets generation & huge memory consumption, etc. Still, there is a scope for improvement to modify the existing Apriori algorithm for identifying frequent itemsets with a focus on reducing the computational time and memory space. This paper presents the analysis of existing Apriori algorithms and results of the traditional Apriori algorithm. Experimentation carried out on transactional database i.e. retail market for getting frequent itemsets. The traditional Apriori algorithm is evaluated in terms of support and confidence of transactional itemsets.

Keyword - Frequent itemsets; Association Rule Mining; Frequent pattern mining; Apriori; FP-growth

I. INTRODUCTION

The tremendous growth of information technology within the companies, businesses and governments, has created immense Databases (DBs). This trend creates a prompt requirement for novel tools and techniques for intelligent DB analysis. i.e., we are drowning in information but starving for knowledge! These tools and techniques are the topics of the field called "data mining" or "Knowledge Discovery in Databases" (KDD). It is used for finding hidden and probably useful patterns and knowledge in databases. In which association rule mining is important factor with various algorithms. In association rule mining frequent itemsets gives the correlation between the larger datasets. Frequent itemset are the itemsets which are present mostly in the transactional databases. So, to get more profit from this we need to find the frequent items. The Apriori algorithm is used for the association rule mining to find frequent itemsets from datasets. Apriori is the basic algorithm for mining frequent itemsets in a set of transactions. A set of items is known as itemset. If the occurrence of items in a particular transaction is frequent, it is called as frequent itemset and the support of a frequent itemset is greater than some user-specified minimum support. Mainly to perform Apriori we have to give transactional database and minimum support value as input and frequent itemsets as output.

Association Rule Mining: Association rule mining is important aspect of data mining concepts which states as following rules, Let $I = (i_1, i_2 \ldots \ldots, i_m)$, be a group of items. Let D be a group of transactions, wherever all transaction T includes one or more set of items in I, such $T \subseteq I$. Every transaction is always comes with a unique identifier, called TID. Let X contains a group of items. A transaction T is claimed to have X only if $X \subseteq T$. An association rule defines its expression as a $X \Rightarrow Y$, wherever X and Y are nonempty item sets (i.e. $X \subseteq I, Y \subseteq I$). This rule is termed as antecedent, such that $X \cap Y = \emptyset$. The rule $X \Rightarrow Y$ contains the transaction set D with support s, wherever $s\%$ of transactions in D that holds $X \cup Y$. The rule $X \Rightarrow Y$ has confidence$c$, within the transaction set D, wherever $c\%$ of transactions in D have X that also have Y.

Support: The rule $X \Rightarrow Y$ has support s within the transaction set$D$, if this is the case of transactions in D contains $X \cup Y$. Rules that have a s greater than or equal to the user-defined support is given as a minimum support threshold(min_sup).

$$Support(X \Rightarrow Y) = Support\ (X \cup Y) = P(X \cup Y)$$

Confidence: The rule $X \Rightarrow Y$ has confidence c within the transaction set$D$, if recollect transactions in D contain X that also contain$Y$. Rules that have a c larger than or equal to a user-specified confidence is termed as a minimum confidence threshold (min_conf).

$$Confidence\ (X \Rightarrow Y) = \frac{support\ (X \cup Y)}{support\ (X)} = P\left(\frac{Y}{X}\right)$$

Therefore, the smaller support with greater the confidence values are used. Satisfying the rules of support and confidence the frequent itemsets are generated by the strong rules. Also the useful information found from datasets in terms of strong rule sets to find frequent itemsets. The issues generated in association rules are of two kinds: (1) Find all the items having greater support value of transaction than the minimum support. These are the frequent itemsets. And alternative

itemset referred to as infrequent itemsets; (2) Use the frequent itemsets to get the specified rules. Support and confidence are the important factors in the Apriori algorithm.

There's a large union between the literature that the primary sub problem is that the necessary of two algorithms. This is because it's more time consuming because of the enormous search space and therefore the rule generation section can be done in main memory in a very simple means once the frequent itemsets are found. That's the reason for the huge awareness researchers paid to the current problem within the recent years. The remainder of this paper is organized as follows: Section II describes the related work on frequent pattern mining. Section III discusses about the analysis of traditional Apriori algorithm. Section IV summarizes the experimental results on transactional datasets. The discussion about the content of this paper is described in section V. Section VI summarizes the conclusion based on the study of existing approaches and finally the paper ends with the future scope followed by references.

II. RELATED WORK ON FREQUENT PATTERN MINING

Literature available on frequent pattern mining is very large. This section presents the detail overview of existing techniques to mine large datasets efficiently. C. Song [1] defines association rule mining with algorithms of data mining performing on larger datasets and generates output efficiently. Jamsheela and Raju [2] compare both the Apriori and FP growth algorithms and based on the survey they suggested that the FP growth algorithm performs better than traditional Apriori algorithm. Fang and Qizhi [3] proposed an improved Apriori algorithm with better in performance than previous one and performing less scan with generating less number of candidate sets to improve algorithm efficiency. Singh and Agarwal [4] proposed the optimized algorithm i.e. FI generator with fewer numbers of database scans. Also reduces the number of candidate set iteration and pruning techniques for reducing storage space. Patil and Deshmukh [5] mainly focuses on the analysis and improvement of Apriori algorithms based on parallelization, time efficiency, interesting itemsets mining, stopping conditions, etc. Rajeswari [6] proposed modified version of Apriori algorithm and compare with different existing Apriori algorithms in terms of different evaluation parameters. Shaoqian [7] find the minimum support and confidence according to the user defined minimum support value with the pruning and joining concept of Apriori algorithm and generates frequent itemsets with greater efficiency. Alharbill et al. [8] proposed two algorithms called horizontal weighted uncertain Apriori (HWUAPRlORl) and Vertical weighted uncertain frequent itemset mining (VWUFIM) for mining frequent itemsets from the any type of larger databases. Ehsan and Patil [9] proposed an algorithm for finding frequent and infrequent itemsets based on Apriori algorithm. The two new approaches are introduced i.e. the normalized weighted and reverse weighted algorithm for finding frequent itemsets. Mainly the weighted algorithm concept forms the groups of similar itemsets and assigning the weights to them.

Agarwal and Singh [10] suggested that by using hash function with hash value generating a tree with Direct Hashing and Pruning (DHP), and Perfect Hashing and Pruning (PHP) algorithms for reducing the generation of candidate itemsets. A new algorithm i.e. Transaction Hashing and Pruning (THP) is also proposed to arrange itemsets in vertical format and use bucket number for hashing transaction id. Zeng et al. [11] proposed the HMT (HASH MAPPING TABLE) and HASH_TREE methodologies are used to optimize the space and time complexity. Rathinsabapathy and Bhaskaran [12] presented MPIP Apriori algorithm. Geng and Tao [13] presented FAHR algorithm based on vector concept with semantic keywords. While assigning the weights to the keywords it reduces the vector dimensions and adds semantic texts to FAHR. Bhandari et al. [14] focus on certain disadvantages of Apriori algorithm and discuss comparative study of six existing improved Apriori algorithms compared with the traditional Apriori algorithm. Deone and Jethan [15] describes the transposition and Boolean matrix technique to get frequent patterns among the larger sets of data in data mining with modification of the Apriori-like algorithm. The proposed method describes the weighted Apriori algorithm based on bit partition technique to reduce the time and space complexity. Due to this the efficiency of the algorithm increases. Qiu-yong et al. [16] proposed the Apriori's optimization algorithm based on reducing transactions. Mundra et al. [17] concentrated more on generating less number of candidate sets and frequent itemsets are calculated in the terms of decimal form, this reduces the number of comparisons and finds the support for frequent itemset.

Sumangali et al. [18] proposed the interesting itemsets algorithm which first performs the preprocessing on database and then remove redundancy among the data. Further the proposed algorithm combines with the FP- tree algorithm for reducing the database scan and produces itemsets from the transactions. The mathematical measures are validated in reduced itemsets. Singh et al. [19] presents the comparison between Apriori and FP-growth algorithm for frequent itemsets generation. Gu Xiao-Feng et al. [20] proposed a new algorithm when the minimum support degree is small; the running speed of the FP-growth algorithm is much faster than the Apriori algorithm. Wang et al. [21] focuses on optimized method which avoids the scanning of database and reduces generation of candidate itemsets repeatedly to improve the performance of algorithm. Here the operational efficiency is still higher than the weighted Apriori algorithm. Singh and Sethi [22] proposed a new approach called Sandwich-Apriori which is a combination of both Apriori and Reverse-Apriori. This Approach reduces number of scans and number of candidates generated as compared to Apriori and Reverse-Apriori. Cheng et al. [23] introduced two different Algorithms based on the concept of higher weight score with the number of frequent itemsets in association rule mining called HWA

(O) and HWA (P) and compared the content of rules between the HWA (O), HWA (P), and Apriori algorithms. Mallik et al. [24] suggested a weighted rule-mining technique to rank the rules in mining algorithms. Weighted rule-mining performs the interestingness measures with weighted support and confidence, these algorithms are mainly used to bypass the problem of rank- based weighted condensed support (WCS) and the weighted condensed confidence (WCC).

III. ANALYSIS OF APRIORI ALGORITHM

Apriori algorithm is used for finding the frequent itemsets among association rules but, this is not the first approach for finding frequent itemsets before that there are two more approaches like, AIS and SETM algorithms. But this algorithms was required more database scans and generate the number of candidate sets. Apriori is mainly works on transactional databases. Each transaction contains a set of items called itemsets. However, the Apriori algorithm takes the transactional datasets and user-defined minimum support as input and produce support, confidence, strong rules and closed itemsets as a result of frequent itemsets. The working of Apriori algorithm is done step by step level-wise for the k itemsets to explore (k+1) itemsets in the database. At every pass of Apriori algorithm after generating the candidate sets it find the new set of frequent items. Firstly in Apriori it scan the database for 1-itemset and also get the counts i.e., support value of each item. This pass is denoted by C1 the first set of candidates. From C1, discover the value of L1 using minimum support value. Generate the value of C2 same as C1 but in this step we have to make pair of items with their count in database. Always preferred the previous pass to generate next one. From C2, generate L2. Likewise, combine items in triples, quadruples and generated L3 this process is repeated till the all combinations of items in transaction are satisfied. At the end of all the passes the set of frequent itemsets are generated. The Apriori algorithm is followed by two important steps like: (1) *Joining Step:* in joining make the possible combinations of itemsets with their respecting support count. the second step (2) *Pruning Step:* Scan the database and check the value of support count is greater than or equal to the user-defined support count value. if not found in database then delete that transaction from database otherwise, the transaction is added to database and perform the next steps to find frequent itemsets. Figure 1 shows the example of Apriori algorithm.

Frequent itemsets are very useful to increase the business growth of product. While maintaining the schema of generating information for frequent itemsets is beneficial for business purpose like supermarket, mall, banks, stock markets, etc, To find the frequent itemsets from larger database use the different algorithms of association rule mining like Apriori algorithm, FP-growth algorithm and improved versions of Apriori algorithms etc., Among all these algorithms of association rule mining this paper is mainly focus on basic traditional Apriori algorithm.

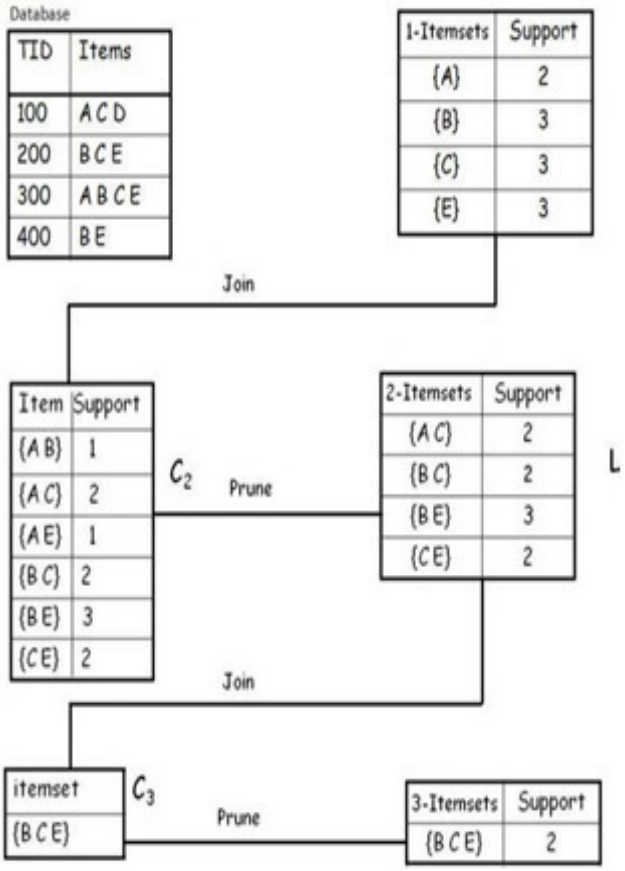

Fig.1. Example of Traditional Apriori Algorithm

The straightforward approach for finding the frequent itemsets is to apply the Apriori algorithm on transactions which is very simple and clear algorithm in data mining. The two important concepts of Apriori algorithm i.e. joining and pruning are used to find the set of frequent itemsets. The experimental results of the Apriori algorithm is given in section 4. But with the ease of Apriori algorithm it also has some limitations.

Limitations of Apriori Algorithm: Apriori algorithm has some limitations as follows: (1) for generating candidate sets, Apriori algorithm requires number of scans over the database. Because of the multiple scanning over database it take lots of time to execute and increases I/O load. (2) Also while scanning databases it generate the number of candidate sets in database.

In order to overcome the drawbacks of Apriori algorithm, there are various types of improvement in this algorithm like matrix, weighted Apriori, hash structure; interest itemsets, transaction compression etc. are possible. But it is found that amongst them, hash structure and weighted Apriori gives better results. On observing above two algorithms it is found that these algorithms are also having some limitations, the benefits of both algorithms could also not bypassed, and not meet the requirement of less computational time and memory

space. Hence, there is a scope to develop new algorithm with the positives of both Weighted Apriori and Hash Tree Apriori algorithms. Individually, they are more efficient, so, to make them more useful, its better to combine both the algorithms to get hybrid algorithm. The main task involved in hybrid algorithm is to address the limitations of normal weighted Apriori and hash-t Apriori algorithms. Limitations associated with these algorithms are as follows. *Weighted Apriori:* (1) Itemset combination will generate frequently. and it will also increase candidate itemsets; (2) The weight of computation for each transaction will take more time to execute; and (3) Not depend on data deviation. *Hash Tree Apriori:* (1) High computational requirement needed; (2) High memory utilization is required; and (3) Node processing requires the high time to compute.

IV. EXPERIMENTAL RESULTS

In Execution of traditional Apriori algorithm the frequent itemsets are generated on retail market datasets. To check the limitations, it is observed that the terms min_support and min_confidence and closed itemsets given by algorithm consumed maximum computational time and memory space. Therefore, traditional Apriori algorithm is not so efficient for larger datasets. Hence, it is found that there is need of better efficient algorithm which will consume less computational time and space to give frequent itemsets. Results of traditional Apriori algorithm are shown in Figure 2 through Figure 5. Generation of itemsets which will be displayed in the list view and on the selection basis the transactions are created which will be added to the database for the further use. Relevant screenshot is shown in Figure 2.

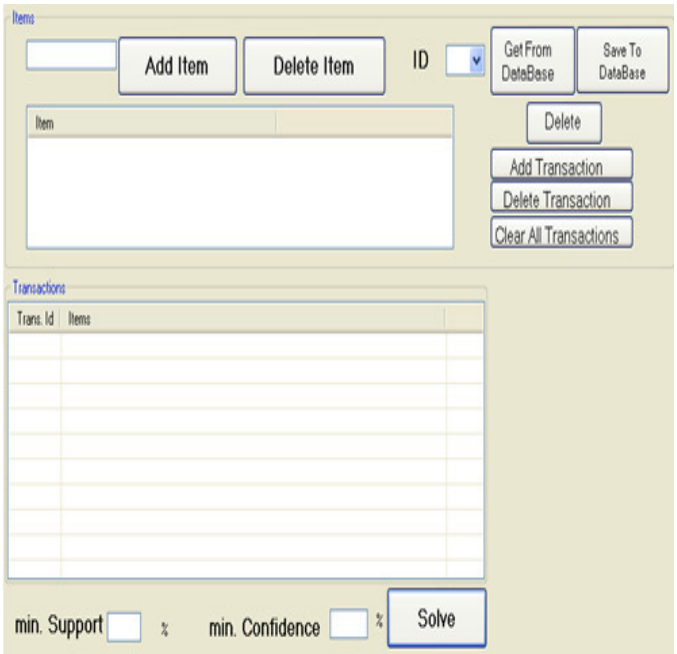

Fig.2. Main Form for Applying Apriori Algorithm

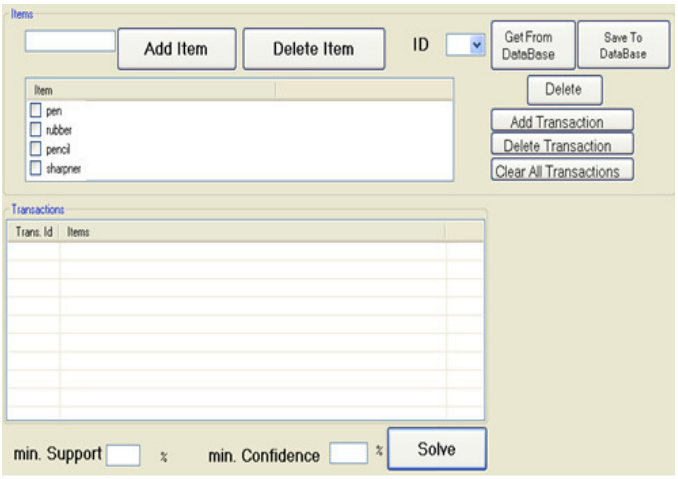

Fig.3. Adding Items for Generating Transactions

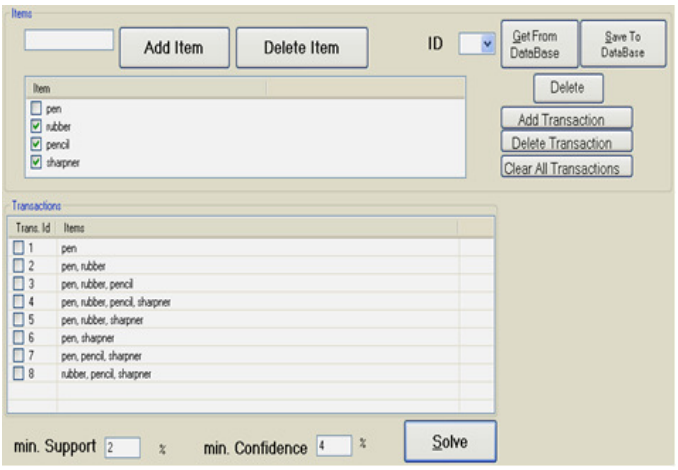

Fig.4. Generating Transactions

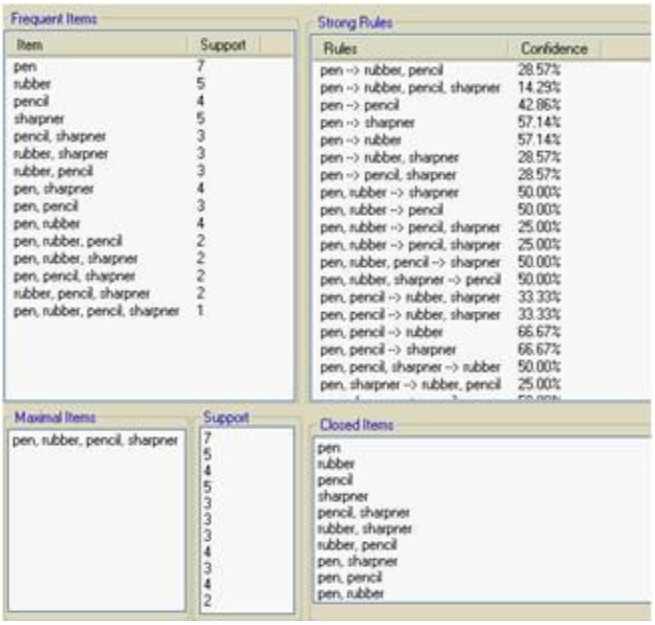

Fig.5. Generating Frequent Itemsets using Apriori Algorithm

Adding items to the item list for generating transaction is shown in Figure 3. For the Apriori application, after adding these transactions to the list, select item as per the individual transaction by add transaction and save it to the database. We can generate transaction or we can get it from the database by using get from database function. Transaction id can be generated or we can use transaction id to get stored transaction from database by providing min_sup and min_conf to the function. Generation of transaction is shown in Figure 4. Calculated support and confidence is shown in Figure 5. Each individual item is calculated by Apriori algorithm and the said transactions can find out the closed itemsets and the maximal itemsets.

V. DISCUSSION

There are many new modifications are possible that can improve the efficiency of Apriori algorithm. The two basics things which are always are the issue in Apriori algorithm i.e. database scanning and generation of candidate sets. So, to deal with them, we can have many improvements in the Apriori algorithm of association rule mining for increasing efficiency of algorithm. But, amongst them, it is found that the weighted value Apriori and hash tree Apriori are the best and they give better efficiency in Apriori. It is observed that individually they are not more efficient as they are together. So, it is better to combine the benefits of both the algorithms to make them more efficient. That is, developing a hybrid approach based on weighted value Apriori and hash tree Apriori algorithm to improve computational time and memory usage. This paper is helpful for the researchers who focus on frequent pattern mining on different transactional datasets i.e. retailing, finance, banking, marketing, insurance, healthcare, etc.

VI. CONCLUSION AND FUTURE WORK

The use of data mining is very wide it helps to growing in business applications, so, the research scope exists for new algorithms applied to the large amount of data stored in enterprise's databases. The main objective of this paper is to observe the various Apriori algorithms and find the limitations of existing Apriori algorithms. From the experimental results, it is observed that the evaluation of support and confidence for traditional Apriori algorithm consumes more time, space and also generates the number of candidate sets.

In future, there is a scope for development of improved or modified version of existing Apriori algorithms based on weighted value Apriori, hash tree Apriori, matrix, interest itemset, transaction compression. One can develop the hybrid algorithm using different existing Apriori algorithms for identifying frequent itemsets with focus on reducing the computational time and memory space using a retail data set and shopping mall dataset.

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Survey on Time Efficient Data Gathering Approach for Wireless Sensor Network

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***Abstract*—Wireless Sensor Networks is a combination of sensor nodes and base station also known as data collection unit. Sensor nodes in WSN's are thus responsible for performing the basic functions to provide better interaction between network and real time applications. Nodes collect data and forwarded it to sink node. Data transmission can be taken in either static or dynamic nature. In a static network scenario the problem of hotspot which is due to converge-cast can be improved using mobile sink. Using mobile sink delay can be reduced and data can be transmitted within time period in real time applications. In this paper we will discussed various techniques for sink placement and scheduling process with delay constraint. However the sleep-awake scheduling based on duty cycle is proposed in which sleeping time is divided into random sleep time and periodic sleep time.**

***Keywords*—mobile sink, sleep/awake scheduling, periodic sleep time, random sleep time, delay constraint.**

I. Introduction

Wireless Sensor network is having number of sensor nodes which co-operatively send sensed data to the base station. The base station can be referred as sink node. To perform the basic functions such as to assemble data, sensing, sharing of information and processing the information, sink node communicate with the sensor nodes [1]. Sensor nodes collect the information from particular sensing area and transmit it to sink node via multi-hop communication.

Sensor nodes are having limited battery power. Hence an efficient utilization of power is essential for improving network lifetime. Data can be sent from source node to sink node either dynamically or statically. The network can be heterogeneous network or homogeneous network [13]. Depending on the scenario, the necessity of continuous monitoring i.e. information need to send to sink node continuously.

But the problems with this static network specification are coverage holes, sink holes, jamming holes and increased in delay [2]. This is due to sink node must be in active state in order to communicate with the sensor nodes in one hop neighbor of sink node. This problem is known as hotspot problem which is due to converge-cast.

According to recent papers the efficiency of WSNs can be enhance using mobile sink. Delay in data packet transmission can be avoided using mobile sink. Thus by preventing nodes from collision by reducing idle time, minimize end-to-end delay and improves the efficiency of sensor network. The following section presents the related work for data gathering using mobile sink with objective to minimize delay.

The section III presents the detail of proposed method. And the section IV will consider conclusion.

II. Related work

This section specifies the related work for minimizing the delay. The various papers have been written which addresses trade-off between energy and delay. It is necessary to create energy efficient topology with a delay constraint. The factors such as transmission delay, processing delay and the propagation delay related to the distance between sender and receiver affect the wireless sensor network efficiency.

Priya V. Ujawe1 et al. [3] has discussed routing issues in wireless sensor network. The various techniques and algorithm are introduced such as tree based, cluster based, centralized data aggregation, in-network aggregation, ant colony algorithm, shortest path algorithm etc. Based on requirement data aggregation can be done efficiently.

By using carrier technique TDMA (Time Division Multiple Access), the time slots are assigned to user in which each user transmit and receive data within assigned slot [6] [7]. The problem with this techniques is it increases delay as well as improper utilization of channel occur which result in NP-complete problem

In Maximum Amount Shortest path (MASP) [10] data collection by mobile sink is maximized. The mobile sink travels in a fixed trajectory. Nodes which are close to this fixed trajectory are known as sub-sink. If a particular node has to send data packets to mobile sink, it must first transmit it to sub-sink. The sub-sink then transmits data packets to mobile sink directly. The problem associated with this is that long time period is required for finding optimal data path.

Long Cheng et al. [11] introduced Query Based Data Collection Scheme (QBDCS) in which the mobile sink queries for data in sensing field where sensor nodes are deployed uniformly. The node which is nearest to the center of sensing field act as cluster head, the cluster head aggregate data from sensor nodes and is responsible for transmitting packet to mobile sink.

The different trajectories during sink mobility are studied. Yusheng Ji et al. [2] proposed centralized optimal algorithms for DeSM with polynomial complexity are proposed for solving the induced subproblems. The factors which affect the network lifetime are generalized and benefits of sink mobility are shown. But the problem with centralized optimal algorithm is the poor performance of time delay and more energy consumption.

Rangaswamy et al. [13] proposed the set of rules for dynamic route construction and the controlled flooding of sink position is proposed in order to cover large network area and to minimize end-to-end delay, energy utilization, etc. The proposed work is compared using two mobile sink with VGDRA (Virtual Grid based Dynamic Routes Adjustment) technique using single mobile sink [15]. However the proposed method does not guarantee node failure due to movability of sink.

The algorithm for information gathering based on using rendezvous points uses some sensor node as a rendezvous point which is responsible for collecting data from sensor nodes [16]. By using traveling salesman algorithm, the mobile sink co-ordinate with these rendezvous points for data gathering. The mobile sink can be able to transmit data via multi-hop communication but sometimes mobile sink may get fail to identify the data path to reach rendezvous points.

M. Sudha et al. [17] presented scheme Energy Efficient Shortest Path (EESP) is used with Multiple Mobile Sink (MMS) also known as Rouse-Slumber which minimizes the energy utilization with delay constraint. The RS scheduling algorithm works well with dynamic trajectory used in wireless sensor network via multi-hop data transmission. Data collection by mobile sink with the help of sub-link, to minimize the delay may get fail due to improper co-ordination.

Due to problem of extra delays during transmission of data packet from source node to destination node the author suggest using anycast data forwarding with sleep wake scheduling. Here the transmitting node [19] [15] does not require the time interval to wake up by its next hop relay node which thus reduced end-to-end delay. The redundancy of data can be increased using the anycast data forwarding which affect the data aggregation.

By using heuristic method [23] the energy consumption of sensor nodes can be minimize. To avoid delay bound, B. Zhao et al. proposed WRP (weighted rendezvous planning) in which each sensor node is having particular weight based on the number of data packets transmitted by nodes and hop distance from that data path. Using this method the NP-hard problem can be resolved by optimizing shortest path for forwarding data but increases complexity.

As shown in table 1, the various techniques are discussed for data transfer in wireless sensor network. Different scheduling scheme are proposed for transferring data. But the problems with given techniques are improper energy consumption management and increased in end-to-end delay. Also the overhead of scheduling is increased in centralized scheduling technique and does not support large size network hence these techniques are not reliable. The summary of related work is given below with techniques along its advantages and disadvantages.

Table 1: Comparison of different data gathering techniques

Sr. No.	Technique used	Advantages	Disadvantages
1.	Extended SSDR Algorithm for DeSM (E-SSDR) [2]	Minimize delay bound and improve scheduling process for routing.	Centralized optimal algorithm developed but not worked for distributed networks.
2.	TDMA (Time Division Multiple Access) [7]	Each user get an equal opportunity to transmit and receive data	Improper utilization of channel and the problem of NP-Complete occur.
3.	Maximum Amount Shortest Path (MASP) [10]	Minimize end-to end delay.	Its takes long time to find the optimal path for routing.
4.	Query Based Data Collection Scheme (QBDCS) [11]	Minimize the latency.	Not feasible for large scale network.
5.	Cluster based approach using multiple mobile sink [13]	Network lifetime can be increased with optimal routes.	Node or sink failure due to interferences.
6.	Rendezvous points based data gathering [16]	Sharing network load balance between different nodes.	Mobile sink node only visits rendezvous points.
7.	Rouse-Slumber Scheduling [17]	Reduce energy consumption.	Synchronization in scheduling process becomes complex.

III. PROPOSED WORK

As shown in figure 1, sleep/awake scheduling can be used in which the sensor nodes include different phases for data transmission, reception, idle phase and sleep state based on duty cycle approach.

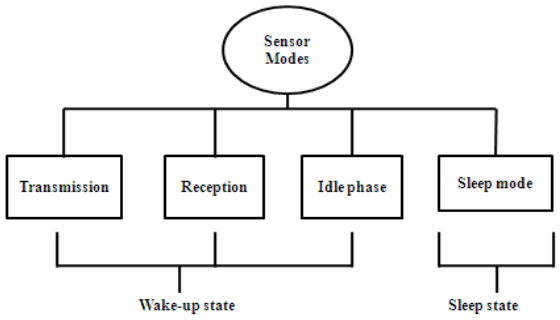

Figure 1: sleep-awake scheduling

After establishing network scenario the sensor nodes are assemble according to energy level of each sensor node. In second phase probability of entering in sleep state of sensor nodes in every level is established. The modes of node i.e. either sleep mode or active mode is decided by estimating the probability through distributive density of nodes. The total time period is divided into random sleep time and periodic sleep time. In random sleep time the sleep and awake status is not fixed whereas in periodic sleep time the sleep and awake status is fixed in every duty cycle. In this way the sleep time and active time can be adjustable. Hence the maximum energy power of sensor nodes can be saved during the transmission phase and better quality of service can be obtained.

The proposed system is to minimize the scheduling overhead in centralized as well as in distributed scheduling with large

size networks. For that purpose two mobility based techniques such as controlled mobility and random mobility are used. Whereas sinks are moved randomly in random mobility and in controlled mobility sinks are moved deterministically across the network.

The system also supports multiple mobile sink based scheduling with limited energy consumption. The scheduling scheme is based on multiple mobile sink mobility with delay and energy parameters to support large scale network. Using this scheduling process with multiple mobile sink the parameters are integrated in order to schedule nodes with greater scalability.

As shown in below figure 2, the scheduling process is to schedule the data movement path by mobile sink. Based on movement of mobile sink, data path is estimated and time periods are assigned to nodes in scheduling scheme. Classification of system is specified into five modules as given below.

In network circumference analysis the properties of sink and node are collected from user. The placement of node and covering area is taken into consideration as well as the information of coverage area and nodes are analyzed. The energy level of sink and nodes are analyzed in this.

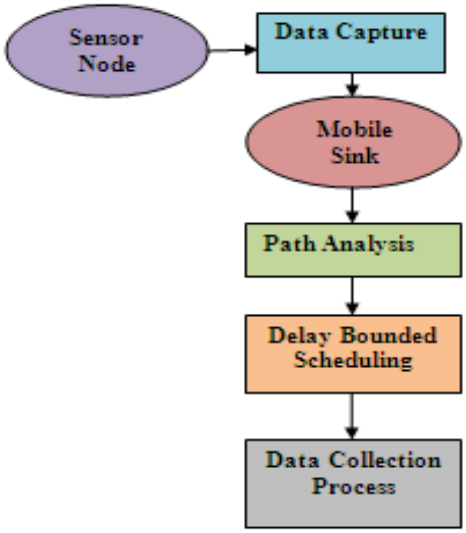

Figure 2: Mobile-Sink based scheduling in WSN

Monitoring of data and data gathering are done in data capture phase. Using local storages the collected data are updated with time interval and these updated data is forwarded to mobile sink. To perform scheduling for single sink centralized scheduling process is follow. Data transmission of sensor nodes and mobile sink are used for this process. Information related to delay in data transmission packets are needed to update data process. For multiple sink there is distributed scheduling process in which requests for data are submitted by users. These requests are then processed or handle by mobile sink.

Movement plan for sink is processed with the help of region based sink movement model which is based on details of sink coverage and network design. Sensor nodes are responsible for transferring data packets to mobile sink. In data collection process the user request for data. These query requests are then evaluated by mobile sink and by processing query request data packet is transmitted by it to intended user.

IV. Conclusion

In this paper we focus on various techniques for efficient data gathering with limited energy consumption. We studied different scheduling schemes whereas as emphasis is given on delay minimization. But the problems inherent with previous work are local minimum problem and mobile sink information cannot flood efficiently when mobile the mobile sink moves its position. Using the proposed technique it is possible to reduce the overhead of data and it is feasible for multipath data transmission. The problems can be solved efficiently with a delay constraint and minimize the end to-end delay. It can also improve other parameters such as power efficiency per packet, general delay, packet delivery ratio and maximize network lifetime.

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Analysis of Datamining Technique for Traffic Accident Severity Problem: A Review

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***Abstract*—This paper is discussing about the road accident severity survey using data mining, where different approaches have been considered. We have collected research work carried out by different researchers based on road accidents. Article describing the review work in context of road accident case's using data mining approach. The article is consisting of collections of methods in different scenario with the aim to resolve the road accident. Every method is somewhere seeming to productive in some ways to decrease the no of causality. It will give a better edge to different country where the no of accidents is leading to fatality of life.**

***Index Terms*—Data Mining, Cluster Analysis and Algorithms, Naive Bayes Classifiers, Hybrid Decision Tree, Association Rule Mining.**

I. Introduction

Accidents happened due to the negligence of driving vehicle on the roads. There are various reasons responsible for the accident like abandon of traffic rules but road conditions and the traffic are considered the one of prime cause of fatality and causality across the globe. These accidents occur due to dynamic design and development of automobile industries. A traffic crash happens due certain reasons like smashes of two vehicles on road, walking person, animal, or any other natural obstacles. It could result in injury, property damage, and death. Traffic accident analysis required study of the various factor affecting behind them. In survey its seen that approximate 1.2 million death and 50 million injuries estimated worldwide every year. The approximate estimation of causality and injuries due to poor road infrastructure is a big challenge before the living beings. The order to deal with the problem, in computational science, we can adopt data mining model for different scenario. In any vehicle accident, it studies about the driver's behaviour, road infrastructure and possibilities of weather forecast that could be somewhere connected with different accident incidents. The main problem in the study and analysis of accident data is its mix heterogeneous environment and data segmentation which is used widely to overcome accident problem. [2,5,7]

Data Mining is a computational technique to deal with large and complex data set and these data sets can be of normal, nominal and mixed. It is quite easy to use in variety of domain belong to science and management; also, it could be used in fraud identification and many more scientific cases as well as in accident severity problem. Partition of objects in a group of clusters or in a homogeneous set is a fundamental operation of data mining. Clustering is a method to partition objects in a similar group. The k-means algorithm having a good efficiency for clustering large data sets but restricted in forming clusters for real word data while working only on numerical data because it helps in reducing the cost function by altering the meaning of the clusters [1,3].

Data mining technique is recognized as reliable technique for analysis of traffic accident severity problem and finding factors behind them.

Damage like property, people due to road accident are undesirable. Many times, it happened that road accident incidents are more common at certain places that can help in identifying factors behind them. Association rule mining is a technique that identifies the correlation in different parameter of road accident. [6]

II. Literature Survey

In the growing countries in the globe, the motorist, are facing road accidents due to poor management in traffic seeing the common leading cause of injury in body and mortality. Data mining techniques could be used to resolve these issues. In survey, numerous researchers contributed and discussed about various techniques of data mining, few important in the context of our problem are shared in this review paper.

Gower et, al., (1971) showed the importance of similarity coefficient and Gowda et, al., and Anderberg et, al., share dissimilarity measures that specify the standard mechanism of hierarchical clustering methods work with numeric and categorical values. But conversion of categorical data with the numeric dataset which will not produce meaningful result when categorical domains are not in order.

Ralambondrainy (1995) introduced k-means algorithm approach using data mining to cluster categorical data which convert multiple category attributes into binary numeric attributes. But in data mining these attributes are in hundreds and thousands that compulsory make increment in computation as well as in the space costs of the k-means.

Zhexue Huang (1998), proposed two algorithms which is extension of K-means algorithm. This extended k-means based algorithm includes categorical domain with numeric and categorical values. The k-mean algorithm uses a simple matching dissimilarity measure to deal with categorical objects where k-means algorithm extended replaces the means of clusters with modes, and uses a frequency-based method to update modes in the clustering process to minimise the clustering cost function.

Sachin et, al., (2015), proposed a framework for Dehradun, India road accident (11,574) happened during 2009 and 2014 by using K-modes clustering technique and association rule mining. The analysis of result using combination of these technique conclude that the result will be more effective if no segmentation has been performed prior to generate association rules [2].

In the world health organization [8], India is taking leading edge with 1,05,000 traffic deaths in a year, with comparison to the china with over 96,000 deaths on road. The survey was executed with approximate 178 countries. As per the survey results, it shown that approximate more than 300 Indians causality on roads every day. There are more than two million people have casualty from a traffic accident. The survey is taken from the report of data collection for 2008.

S. Krishnaveni, (2011), work with some of classification models to predict the injuries happened in traffic accident in Nigeria's and compared Naive Bayes Bayesian classifier [3]. This research is employed on the artificial neural networks based approach while the decision trees data analysis can be used to works on reduction of massacre on the highways. The data was classified in continuous and categorical data where continuous data analysed using artificial neural networks technique and the categorical data, using decision trees technique. The results reveal that decision tree approach outperformed the ANN with a lower error rate and higher accuracy rate. This research based on three most important causes of accident due to tyre burst, loss of control and over speeding.

This study used traffic accident records from 1995 to 2000, a total number of 417,670 cases. They applied them to an actual data set obtained from the National Automotive Sampling System (NASS) General Estimates System (GES). Experiment results reveal that in all the cases the decision tree outperforms the neural network. This research analysis also shows that the three most important factors in fatal injury are: driver's seat belt usage, light condition of the roadway, and driver's alcohol usage. [4]

K. Jayasudha, (2009), shown the effective use of association rule to investigate the accident issue. She also put efforts that systematic deployment of patters and rules shows the positive impact and it helps in understanding the case of fatality in accidents using decision support system. [9].

K. Geetha, (2015), this study works on traffic accident data of tamilnadu city. The main aim of this study is to reduce the number of road accidents. The traffic accident data is managed in form of text or numerical formats in unsorted manner [5].

Sachin Kumar et, al., (2016) suggest to apply k-means algorithm and ARM technique to solve traffic accident severity problem. Author divide the different accidental prone location with three different categories which are high, moderate and low frequency to extract the hidden information behind the data set and take some preventive action according to accident location [6].

Miao Chong. et. al., also proposed the efficient use of ANN and DT prove good result, in support they have used GES automobile accident data from 1995 to 2000, by studying the analysis performance of different data mining technique a significant result visible in support of fatality case study. Direct decision based approach outperforms the direct NN approach in all cases. Author discussed in this theory, if speed limit factor is well known then accident can be controlled [10].

Zhexue Huang, (1998), concludes that Ethiopia has the highest rate of Road Traffic Accident (RTA), due to major transport option is only road, instead of train or airways. Report state that approximate one million deaths and nearly 50 million injuries each year. Author has also applied data mining techniques to the connected road feature to accident severity in Ethiopia and develop rule to improve safety. The work support that the accidents are not randomly scattered and alone the drivers are not involved in accident at random but they are based on various circumstances like vehicle speed, road and car condition etc. The objective of this research was to find the applicability of data mining technique in support of road accident analysis in preventing and controlling vehicle accidents, which easily leads to fatality and harm to body. [1, 7].

M. Sowmya, (2013), shown the study work on traffic accident data produced by transport department of government of Hong Kong in 2008. This study applies Naive Bayes, J48, AdaBoostM1, PART and Random Forest classifiers for predicting classification accuracy to analyse the performance. The classification accuracy on the test result reveals for the following three cases such as accident, vehicle and casualty [11].

Sohn S., (2003), studies multiple algorithms on data mining. He also suggested that fusion algorithm could give effective result. He also emphasis that fusion algorithm is better than single classifier techniques. He also claimed that in term of classification accuracy, DSA better than the neural network or decision tree. He has study in Korean environment and claimed that his study proves an effective way in homogenous environment [12].

Depaire B, (2008), analysed whether cluster analysis can be used as a traffic accident segmentation technique or not. Author modelled seven clusters in this theory and make sense and add value to subsequent injury analysis [13].

Mario De Luca et, al., (2011, 2013) shown the study of analysis of after-before approach using cluster and multivariate methods, in a segmented area in Italy. The two methods which is mainly taken in study is cluster analysis and Hard C means Methods proved effective in the study

carried out by author is easy and seen effective in meaningful ways [14-15].

Naina et. al., (2016) used the classification model, with Iterative Dichotomiser 3 and decision tree algorithm. She also compares the existing algorithm with enhanced algorithm C 4.5 with the use of WEKA tool she has shown that its useful in the case when we are using big data sets and the results are quite impressive. [16].

Shanti et. al., (2011) used classification algorithm for vehicle collision patterns. The results prove that random tree approach better than other techniques. The classification algorithm applies to this data set are C4.5, C-RT, CS-MC4, Decision List, ID3, Naïve Bayes and RndTree. The achieved results prove that RndTree technique is better and accurate than other algorithms in collision cases which fatality rate increase in road accidents [17].

Sami Aryamo et, al., (2009) Finland submitted a report which comprise of number of data mining algorithm. The team has very nicely started the data mining algorithm starting from basics to advance level. The long report suggest that the road accidents are due to variety of issue, however the single road lead to more fatality cases. This report present the number of cause of accidents results from the young ages to old drivers. Author also suggest that association rule play significant rule in the study. The report also shown that rule mining is easy in cluster analysis and it can be categorised in different strata, which give effective result as well [18]

Dinesh Mohan et. al., (2015) report state that in India there are huge number of fatality due to poor road conditions. He has discussed number of variable responsible for road accidents, report suggest the number of graphs supporting the accidents causes, authors believe that the data mining can be adopted to find the systematic avoid of road accidents, the number of approaches available in data mining has given a number of futuristic scope in the road accident prevention scheme. The study carried out in IIT Delhi, so it can be considered at one of most trusted document for the subpart of road accident issues [21].

III. Conclusion

In this paper, we have collected multiple researchers' works together in single document as review and discussed about the contribution towards impact of road and traffic accident on human life and society. This survey highlights the number of approaches used to avoid the accident happened in various countries and cities.

The paper also discussing about various data mining techniques which is proved supporting to resolve traffic accident severity problem and conclude which one could be optimal technique in road traffic accident scenario. The brief survey will also help us to find better mining technique in this kind of problem.

In the expansion phase, it's our endeavour to sketch better work to resolve traffic accident severity problem.

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Evaluation of multilingual websites using localization matrix

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***Abstract*—Creating, implementing and maintaining a huge website can be a terrifying task when the website is within multiple natural languages. The probable communication issues related to website content and structure become even more complex for multi-linguistic sites. The fact is that a majority of Web consumers today don't speak English, and they opt to access websites about companies' services in their own language. Organizations always want to keep a global image for that it required to use the website localization for local users. People can communicate via multilingual websites which need to browse independent screens for each one. It brings one of the most crucial areas exposed up by the period of electronic procedure. Web page localization is a solution to many organizations are leverage to appropriately translate their websites so their international customers can read site content and access information in their native languages. This address to improve culturally adaption of any multi-lingual website that focuses individual user-centric.**

***Index Terms*—Localization; Information Retrieval; Translation; Multilingual website**

I. Introduction

Web page localization is not only doing a simple translation of text [1]. Translating content only resolves partial language problems. Texture and images of website are customized to claim to the target culture. Web page localization means the translating an existing website to local language and culture in the target market [3]. It is the process of approbating an online site into a kind of linguistic and cultural environment [4] involving considerably more than performing a translation of text. Website localization should construct a site so that it seems local, to its audience except cultural variations between website inventors and the viewers [4]. While performing localization, main translation process done by programmer and knowledge of cultural. This localize involves alteration target language and ethnical selection in the textual structure, images ,map and requirement of the site with having consistency of the web site. A target wise accepted web site doesn't need extra worry from visitors of the site to process information. It makes individual theme easier and perceptions toward the site more favourable. The website will be qualifying when the goal of the new website with providing to the locale market in the new locale [4].

The web site localization is the consequence of due to popular use of computer and Internet surfers. Now-a-days, internet as main resource for providing information and facilities. These consumers around the world can communicate in only language. If any business needs to expand globally then web page localization provides platform to it [5]. Localization determines the converting existing product, application or file to specific target market with consideration of requirements, language, cultural preferences. Web page localization is on the top of market to make website progressively important to supplier of a product in that area and replace in foreign markets. Since web design becomes more deadening task if it is developing in many multiple languages with national culture, it will attract online consumer purchasing to access as per locality [7]. Web page creators consider the theme, education level, belief and language, value systems, traditions and habits of the locale culture in order to gain more profit [8]. The website localization is a complicated process and involves three different levels of adaptation.

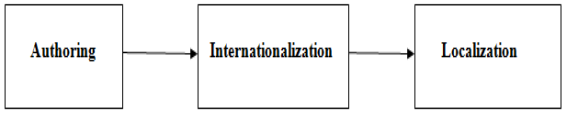

Fig 1: Levels of Adaption

1) Translation: Web page localization processing converting any sort of text used in the language of the state. While doing this process, it is necessary information of the web should be clear and meaningful to avoid ethnical ambiguity. To convert a text, the target preferences must be known [9].

2) Localization: In this, translation process comes first. Even translation of text should be meaningful but also have other activities to show it to local people. It contains to ensure that accepting of text structure, visual display, navigations and images and culturally appropriate for the target area. Many specialized elements which is need to be localized like: current date, current time types, numerical forms, postal address and telephone number formats, foreign currency/money formats, units of measurement and timing speed of website [10]. In localization process, communication does effectively in collaboration with different culture to consider the following items: information construction, theme, routing graphics, photographs, audio, and visual appearance [11].

3) Internationalization: It involves making application program standard that will be fully standardize as per technology, research of the country.

A. Localization

A process of properly converting cultural subjects in the internationalization process which proposes for specific local language. It is also included many features considered specifically to the target culture. In this case, localization means adapting existing features to accommodate a particular local things, which turns to be recognized industry standards are currency, language, educational level or income standards depending on kind of the communication [5]. The technological elements localized are the pursuing:

- Current Day and time configuration, calendar settings.
- Currency Standards.
- Monetary-associated information.
- Number operator.
- Telephone number scheme.
- Address scheme including postal codes, lane, states.
- Name formats.
- Different Paper size dimensions.
- Units of measurement.
- Color conventions: Specific Color indicates different things as per country
- Navigation conventions: A ‘exit’ button might mean differently as per country.

Among all diversifications might be covered through print media conveying meaning of translation. Some extra would possibly come below the heading of ‘translation’ in an exceptionally practical method; however now not all of things in translation could include all the technical and advertising and marketing decisions that are encompassed by way of the concept of localization.

B. Motivation

The need for localization nowadays is huge from every issue, because it brings blessings to industries, clients, and government, without a doubt to everybody. Even extra importantly, usually localization saves lives in nations where human beings have trouble on get right of access to existence saving facts in their local language. The need of localization to industries, as their products should be depleted everywhere within the global. The earnings are an awful lot greater while the product is customized to the needs and preferences of a locale. It is a great idea to localize country or vicinity-centric of the user, as it brings additional valuation to your product and suggests which you appreciate their neighborhood history, language particularities, subculture and traditions. One of the

motive purpose behind localization is the concept that it facilitates expands your business.

C. Literature Survey

The internet studies shows that all websites have reality multilingual internet site proposes different language vocabularies and data can be posted in a language-unbiased style, whilst appropriate culture-based (linguistic) data permitting to transfer languages may be saved one after the other. On this sense, the multilingual website records [3] can be realized as a layer of languages and resources on top of the prevailing connected facts architecture with the aid of adding linguistic data and its vocabularies in multi languages, using with overlapping between records with labels in multilingual languages and facilities to dynamically technique and traverse linked records throughout different languages [5]. A different graph based technique is a combination of the link structure and the translation path between the distinctive language variations of a multilingual website. Common methods for robots varies from performing a fully automated systems that helps to perform all task towards to semi-automatic structures that vantage current content which include input text or maybe prerecorded speech inside the transport of the final online robot[7][11].

In a business website, many viewers able to access products of online website which will describe in proper details and examine it with special language. Most of the companies will analyze purchaser comments in multiple languages for analyzing review comments [8][12]. Simply, comments in a couple of languages raise problems in studying the fabric. To analyze multilingual comments of purchasers categorize into: affirmative and negative sentiments. To evaluate it accordingly comments technique used as “Multilingual Sentiment classification (MSC)”.

II. Proposed Methodology

A. Multilingual Linked Data

A cloud data with a layer of multilingual languages which does overlapping between multilingual applications with linguistic statistics providing a set of services for growing websites. It provides access to link a different linguistic multilingual statistics [1]. A set of statistics that could be exported as related records. The data silos can be multilingual or monolingual. For producing multilingual linked facts a few offerings are performed to transform these statistics into multilingual linked facts. Further, few changes are needed to move lingual discovery and representation of mappings between related facts of vocabularies of different languages and datasets expressed in target languages [5]. Such cross-cultural linkage things are accessed by using localization services. These localize services which definitely translate vocabularies or ontology which used within the linkage information of cloud into variety of local languages.

B. Graph model for Localization Pattern

To purpose of graph model along with the data aggregation to extract local patterns in a multilingual website, a tiny website test some subparts of different multilingual websites [2]. The Japanese website related to computer science research center having web pages in both language English and Western. The most important part of the Japanese city and a community site developed in Linux, launching various articles proposed in eleven languages and relying on its members for the translations of websites[6][10]. Languages of website followed the global or local web content pattern, with all pages having global information were available both in English and Western, the English language sub-contract graph becoming a sub chart of Japan one. Graph model follows the mirror patterns where both vocabulary versions followed the same structure.

C. Dynamic generated Localization

An international web application consider web text structure and image captions provide randomly just like it treats actual web data elements as financial values. On this values translators can work in concealment of the web application

and HTML CODE page templates [2]. The technique proposes to modify strings tables to every local language. It is to codec locale language properties such as filename, lingustic properties which load the appropriate data file according to Locale's getting language method. The language files are simple key-value pairs. Take an example, Any webpage file, as properties would have title of page as Welcome to Sample page whereas a form setting file would have deal with a test page.

D. Reusable, Interactive, Multilingual online avatars

Online robot should try to deal with both the sound track and visual content required to implement the character. An audio track file would be in any target language is allocated specific moves and stored in the database. An online robot consists a skeleton including a library of movements are stored in database to contribute assets [4]. Whenever the user tries to make a movement, it requests in a specific language, the inter-related voice as per movements is gathered from the database and performed by robot. A voice recording of specific cultivate scripts are analyzed and combined to provide gestures and movements related to the events in the conversation [8].

E. Multilingual Sentiment Classification on Textual Data

To investigate an multilingual websites having product review in multilingual dataset with bilingual texts [5]. The classification is a formation associated with an ontology and textual structure category. The technique to classify multilingual text proposed as "Multilingual Sentiment Category (MSC)". This technique works by performing two main processing steps: lingual separation of multilingual data and sentiment category. The overview of the MSC

methodology can be presented as Fig.2

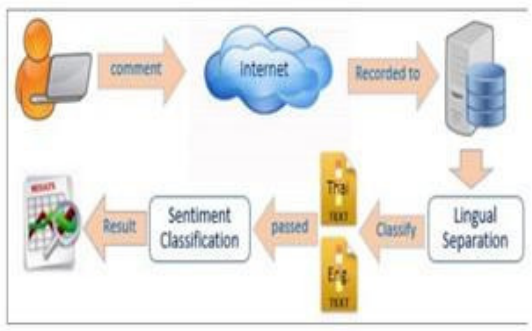

Fig 2: *Overview of the SSC methodology [5]*

III. COMPARISON ANALYSIS

A. Techniques

Ontology Localization involves ontology mapping [1] helps to mapping between cross linguistic information. Linked structure and translation path [2] between different language helps to understand a multilingual website. To analyze multilingual data set, multilingual segment classification [4] is needed.

B. Methods

Multilingual sentiment classification [3] for analyzing bilingual texts. Ontology localization[12] of an adapting culture context of data. Online avatar uses speech of recording and 3DSMax, Maya to improve flexibility and effectiveness.

C. Advantages

The multilingual model [4] provides interactive to bilingual speech and to analyze it. Cross linguistic helps to dynamically mapping of data based on sentiment classification. A transition graph helps to identify appropriate cultural adaption.

IV. CONCLUSION

An individual can't always understand all languages other than local language. To maintain a site which does appropriately localization is more meaningful than just translation. It helps to recognize the scope of improvement in multilingual websites. The different techniques proposed to analyze pattern of localization and conversion with maximum result. It can help to reduce errors and bugs in multilingual websites and

definitely will validate user friendliness of region-centric websites

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Performance Enhancement Heterogeneous Based EECP for Bandwidth Utilization

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***Abstract*—Using the increase of user made on distributed network scheme, traffic congestion is one of the necessary circumstances. Distributed network consists of various networks, processors and intermediary strategies that overwork the changes or routers with high traffic and it is because of the project fault in the circulated networking architecture. Even though several researchers address the congestion recognition method, its avoidance and modification in their investigation are solid to be explored for any effective solution for this problem. Due to huge network congestion user will face the network speed problem, real congestion control methods are desirable, and mainly to solve "bursty" transportation of today's for actual extraordinary speed networks. Subsequently dawn 90's many systems have been proposed. This paper concentrates on heterogeneity based congestion mechanism patterns on the basis of certain key performance metrics. Mainly in this work we will judge the performance of Delay, congestion rate, throughput and channel capacity EECP based solution for a steady state against these key performance metrics.**

***Index Terms*—Heterogeneity EECP, RCM, Delay, congestion rate, throughput and channel capacity etc.**

I. Introduction

In past a few year or recent years the wireless tools are developing quickly and get the incredible success. As earlier slow speediness systems have be present compulsory to combine with the high speed Systems. But reason behind to growth in Internet scope and users are probable to understanding longer delay, for further packet damage and further routine poverty problems because of network congestion. Firmly this problem was tried through network facility providers in terms of kind utilization of the net slow, which possibly will respect such as an infeasible description. For example the Internet is increasingly conquered using the internet protocol and packet switching; therefore to growth of network presentation in positions of agreeable facility to customers is measured as stimulating problematic [11]. Nowadays, end of the Internet systems, restricted access mechanism tool are implemented at transports layer. Due to delay complex environment of software uses, the necessity functioned of significance origin for satisfying the quality of service controls [12]. Network traffic made through the software requests as identified by nature and as of accidental queuing in routers here we have planned of occurrence overcome the problem of delay jitters and end to end delay. Generally most of the congestion control appliances, system routers are well-found through extension descent device taking predetermined capability sequence. When the server is tiring, tail drop mechanism that provide lodgings the incoming packets provisionally then upon sequence complete phase the received packets are released consequently. Separately from difficulty, the method may suffer various complications i.e. lockout behavior, overall organization and filled sequence [13]. The issue of filled sequence is the leading trick which can build time-consuming delay and create this device an incorrect choice for real time uses.

A. Congestion Avoidance Mechanism

As defined beyond, our device rest on scheduled active sequence organization the routers to perceive initial congestion and usages Internet Control Message Protocol to handle the source sate messages and specify the congestion state back toward the senders whose packets are elegant in congestion, as presented in Fig.1.

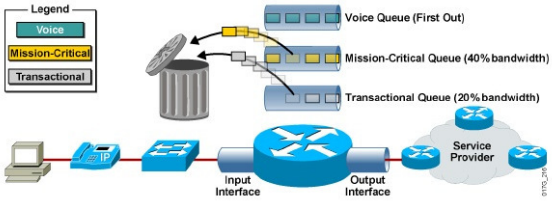


Fig.1.1: Source and destination mechanism in congestion control

(i) Router mechanisms.

The router dynamic sequence managing process determines initial congestion. In this case, the initial packet leads as verified in instruction to organize two different circumstances:

1st ECN marked, and 2nd last packet of a burst packets that going to the parallel flow and left in the router's sequence. If packet is not visible, then ECN bit is set in the internet provider header. If 2nd rule put on and if the packets of the burst do not hold any ECN mark, an internet control message protocol source satisfy message is reverted to the source of the burst.

The ECN bit set in the internet provider header of a packet is used over the successive congested routers as a suggestion that the burst has formerly passed complete at smallest amount one congested router. Hence, an internet control message protocol source quench was already interconnected to the sender for this burst and an added internet control message protocol source satisfies broadcast is circumvented.

After the router's sequence grows full, the sequence come at the congestion state then the incoming packets are released. The sequenced packets to be sent are tested as in the developing congestion case.

(ii) Mechanisms of Sender

The sender response to network congestion which is greatest searching part of a congestion avoidance structure, controlling the loss rate at the restricted access link, the active request of resources and the parity between the flows elaborate. Discussions between sender and receiver concluded resources of end-to-end movement controller devices that permit establishment data broadcast rate limits absolute by receiver.

These limits are known as restrictions. In this case, transmission protocol controls through a window device that usage for acknowledgments to promote the buffer space of the receiver to the sender.

Let assume, each node can communicate to nearby node using the side of an interval and cannot communicate or receive concurrently. Each location dependent knot has a restricted communication variety and conflict between relations.

Time is located in intermissions of equivalent unit length and the i^{th} slot signifies to the time intermission [i, i + 1), where i = 0, 1, . . .; i.e., transmission goes of each node ensue at discrete time instances i. Assume a MAC protocol based on random access with probabilistic broadcasts. Each node n transfers data with possibility qn at the start of a slot. To determine the send data, it selects one of its outer links l ∈ Lout(n) with probability pl/qn, where pl is the link resolution option;

$$\text{Sum } (pl)=q_n \ <=1 \ \text{ where } l \in L_{out}(n)$$

The utility is maximum is $\max(\text{sum}(U_s(x_s))$ the link throughputs specified p and q, as the duration $pl*\prod (1-q_k)$where $k \in N^l(l)$is the possibility that a packet is transferred over link l and successfully acknowledged by its receiver.

II. Related Research Works

Generally network congestion occurs when collective demand exceed be the greater than as associated to the manageable ability of the properties.

Congestion and safety attacks are mutual occurrences in source controlled wireless sensor networks, especially for distributed network, somewhere a large capacity of high bit-rate multimedia data needs to be managed by the network. Trust-based bottleneck aware routing in WSNs is a novel investigation subject and has not been lectured in writings to an unlimited scope. T-LEACH [3] is the enhanced type of the generally known data-gathering procedure, low energy adaptive clustering hierarchy [4], which reduces the no. of cluster bean collections and therefore covers the generation of the network, likened to that of other comparable procedures, but it does not takings trust & congestion into explanation. TRANS [5] defines a set of routing protocols prepared with trust organization. In the fuzzy c-means clustering protocol [6], Zarei et al. have recommended a fuzzy logic-based trust approximation system for congestion controller in wireless sensor networks. Fairness Congestion Control for a dis Trustful protocol [7] is essentially an adaptation of FCC, in which the Threshold Trust rate is used for choice making. Our previous work, which shows a major improvement completed the Fairness Congestion Control for a dis Trustful procedure, is considered in TFCC [8], in which road traffic flow from the source to sink is improved by adaptive data-rate control and data routing takes place by asset of the Link State Routing Protocol.

III. Problem Statement

Nowadays, Congestion likes a big issue that arises on joint networks when numerous operators resist for use to the similar properties. Consider adjoining throughway congestion. As added numerous vehicles enter on freeway when congestion gets inferior.

Ultimately, the access can back up to avoided vehicles from receiving on next to all. In packet-switched nets, packets travel on out of the barriers and files of exchanging procedures as they pass through the system. In detail, a packet-switched system is frequently mentioned to as a "scheme of sequences Congestion classically studies where various associations feed into a single link, such as where internal local area networks are associated to wide area network links. Congestion also arises at routers in core networks where nodes are exposed to more traffic than they are designed to handle. Transmission control protocol/internet protocol networks such as the Internet are specifically vulnerable to congestion as of their basic connection-less environment. There are no computer-generated routes with certain bandwidth. Packets are inserted by several hosts at some time, and individual's packets are mutable in size, which variety forecasting traffic flow designs and providing certain service unbearable. While connectionless systems have benefits, value of service is not any of them.

IV. SYSTEM MODEL

Size of Congestion window

Boundary of Sender-side on the measure of data sender can formerly receive an acknowledgment from the client. The cwn variable is not promoted or exchanged among the sender and receiver in this condition, mutable preserved through the server in London. Further, a new rule is introduced: the maximum amount of data in flight among the client and the server is the least of the rwnd and cwnd variables.

The explanation is start slow and to raise the window size as the packets are approved: slow-start initially, the cwnd start cost was normal to 1 network section; RFC 2581 effective this cost to 4 segments in April 1999; most newly the value was amplified when more to 10 sections through remote function call 6928 in April 2013.

The determined quantity of data in route for a novel transmission control protocol assembly is the minimum of the rwnd and cwnd cost; a modern server can send up to 10 network segments to the user, at which point it must stop and wait for an acknowledgment. At that time, for each established ack, the slow-start process displays that the server can increase its cwnd window size by one fragment for each acknowledge packet, two new packets can be main. This phase of the broadcast control protocol connection is frequently acknowledged as the "exponential growth" process (Fig. 4-1), as the client and the server are challenging to promptly meet on the available bandwidth on the network path between them.

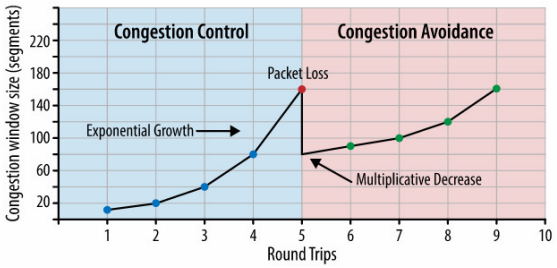


Fig.4-1. Congestion control and congestion avoidance

Thus it is slow-start a significant issue to save in mind when we are building applications for the browser. Well, hypertext transmission protocol and numerous other application protocols run over transmission control protocol, and no substance the presented bandwidth, each transmission control protocol assembly must go decided the slow-start phase. We cannot use the whole capability of the link instantly.

As an alternative, It start with a minor congestion window and binary it for every cycle — i.e., exponential growth. As significance, the time is required to range a precise target function of both the round trip time among and the client and server. The initial congestion window size [14].

Reaching time for cwnd size of size N

$$\text{Time} = \text{RTT} \times \left\lceil log_2 \left(\frac{\text{N}}{\text{initial cwnd}} \right) \right\rceil$$

To handling the assume following situation:

- Client and server obtain spaces: 65,535 bytes (64 KB)
- First congestion window: 10 sections (RFC 6928)
- Round trip time: 56 ms (London to New York)

In spite of the 64 KB obtain window magnitude; the output of a original transmission control protocol

assembly is firstly restricted through the size of the congestion window. In circumstance, to extent the 64 KB accept window boundary, we will first necessity to develop the congestion window size to 45 sections, which will take 168 milliseconds:

65,535 bytes /1,460 bytes ≈ 45 segments

56 ms x [$\log_2$ (45/10)]=168ms

That's three round trips (Fig. 4-2) to reach 64 KB of throughput among the client and server! The fact that the client and server may be accomplished of relocating at Mbps+ data rates has no consequence when a new connection is recognized [14].

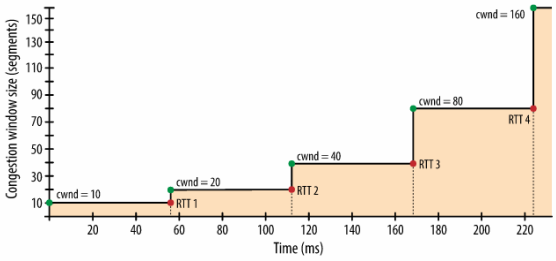


Fig.4-2. Congestion window size growth

To drop the sum of time it proceeds to produce the congestion window, we can decrease the round trip time among the user and receiver, or we can growth the preliminary congestion window size to the new RFC 6928 value of 10 sections.

V. PROPOSED IMPLEMENTATION

A.Congestion-avoidance techniques

In congestion avoidance, monitoring of network traffic do effort to forecast and ignore congestion at mutual network and internetwork traffic jam before congestion converts in a big problem. These techniques provide special action for best traffic once there is congestion while simultaneously exploiting network quantity & capability use and reducing delay and packet loss. Routers capacity also drops packets for other less mutual explanations:

- **Input sequence drop:** In this leading control handling unit is demanding and cannot develop packets.
- **Ignore:** The router rings out of barrier space.
- **Overrun:** The control processing unit is busy and cannot allocate a free buffer to the novel packet.
- **Frame errors:** The hardware detects an error in a frame; for example, cyclic redundancy checks, runt, and massive.

Packet loss is frequently the outcome of congestion on a boundary. Maximum submissions which use transmission controller protocol knowledge go-slow as broadcast control protocol mechanically regulates to network congestion. Released transmission control protocol sections reason TCP assemblies to decrease their window sizes. Certain submissions do not use TCP and cannot tackle drops.

A. Approaches for prevent drops in complex uses:

- Growth connection ability to security or avoid congestion.
- Assurance sufficient bandwidth and growth defense space to put up bursts of traffic from delicate movements. Here numerous tools presented in Cisco input output scheme excellence of system software that cans assurance bandwidth and gives selected promoting to drop-sensitive uses.
- To prevent congestion through reducing poorer importance packets formerly congestion occurs. Cisco value of system delivers queuing mechanisms that start dropping lower-priority packets before congestion follows.

B. Cicco IOS QoS software gives the subsequent mechanisms to avoid congestion:

- **Traffic controlling:** Traffic regulating broadcasts bursts. Once the traffic amount ranges the arranged extreme rate, added traffic is released. The outcome is a production rate that seems as a scored with apices and troughs.
- **Traffic shaping:** In compare to policing, traffic shaping preserves spare packets in a sequence and formerly programs the additional for advanced broadcast over increases of time. The consequence of traffic determining is a round packet output rate.
- There are three basic steps involved in implementing quality of system on a network:

C. Identify types of traffic and their requirements:

Study a network to control the type of traffic that is running on the network and then control the quality of system requirements desirable for the different kinds of traffic.

- **Describe traffic programs**: The action traffic collection with similar excellence of system necessities into modules. For instance, 3 classes of traffic strength are definite as mission-critical, voice and best power.
- **Define quality of system policies**: quality of system strategies come across with feature of scheme requirements for each traffic class.

D. Heterogeneity EECP

In heterogeneous distributed systems, outcome done expected routes that depend on the minimum data rate of its whole associations. The EECP protocol which used for appreciate precise event detection, energy effectiveness and less traffic. The declaration of protocol will deal an effective mobile agent based clustering algorithm to appreciate the energy potency and congestion resolve. In a way of associates with numerous files amounts, In case of high data rate node forwards more transportation to a low data rate node, near to chance of congestion, which proposals to long line up delays in such instructions. In the meantime hop count is used as a routing metric in outmoded direction-finding, it do not adjust to mobile nodes. A congestion-aware direction-finding metric for mobile ad hoc networks should include broadcast ability, dependability, and congestion about a connection.

E. Rate Control Metric

We recommend a new metric identified as RCM, conveyed concluded stochastic values. The routine of this metric in observation of active congestion control in the complex Internet work scheme is evaluated complete model.

Formulation of RCM

The mechanism of rate control mechanism is approved for allowing for the design challenging for implementation model of rate monitoring feature in future architecture of Internet. The rate control instrument prototypical deliberates strategy of rate monitoring issue in model mode where an interacting scheme like router controls a component rate R_{unit} for each single communication regularity. The router period "stamps" Runit on all communicated data pack/package and progressive to the sender node to designate deliberate rate alongside the routes. It keeps the sender to start itself for a small compacted data transmission to avoid congestion.

Automatically, in instruction to put on computer allocation, then router will similarly considered to suggestion the corresponding speed to each movement, effort to block the leaving communication path by recognized traffic, and save the sequence tenancy close to zero. In view of the traffic deterministic, the major object of the projected work is appreciating the performance of the upcoming Internet construction. Seeing Lcap as ability of the message connection and $Traf\_Rate_{Agg}$ as projected combined involvement traffic rate through the last appraises intermission, the experiential remainder defense of network can be considered as:

$$\text{Remnant Buffer} = \text{Lcap-Traf\_RateAgg} \quad (1)$$

The above eq. is calculated (1) that may differ permitting to the category of network. Similarly, recommended scheme is explored by experiment based work, a constancy constraint is including for best correctness (ψ). Consequently, eq. 1 develops:

$$\textbf{Remnant Buffer} = \psi\ \textbf{(Lcap-Traf\_RateAgg)} \quad (2)$$

The recommended method still accepts the congestion percentage extremely traffic message connection, that is written through router as it permits done the system. The acceptor connects the congestion rate to the source by I_{update} factor wherever it appraises the intermission frequently. The round trip time conveys the source's facts and it is used for updating round trip time. Hence, eq.2 such as enhanced:

$$\text{Remnant Buffer=R=Iupdate/Mavg}\ (\psi\ (\text{Lcap Traf\_RateAgg}) \quad (3)$$

The beyond equation maintenances in approximating the remnant barrier help in rate control mechanism construction. The characteristics ψ & ρ are regularly help in the observed assessment of blocking control device. To enhance the presentation of novel metric rate control mechanism have presented a new feature in equation 4. The new attribute is reached built on sequence magnitude and M_{avg}.

NA for end host = NA= ρ.Sequencesize/Mavg (4)

Now recommended novel metric rate control mechanism is developed allowing for the current

projected link capacity γ. It is definite as represented in equation. 5.

$$\gamma = 1 + R\text{-}NP/Lcap \quad (5)$$

Then attained the recommended novel metric rate control mechanism. It is definite as the produce of $R_{atelast}$ and the present projected link volume (γ).

$$RCM = Runit\ (t) = (t - Iupdate)\ :\gamma \quad (6)$$

It is perceived that rate control mechanism which was applied in the example distributed network as presented in Fig. 1 has operative control over the stability, individuality of the link measurements, the current occurrence, and the net round trip interval.

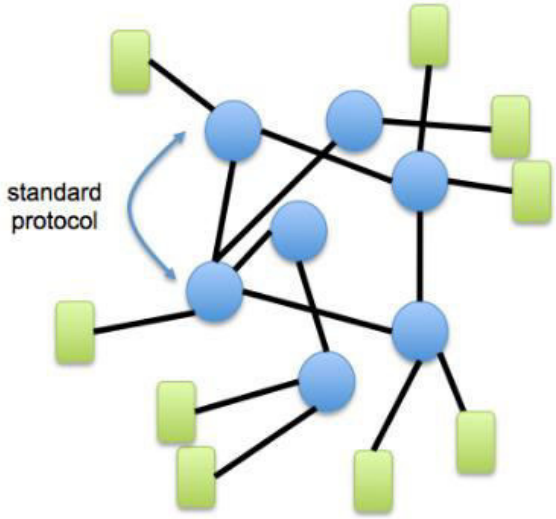


Fig. 1: Scattered/distributed system

Deliberate h1 as tester time, C is the connection volume, Tp be the system delay, N0 be the amount of contributors, and p0 be the anticipated reducing likelihood for founding the constancy completed the designated linkage. The frame at symmetry can be expressed as $W_0 = \sqrt{(1/p_0)}$ and RTT in signified as $R_0 = (N_0.W_0)/C$. Correspondingly, sequence length at stability can be specified as $q_0 = C.$, although the max. & min. sequence distance is signified as Qmax $= q_0 + 100$ and Qmin $= q_0 - 100$. Later, the eigenvalue matrix of the circulated interacting scheme is exemplified as:

$$bo = \max (Eo)\ (\alpha + \beta.\exp \sqrt{-1}Freq.Ro)) \quad (7)$$

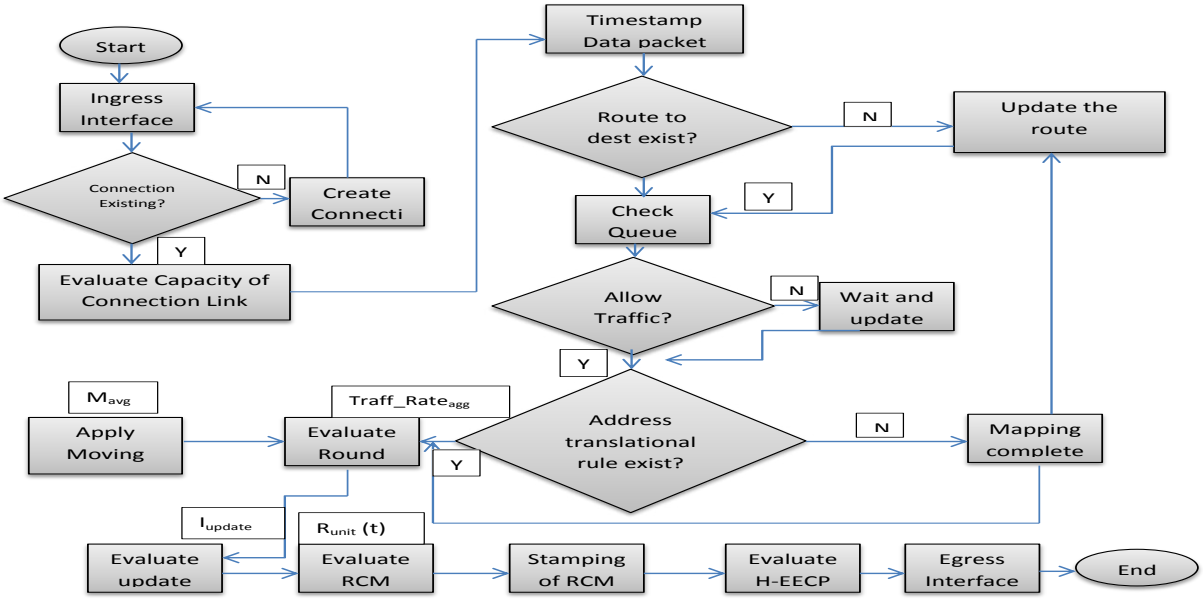
As above equation 7, Eo is the purpose for accomplishment eigenvalue of classification matrix, α is the matrix appraised from the no. of transmitters No, and round trip time Ro, although β is additional scheme matrix seeing reason being congestion.

$$\beta = \left\{ \left(-\frac{N_o}{R_o^2}.C \right), 2.\frac{C.R_o - q_o + q_{\min}}{C.(q_{\max} - q_{\min})}.R_o^2 \right\} \quad (8)$$

The beyond equation. 8 provide the cost of β which is recommend for Eq. 7. Later, if bo > 0, before the circulated system can be measured as unbalanced. It is required to development bo as it is extremely non-deterministic in nature outstanding to the dynamic traffic state in viewpoint Internet construction. Consequently, in training to project a stochastic perfect, a distributed network association is stately in its high traffic proper as bo is a non-deterministic prescribed.

F. The algorithm to implement rate control mechanism with Heterogeneity EECP is as follows:

1. Input sample packet
2. Design congestion Header (14 byte.
3. Con Header = {bottleneck krate(x), reversepathx, RTT}
4. Design end host function
5. Each node initially advertises its neighbour'sinformation with rest of its neighbours.
6. If(neighbor of a node changes)
7. {
8. Each node advertises its neighbor mobile nodes to all other neighbors using H-EECP.
9. Route selection
10. Route discovery is done by sender according to routing tables shared. Only those routes are selected which have minimum traffic based on Genetic algorithm
11. Read inbound packets→update RTT
12. Timestamp rate in outbound packets.
13. Estimate
14. Initiate packet processing on Arrival of packet
15. In bound_Bytes + = Data_size_Bytes
16. If (Current_data_RTT < Max_RTT)
17. ΣRTTTx + = Current_data_RTT
18. Σ Data_with_RTT + = 1
19. .Perform processing on outbound data
20. If (Data_BW_Request > Estimate_Ctrl_rate)
21. Data_BW_Request = Estimate_Ctrl_rate
22. Perform evaluation (throughout, delay, congestion rate and channel capacity)
23. End



Fg.5.1: Proposed Flow chart

VI.RESULT

The proposed congestion control scheme is implemented on a multihop network. The network is created with randomly distributed nodes. Assume network having following properties:

Input parameter	Values
Networks	Distributed systems
Sample Period	10^{-3}
Link Capacity	1000
the number of TCP senders	60
Desired Dropping Probability	0.1
Number of channels	4
Number of trials	7
Timestamp rate in outbound	1000
Timestamp rate in outbound	100
Simulation tool	MATLAB 2014a

This segment present an advantage of the projected H-EECP system examined concluded with wide MATLAB models. In the simulation experiment, we have taken four parameters namely queuing delay, congestion rate, and Throughput and channel capacity of the nodes. Primarily, we have measured nodes are all significant nodes. The confidence cost of the node is efficient intermittently afterward Δt seconds. The Trust Threshold level is occupied as 0.5 while min. and max. Trust values are 0 and 1 individually. The parameters are chosen as: Sample Period=10-3, Link Capacity=1000, number of transmission control mechanism senders =60, Desired Dropping Probability =0.1, Number of channels =4, Number of trials=7, Timestamp rate in outbound =1000 and Timestamp rate in outbound=100 Fig. 6.1 shows the graphical view of the Throughput, we can see that the higher throughput gain by the H-EECP.

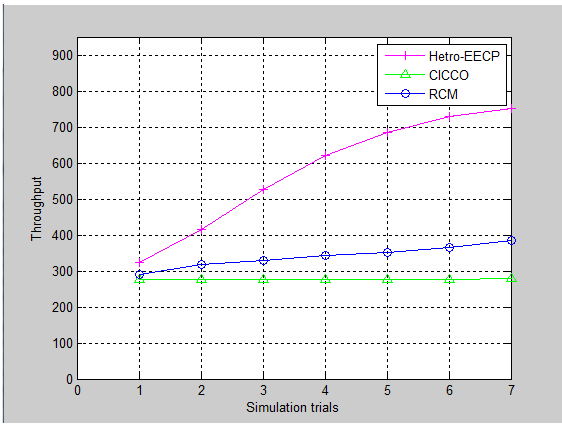


Fig.6.1: Simulation trials Vs Throughput for Hetro-EECP, CICCO and RCM

Throughput: It is known as the packets received positively.

Fig.6.1 provides the throughput for three procedures once the simulation trails is amplified. As seen from the fig. the quantity is new in the case of Hetro-enery efficient and congestion aware protocol as compare to rate control mechanism and CICCO

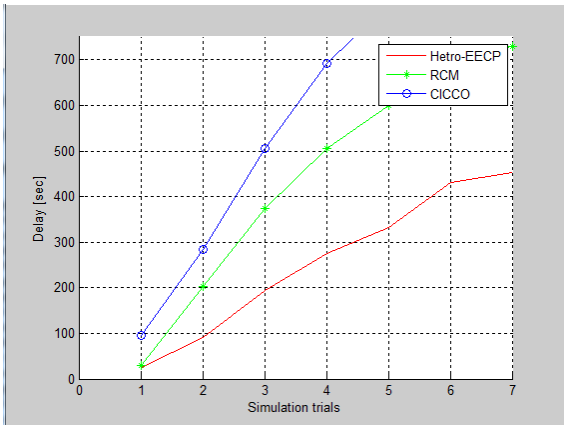


Fig.6.2: Simulation trials Vs Delay for Hetro-EECP, CICCO and RCM

Fig.6.2 shows the delay time while an incident arises, when the 1st packet recognized at the base station. This condition as first package goes over the sensor nodes nearby the path that can break wide-awake for this work. From now, subsequent packets do not necessity to obtain the wake-up delay at every hop, and hence the end-to-end delay for the resulting packets is considerable smaller than that of the 1st packet.

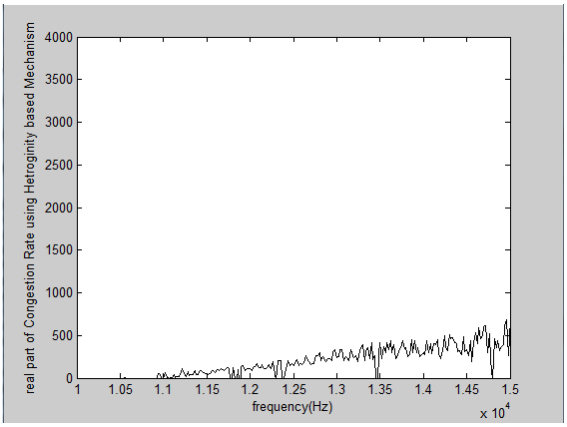


Fig. 6.3: Frequency Vs congestion rate for Hetro-EECP, CICCO and RCM

Frequency parameter

This is usages node hop mechanisms between different channels. Two variations are explained as:

- **Common hopping:** If nodes decide to interchange the data packets and reply the bounding sequence after the transmission, all nodes hop permitting to the same patterns and also remain in the similar network.

- **Independent hopping:** Nodes don't depend on the other nodes' hopping classification. They usually follow their own bounding sequence which allows the talk of hopping sequences.

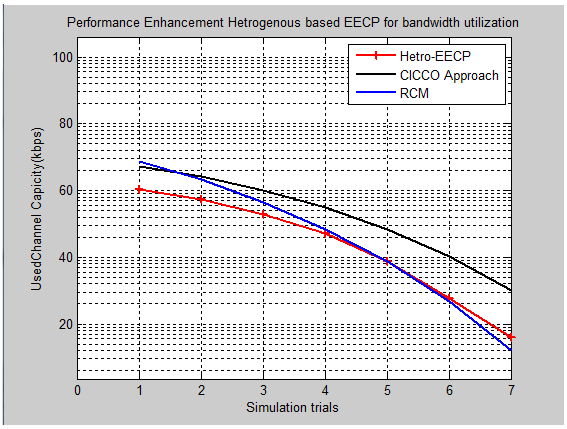


Fig. 6.4: Frequency vs. congestion rate for Hetro-EECP, CICCO and RCM

A smallest-cost straight track ranking involving all nodes can be produced to classify the minimum-cost

tracks after sensor nodes to sink. Direction-finding the facts pack in the direction of the sink on these minimum-cost tracks is capable as long as the rate of indication collection is low or the network capability is correctly high. The average access controller protocol controls the mean rate at which a sensor node can connect data to its neighbor over a wireless network. This rate is the frequency volume.

VII. Conclusion

In heterogeneous distributed network congestion follows with incomplete resources and throughput through an assumed route is dependent on the smallest data rate of its whole links. Traditional routing procedures using hop count as a routing metric do not familiarize well to mobile nodes. So there is a need for a congestion conscious routing metric which includes transmission ability, reliability, and congestion about a link. We have advanced a hop-by-hop congestion conscious protocol which works a mutual weight value as a routing metric, founded on the data rate, queuing delay, congestion rate, and Throughput and channel capacity. We have used an energy-efficient and congestion-aware protocol that determines numerous disjoint routes from a source to destination, as our base. Between the learned routes, the route with minimum cost directory is selected, which is grounded over node weight of the entire in-network nodes source node to the endpoint node. By model consequences, it demonstrated that projected protocol achieves high amount and channel capacity, by decreasing the delay and packet drop.

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An Overview of Block Matching Algorithms for Motion Vector Estimation

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***Abstract*–In video compression technique, motion estimation is one of the key components because of its high computation complexity involves in finding the motion vectors (MV) between the frames. The purpose of motion estimation is to reduce the storage space, bandwidth and transmission cost for transmission of video in many multimedia service applications by reducing the temporal redundancies while maintaining a good quality of the video. There are many motion estimation algorithms, but there is a trade-off between algorithms accuracy and speed. Among all of these, block-based motion estimation algorithms are most robust and versatile. In motion estimation, a variety of fast block based matching algorithms has been proposed to address the issues such as reducing the number of search/checkpoints, computational cost, and complexities etc. Due to its simplicity, the block-based technique is most popular. Motion estimation is only known for video coding process but for solving real life applications many researchers from the different domain are attracted towards block matching algorithms for motion vector estimation.This paper is a review of various block matching algorithms based on shapes and patterns as well as block matching criteria used for motion estimation.**

Keyword- Motion Estimation; Compression; Redundancies; Block Matching Algorithm; Inter-frame; Motion Vectors.

I. INTRODUCTION

A video consists of a sequence of frames and the approach to compressing the sequence of frames can be viewed through two windows i.e. Inter-frame compression and Intra-frame compression. Classification of the frame is shown in Figure 1.Video compression [1,2] is a technology that reduces the bandwidth requirement for transmission of video signals. Lossless and lossy compression are two types of video compression techniques. There is no loss of information in lossless compression and in lossy compression, some amount of information is a loss. In the entire compression process, most computationally expensive and resource hungry operation is motion estimation. Two types of redundancies present in video sequences are spatial and temporal

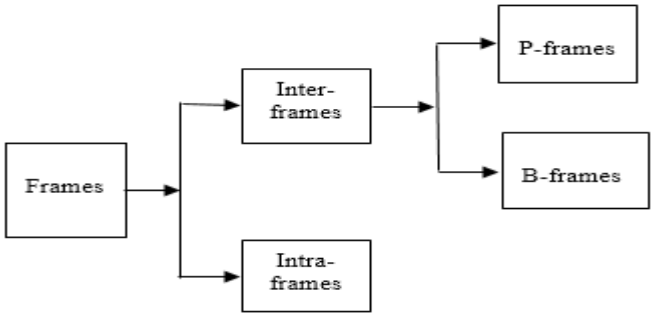

Fig. 1. Classification of Frames

redundancies. Redundancy among neighboring pixel in the image is called spatial redundancy where as redundancy between adjacent frames i.e. current and the reference frame in the sequence of the images is called temporal redundancy [3]. A coding technique that reduces spatial redundancies and temporal redundancies are called intra-frame coding and inter-frame coding respectively. The block schematic of coding technique (intra-frame and inter-frame)is shown in Figure 2. Motion estimation is the process which reduces the temporal redundancies in video sequences. Motion compensation is an algorithm used in the encoding/decoding of video data for video compression. Motion estimation is the most popular technique are used for implementing various video coding standards such as moving picture experts group MPEG-1 to MPEG-4, H.263 and recent/advanced video coding standards H.264/AVC.

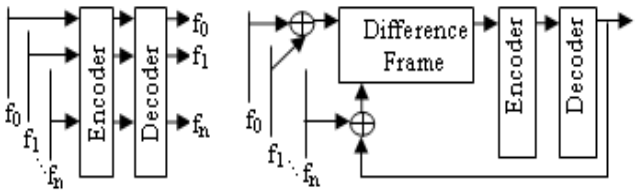

Fig.2. Intra-frame and Inter-frame Coding Technique [6].

This paper is organized as follows: Section II gives block matching criteria for motion estimation. Overview of motion estimation process is given in section III. Related work on block matching algorithms is given in section IV. Section V summarizes the conclusion and future scope from the studied literature followed by references.

II. BLOCK MATCHING CRITERIA

Block matching criteria give a way to find the best match of current block within the search window in the reference frame. Three popular matching criteria used as a block distortion measure (BDM) for block matching motion estimation [4] are mean square error (MSE), mean absolute difference (MAD), Peak to Signal Noise Ratio (PSNR) and sum of absolute difference (SAD) given by equation (1,2,3 and 4) respectively.

$$MSE(i,j) = \frac{1}{N^2}\sum_{i=0}^{n-1}\sum_{j=0}^{n-1}\left(C_{ij} - R_{ij}\right)^2 \quad (1)$$

$$MAD(i,j) = \frac{1}{N^2}\sum_{i=0}^{n-1}\sum_{j=0}^{n-1}\left|C_{ij} - R_{ij}\right| \quad (2)$$

$$PSNR = 10\log_{10}\frac{(peak\ to\ peak\ value\ of\ data)^2}{MSE} \quad (3)$$

$$SAD(i,j) = \sum_{i=0}^{n-1}\sum_{j=0}^{n-1}\left|C_{ij} - R_{ij}\right| \quad (4)$$

Where N×N is the size of macro block. C_{ij} and R_{ij} are pixels value compared to current and reference macro block respectively. Among all these MAD, MSE is mostly used and PSNR is used for finding image quality. In motion estimation algorithm, the macro block size is an important factor for motion vector computation. In most coding standards, smaller macro block size i.e. 8×8 / 16×16 is used to compute motion vectors (MV) between two macro blocks.

III. OVERVIEW OF MOTION ESTIMATION

The motion estimation is mainly of two types that are forward motion estimation and backward motion estimation. In the backward motion estimation, the candidate frame is considered as current frame & reference frame is the previous frame on which motion vectors are computed. Backward motion estimation escorts to forward motion estimation. Forward motion estimation is opposite of backward motion estimation. In the forward motion estimation, the forward motion vectors are carried out on a frame that appears after the candidate frame. Forward motion estimation drives to backward motion estimation. Motion estimation algorithms are of three types: pixel based, region based and block based. Pixel based algorithm is not preferred due to dependency on the threshold, as threshold value varies from pixel to pixel. Region based is restricted as it has large computations and complexity involved in segmentations. So mostly used is block based algorithm as it is simple and regular. In block matching process [5], the motion vectors are computed between the two frames i.e. current frame and the reference frame. The current frame is divided into a non-overlapping matrix of macro blocks. These macro blocks are compared with a corresponding block and its adjacent neighbors in the reference frame to find motion vector (MV). A motion vector is computed by finding the best suitable block matched between the current frame and the reference frame i.e. f and f+1 respectively. A motion vector (MV) for block B(x, y) is given as (+1, -1) as shown in Figure 3. The MV for all macro blocks comprising a frame gives motion estimated in the current frame. The displacement of pixels position of the reference macro block to the target macro block is called a motion vector (MV).

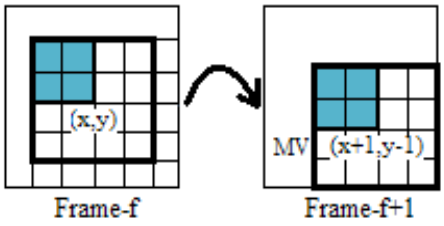

Fig.3. Motion Vector Estimation [6]

A searching window as shown in Figure 4 consists of 'p' pixels on all four sides of the macro block. Where p is called search parameter, as p increases the cost of motion estimation process also increases, p and cost are directly proportional. A macro block is considered as a square of 16×16 pixels and p has a value of 7 pixels in both direction i.e. horizontal and vertical. In the searchwindow, if the size of the block is increased then a total number of blocks that needs to be processed will decrease in each frame. This results in reducing the computational complexity.

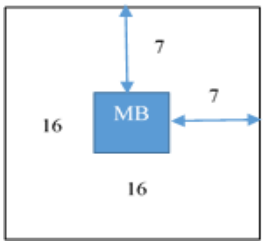

Fig.4. Search Window

IV. RELATED WORK ON MOTION ESTIMATION

The literature associated with block-based motion estimation techniques using various shapes are reviewed and discussed in this section.

A. Rectangular Shape Pattern

Koga and Iinuma [7] proposed the three-step search (TSS) motion estimation algorithm. It employs rectangular search patterns with different sizes. This algorithm is robust and very simple. The TSS algorithm is well known for low bit rate video application. It performs the coarse to fine search method and it gives the motion vectors. The algorithm steps are as follows: Firstly, choose the window size as specified area for searching the best match. Initially, plots eight points around the center point at an appropriate distance of step size and make choice for comparisons. In the step second, if minimum cost point i.e. BDM is found at any one of the nine points then halved the step size and then the center is shifted to that point for next comparison in the third step. In the step third, the second step is repeated until the step size for the window is smaller than one. The TSS requires 25 search/check points. This proposed algorithm doesn't work well on most real-world video sequences in which the motion vector distribution was non-uniformly biased toward the zero vectors.

Li et al. [8] presented the new three-step search (NTSS). NTSS suits well for searching large motion. It is faster and yields better motion estimation as compared to the TSS. The NTSS apply center-biased checking pattern and also consists of halfway-stop technique like TSS used to reduce the computational cost. In the first step of NTSS choose appropriate window size and plot 17 points on selected size of window. Out of these 17 points plot 9 points on the 3 x 3 grid on the central part of the search window and remaining eight points plot on the 9x9 window. If the minimum BDM is found at the center then search stopped/halt, otherwise, go to step 2. In the second step, if one the central neighboring point on the3x3 pattern is found to be minimum BDM point then go to step 3, otherwise goto step 4. In step 3, if the minimum BDM point is found in the middle of a vertical or horizontal edge of 3x3 window then plot 3 points or if the corner of the3x3 grid then plots 5 points. In step 4, if minimum BDM point is found on the outer9x9 window then the halfway-stop technique is used same as in the TSS. In NTSS 17 search/check points are required for the best case, in average case for stationary block 20 or 22 points are required and in the worstcase, 33 points are required.

Jing and Lap-Pui [9] suggested an efficient three-step-search (ETSS) algorithm. ETSS is the modification of three step search method. In ETSS, the motion vector is obtained by applying the small diamond shape pattern in the initial step with unrestricted search steps for searching the center-biased motion vectors. ETSS is useful for the large range of video application and for video sequences which involved complex and large motion such as a movie, sports etc. In ETSS choose search window of size 7. Initially, plot the 13 points. Plot 9 points on a 9x9 pattern same as in TSS and remaining 4 points plot in a pattern of diamond shape around the central point. If the minimum cost point i.e. BDM is obtained at the center then the search will be stopped/halt. If the minimum cost point i.e. BDM is found at the outer eight points then the search is same as TSS algorithm, otherwise goto step 2. In step 2, if minimum cost point i.e. BDM is on the small diamond pattern then additional 3 points will be checked. The center will be changed until the minimum cost point is found to be at the center of the small diamond shape pattern or diamond shape pattern reaches to search window boundary. In ETSS, 13 search/check points needed for the stationary block and in worst case29 points are required. Simulation results show that ETSS algorithm performs better than NTSS in terms of mean square error (MSE) and computation time is saving up to 15% on average.

Po and Ma [10] proposed the four-step search (FSS) algorithm which reduces the search points. It performs better than the TSS and similar to NTSS. In FSS, the center-biased approach is utilized with 9 checking points. In this algorithm the window size 5x5 is used in step 1 then window size is variable it depends on according to the situation which gives the minimum BDM point location. If minimum cost point i.e. BDM is found at the center then goto step 4, otherwise, goto next step. In step 2,if the minimum cost point in step 1 is found at the corner position then, 5 additional checking points are checked and if the cost point found in the previous step at the middle of vertical and horizontal axis then additional 3 search/check points are checked. If the minimum cost point is found at the center then goto step 4, otherwise go to step 3. In step3, searching strategy is same as step 2. In step 4, reduces the window size5x5 to 3x3. FSS requires 17search/check points for best case and 27 search/check points for the worst case. Xu et al. [11] presented improved three step search (ITSS) which is used for low bit-rate video coding applications. The number of computation is reduced by using 11 × 11 search window size instead of 15×15 search window size. It provides better performance than TSS and NTSS.

Nisarand Choi [12] proposed advanced center biased TSS. It reduces the number of computation and improved error performance. Block matching process is speed up by using half way stop technique and it performs better than TSS. Verma et al. [13] suggested fast three step search (FTSS) which is much robust, less computational complexity and has less error. A simple and efficient search (SES) algorithm is proposed by Lu and Liou [14] for motion estimation. The SES and TSS have similar regularity and parallelism but SES has twice sped up factor than TSS. SES performs better than TSS in terms of PSNR and MSE. SES is excellent in low bit rate application for implementation of real-time software applications.

B. Diamond Shape Pattern

For fast motion estimation, a new diamond search (DS) algorithm is proposed by Zhu and Ma [15]. Simulation results validate that it performs better than the three-step search (TSS). DS algorithm gives a close performance as new three-step

search (NTSS) but required22% of less computation on average. Two types of patterns are present in DS algorithm i.e. large diamond shape search pattern (LDSP) which consists of nine checking points out of these eight are plotted around the center one. The second pattern is called small diamond shape search pattern (SDSP) it comprises five checking point i.e. small diamond. The algorithm consists of following steps: In step 1, LDSP is plotted on the search region then checks the 9 points of LDSP. If minimum cost point is obtained at the center position then goto step 3, otherwise,goto step 2. In step 2, form new LDSP pattern if minimum BDM point in the next step is obtained at a point other than the center of LDSP. If the new minimum cost point is found at the center position then goto step 3 otherwise repeat step 2. In step 3, shift LDSP pattern to SDSP pattern if minimum cost point found at the center of LDSP. The minimum cost point is obtained in step 3 then calculate MV. DS requires 13 searches/check points in the best case. DS algorithm is better than 4SS and block-based gradient descent search (BBGDS), in terms of MSE and required a number of searching/checking points.

Small cross diamond search (SCDS) proposed by Hongand Po [16], motion estimation process is faster with negligible loss in video quality and it requires a very few number of search/check points. Cheng et al. [17] introduced modified diamond search (MDS) consist of the shape of small diamond search pattern (SDSP) in the initial search step then used a simplified large diamond search pattern (LDSP) in next search. Singh and Ahamed [18] introduced modified small cross diamond search for fast motion estimation. Nie [19] proposed adaptive rood pattern search (ARPS) algorithms, which consists of initial and refined the local search. In video coding applications it is a very robust and efficient motion estimation algorithm. The computation of video coding is greatly reduced with ARPS. Cheung and Po [20] suggested normalized partial distortion search algorithm whose MSE performance is same as full search (FS) algorithm but it reduces the computation 12 to13 times.

C. Hexagonal Shape Pattern

A novel hexagon-based search algorithm (HEXBS)is proposed by Zhu et al.[21]. The HEXBS algorithm calculates motion vector with less number of search points than the diamond search (DS) algorithm. The speedup factor of the HEXBS algorithm is more than the DS algorithm striking for finding large motion vectors. The HEXBS algorithm can discover any motion vector having fewer searches than the DS. Plot 7 points along with center point on the specified search area. If the minimum cost point i.e. BDM is obtained at the center of large hexagon shape pattern (LHSP) then LHSP is shifted to small hexagon shape (SHSP)and final MV is computed from the SHSP point. The small hexagon consists of four points. The final new cost point is the solution for the motion vector. Otherwise, if minimum cost point is other than the center of LHSP then form new LHSP to check another three points and again this process is repeated until minimum cost point found at the center of LHSP. HEXBS requires only 11 searches/check points for the best case. The HEXBS gives the efficient result than the FS, TSS, NTSS and DS. This algorithm shows the substantial speed enhancement and equal distortion performance with the diamond search (DS).

The cross-hexagon-based motion estimation algorithm using motion vector adaptive search technique is proposed by Li Hong-ye et al. [22].The proposed algorithm is combined with hexagon and cross search pattern algorithm. The experimental results show that the speed of the search algorithm is superior and searching points close to Hexagon algorithm (HEXBS).Zhu et al. [23] proposed an enhanced hexagonal search algorithm (EHEXBS) to improve the performance in terms of reducing the number of search/check points and block distortion. The experimental results show that the EHEXBS algorithm outperforms the original HEXBS up to 57% in both speed improvement rate & distortion decrease rate. Chorng-For further reducing the number of searching points Yann Su et al.[24] proposed an inner search algorithm, named efficient hexagonal inner search (EHIS). The EHIS uses the central minimal distortion information and exploits the distortion information of the points located in the hexagonal shape pattern. The EHIS uses the central minimal distortion information and exploits the distortion information of the points located in the hexagonal pattern. Simulation results show that EHIS performs better in terms of the number of search/check points and MSE than EHEXBS for fast block motion estimation. Cheung and Po [25] proposed cross-diamond hexagonal search (CDHS). Before the first step of CDS, CDHS employs a smaller cross-shaped pattern and in next step replaces the diamond-shaped with hexagonal search patterns (HSP).

Belloulata et al. [26] suggested new cross-hexagon search (NHEXS) for block motion estimation for fractal video coding. The NEHEX uses two cross-shapedpatterns as the first two initial step and large small hexagon shaped patterns as the subsequent steps for BME. NHEXS apply half way stop technique to achieve significant speedup on sequences with the stationary and quasi-stationary block. Experimental results indicate that it reduces the encoding time & increases the compression ratio and quality of the video. Kamble et al. [27] proposed modified three-step search (MTSS) which consists of three-step search (TSS) and Hexagonal Search (HEXBS).A new block matching motion estimation approach i.e. diamond-arc-hexagon search (DAHS) which uses diamond, arc, and hexagon search patterns to accomplish the fast searching process proposed by Lin and Chiang [28]. DAHS are best for both quasi-stationary and large motion computation.

D. Motion Estimation for Video Coding Standards

Motion estimation widely used to video coding standards such as MPEG-1 to MPEG-4, H.264 to H.263 and recent/advanced

video coding standards H.264 of video data for purpose of storage requirement and transmission.

Park et al. [29] proposed fast three-step search in H.264. For searching motion vector, it uses error surface and pixel interpolation property of SAD. Time taken to calculate for motion estimation was reduced by approximately 24% for encoder processing and by approximately 51 % for sub pixel processing. Parallel architecture for efficient new three-step search (NTSS) in H.264 is proposed by Ho et al. [30]. Among the all existing previous works, this architecture is the best tradeoff in terms of hardware area overhead and speed. To separately encoded frame, it adopts the partitioning technique. Experimental results show that NTSS architecture can reduce the encoder time while maintaining similar PSNR compared with traditional NTSS.

So and Wu [31] suggested four step genetic search achieving better quality of video. This algorithm is suitable for H.261, MPEG-1, and MPEG-2. Tsai and Pan [32] proposed 3-D predict hexagonal search (3DPHS) on video coding standard H.264. 3DPHS depends on the motion vector distribution characteristics. It uses a rood-shaped search pattern at first two steps of searching with a higher probability to get motion vector. It also predicts the movement of an object in a vertical and horizontal direction. Simulation results show that it increases the speed by 25% to 75% over other fast block matching algorithms. New hardware-oriented modified diamond search for H.264/AVC for motion estimation is proposed by Ndili and Ogunfunmi [33]. The goal of this architecture is to support low bit rate applications as well as of high-quality video mobile devices with low power. This architecture is more hardware-efficient. Simulation results show that, it has better speedup quality and rate-distortion performance. Kamble et al. [34] proposed a modified three-step search (MTSS) block matching motion estimation algorithms and finite automata theory based fractal coding approach.

V. CONCLUSION AND FUTURE SCOPE

Based on studied literature, it is found that there is a scope for improvement on developing the fast motion estimation algorithm in terms of reducing the number of search/check points. The performance of different existing motion estimation algorithms is measured by conducting experimentation on different video sequences i.e. soccer, suzie, traffic, football, ice, akiyo, salesmen, missa, tennis, and mobile etc. within macro block size 8×8 or 16×16. The comparison for different block matching algorithms discussed in this paper based on the number of search/check points per macro block is given in section IV. Existing algorithms for motion vector estimation used in various applications such as medical, security, space science and psychological studied etc. The MAD and MSE are mostly used as a block distortion measures for motion estimation. Among the all motion vector estimation algorithms based on block matching received a high attention by researcher because of their simplicity and regularity.

These motion estimation algorithms are limited by shape pattern and searching speed so that fast movements in video sequences can't find exact/correct motion vectors. There is the scope for expansion in developing the new block matching algorithm or by combining existing algorithms i.e. hybrid algorithm based on different shape and search patterns so the computational cost, the number of the searching point will reduce as compared with traditional fast motion estimation algorithm. Also, we will try to implement new block-matching estimation algorithm for efficient video compression and tracking single/multiple objects in the video. In future, other evolutionary computing techniques i.e. nature-inspired algorithm- genetic algorithm, particle swarm optimization etc. also can be tried to estimate motion vectors for better performance. Comparisons of existing algorithms in terms of the searching points are given in Table I.

TABLE I: COMPARISON IN TERMS OF SEARCHING POINTS

Motion Estimation Algorithms	**Number of Searching Points**		
	Best Case	***Average Case***	***Worst Case***
Full Search (FS)	225	225	225
Three Step Search (TSS)	25	25	25
New Three Step Search (NTSS)	17	17 to 33	33
Efficient Three Step Search (ETSS)	13	13 to 29	29
Improved Three Step Search (ITSS)	17	17 to 22	22
Four Step Search (FSS)	17	17 to 27	27
Diamond Search (DS)	13	13 to 30	30
Cross Diamond Search (CDS)	9	9 to 29	29
Hexagonal Search (HS)	11	11 to 30	30

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Approaches used in efficient migration from Relational Database to NoSQL Database

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***Abstract*—now a days, the emerging software applications producing the large volume of data rapidly. Hence, sufficient management of such a large data is major challenge. The traditional relational databases are inefficient to handle such a dynamic data which would be in any form (i.e. structural, semi-structured or hybrid). The ever increasing data have pushed the centralized databases like oracle, MySQL, SQL server to their limits. So, the NoSQL databases are the new generation databases for tackling such a problem with terabyte to petabyte of datasets. Hence, many leading companies such as facebook, Amazon, eBay, foursquare and many more using NoSQL databases. Some companies' still using relational databases and they wish to move towards new technologies, this motivated us to study the approaches used for migration of databases from relational database to NoSQL database. There are different techniques in the literature introduced by people for such migration. This paper surveys different approaches used for Migration of structured database to un-structured database.**

***Keywords*—Relational database, MySQL, SQL server, Oracle, NoSQL, Migration**

I. Introduction

In recent years the increasing volume of data (i.e Millions of queries per second) makes query processing, data retrieval speed slower and limits the traditional relational databases like MySQL, Oracle, SQL server. The relational database stores the data into tabular format and they follow specific structure, in the form of rows and columns. Ever increasing growth in data limits the traditional relational database and makes query processing, data retrieval speed slower. The new generation databases such as different NoSQL databases (i.e. Cassandra, MongoDB, Redies, Hbase, CouchDB) can tackle this problems and provide efficient way to handle such Big Un-Structured data which would be in the form of images, audio or video. The NoSQL is Database Management System is also referred as "Not-Only SQL". The NoSQL make it easy for application to build, scale and deploy.

II. Relational vs NoSQL

The relational database and NoSQL database are different in their data-structure. The relational database is suitable only for structural data whereas the NoSQL databases could have structural as well as un-structural data. The relational databases follow strict ACID rules wherein if business requires large volume of data which don't need to be up-to-date and not all node in the cluster follow strict ACID property then the NoSQL is better fit.
The NoSQL databases mainly developed to serve the purpose of performance, high availability, scalability availability, scalability (i.e. horizontal scaling).
That means the NoSQL database can allow any number of nodes to be added parallel to the distributed cluster. Wherein, the relational database allow vertical scaling in this we can add hardware at centre to serve more number of users this increases the complexity of system.

III. Comparison between NoSQL databases

Relational Database MySQL suffers when dealing with millions of query per second. Hbase is better at write speed where the Cassandra is best fit for read speed. The MongoDB is write-capable which provides the dynamic schema documents of many form can be easily added within the same collection.

Today's leading companies like Facebook, Google, Twitter, Amazon, eBay moving towards the new technologies, they have influenced the use of NoSQL database. The facebook introduced the Cassandra for their inbox search. Now, they are using Hbase for same purpose. The facebook instagram switched to Cassandra from Hbase as instagram is a facebook family now. Different NoSQL databases are introduced with their own specific feature and purpose, Example. The MongoDB is Document oriented data structure which stores the data in the form of documents and collections.
MongoDB isn't replacement for relational databases. It can serve some different needs. MongoDB works well if we want to write data a lot. Apache Cassandra is right choice for those who want high availability without affecting performance. Similarly, Hbase is data store uses columnar family. The NoSQL databases discussed above can process billions of

rows and columns per second which is not possible with relational databases.

The new generation software producing the large volume of data which can be in the form of Structured, Un-Structured or Semi- Structured. So, the inability of relational Databases to handle such a rapidly growing data motivates to study the approaches used transformation from relational database to NoSQL databases.

The data migration contains three steps ETL (Extract, Transform and Load)

(1) Extract data from source database, (2) Transformation data, (3) Migration of data to the target database[6].

The first step extracts the data from homogeneous as well as heterogeneous database(i.e. Relational database) the next step is to transforms the data for storing in proper format for further querying. Third step migrates the data to the target databases (i.e. NoSQL database) the migration process contains many challenges; first one is large volume of data.

The second is representation of existing relationship have to be correct. The cost of adapting new database with existing applications needs to be addressed and there are different techniques in the literature introduced by people for migration of relational database to NoSQL database.

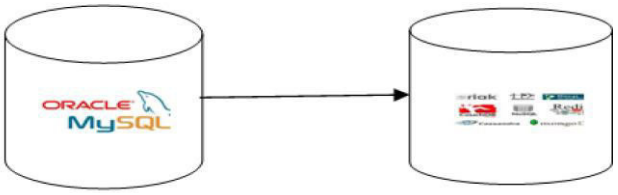
We can find many solutions in the literature that offers methods for migration from relational database to NoSQL database A paper presents NoSQLayer presented for migration of data and model from relational database (i.e. the MySQL) to NoSQL database (MongoDB NoSQL database) while keeping the semantic of the original database w.r.t manner the data is modelled and the way programmer write the source code to retrieve data from database [1]. A method presented by author which creates semi-automatically two logical levels over physical data [2].

A virtualization system which allow users to retrieve data from both sql and NoSQL database by using source specific API[3] A paper on schema conversion model for transforming SQL database to NoSQL proposed a method of graph transforming algorithm which can provide high performance of join query with nesting relevant tables, and for containing all required content of join query in a table by offering correctly nested sequence [4].The research in which the Methodology presented for migration from RDBMS to NoSQL databases. The author used MySQL as RDBMS and MongoDB as NoSQL database. Author discussed detailed analysis on NoSQL databases and its comparison with other NoSQL databases such as Cassandra, MongoDB, HBase etc in [7].

Now a days, the cloud computing area highly impacting the use of NoSQL databases, the emerging areas in cloud such as cloud computing threats such as categorization of threats in cloud computing [8] is hot topic in research area which increasing the popularity of cloud computing and indirectly the cloud technologies influencing the use of NoSQL database

Many companies such as facebook which using the Cassandra and MongoDB to improve respective read and write performance, wherein redies NoSQL database is used by twitter and instagram, HBase database is used by yahoo and adobe. Some companies still using the relational databases and wants to use the NoSQL databases.

Fig 1 illustrates the conversion from relational database source that is oracle or MySQL to Destination NoSQL databases would be MongoDB, cassendra, couchdb or redis.



Source database Destination database

Fig.1.Migration from relational database to NoSQL

II. Methods Used In Migration

Following are some approaches used for migration from Relational database to NoSQL:

The paper [1] presents the NoSQLayer framework. The framework consists of two modules: Data Migration Module and Data Mapping Module. In data migration module the elements for example, coloumn, rows are identified from source database and then they are mapped automatically into NoSQL model. At last complete data will get migrated.

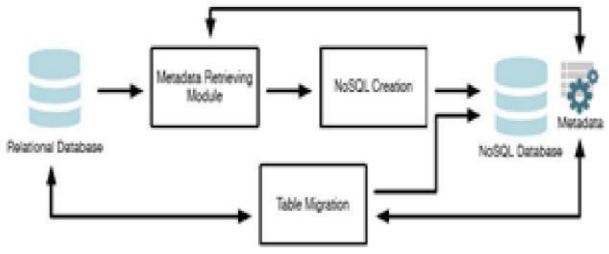


Fig.2. Migration Module Working Diagram

The migration module uses the Java Database MetaData API, which contains the methods and classes usefull for retrieving metadata e.g. getColumns(), getTables(), getMetaData() . Next step is creating new schema for NoSQL database. the NoSQLayer supports MongoDB[1] and the MongoDB is document store. So, the records which are retrieved previously stored in document format in MongoDB database.

Last step of this module migrates data which is retrieved from relational database by using select * from sql query and insert into MongoDB documents.

Data mapping module: data-mapping module provides interface between user application and NoSQL source. It uses mediator which is open source MySQL parser which acts as an interface which converts user request into source specific format.

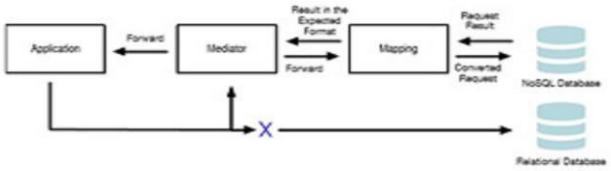


Fig.3.Mapping Module working Diagram

In [2] paper the nested relationships are handled efficiently by using mapping algorithm and also used index migration to support faster query search. The HBase database is used at backend in this approach. The virtualization architecture allow user to query and join from both databases i.e. from NoSQL and relational SQL using single SQL statement.

This architecture allows the applications to use jdbc API to interact with NoSQL as well as SQL databases while preserving the user way to query the database.
[3].

A. *SQL Query Parser*

- The parser checks syntax and also validates relations. It can be implemented using java CC supports standard SQL-92 syntax for SELECT, INSERT, UPDATE, and DELETE statements including inner and outer joins and GROUP BY, ORDER BY, and HAVING[3].
- The parser validates for correct SQL syntax and throws exceptions if syntax of user query is not correct.

B. *SQL Query Translator*

- The query translator takes the input tree which is generated by parser and validate fields by checking relational schema for database source.

C. *Schema Generator*

- In this step the NoSQL schema is generated here they considered NoSQL database as MongoDB so by considering data from all collection the schema is generated.

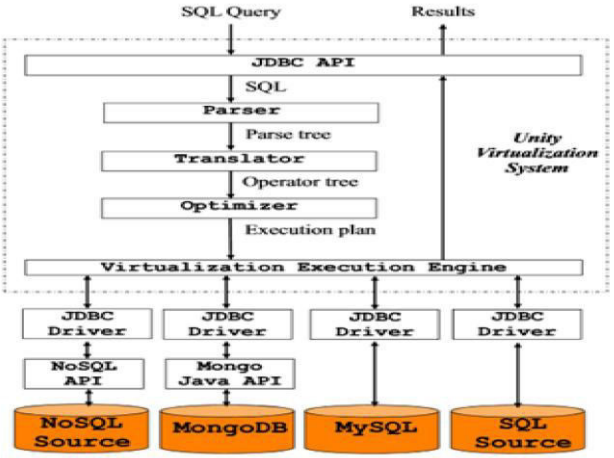


Fig. 4. Unity Architecture

D. *Query Optimizer*

- The main goal of optimizer is to perform all operations on the single database the optimizer also use different filters for faster query retrieval and execution.

E. *Execution Engine*

- The execution engine consist of implementation logic for different operators such as selection, different joins , projections, grouping etc.

F. *MongoDB SQL/JDBC*

- The authors constructed the MongoDB drivers for accepting the SQL queries.

G. *MongoDB SQL/JDBC*

- The Virtualization Engine contains different dialects database that perform mapping and in this step the regular syntax are identified.

The author introduced two logical levels over physical data for transformation from structural database into a Document store [4].

A. *Physical level of data*

The authors given example of university application which can store data in structural database which may contain logical objects such as Course, Teacher, Student, Lecture, Examination, Grade, and Attendance.

Fig. 4. illustrated the metadata of relational database. The relational database metadata is useful in conversion from relational database to NoSQL database.

B. First Logical level of data

The following Figure shows the metadata of relational database in this entity contains the table like structure which consist of view and table also the constraints like foreign keys and primary keys which play very important role in migration. The view and table is sub entity of the Table-like-structure and which having one to many relationship with attribute and primary key and foreign key are sub entities of constraint entity which has unique name, the unique key also comes under the PK_UK .

C. Second Logical level of data

The Table-like-structure (TLS) is taken as a basis for the document.

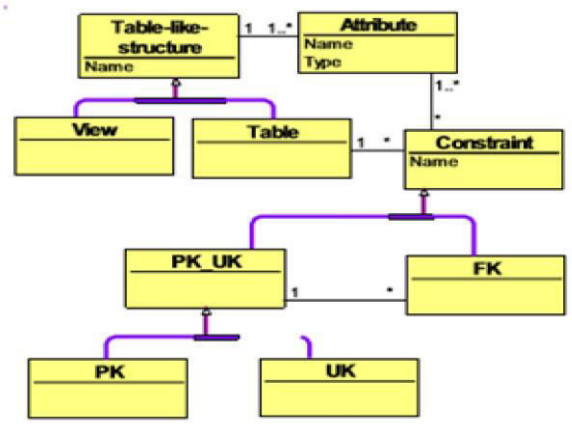


Fig. 5. Metadata of Relational Database

First, tree is created for Table-like-structures. Second, the new table-like-structures is added and others are eliminated. At last, authors chose attributes that are excluded from document.

D. Data Transformation

In this step the actual data is transformed and document is generated based on previously created template. All queries which are requested from application are executed and generated based on the template and metamodel transformation.

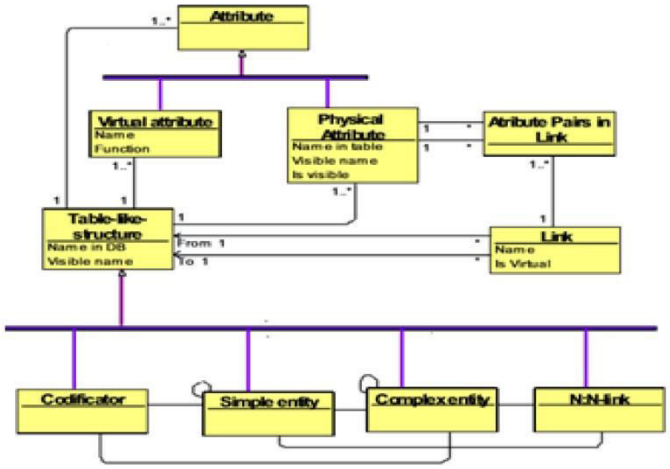


Fig. 6. Logical Levels of Data

The NoSQL databases not support the join queries. While migrating from relational database to NoSQL database the join queries brings poor performance. The authors proposed the graph based schema conversion model [5].

The paper [8] research focus is on the schema translation; more specifically set of rules are used to assist in translation process.

III. COMPARATIVE ANALYSIS OF MIGRATION APPROACHES

Table 1 shows the comparative analysis of the five approaches In paper [1] the NoSQLayer framework is used which preserves the semantics of original database and suitable to handle large volume of data. The authors [2] provided multiple nested approaches to improve the query performance and also contain migration of index for faster query execution. The unity virtualization architecture [3] allows us to use both the relational databases and NoSQL

TABLE I. COMPARATIVE ANALYSIS OF DIFFERENT APPROACHES USED IN MIGRATION

Parameters	Paper[1]	Paper[2]	Paper[3]	Paper[4]	Paper[5]
Approach/Method	NoSQLayer	Multiple Nested Schema	Integration and Virtualization	Structure Demoralization and Transformation	Graph based
Database used	MongoDB	HBase	MongoDB	Document-Oriented	MongoDB
Application	Web application	Coloumner database	UnityJDBC	Tool DigiBrowser	MySQL MongoDB migration system
Future scope	Will Extend NoSQLayer For other applications using different technologies	New algorithms will be used to identify table types and defining document structure	Parallelizing the Virtualization	New algorithms created for recognizing table types, defining document structure	Will use different techniques which are used to remove space problem
Advantages	Suitable to handle large volume of data	Improve query performance	Minimal overhead in SQL translation process	Easy to implement	Improve query performance
Disadvantages	Less efficient for small data	Consume more memory	Current system not supporting parallelism	-	Consume more memory

databases. The migration from a Relational DB into a document-oriented DB and authors introduced two logical layers over physical data [4]. The graph based model helps in improving query performance by nesting related tables.

IV. COCLUSION

In this paper, we have studied different NoSQL databases and comparison of relational database to NoSQL databases. We found some approaches used for migration from relational database and compared different approaches used in migration from traditional relational database to NoSQL databases. The framework approach can be used when the data volume is large and need to preserve the semantics of relational database. The Hbase schema for migrating of relational database to NoSQL supports multiple nested and the Data migration features. Wherein the virtualization architecture enable users to access both the structural and un-structural database using single sql request. The schema conversion model nested the relevant tables together to improve the performance.

Each approach has their own strengths and weakness. One or two approaches can be used based on the best fit to the application requirements.

In future we will implement one or more approaches and compare its performance with relational database for handling big data.

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Application of MADM Methods for Selecting the Best Private Institution for Professional Courses in Uttarakhand State, India

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***Abstract*—Engineering and doctoral courses are considered to be golden professions for successful life. India is the largest Engineers' producing country, with changing technology, education system also has been changed from Gurukul to new modern technology based teaching system. Learning and knowledge are correlated terms, which go side by side and have imperative value and learning right knowledge from the best educational institute plays a vital role in one's life. IIT's, NIT's and Govt. institutes could not accommodate all the aspirants who have dreamed to be an engineer, certainly they are required to take admission in some private institutions. Due to numerous engineering institutes and universities this becomes a tedious job for both the parents and aspirants to select a perfect institution. Multi Attribute Decision Making (MADM) methods provide a ranking of the available alternatives thereby, decision of critical thinking become easier. The present paper examines the application of few MADM paradigms for selecting the most suitable academic institution, four state private universities of state Uttarakhand are considered as alternatives and evaluated and prioritized on seven major criterions.**

***Index Terms*—MADM Methods, AHP, Institute Selection**

I. Introduction

Since ages, engineering and doctoral courses are on top demanding professional programs. IIT's, NIT's and top ranked Govt. institutes / universities have limited seats to offer admission for newly and drooped aspirants in each academic session. Due to high number of admission seekers in engineering program the private institutes / universities are taken place in the market to offer admissions for those who have filtered out from premium institutes, it is a tedious job for parents and aspirant to select best institution. There are number of ways to choose institute, for example 1) institute where just seniors are pursuing their B. Tech, 2) institute which is nearest to home town, 3) through agents, 4) through recommendation either by school or coaching teachers, 5) high visibility through media or newspapers advertisements / hoarding, 6) state of the art infrastructure etc. These criteria's are not appropriate on the basis one should select the institute. However a self analysis among number of alternative on the basis of popular MADM methods [4] may lead to select a better institute in then this will be his first move towards the successful career. MADM methods are also applied on problem of personnel selection fuzzy AHP method proposed in [2], MADM methods for heterogeneous wireless networks are tested in [7] to evaluate the performance of each vertical handoff method under different applications such as voice, data, and cost-constrained connections. This paper is organized as follows; the following section presented modeling of the problem, section 3 consist problem solving methodologies, in section 4 the application of the methods and execution of AHP, SAW, WPM methods are addressed.

II. Problem Modeling

Four private engineering institutes of state Uttrakhand have been considered as inputs for the proposed MADM algorithms, survey was conducted and observed that institute CC has better placement records but lacking in good faculty staff, institute DD has renowned faculties but lacking in infrastructure, institute PP has good infrastructure as well as good curriculum but lacking in placement and MoU's, similarly other institutes having some positive and some negative in comparison to another one. The decision making is complicated because identifying the solution for this complex problem in the context of various parameters is varying from institute to institute. As per the problem similarities we are suggesting MADM approaches e.i. AHP, SAW and WPM to find the batter solution with qualitative

parameters. The following assumptions are considered while tabulating.

Assumptions are as follows:

a. There are four institutes and all evaluated on seven different criteria.

10	Excellent
9	Very good
8	Good
7	Above average
6	Average
5	Below average
6	Poor
3,2 &1	Very poor

Table 1 the Decision Maker's Judgment

	INF	**FP**	**PL**	**RP**	**CU**	**AF**	**MoU**
GG	7	8	8	5	6	5	8
CC	5	6	9	2	8	6	2
DD	8	7	5	4	6	6	7
PP	6	6	6	7	5	7	6

Table -2 Information extracted through survey for selecting best Institute

Abbreviation: Infrastructure –INF, Faculty Profile –FP, Placement –PL, Research and Patent –RP, Curriculum – CU, Academic Flexibility-AF, MoU- memorandum of understanding

3. PROBLEM SOLVING METHODOLOGIES

Following steps are to be followed to address the current problem

1. Identifying the suitable weights
2. Implementation of different MADM methodologies

Weights, which are determined based on preference factor among the attributes. Direct Weight Elicitation Technique and Rank-Order Centroid method [6] are used to assign the weights. The weights in this study have been assigned using the following equation

$$\frac{1}{N} W_j = \sum_{j=1}^{N} 1/\mathrm{j}$$

Where N is the number of criterion and W_j is the weight for j^{th} item. For example, in the present study, the criterion ranked first, is weighted (1 + 1/2 + 1/3 + 1/4+ 1/5 +1/6 + 1/7) / 7 = 0.37, the second criterion is weighted (1/2 + 1/3 + 1/4 + 1/5 + 1/6 + 1/7) / 7 = 0.22, and so on. In order to avoid complexity, weights are rounded off to nearest decimal value.

b. The problem considered here may vary with institution to institution and the requirements are not at all same all the times.

For the survey we have been used qualitative values like Excellent, Very good etc. are converted in quantities values as mentioned in table 1 for analysis purpose.

Implementation of different MADM methodologies:

The weights are obtained by Direct Weight Elicitation Technique, as explained in section III can be moved forward to implement different methodologies of MADM.

3.1 SIMPLE ADDITIVE WEIGHING METHOD (SAW)

The SAW method [2] is Simple Additive Weighing Method and also called grading method. This method is simple and basic of all MADM methods. The score to each alternative can be calculated by the formula. Based on the score, select the alternate.

$$K_i = \sum_{y=1}^{B} Z_{xy} w_y \qquad \ldots\ldots\ldots\ldots\ldots\ldots \qquad (1)$$

Where K_i is the SAW score of the best alternative, B is the number of decision criteria, w_Y is weight matrix, and Z_{XY} is a normalized matrix of basic table 2.

3.2 WEIGHTED PRODUCT METHOD (WPM)

Weighted Product Method (WPM) [4] is similar to SAW Method but where as instead of addition there is multiplication in the model. Each ratio is raised to the power equivalent to the relative weight of the corresponding criterion.

$$Ji = \prod_{Y=1}^{B} (Z_{xy})^{W_j} \qquad \ldots\ldots\ldots\ldots\ldots\ldots \qquad (2)$$

Where J_i is the WPM score of the best alternative, B is the number of decision criteria, w_Y is weight matrix, and Z_{XY} is a normalized matrix of basic table 2.

3.3 ANALYTICAL HIERARCHY PROCESS (AHP)

This is the most popular Technique in MADM methods. Saaty T.L [5] developed Analytical Hierarchy Process (AHP) in 1980 the whole problem into a system of hierarchies of objectives and alternatives. The steps to solve a problem is as follows

Step1: Make a pair wise comparison to each attribute. If there is B number of alternatives and A number of criterion then there will be A X B matrices of judgments. Use a preference scale (Table 8) to grade the relative preferences for two criterions. While comparison of any alternative against itself must equally preferred, so all elements on the diagonal of the pair wise comparison matrix become unity.

Step 2. Synthesis. Developing relative priority matrix for each decision. First, formulation of normalized pair wise comparison matrix by sums the values in each column of the matrix and then divides each element in the matrix by its column total. The resulting matrix is referred to as normalized matrix. Finally, the relative priorities by compute the average of the elements in each row of the normalized matrix

Step 3. The consistency check . The consistency of judgments that we considered during the series of pairwise comparison. If the degree of consistency is acceptable, the decision process can continue, otherwise the decision maker should reconsider their judgments before proceeding any further with the analysis. Consistency ratio exceeding 0.10 are indicative of inconsistent judgments.

The consistency index (CI) is calculated as $CI = \frac{\lambda_{max} - n}{n-1}$

where λ_{max} is the average of the elements of A_4 matrix and n is the number of items being compared.
Consistency ratio (CR) is calculated as follows $CR = \frac{CI}{RI}$

Random index (RI), randomly generated pairwise comparison matrix. The values of RI can be obtained as per Table 3. [5]

Size of matrix	Random consistency
1	0
2	0
3	0.58
4	0.9
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

Table 3 Random Index

Step 4. Final step is to develop a priority ranking. First, establish reaming all pairewise matrices and compute relative priority vector then overall priority for each decision alternative is obtained by summing the product of the criterion priority (with respect to the overall goal) times the priority of the decision alternative with respect to that criterion. Ranking these priority and we will have ranking of the alternatives.

4. RESULTS AND DISCUSSIONS

The MADM based approach for selecting best professional institute is described in conjunction with the survey data presented in table 2. As discussed in section 2, there are four different institutions (GG,CC,DD and PP) that are desirable according to different criteria such as Infrastructure –INF, Faculty Profile –FP, Placement –PL, Research and Patent – RP, Curriculum –CU, Academic Flexibility-AF, MoU-MoU . From practical perspective, always desire to arrive at a single and best possible alternative among such non-unique outcomes. Three MADM techniques such as simple additive weighting, weighted product model and analytic hierarchy process used to choose the best possible alternative.

4.1 SIMPLE ADDITIVE WEIGHTING

As described in section 3.1, simple additive weighting method is applied to choose the best possible alternative. Table 2 shows the selective details for seven different selection criteria corresponding to the four best possible alternatives and the respective weights are determined based on Rank-Order Centroid method as discussed in section 3.

Attributes/ Alternatives	INF	FP	CU	PR	AF	PL	MoU
GG	7	8	8	5	6	5	8
CC	5	6	9	2	8	6	2
DD	8	7	5	4	6	6	7
PP	6	6	6	7	5	7	6
Weights	0.37	0.23	0.16	0.1	0.04	0.07	0.04

Table 4 the preference Table for Evaluation

The SAW scores are furnished in Table 5 and the best possible institute has been ranked as 1 (refer equation 1). According to simple additive weighting method GG institute is the best among the alternatives

Attributes/Alternatives	INF	FP	CU	PR	AF	PL	MoU	SAW Score	RANK
GG	0.88	1.00	0.89	0.71	0.75	0.71	1.00	0.90	1
CC	0.63	0.75	1.00	0.29	1.00	0.86	0.25	0.71	4
DD	1.00	0.88	0.56	0.57	0.75	0.86	0.88	0.85	2
PP	0.75	0.75	0.67	1.00	0.63	1.00	0.75	0.79	3

Table 5 the normalized preference table for SAW

4.2 WEIGHTED PRODUCT MODEL

For calculating the WPM score same preference matrix is used as shown in Table 3. The WPM scores and ranking of

different alternatives (calculated following equation 2) are presented in Table 6, According to Weighted Product Model GG institute is the best among the alternatives materials. The result following WPM method is further validated with AHP method.

Attributes/Alternatives	INF	FP	CU	PR	AF	PL	MoU	WPM Score	RANK
GG	0.88	1	0.9	0.7	0.8	0.7	1	6.8621	1
CC	0.63	0.8	1	0.3	1	0.9	0.25	6.5829	4
DD	1	0.9	0.6	0.6	0.8	0.9	0.875	6.7928	2
PP	0.75	0.8	0.7	1	0.6	1	0.75	6.7421	3

Table 6 the normalized preference table for WPM

4.3 ANALYTIC HIERARCHY PROCESS

AHP is applied further make a decision among the four alternatives. The AHP method as stated in section 3.3 applied to the present investigation. A pair-wise comparison matrix is formed based on relative preference among each criterion as presented in Table 7.

Criteria/ Criteria	INF	FP	CU	PR	AF	PL	MoU	Eigen Vector
INF	1.000	3.000	3.000	3.000	3.000	2.000	3.000	0.292
FP	0.333	1.000	3.000	3.000	2.000	3.000	5.000	0.237
CU	0.333	0.333	1.000	3.000	3.000	5.000	2.000	0.116
PR	0.333	0.333	0.333	1.000	0.500	0.500	0.333	0.052
AF	0.333	0.500	0.333	2.000	1.000	0.500	0.500	0.071
PL	0.500	0.333	2.000	2.000	2.000	1.000	4.000	0.152
MoU	0.333	0.200	0.500	3.000	2.000	0.250	1.000	0.080

Table 7 pair-wise comparison matrix (criteria Vs criteria)

The values considered in Table 6 are checked for their consistency in further steps. If the consistency criterion not satisfied, these values are needed to be changed and the entire procedure is to be repeated.. The consistency check to validation of the assumptions made in Table 6 is calculated as consistency ratio (CR) = CI / RI = 0.091. (CI=0.123284, RI= 1.35).). As CR ≤ 0.10, the degree of consistency exhibited and acceptable for further analysis. another pair wise comparison matrix is formed separately for each of the seven criteria (Table 8)

INF	GG	CC	DD	PP	Eigen vector
GG	1.00	3.00	2.00	2.00	0.39
CC	0.33	1.00	0.20	0.33	0.08
DD	0.50	5.00	1.00	4.00	0.37
PP	0.50	3.00	0.25	1.00	0.16
C.I.= 0.0970192 and CR = 0.10					

CU	GG	CC	DD	PP	Eigen vector
GG	1.00	0.25	0.33	0.33	0.08
CC	4.00	1.00	4.00	3.00	0.52
DD	3.00	0.25	1.00	0.33	0.14
PP	3.00	0.33	3.00	1.00	0.26
C.I.= 0.0793234 and CR=0.08					

AF	GG	CC	DD	PP	Eigen vector
GG	1.00	0.50	2.00	3.00	0.28
CC	2.00	1.00	3.00	4.00	0.47
DD	0.50	0.33	1.00	2.00	0.16
PP	0.33	0.25	0.50	1.00	0.10
C.I.= 0.0103278 and CR=0.01					

FP	GG	CC	DD	PP	Eigen vector
GG	1.00	6.00	0.50	3.00	0.33
CC	0.17	1.00	0.17	0.20	0.05
DD	2.00	6.00	1.00	3.00	0.46
PP	0.33	5.00	0.33	1.00	0.16
C.I.= 0.0558126 and CR=0.06					

PR	GG	CC	DD	PP	Eigen vector
GG	1.00	6.00	2.00	3.00	0.45
CC	0.17	1.00	0.17	0.20	0.05
DD	0.50	6.00	1.00	4.00	0.35
PP	0.33	5.00	0.25	1.00	0.15
C.I.= 0.079447 and CR=0.08					

PL	GG	CC	DD	PP	Eigen vector
GG	1.00	2.00	2.00	2.00	0.38
CC	0.50	1.00	2.00	2.00	0.27
DD	0.50	0.50	1.00	3.00	0.22
PP	0.50	0.50	0.33	1.00	0.12
C.I.= 0.0717532 and CR=0.07					

MoU	GG	CC	DD	PP	Eigen vector
GG	1.00	3.00	4.00	3.00	0.51
CC	0.33	1.00	0.33	2.00	0.14
DD	0.25	3.00	1.00	2.00	0.23
PP	0.33	0.50	0.50	1.00	0.11
C.I.= 0.097924 and CR=0.10					

Table 8 Other pair-wise comparison matrices

Judgment of Preference	Numerical Rating
Extremely Preferred	9
Very strongly to extremely preferred	8
Very strongly preferred	7
Strongly to very strongly preferred	6
Strongly preferred	5
Moderately to strongly preferred	4
Moderately preferred	3
Equally to moderately preferred	2
Equally preferred	1

Table 9 Saaty's preference scale

Overall Priority	INF	FP	CU	PR	AF	PL	MoU	Criteria vs Criteria	Priority	Rank
GG	0.392	0.326	0.081	0.449	0.277	0.383	0.514	0.292	**0.344**	1
CC	0.078	0.052	0.517	0.050	0.467	0.273	0.142	0.237	0.183	3
DD	0.371	0.459	0.142	0.349	0.160	0.219	0.235	0.116	0.315	2
PP	0.159	0.164	0.260	0.151	0.095	0.125	0.109	0.052	0.158	4
								0.071		
								0.152		
								0.080		

Table 10. Overall priorities for each decision alternatives and rank matrix

Based on Saaty's (T.L. Saaty 1988) preference scale (Table 8). Overall relative priority matrix is formulated as described in section 4.4. Finally score respective to each of the alternatives (Table 9) are calculated by matrix multiplication, wherein it is evident that GG is the best alternative as per AHP. Thus SAW, WPM and AHP algorithms suggest that GG is the best suitable among the prospective four alternatives on the basis of seven different desirable criterion

V. Conclusion

A novel MADM based approach for selecting most preferable institute has been proposed in this article among four equally competent institutes of Uttarakand state. These methods provided simple and powerful ranking criteria to institute. The institute Ranked high among the others is GG and the least preferred is PP. The same problem can be extended not only to engineering college staff selection but also to any organization / Industry so on by varying different attributes and selection criteria. Fine tuning of weightage to individuals, creating more fuzziness in the problem can be implemented in the future.

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To study of various security attacks against Biometric template in a generic Biometric Recognition System

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***Abstract*—Biometric recognitions system is a system which provides the reliable solution for user authentication in identity management systems. The motivation is that how we can use the effective biometric system in e-Governance service delivery with secure channel. So first we discuss the various security attacks that can be encounter during the enrollment and verification of biometric traits. We analyze various vulnerabilities of biometric system and study the various counter measures that can be present in biometric system in any way. There are many successful developments in the field of e-Authentication but the security is remain challenge in real world. This paper focus on the risks of biometric data at the time of enrollment and verification process. There are many types of attacks like finger print in biometric system by using fake fingers at the sensor could be a serious threat for unattended applications. In biometric system fingerprint matching is very big challenge to match the saved image with real time template with reduce the false match rate and false reject rate. We focus here to analyze the behavior of fingerprint verification because fingerprint verification is the very reliable personal e-Authentication mechanism.**

***Index Terms*—Biometric Recognition System, Biometric Sensor, Biometric system vulnerability.**

I. Introduction

Biometric recognition system is wide-spread development in the field of e-Authentication that ensures the identity of person is unique. Biometric recognition system is reliable system unlike the traditional authentication system as password, Pin number which is stolen and forgotten easily. We are review and discussing all the various types of biometric attacks and conclude the analysis of different types vulnerability encounter in biometric security opponent. There are various advantage o Biometric Recognition System which is better than traditional mechanism that is based on password, PIN number or One Time Password, digital signature etc. Recently, the research on the presenting fake biometrics to the acquisition sensor which attack has been particularly active in the fingerprint domain [1]. There are numerous difficult problems present in biometric recognition system which creates the problems for biometric stored template during the enrollment. Third party attacker may steal the stored template and may gain unauthorized access to the biometric recognition system by creating the duplicate biometric template. In the basic theme of biometric recognition system is that the biometric image is stored in the biometric system at the time of enrollment and this stored biometric image is called template. At the time of verification to stored template is matched with the real biometric image should be successfully. The challenging task is to secure the stored biometric template. In this paper we study the biometric system, enrollment phase and verification phase and then different types of attacks that may be present in the biometric system.

II. Biometric Recognition System

A biometric recognition system is a pattern recognition system which recognizes a person with his biometric traits.There are four modules of a generic biometric system[2]:

a) Biometric sensor module- Biometric Sensor is the part of biometric recognition system. Behavior of biometric sensor is to capture the biometric image. The work of sensor is to scan the visible biometric image and capture this biometric image in the biometric system. The user can interact with biometric recognition system with the help of biometric sensor.

b) Feature extraction module- Feature extraction module is the part of biometric recognition system. The work of feature extraction module is to extracts important and qualitative area of biometric image which is useful for identifying the particular user. Because biometric image have many problem like over inked area and under inked area. Biometric extraction module remove this type of problem. And stored then stored the template in database.

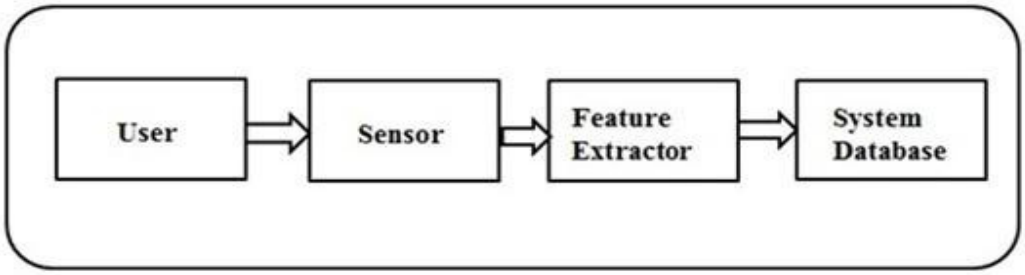

Figure 1: Enrollment in Biometric recognition system

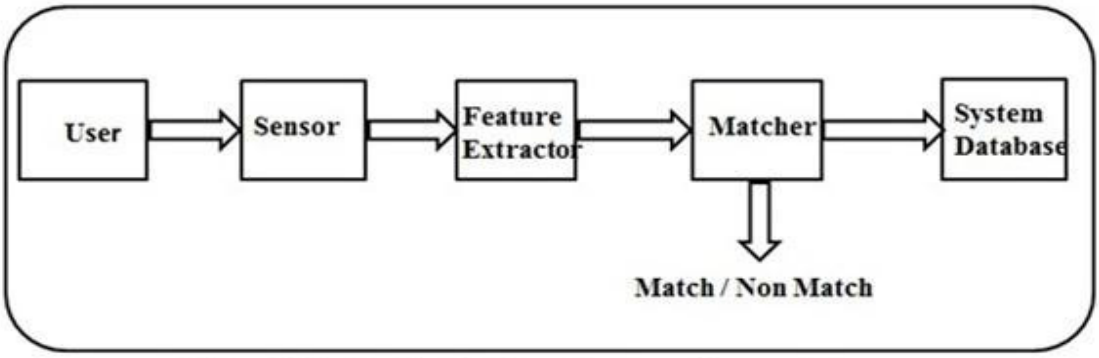

Figure 2: Verification in Biometric recognition system

c) Biometric matcher module- Biometric matcher module is the part of biometric recognition system. The work of biometric matcher is to match the biometric feature and compare each other and gives the output result as some match score. The score represent the two biometric image is how much similar.

d) Decision- making module- The template feature set is typically generated during enrollment when a user first interacts with the system and is refreshed or updated over a period of time in order to account for intra-class variations [3]. Decision module is Matcher module that gives the result as two biometric images is related or not. A typical biometric recognition system can be defines in two modes: (see Figure 1 and Figure 2) first is Enrolment and second is verification or authentication. In enrollment mode the biometric

recognition system capture the biometric samples from the user and biometric system store that samples in the system database which is called biometric template. In verification mode the user give his identity along with biometric sample to the biometric recognition system. The feature extractor matches the stored template with claimed identity. If match score is greater than the system threshold then the biometric system declare match otherwise non match. Identification system uses the governmental applications in the field of e-Governance where the identity of any individual matches his biometric traits against the stored template. The best part of verification system is first user verifies the user with some credential then biometric trait has to be verifying by the biometric system. Examples of identification system include the UID system by the Government of India [4]. Unique identification project was initiated by the Planning Commission of India which provides identification for each resident across the country and provide the efficient delivery of welfare service.

III. BIOMETRIC SYSTEM VULNERABILITY

In the developing area of biometric computing technology have affordable and very easily inbuilt the various consumer devices. To avert any potential security crisis, vulnerabilities of the biometric system must be identified and addressed systematically [5]. There are different methods of vulnerability attack that could be analysis. Biometric recognition systems are prone to deliberate attacks as well as inadvertent security lapses that can lead to illegitimate intrusion, sabotage [6] or theft of sensitive information such as the biometric templates of the users enrolled in the system. There may be many factors which lead to such security lapses. A biometric system is vulnerable to different types of attack that can compromise the security afforded by the system, thereby resulting in system failure [7]. We can categorize these security lapses belong to following categories: Intrinsic failures, Administrative privileges, Non secure infrastructure, Biometric overtness. Thus it is essential to protect the template from possible attacks [10].

A. INTRINSIC FAILURES

Intrinsic failure due to an existing limitation in the sensor of biometric system, feature extraction or matching technology. Intrinsic failure is the cause of incorrect choice by the biometric matcher module. There are two types of error committed by biometric verification system while decision matcher module which is false match. A legal user may be wrongly rejected by biometric recognition system because of various differences of two identical templates. The ridges and valleys in a finger print alternate of fingerprint reveals that the ridges or valleys exhibit anomalies of various kinds, such as ridge bifurcations, ridge endings, short ridges and ridge crossovers [8]. Two different fingerprint sample of the same finger obtain on different days which gives the large difference because of different movement that biometric finger is pressed in the sensor module. This difference is called minutia. When two unrelated biometric samples incorrectly matches using some rate of these two samples this is called false match rate. False match rate may be because of dissimilarities of two biometric traits like when two identical twins are very similar to each other which gives wrong decision while verifying the identity of the twins. When we get two very different samples obtain from the same finger, the error is called false reject rate (FRR). A biometric sensor may incorrect match due to limit of sensing technology. In biometric recognition system, a biometric sensor may not be identify a good quality fingerprint so that we can measure genuine accept rate (GAR) by the performance biometric system is GAR=1-FRR.

Intrinsic failures may occur when no explicit effort by third party that attack is called zero-effort attack. It can create a problem when the probability is high of false accept and false reject. So the objective is to create the sensors that could be reduce the intrinsic failure and the sensor should be reliable, convenient and secure.

B. ADMINISTRATIVE PRIVILEGES

The administrative attack we may say insider attack where all vulnerabilities could be encounter all because of improper administration of biometric recognition system, because the system administrator have the privileges to register the biometric template and make the exceptions for the individual whose biometric sample cannot be obtain by the system due to some injury or disease. This attack may be introduce using the

integrity at the time of enrollment process by the administrator or a authorize user or may be improper processing procedure.

Non secure infrastructure may be encounter the hardware infrastructure, software infrastructure or communication channel of different module of a

C. NON SECURE INFRASTRUCTURE

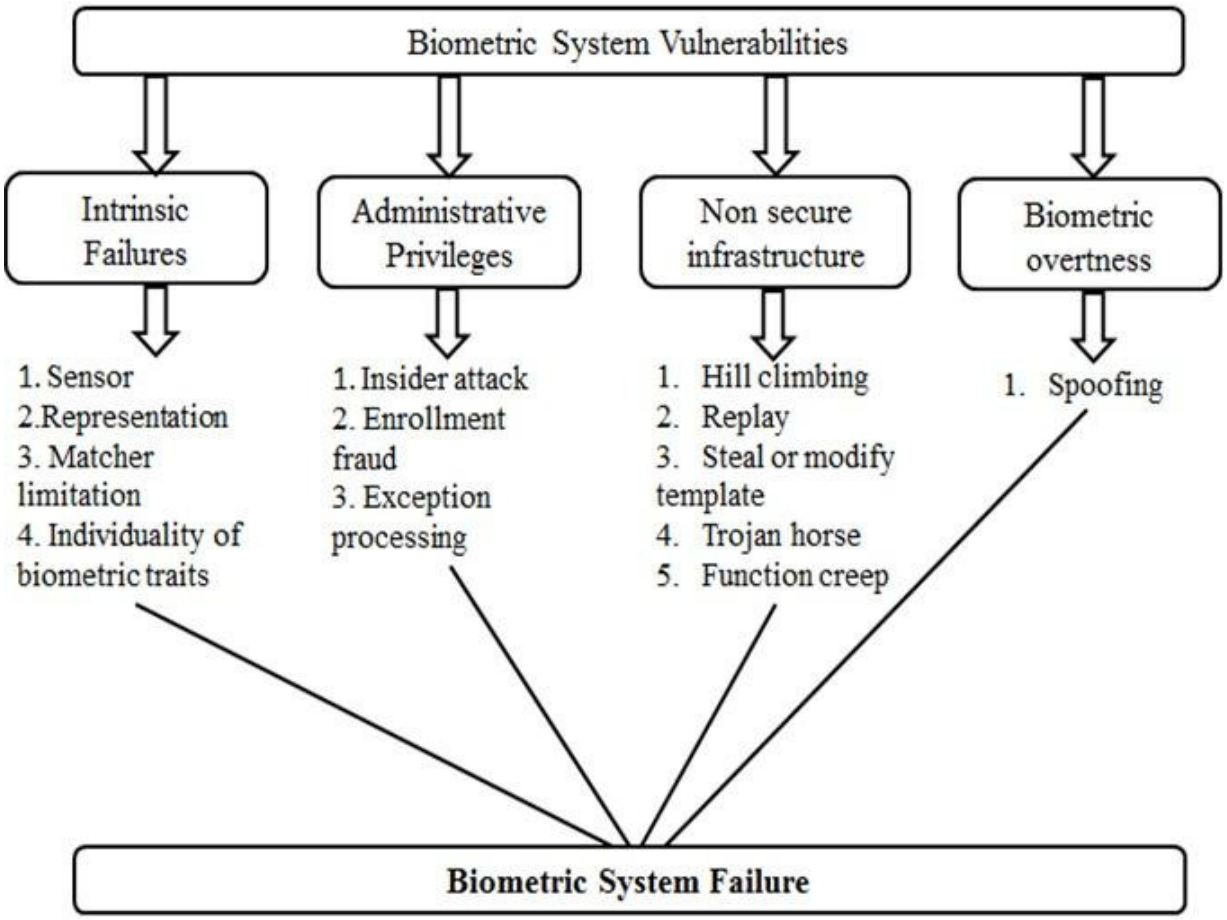

Figure 3: Biometric System Failure

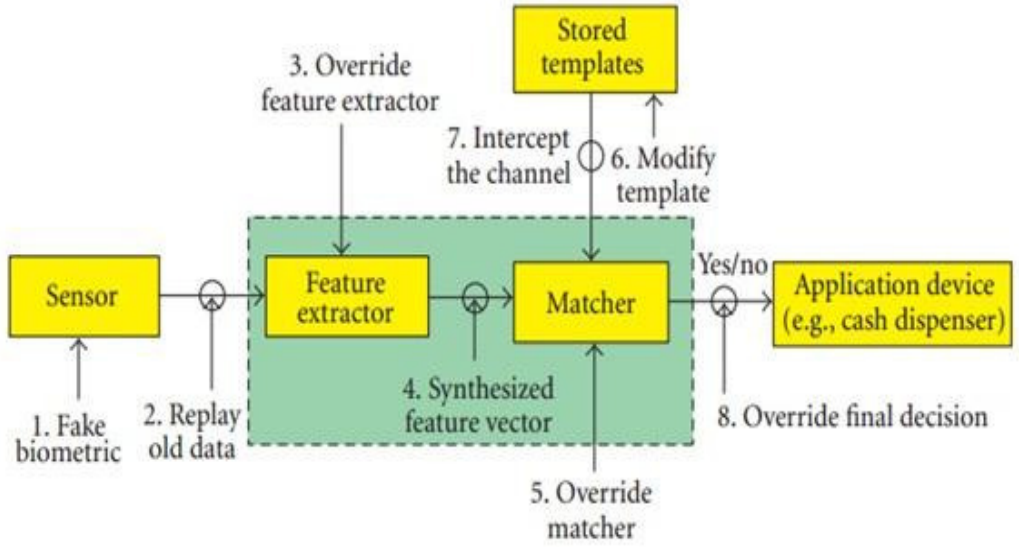

Figure 4: various security attacks in a generic biometric system (adapted from [9])

biometric system. An opponent can attack for the biometric infrastructure by various way so that the security may be break through the biometric infrastructure. Ratha et al.[9] identified eight point of attack in a generic biometric system(see in Figure 4). Anil K. Jain et al. [6] categorize the different types of biometric infrastructure attack into following four categories:

a) Attacks at the user interface

In this type of attack can be introduces due to the sensor because sometimes the sensor could not distinguish between the fake and genuine biometric sample. So that the opponent can easily introduce in the biometric system through fake identity. It is best to use the liveness detection through the software and hardware solution.

b) Attacks at interface between modules

In this types of attack the opponent introduce on the communication interface between various modules. If the communication channel is not secure or not properly encrypted, the opponent can intercept, modify the data during the transmission. This attack is called man-in-middle attack. When intruder intercept or replace information during transmission. When we use insecure communication channel the chances of replay or hill-climbing attack is high.

c) Attacks on software modules

In this type of attack using the executable program which can modify the module such a way that output is desired by the opponent. This type of attack is like Trojan-horse attacks. An opponent may modify or replace software module using the virus.

d) Attacks on the template database

In this types of attack the attacker damage the biometric template from the database in biometric system. An attacker can replace the templates stored in the system database with desired template. A template can be replaced by an impostor's template to gain unauthorized access, a physical spoof can be created from the template to gain unauthorized access to the system and the stolen template can be replayed to the matcher to gain unauthorized access [6].

D. BIOMETRIC OVERTNESS

In this types of attack the opponent can acquire the biometric traits of legitimate user and use them to create copy of that biometric trait. So that the biometric system cannot identify or distinguish live biometric trait and physically artificial spoof.

IV. Conclusion

In this paper we discussed various type of attack which compromises the security. The research is analysis of different types of attack against the stored biometric template in the biometric system. To secure the biometric template we should use the multifactor authentication. In multifactor authentication we may use one factor is necessarily being used which something is like biometric trait of individual and another factor is his/her password, OTP (One Time Password), and PIN number. In Aadhaar based authentication the UID number is first factor for authentication and his/her biometric trait is the third factor authentication.

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Cardiac arrhythmia detection in ECG signals by feature Extraction and support vector machine

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***Abstract*—Purpose of this work is to develop an automated physiological signal diagnostic tool that can help us to early determination of arrhythmia for proper medical attention. This paper presents a simple automated approach for classification of normal and abnormal ECG based on arrhythmia. The proposed method validated by the data MIT BIH arrhythmia database. The performance in terms of accuracy for clinical decision must be very high. This method uses fourth order wavelet decomposition, wavelet decomposition used for time frequency representation and feature extraction. For classification support vector machine is used for detection kinds of ECG signals.**

***Index Terms*—Arrhythmia; Support vector machine; Wavelet decomposition; Pre-processing; Feature extraction; ECG signals.**

I. Introduction

Presently Heart diseases are one of the various illnesses that cause deaths of many Human beings. Early detection and proper clinical treatment can help to save the life of patients for that purpose features of heart beats are used. Heartbeat is a kind of Physiological signal generated due to electrical activity in the heart. The Electrocardiogram (ECG) generated due to changes in Bioelectric Potential respect to time like the human heartbeats. ECG signal play important role in the diagnostic of arrhythmias [1].

An arrhythmia is abnormal heart beat, the primary and basic classification is two type bradycardia and trchycardia, when heart rate is less than 60 BPM its bracycardia and if heart rate is more than 100 BPM it is trchycardia. And both have different effect on the human being like bradycardia causes a drowsiness, fanting, sleepiness and rare chances of cardiac arrest, but Tachycardic affect the pumping capability of the heart and generate the symptoms chest pain, Problem in breathing and cause of heart attack.

A heart beat can be represented in terms of QRS, T and P wave as shown in figure 1.For the arrhythmia detection we are interested in the beat morphology (Normal and abnormal pattern) of different waves of ECG signals. So perform wavelet decomposition operation, in this process downsampled the signal for reduction in detailed feature of ECG signals, we use fourth level decomposition and choose a pattern similar to the original pattern. Locate value of ECG signal from second order decomposition and get the R peaks and some more feature can be extracted based on location of R, T, S waves and their respective amplitude.

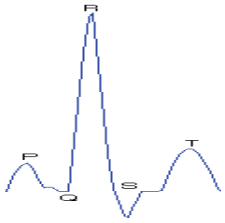

Figure 1: ECG signal

The extracted feature used for classification by the support vector machine. It is the most efficient tool for classification problems. Although there are various method for classification of arrhythmias, but the attention in this work is developing an automated simplest algorithm and arrhythmia detection.

II. Database

The Physiological ECG signal use of this work provided by the MIT BIH arrhythmia database [2]. The MIT BIH arrhythmias data base includes 48 ECG recording; these recordings are half an hour long. Signals are sampled 250 Hz. In the database each signal has an annoted file that includes the beat, rhythm and other information. This database is used by researchers to test their algorithms for detection of arrhythmias and classifications. In present research work we use 32 records of full length to classify into normal or abnormal class, abnormal for arrhythmia ECG signal.

III. Methodology

Methodology of this work is shown in this section. We use RAW ECG signal of two type normal and abnormal (Arrhythmia signal), these signal are acquired from MIT BIH database as explained previous section, the complete database

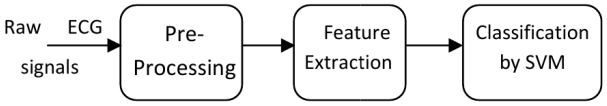

Figure 2: Methodology Block Diagram

contain 32 patients data. The process of work carried in this research work is shown in figure.

A.Pre-processing

All kind of physiological signals are weak in nature mixed with different kind of interferences, The aim of Preprocessing is just use to remove the signals interferences. To achieve the highest accuracy. It is necessary to remove Interferences from ECG signal. Otherwise wrong classification leads to wrong clinical treatment. There are generally four main categories of interferences low frequency interferences, baseline interferences, power line interferences and high frequency interferences. To removal of these noises we use three kinds of filters.

Adaptive filter:

Adaptive filter is a kind of filter in which changing of filter parameter give optimum results for power line interference reduction [3], Adaptive filters 'learn' with initial input signal for track them to remove the signal interferences by changing the filter parameters.

Butterworth Low Pass and High Pass Filter:

Interference of low frequency and base line drift is major problem, if there is large drift in the ECG signal then it change heart rate and location of different waves in ECG. So the proper attention required correcting the baseline wander inference, to remove the low frequency noise and baseline wander we use a low pass Butterworth filter.

Butterworth filter also best for removal of high frequency interferences due to its simplicity and maximum flat magnitude response, the filter function is represented as

$$H(Z) = \frac{g'(1 - Z^{-1})^p}{\sum_{p=0}^{N} b_p \, Z^{-p}}$$

Where bp series are filter coefficients and g' is gain factor

B.Feature extraction:

Classification of arrhythmia by support vector machine requires generation of input vector; an input vector to classification should include the morphology and rhythm feature of ECG signal as shown in figure [3]. Feature extraction step is very influential for arrhythmia detection. The objective of feature extraction step is to derive a set of extracted parameter. Those signalize the ECG signal. These set should contain maximal information about ECG signal, so the selection criteria of these feature parameter is very important for Arrhythmia classification.

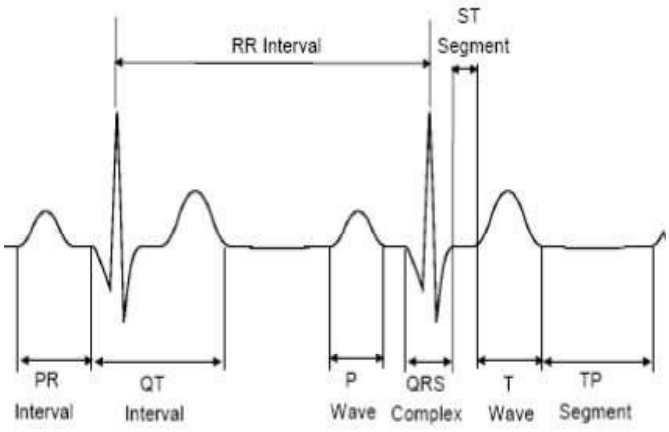

Figure.3: ECG Waveform [4]

In this work input vector for classifier contain two kind of feature Morphological and Frequency domain feature as listed in table no.1. Discrete wavelet Transform (DWT) use for feature extraction, Discrete Wavelet transform is one of the newly used techniques for feature extraction. Signals decomposing into elementary building blocks that are well localized both in time and frequency [5]. Its application to Physiological signal processing has been at the cutting edge of its developments where it has been found particularly useful in the study of these, often problematic, signal like ECG [6]

Selection of appropriate decomposition levels for wavelet levels is play crucial role in the analysis of signals using the discrete wavelet Transform (DWT) [7]. Dominant frequency components are use to choose the decomposition levels of the signal. In the present work, the decomposition levels were chosen to be 4. Therefore, the ECG signals were broken up into the details D1 − D4 and one final estimate, DWT design can take many forms. Sherlock and Monro [8] developed a way to determine the coefficients of a filter bank. They derive an orthonormal perfect-reconstruction finite impulse response (FIR) filter of arbitrary length. The z-domain filter coefficients are represented by a low pass filter

$$H(Z)\,H(Z^{-1}) + H(-Z)\,H(-Z^{-1}) = 1 \qquad (1)$$

The z transform of high-pass filter h is H (z) and represented as

$$G(Z) = z\,H(-Z^{-1}) \qquad (2)$$

Increasing sequence length of filters (indexed by j) can be obtained:

$$H_{j+1}(Z) = H\left(Z^{2j}\right)H_j(Z)$$
$$G_{j+1}(Z) = G\left(Z^{2j}\right)H_j(Z) \quad (3)$$

Where j=0, 1.....K-1

With initial condition $H_0(z)=1$, we can express its relationship in time domain

$$h_{j+1}(p) = [h]_{\uparrow 2^j} * h_j(p)$$
$$g_{j+1}(p) = [g]_{\uparrow 2^j} * h_j(p)$$

The subscript $[.]_{\uparrow q}$ show q factor up-sampling of and p is the equally sampled discrete time. The normalized wavelet and scale basis functions $\psi_{il}(p)$ $\varphi_{il}(p)$, can be defined as.

$$\varphi_{i,l}(p) = 2^{j/2}\ h_j(p - 2^j\ l)$$
$$\psi_{i,l}(p) = 2^{j/2}\ g_j(p - 2^j\ l)$$

(Scale parameter j, translation parameterl)

Factor $2^{j/2}$ is inner product normalization, the discrete WT decomposition can be described as.

$$s_{(j)}(l) = x(k) * \varphi_{i,l}(p)$$
$$d_{(j)}(l) = x(k) * \psi_{i,l}(p)$$

Where $s_{(j)}(1)$ is approximation coefficients at resolution.

$d_{(j)}(1)$ detail coefficients at resolution.

In the present work smoothing of the Daubechies wavelet of order 4 uses, here we chose order according to our need. Decomposition of a signal $x^{(N)}$ can be represented as.

$$x^{(N)} = g^{(N-1)} + g^{(N-2)} + \cdots + g^{(N-M)} + x^{(N)}$$

(N=level of decomposition)

The ECG feature described in Fig. 2, were obtained from the MITBIH database signals using Matlab. The R peak of heartbeat of the ECG signals was obtained by determining the peak having higher amplitude than a threshold value. A Similar method was employed to obtain other wave location like P and T, after finding the location we also calculate the distance between them. Extracted features shown in table 1, total 18 features are extracted and used for classification purpose.

Table 1: Feature of ECG

S.No	Feature Symbol	Feature Description
1.	P wave	Duration of P wave in second
2.	S wave	Duration of S wave in second
3.	T wave	Duration of T wave in second
4.	Q wave	Duration of Q wave in second
5.	RS Slop	Slope Between R and S
6.	QS Slop	Slope Between Q and S
7.	PR Interval	Duration between P and R wave in second
8.	ST Interval	Duration between S and T wave in second
9.	QT Interval	Duration between Q and T wave in second
10.	TP Interval	Duration between T and P wave in second
11.	QR Height	Amplitude of QR wave
12.	RS Height	Amplitude of RS wave
13	HRV	Heart Rate Variability
14	Energy	Signal Energy
15	Area	Area Of QRS
16	Non linear Energy	Energy of signal in sum of sampled energy form
17	Spectral Entropy	∑ PSD. log(PSD)
18	Peak Power	Max(Power spectral density)

C. Classification by SVM:

SVM is a well-known supervised learning method [9],For the classification, we will adopt in this work support vector machine (SVM) approach which has shown particularly effective in numerous application fields including the classification of ECG signals [10]. The SVM proposed by Vapnik (1995) has been most widely used for classification.

To understand SVM lets consider for simplicity a supervised two class (Binary) classification problem. Here we can apply a maximal margin classifier; it is a simplest version of SVM applicable to linearly separable data [11]

Now we have a dataset $\{(Y_j, d_j)\}$, Where Y_j is the input pattern for jth example and d_j is the corresponding desired output {-1, 1}.

For the decision surface a hyper plane working. We can represent:

$W^T Y_j + b \geq 0$ then $d_j = +1$

$W^T Y_j + b \leq 0$ then $d_j = -1$

Where $W^T Y_j + b$ is the output function. The minimum distance between points to hyper plane called geometric margin. For the good classification we want to maximize the geometric margin. For that first we introduce functional margin $W^T Y_j + b$ for the linearly separable data we can write;

$$W^T Y^+ + b = +1$$
$$W^T Y^- + b = -1$$

The closest data point on the hyperplane is Y^+ (Y^-), Y^+ for positive side and Y^- for negative side. Now we can compute the geometric margin

$$\gamma = \frac{1}{2}\left(\frac{W^T Y^+ + b}{|W|} - \frac{W^T Y^- + b}{|W|}\right)$$
$$\gamma = \frac{1}{2|W|}(W^T Y^+ + b - W^T Y^- - b)$$
$$\gamma = \frac{1}{2|W|}(1 - (-1))$$
$$\gamma = \frac{1}{|W|}$$

Geometric margin can be maximizing by fix the functional margin value to one and minimize the weight vector $|W|$. By the Lagrange multipliers $(\alpha_j \geq 0)$ we can transform in to dual problem.

$$\alpha_j[d_j(W^T Y_j + b) - 1] = 0$$

Which means only the point with functional margin unity contribute to the output function [5]

The problem solution by SVM done by mapping the training data into a higher dimension and transform them to feature vector. Then transform function used for linear separation.

IV. Results and discussion

The experimental Work carried out in MATLAB and for this work MITBIH arrhythmia database is used. We have used 32 recorded signals divided into normal and abnormal categories, (15 normal, 17 abnormal) each recording is 30 minutes long [12].

The DWT transform used for feature extraction where total 18 features are extracted. We combine these features for training and testing vector of SVM classifier. For the training purpose, we use these different inputs and text matrix to meet the best accuracy of the classification as shown in table 2.

Table: 2 Value of SVM parameters

Training data	Specificity	sensitivity	Classification accuracy
24%	78.33	82.35	78.2
30%	86.67	88.24	87.5
36%	98.84	97.12	98.2

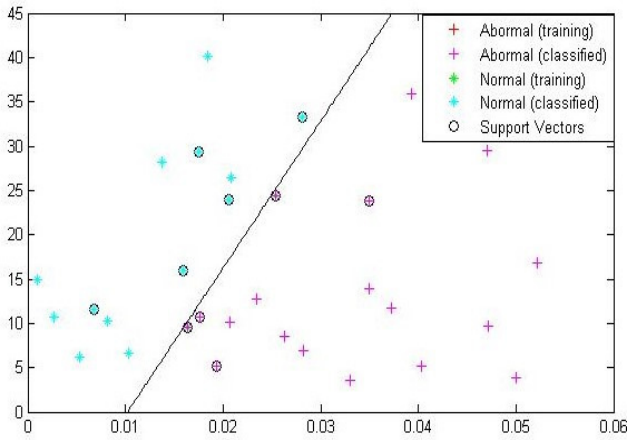

Figure 4: SVM classifier output

The SVM classifier trained with input data, initially we take only 24% of the total data for training purpose, and the classifier result is shown in figure 4. Then we achieve the 78.2 % accuracy. But if we increase the training data to 36%, then we achieve highest accuracy up to 98.2 %. So the higher training data give optimal classified result. We can also increase the accuracy if we increase the total number of record used, in this situation less percentage of training data also effective.

The result obtained by proposed method detects arrhythmia with 98.2% accuracy. Clearly indicates that proposed method is better for arrhythmia detection.

V. CONCLUSION

In this paper, we proposed an automated arrhythmia classification system using different feature of ECG signals. We discussed the classification result of SVM shows the ECG signal feature can be used as a reliable indication of cardiac problems. Generally results are not achieved with 100 percent accuracy. The accuracy of the suggested system depends upon several factors like quality and size of training data and also used parameters. However the present method shows the result with 98 percent accuracy.

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A Review Paper on Cloud Computing and its Security Concerns

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***Abstract*—Cloud computing in the present scenario is a developing and fast growing technology that is being widely used around the globe. It utilizes the power of Internet based computing and here the data, information and other resources are provided to the user via computer or device on-demand. It's a new conception that uses virtual resources for sharing data has evolved. Yahoo or Gmail are some suitable examples of cloud computing. Various industries that include health care, banking and education are drifting towards this technology, all because of the efficiency provided by the system which is powered by pay as you use model and hence it takes care of the bandwidth, data movement, transactions and storage information.**

***Index Terms*—Cloud, network, virtual, economical computing, effectiveness, pay-per-use.**

I. Introduction

Cloud is a common representation for an Internet-accessible organization which is hidden from users. Cloud Computing can be described in simple words as a combination of technology that provides hosting and storage services over the internet. Cloud can be classified into public, private or hybrid.

With the increasing popularity of Cloud based system, the cloud operators have been targeting at its consistency, safety, privacy-preserving and cost-efficient cloud design. Requirements of Cloud applications vary based on the resources which are demanded as services. Thus, the resources may rise to heavy computation resources, large storage resources, high volume network resources and so on. Cloud computing in other words is a standard term for conveying hosted work over the Net. It offers abundant benefits for the initiative, though; there are also a number of issues, as with any new technology. And one of the major concern relates to the safety and privacy of client information in terms of its placement, accessibility and security. Cloud computing may also be referred as permitting a network of remote server hosted over the internet to store, manage and process data.

II. Heuristic Search Method

Cloud computing allows customers and industries to utilize applications via internet on any computer

directly without any established connection and access to their private files. The user uses the information and resources and in turn they just need to pay for the service in order to save time and money without including any third party. In the process of Cloud computing the services are provided by the enterprises and accessed by the users over the internet.

III. DEPLOYMENT OF CLOUD SERVICES

Deployment of cloud services

There are four assorted types of cloud preparation models viz.: “Private cloud”, “Public cloud”, “Hybrid cloud” and “Community cloud”. Information about theses are given below:

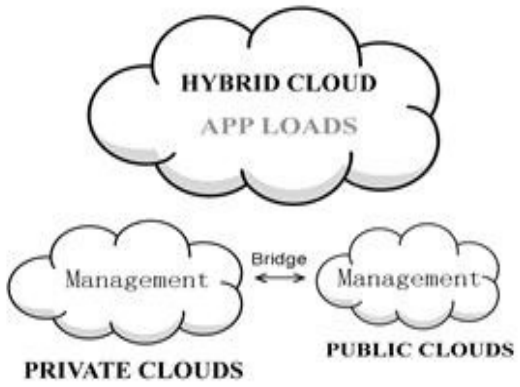

Fig 1. Deployment Methods in Cloud

Private cloud:

This cloud computing is very similar in nature to public cloud and includes “scalability” and “reliability”. But the main difference in private clouds is that, it is designed only for a single organization.

Public cloud:

In public cloud, the cloud seller at the vendor’s places hosts the computing model. The consumer has no perceptibility and power over where the computing model is hosted.

Hybrid cloud:

This is basically the joint venture of the public and private cloud system working together.

Community cloud:

Community cloud: a cloud that is mutually used by various organizations and is commonly framed-up for their special requirements. The framework may be closely-held and operated by the organizations or by the cloud company provider.

The nature and mode of services offered by the cloud computing providers to the cloud clients is defined into three fundamental models:

1) Software as a Service(SaaS):
   Also called as ‘On-demand software’, SaaS is a layer of cloud computing that allows the users to have access to information and application required, not locally, but, from a remote server or facility via Internet. The client can access such services on their laptops, desktops, mobiles, browser etc. on a pay-per-use basis.
   Security of data is a major concern when it comes to the user’s data being stored on the cloud.
2) Platform as a Service(PaaS):
   Even if we have a software available on-demand on the cloud sometimes the local machine is not efficient enough to deliver a high processing power required for certain applications.
   This problem is solved by the cloud providers who provide platforms, basically compilers, interpreters, webservers, assemblers, virtual environments, Processing engines , development environments operating systems, programming language specific program specific execution environments. So this allows application developers to develop applications without caring about the software and hardware layers, and the amount and complexity associated with them. This layer makes scaling the business an easy piece of job as the cloud providers scale the processing power and the requisite resources automatically, to meet the application development requirements.

3) Infrastructure as a Service
The services that support a software and platform service, are the infrastructural services. These basically include the services pertaining to the hardware resources that support and the software and platform services of the cloud providers. The cloud providers facilitate a cloud infrastructure for installing the software and the platform.

Cloud Services:

Fig 2. Showing the three types of Cloud Services

IV. SECURITY IN CLOUDS

Gartner an American information technology research and advisory firm recently suggested that cloud computing as used for service-enabled applications still had seven years until it reached market maturity. Some of the problems it faces till now includes scalability, interoperability, shared environment and security, not to mention more business-focused topics.There is no denying the fact that Cloud resources are virtualized, different cloud service users share the same infrastructure and platform for building application and to store data. One key interest is affiliated to architecture set, asset alienation, and data segregation. Any disapproved and ferocious access to cloud service user's delicate data may accord its wholeness, secrecy and privacy.

A. Cloud Threats:

Several of the threats that were analyzed over a period of time, and it was found that a large amount of data was compromised by Thefts and Unauthorized Access. Other small percentage of security threat was due to Loss, Combination, IT incident, Improper Disposal etc.

Fig 3. The Statistics of Various Cloud Threats

B. Technical Issues:

- *Security*

Security can be defined as “how information can be locked safely”. The fact that the priceless enterprise information will dwell outside the firm firewall raises grave concerns.
Many high sensitive data can be exposed publicly if necessary measures are not taken. Hacking and different attacks to cloud structure would impact multiple clients even if merely one site is broken into. These risks can be impaired by using safety applications, encrypted data file scheme, data loss software, and purchasing security hardware to track out-of-the-way conduct across servers.

- *Distributed Responsibilities*

The main security issue is that the user must check before uploading the delicate data into the cloud storage. They must also take decent security measures such as using 32-bit encryption. This is a vital part because data can be secured if it is encrypted before saving it in the cloud store. Thus,

even if intrusion happens, there is a very minimum chance of the data getting stolen.
Encryption in the cloud is given in the diagram below.

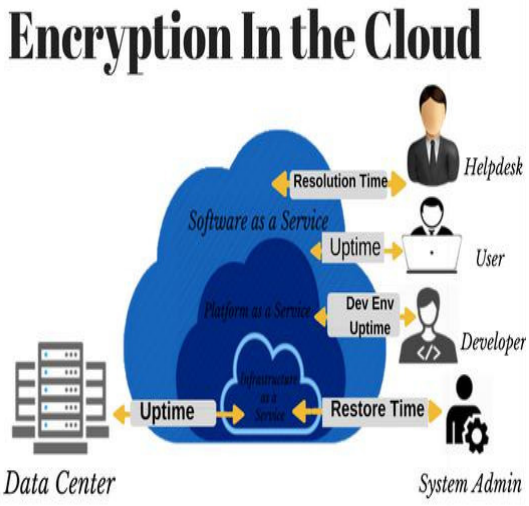

Fig 4. Encryption in the cloud

. .

- *Fault tolerance and failure recovery*

The data centers are merely responsible to process tremendous amount of data each day. Cloud services can face the problem of loss of data due to the failure of the system of the cloud. The shortage of power supply, low space or break down of the main system could lead to failure.

C. Challenges Faced In Cloud Computing

These are some of the challenges that are needed for security and their knowledge is necessary for mitigation purposes.

Privileged User Access:
Any client that accesses data outside the enterprise then the user has to take permission or buy membership for prevention of data leak.

Data Location:
The client shouldn't know where the data is stored or the place form where the data is being propagated (hosted).

Availability:
Data should be available everywhere even when the range of company is not available at that moment. This is called anywhere-anytime availability of software.

Regulatory Compliance:
The hosting providers should never allow external audits or allow installation of external new security certificates.

Recovery:
If under any condition the data is ruined by any disaster, man-made or natural, the providers should be able to deliver the backup data to the users on time.

C. Security Risks in Cloud Computing

Cloud Computing helps us to access data and information for particular organization. Hackers and Attackers have found out loopholes to gain access to these information.

IP Spoofing:

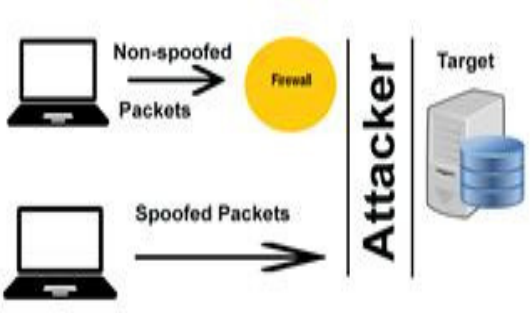

Fig 5 Showing IP Spoofing attack by modifying packets

IP Spoofing is known as analysis of the data that is being sent over the network. When data is sent over the network the attacker manipulates the data. The manipulation is done in a way that the IP address of the trusted system and then modifies the packet information and then sends it to the receiving system.

DDOS attack:

In this attack, DDOS the attacker spoofs the information and sends many requests of the data. The

server gets confused and doesn't understand what to do with all these request and finally ends up giving up authenticated data. The basic diagram of a DDOS attack is below:

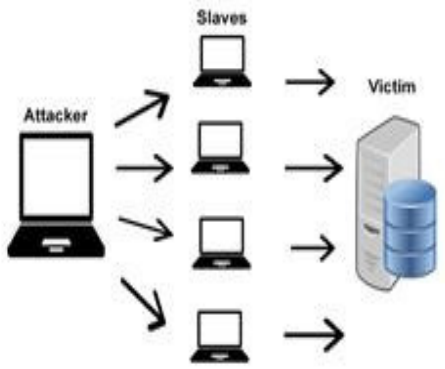

Fig 6. Showing the multi-requests sent by the attacker

Insecure Interface:

Interface is the model that helps the client to adhere to the cloud internal software. Management of data, identity management, monitor service and other functions that happen on the cloud are done through these interfaces. If interface is not secure, then data theft is very easy.

Malicious Insider:

The insiders such as the employees or any user can manipulate the data, such that they can even sell the information to other organizations. Any this causes severe data leaks in cloud computing.

Data Loss or Leakage:

There are two process taking place when data is being transmitted from host to client. First of all, data is being stored in a far of place and secondly, data transmission happens from one mode of execution to modes that are multiple in nature. Thus, if any modification happen in between, the loss or leakage of data occurs

Malware attack on VM:

Cloud Security can be compromised by the unwanted Vm-based virus or tool-kits that are used to cloak the information sent to the server by the user. Same process can happen when the data is being sent form the server to the client.

These viruses or malwares are also used to store the data such as registry information, system logs, and security program details. This flow charts shows us how these risks are interrelated:

Fig 7. Showing the risks that cloud computing faces.

But security & privacy issues caused by hackers and crackers and many security researchers have concluded that due to loss of control, invalid storage, access control and data boundary. The cloud computing is insecure and many preventive measures have been implemented over the time to reduce such risks.

V. CONCLUSION

Cloud computing is the newest technology that is becoming very popular now-a-days. This is a developing technology due to its applications in various fields like testing & development, big data analytics, file storage etc. Cloud Computing and their services are new but many new organizations are implementing the cloud services but there is always a risk of data breaching. There are more chances for data breaching for the organizations that implements the cloud services rather than the other that don't. Malware injection is also a big problem in cloud

services due to this the attacker can easily steal the sensitive data of organization. Cloud companies offer real benefits to the companies seeking a competitive edge in today's economy.

The biggest and scariest concern about cloud computing is that privacy and security doesn't come in the package, because while companies are sharing data with each other, critical data is being exchanged, the chances of data leakage and data theft is an undeniable fact.

So every company should have a reliable security measures to implement the technology to protect the data of the client. While many clouds have firewalls and intrusion prevention, but they are not tailored to meet the clients' specific system.

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Comparative Analysis of Angle Based and Traditional Routing Protocols for MANETs / WSNs

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***Abstract*—In this paper Angle based routing protocols are discussed and analyzed, which are developed for Mobile AdHoc networks or mobile Wireless Sensor Networks. Moto of this paper is to provide an idea that the routing protocols developed for Mobile Adhoc Networks can be completely used in Mobile Wireless Sensor Networks, by applying angle-based approach with them, as described in AODV, DYMO, OLSR, ZRP. This paper presents the approach of angle based routing protocol which are compared with the traditional routing protocols. The protocols are simulated on Qualnet simulator. The results shows different parameters of routing protocols like packet sent, packet received and forwarded at MAC layer etc.**

***Index Terms*—Angle based protocol; RREQ; WSNs;.**

I. Introduction

Routing of the information is a dominant issue in designing of wireless sensor networks, due to limited resources of energy, processing power, and memory. This study proves that it requires an urgent requirement to design energy efficient routing protocols for wireless sensor networks for increasing the network lifetime [1]. To minimize the required energy consumption of the wireless sensor network, many types of the routing protocols and routing algorithms have been projected so far all around the world. The standard existence of a wireless sensor network can be enlarged extensively if the operating system of network, the application layer of the model and the network routing protocols are designed to be energy conscious. These routing protocols and algorithms must have to be awake of the sensor network hardware and must be able to use special characteristics of the micro-processors based components and transmitter and receiver terminals to minimize the wireless sensor node's energy utilization. This may move forward to a traditional solution for different types of protocol designing. For the same angle based approach is incorporated in the traditional routing protocols for Mobile Adhoc Networks MANETs to get them utilized for Wireless Sensor Networks also. This may also guide to the different types of mutual algorithms in wireless sensor networks arena. [2].

II. Angle Based Approach

In this work angle-based mechanism, which was proposed in [3] is utilized. This approach utilizes the geological information of a nearby mobile sensor node in the sensor network and immobile sink node to decrease the number of RREQ (route request) packets. It is understood that every sensor node consists of a GPS system inbuilt in it to recognize its geological spot and also consists of information about immobile sensor node position.

The fundamental idea of the angle-based approach is that as a sensor node which is not a sink node receives a route request RREQ packet, then the sensor node measures the angle between the node which has sent the route request RREQ, and the receiver node itself by utilizing their geological location information. If the measured angle is larger than the threshold angle then the receiver node just drops the route request RREQ packet; or else, it broadcasts the route request packet RREQ again. The basis for plummeting a route request RREQ packet that does not satisfy the above principle is that the sensor node, which is exterior of the threshold angle, hardly finds the shortest path to the sink node since the node's geological distance to the sink node is farther than that of the route request RREQ sending node.

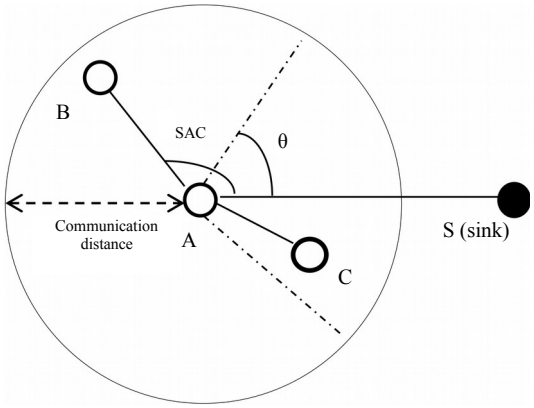

Fig. 1. Basic Idea of Angle-based mechanisms.

Fig.1. shows the fundamental concept of angle-based approach [3]. In this figure, node A broadcasts a route request RREQ packet to discover paths to a sink node. The node B accept the route request packet and measures the angle based on the geological position of the sending node A and its own. Node B drops the route request packet since the angle SAB, is larger than the threshold angle θ. When node C receives the packet it also measures the angle based on the geological position of the sending node A and its

own, it broadcasts the route request RREQ packet again because its angle SAC, is smaller than threshold angle θ.

Main deciding factor for packet broadcast and packet drop is the threshold angle. So, here is the formula for calculating threshold angle:

$$\theta = \theta_{init} - \alpha \times speed^{send\_node} - \beta \frac{\text{Number of sensor nodes}}{\text{Size of sensing area}} \quad (1)$$

Where, α and β = constants

θ_{init} = initial threshold angle as he route request is received

$speed^{send\_node}$ = speed of route request RREQ sending node

The above equation provides a small value of threshold angle to a sensor node which is located in a area where sensor deployed density is high and if the route request RREQ packet is received from a node of greater speed [3]. The reason behind is that because an when the node sending route request RREQ packet has higher speed, it possibly moves away out from the original location from where the node initiated the route request RREQ packet; so, the RREQ sending node has larger likelihood of failing to receive the RREQ packet returning from a sink node and the likelihood can be reduced by giving a smaller threshold angle. The threshold angle calculation is adjusted according to the density of sensor deployments in a area because if more sensor nodes be present in an area, then more routes can be recognized to a sink node, and so even if the threshold angle is getting smaller, the node can still find paths to a sink.

Following routing protocols have been simulated and analyzed with the angle based approach in the qualnet simulator.

A. Ad hoc On Demand Distance Vector (AODV)

Adhoc On-Demand Distance Vector AODV is a type of 'on demand routing protocol' with a minute wait-time. It means that nodes create the routes only when it is required to decrease traffic overhead. AODV protocol is compatible with Unicast, Broadcast and Multicast. In AODV protocol a routing table is developed and expanded by a particular order number to every destination node and by a time to live for every entry. It is also expanded by routing flags, the interface, a list of precursors and for outdated routes the last hop count is stored [5].

B. Dynamic MANET On-demand Routing Protocol (DYMO)

Dynamic Mobile Adhoc Networks On-demand routing Protocol (DYMO) is a descendant of the AODV routing protocol. It operates almost same to that of AODV. DYMO is the simplified version of AODV and it retain the basic mode of operation of AODV. As is the case with all table driven ad hoc routing protocols, DYMO also utilizes two protocol operations: route discovery and route maintenance [5].

C. Optimized Link State Routing (OLSR)

Optimized Link State Routing is a pro-active protocol, which is also based on table-driven in nature. It utilizes the link-state approach in an optimized way to diffuse topology knowledge. Typically, link-state algorithm circulates link-state information throughout the sensor network [6].

D. Zone Routing Protocol (ZRP)

The Zone Routing Protocol (ZRP) is a hybrid of the proactive and reactive mechanism. It maintains an state-of-the-art topological plot of a zone centred on every sensor node. The routes are immediately available if desired destination is within the zone. If the destinations are outside the zone, ZRP employs a route discovery procedure, which can be benefited from the local routing information of different zones [7,8].

III. SIMULATION TOOL

In this research work for comparison of traditional and proposed angle based mechanism protocol, we have utilized QualNet 5.0.2 for the simulations and analysis of wireless sensor network. QualNet is a developer for network evaluation software that analyzes the performance of wired, wireless and hybrid network protocols and device models, useful for simulating diverse types of networks. QualNet supports thousands of nodes for simulation and also supports for 64 bit Operating system [4].

Qualnet has been used to simulate various robust models of wireless sensor networks with almost 50,000 sensor nodes [4].

IV. SIMULATION ENVIRONMENT

In the scenario 61 nodes of network, 60 nodes are connected with one node, where node 61 is static i.e. there will be no movement in this node and node 1-60 will have random waypoint mobility model and node 61 is a full function device and work as a PAN coordinator and other nodes 1-60 are reduced function device in sensor network. The scenarios area is 1500m * 1500 m. and mobility model is random waypoint with mobility of 10mbps.

In QualNet Simulator, following parameters are configured before simulation. Table 1 shows these parameters along with their values.

TABLE I. SIMULATION PARAMETERS

S.No.	Parameters	Values
1	Simulation Time	100 sec
2	Mobility Model	Random way Point for sensor nodes, None for sink nodes
3	Simulation Area	1500 * 1500 m^2
4	Radio Type	802.15.4
5	MAC Protocol	802.15.4
6	Traffic Type	CBR
7	Number of Nodes	61

Scenarios and simulation for both the networks are shown below:-

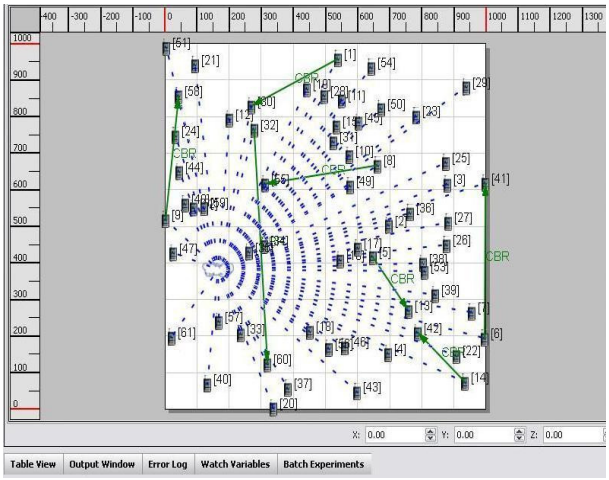

Fig. 2. Scenerios for WSN.

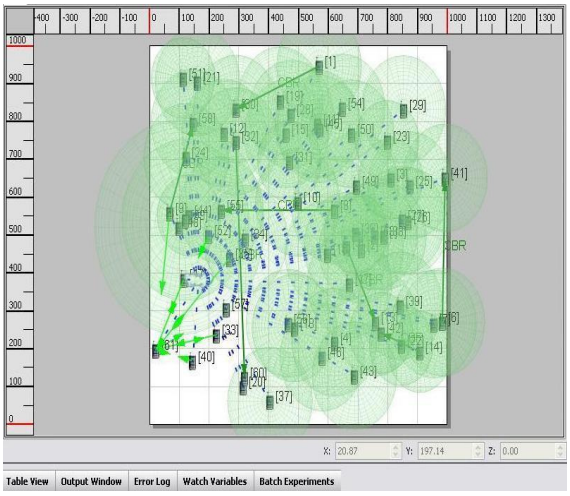

Fig. 3. Simulation for WSN.

V. Results And Discussions

Using QualNet 5.0.2 simulator different parameters for both networks are analyzed. Results of analysis are as follows:-

A. *Number of data request received*

Fig. 4 shows graph of typical and modified protocols with respect to number of data request received. Number of data request received in protocols is varied except in ZRP, whereas major difference can be seen AODV & AAODV. DYMO & ADYMO has slight difference in values. In AOLSR, it can be clearly seen that data packet are decreased as compared to OLSR.

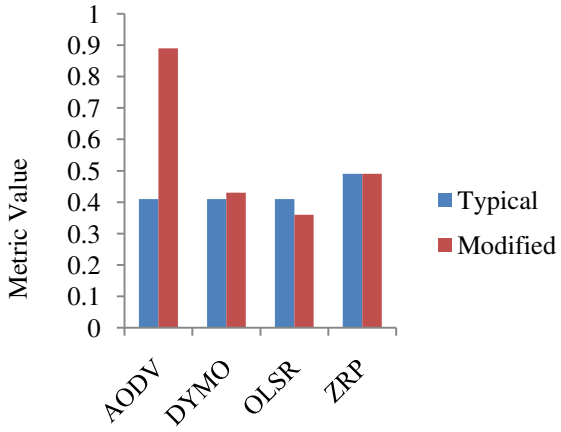

Fig. 4. No. of Data Request received.

B. *Signals Transmitted*

Fig. 5 shows the signals transmitted in WSN network. As it is clearly seen that in AAODV, ADYMO and AZRP more signals are transmitted as compared to AODV, DYMO and ZRP. But in AOLSR, fewer signals are transmitted as compared to OLSR.

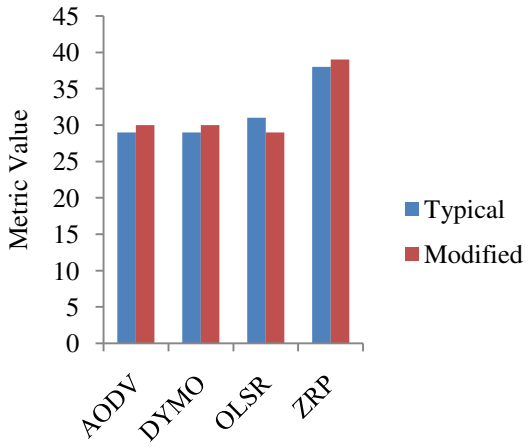

Fig. 5. Signals Transmitted.

C. *Signals Detected*

Fig. 6 shows signals detected in the network. It can be seen that typical AODV, DYMO, and ZRP have less signals detected in physical layer as compared to modified protocols. Whereas typical OLSR have detected less signals as compared to modified one.

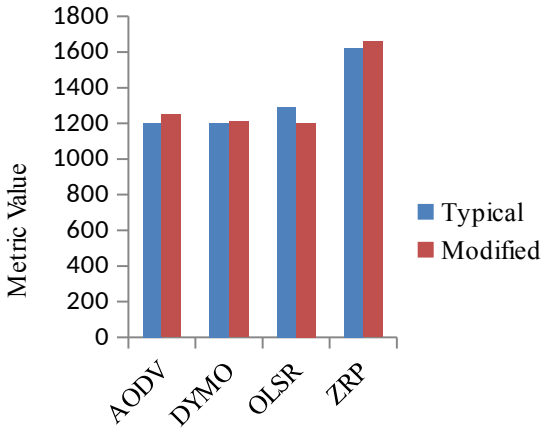

Fig 6: Signals Detected

H. Number of data packets received

Fig. 7 shows the number of data packets received in MAC layer. The value of packet received in AODV is 0.4 and AAODV is 3.9; value in DYMO is 0.6 and ADYMO is 0.4; value of OLSR is 4 whereas AOLSR is 2; value of ZRP is 15 and AZRP is 17. So, AAODV and AZRP shows more data packets received as compared to AODV and ZRP, whereas ADYMO and AOLSR receive fewer data packets as compared to DYMO and OLSR.

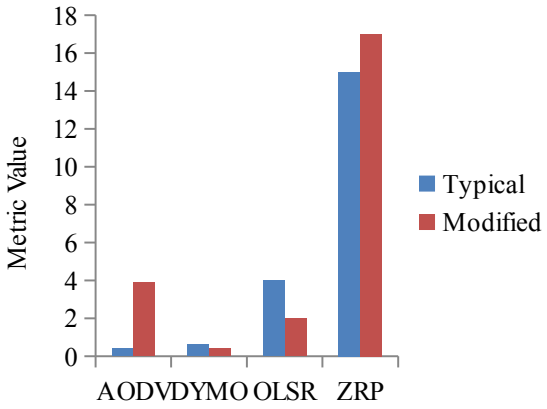

Fig 7: Number of data Packet Received

VI. Conclusion

In this work, angle-based mechanism is used in routing protocols and then a comparison is done between typical and modified protocols are compared. Routing protocols used are AODV, DYMO, OLSR and ZRP, which are modified to AAODV, AOLSR and AZRP. Results show that number of data request received is not much affected by using angle-based mechanism in protocols, except AAODV has received higher data requests as compared to AODV.

Signals transmitted have equally affected all the protocols, i.e. modified protocols transmit more signal as compared to typical protocols, except AOLSR, in which signal transmitted is decreased. Signals detected are also increased in all protocols except AOLSR in which fewer signals are detected. In AAODV and AZRP number of data packets received is increased as compared to AODV and ZRP respectively, whereas lesser number of data packets is received in ADYMO and AOLSR as compared to DYMO and OLSR. Number of packet dropped is also decreased in modified protocols, except AOLSR.

From all these results, it can be concluded that by adding angle-based mechanism, protocols have enhanced in many aspects. But it can be also seen that in every aspect modified OLSR does not responded well to the network. So, with respect to OLSR, this mechanism is not as much advantageous. All other protocols, AODV, DYMO and ZRP give approximately same changes by applying angle-based mechanisms. Therefore, this mechanism gives expected results for sensor networks. By using slight modifications in routing protocols, they can be used in sensor networks.

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Impulsive Noise Cancellation from Cardiac Signal using Modified WLMS Algorithm

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***Abstract*—For clean signal, noise cancellation techniques are explored day-by-day. At the user end the clean signal is highly essential for different purposes. In this authors have considered the bio-medical signal that is corrupted with impulsive noise. It is very important to separate from the signal, as its occurrence is sudden and often similar to the signal. The popular adaptive algorithms have been tested for cancellation of impulsive noise. Further most used Wilcoxon LMS is also verified for impulsive noise case. Finally it has been modified for the same purpose. The result found excellent in terms of less MSE, SNR improvement and faster convergence.**

***Index Terms*—Impulsive noise; ECG; Adaptive Algorithm; LMS; NLMS; WLMS; MA-WLMS.**

I. Introduction

As per World Health Organization review, about 20 million individuals may bite the dust in the year 2017 because of the heart attack. Heart related issues are expanding day by day and Electrocardiogram (ECG) signal is vital in determination of heart related issues. The ECG signal is utilized to know the cardiovascular state of a human. ECG is obtained by the electrical movement of the heart and can be measured by interfacing electrodes on the skin surface of particular parts of the body. As the ECG is a recording of the electrical exercises of the heart, it can help one get an idea of a human's heart exercises and can likewise help in recognizing variations in heart action, for example, cardiovascular infractions or unequal beat intervals.

ECG signal contains various noises. For better decision on patient treatment, it is essential to remove these noised from the monitoring receiver. Due to non-stationary nature of majority ECG signals, filtering of the signal to remove these noised is an essential component of signal processing. Different noises can be associated with ECG signal are: Base line wander, 50 Hz power line interference, motion artifact electromyogram (EMG) etc. Actually, most sorts of noises are not stationary, it implies, that the noise power measured highlights some variability.

The noise generated by the human muscle is the most difficult noise that ought to be removed. The switching transient in power, incidental pulses in phone lines add to impulsive noises. Such wonders happen in bio-medical signal in diathermia, while utilizing surgical gadgets, in electro cardiology (muscle noise). Also this type of noise gets included in ECG signal at the time of signal acquisition. To accomplish better noise reduction from non-stationary signals like ECG, different adaptive algorithm can be utilized. As adaptive filters don't have fixed channel coefficients, these channels can change their coefficients to lessen the noise present in the signal through adjustment.

A little amount of the works related with this area of investigation has been accomplished. Some major works are cited in the accompanying section. In this piece of work, we have endeavored to develop a system which will nullify the impulsive noise from ECG signal by using adaptive filtering theory. We have modified the Wilcoxon norm based LMS algorithm in a new way to weight variation. We have compared the Signal to Noise ratio (SNR) improvement of various adaptive filters. Also we have compared the Mean Square Error of those filters.

The organization of the paper is as below. The detail literature is provided in section II. In segment III, our proposed method along with some other existing adaptive filtering techniques has been explored. Section IV introduces the results and discussion. Finally, section V finishes up this paper with conclusion.

II. Related Literature

Adaptive algorithms have been used in many applications since two to three decades. One of the important applications is noise cancellation. This has been attempted by many researchers also. But the variant of noise with variation of applications are less used till date. Some of the works based on adaptive algorithm for noise cancellation is cited in this section.

Different algorithms concerned to adaptive filter sparsity has been introduced in [1]. The algorithms emphasize on the application domain of echo cancellation and identification of system. It was based on minimization of cost function with respect to a time dependent norm of filter update. They assumed that their problem has not a closed form solution so they have proposed an approximate solution followed by asymptotic behavior. Conventional linear system's performance becomes poor when data is distorted with non-

Gaussian noise. Adaptive filter design is an alternative solution to it. S.R Kim *et. al.* have proposed an adaptive pre-processor to minimize the impulsive components when the background noise is correlated with Gaussian process [2]. Their proposed method can adapt to the changes happened in the real time environment and have minimized the effect of impulsive noise from the system. In order to reduce the mixed norms and for the error signals, these authors have proposed two RAPS (robust affine projection sign) algorithms. In RAPS, the norm-based objective function gradient decides the direction vectors. The line search for both RAPS algorithm has been estimated using two norm-based minimization problems. Norm-based direction vector helps minimization of the effect of impulse noise. On the contrary, production of unbiased solution is possible using the line search. The SMAP (set-membership affine projection algorithm is the main source data selective adaptation followed by one of the RAPS technique. As compared to PAPs (pseudo affine projection sign) and Affine projection sign (APS), the RAPS algorithm has shown improvement in steady state misalignment reduction and convergence speed. A simulated application of RAPS has been explored in this area [3]. Similarly the adaptive LMS algorithm was modified to filtered LMS (Fx-LMS) and used for different applications. But when outliers are present this algorithm does not gives satisfactory result. For improvement of the technique Filtered-X Wilcoxon LMS and Filtered-X least mean log square was proposed. Both of them are basically learning algorithms which are robust in nature [4]. A solution to many problems like target tracking, environment sensing, and data collection is Distributed wireless sensor network. T Panigrahi *et. al.* have used cost function like Wilcoxon norm and error saturation nonlinearity in impulsive noise environment to solve the robust adaptive estimation problem [5]. But the incremental scheme is not useful to impulsive type environment so that they have used Wilcoxon norm to the incremental scheme to estimate the desired parameters in the existence Gaussian corrupted impulsive noise. LMS algorithm is one of the generally utilized algorithms in many tasks in the field of engineering, medicine, industries etc. The AFA (adaptive filtering algorithm) with averaging is a development over the LMS algorithm and has an enhanced performance. Also authors have used this algorithm in speech processing. Their proposed modification was verified for noise cancellation and had a better performance in terms of improved signal-to-noise ratio [6]. Recovering of signal from distortion and noise is performed by the application of various adaptive algorithms and has made the focus of research work. Excess mean square error is a disadvantage in LMS algorithm that causes performance degradation when desired signal has large power fluctuation. To avoid it, many researchers have given effort in many ways. Some of them have proposed two methods associated to LMS algorithm. One of them is weighted sum method and another is sum method. They have compared the weighted sum method with the sum method. Either one technique provides significant upgrades in the existence of strong desired signals and identical performance in the presence of weak desired signals, with respect to the conventional LMS algorithm [7]. Similarly the averaging algorithm as Filtered-x Adaptive Filtering with Averaging (FxAFA) was used the averages of information and correction term to update the weight value. It has been simulated for single channel feed forward noise controller system and compared their result with FxRLS algorithm on the basis of computational complexity and stability. G.G Yin *et. al.* have considered the averaging scheme in adaptive algorithm and have obtained optimal convergence with the algorithm with respect to the traditional approach [8-9]. AICF (adaptive impulse correlated filter) for event-related signals was used to remove the noise, even though the noise is colored noise and estimates the deterministic component of the signal. It has experienced with two inputs as primary input and reference input for the performance analysis in terms of signal-to-noise ratio, convergence and misadjustment error applied in ECG signal analysis [10]. RLS algorithm was compared with this algorithm for computational complexity and stability issues. AFA algorithm has high convergence rate as compared to that of the RLS algorithm and low computational complexity and robust in fixed-point calculation. The algorithm was tested in presence of car noise and office noise in speech signal [11]. Widrow's adaptive algorithm have been applied to speech signal, where which there is an acoustic barrier in between primary and reference inputs. During silence active noise canceller can cancel the noise with a little speech distortion by updating the weights. The modified ANC system works well and a SNR improvement up to 11 dB was achieved by involving a reference input to the outside of the face mask [12]. Comparison among LMS and RLS has been made for AC and DC noise within ECG signal in [13]. Performance of RLS algorithm is better than that of LMS in terms of MSE and convergence. Also for ECG signal case, M.Z U Rahman *et. al.* have used normalized signed regressor LMS (NSRLMS) algorithm. This algorithm has less computational complexity due to the sign present in the calculation and better filtering capacity due to the standardized term as compared to the standard algorithms. But it is especially reasonable for applications requiring substantial signal to noise proportions with less computational complexity [14]. Similarly, many trials have been made to cancel the noise from ECG signal with modification of existing algorithms [14-21]. But the literature cannot provide sufficient information regarding impulsive noise cancellation from cardiac signal. For the real time application authors in this piece of work have considered the cardiac signal contaminated with impulsive noise. The proposed algorithm is compared with existing algorithms for its performance and is depicted in the following section.

III. Method for Impulsive Noise Cancellation

The bio-medical signals are recorded with a disturbance at the time of signal acquisition. An extensive variety of noise exists

in bio-medical signal. One of the noises is a waveform of an electrical movement made by human muscles. In some cases this noise can be impulsive in nature. Impulsive noise can be due to internal i.e. from the human muscle or can be from eternal i.e. from the environment. So separating of this sort of noises is a fundamental need as impulsive noises are sudden burst having high amplitudes. Adaptive filtering theory can be utilized to remove impulsive noise from ECG signal ad adaptive filters can change their coefficients according to the environment.

The proposed block diagram of the adaptive noise cancellation for ECG signal is as follows,

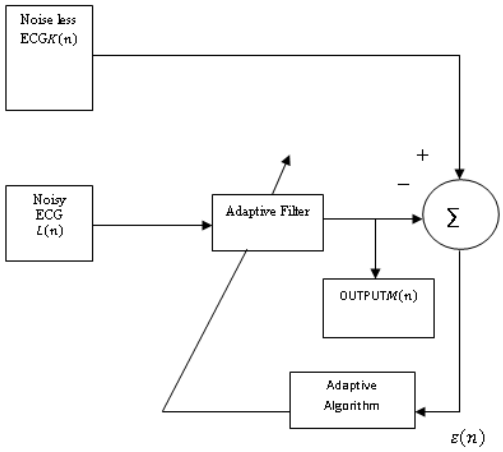

Fig. 1. Structure of Adaptive Noise Cancellation Procedure

Transversal structure is commonly employed framework for adaptive filter implementation. It considered as the desired signal as $K(n)$ which is noise less ECG signal. For input $L(n)$ we have picked an impulsive noise influenced ECG signal. The error signal which is obtained by taking the difference between the desired signal and the output signal gathered by passing the input signal through a adaptive channel is meant by $\varepsilon(n)$ [22].

The error signal $\varepsilon(n)$ can be estimated as,

$$\varepsilon(n) = K(n) - L(n) \tag{1}$$

The adaptive changes its weights as demonstrated by the noise signal. Whenever the error will be minimum, ideal point will be reached and at this instance of time we will get our clean ECG signal without impulsive noise. The adaptive output is described by,

$$M(n) = \omega(n)^T L(n) \tag{2}$$

$\omega(n)$ is the weights of the adaptive filter. Some adaptive algorithms we will explore now to update the weights so as to achieve the noise cancellation task. For comparison purpose, following algorithms have been used. Finally in subsection 3.4 the proposed approach is clearly explained.

3.1. Least Mean Square (LMS) Algorithm

When we are analyzing a noisy signal to get the clean signal adaptive algorithm plays a vital role to eliminate the noise. LMS algorithm can be used for changing the weights of the adaptive filter [23-26]. The weight adaption relation can be demonstrated by the following relation [23],

$$\omega(n+1) = \omega(n) + 2\mu\varepsilon(n)L(n) \tag{3}$$

Where, $\omega(n+1)$ is the next weight value to be updated and μ is the convergence coefficient, whose value is generally between 0 to 1. Also μ controls the stability of the system and convergence rate.

3.2. Normalized Least Mean Square (NLMS) Algorithm

Norm is associated with LMS algorithm. When LMS is normalized, the algorithm is termed as normalized LMS (NLMS). Due to normalization it has a greater stability than LMS algorithm and convergence rate is also higher. The weight update relation of NLMS algorithm can be as follows [22, 23, 26],

$$\omega(n+1) = \omega(n) + \mu\,.\varepsilon(n).\frac{L(n)}{\delta+\|L(n)\|^2} \tag{4}$$

Here δ is the small correction factor. Norm can be zero so if the denominator part will be zero then the equation will be invalid. So we are considering one small correction factor to avoid this problem.

3.3. Wilcoxon Least Mean Square (WLMS) Algorithm

Let us use the cost function as Wilcoxon norm to upgrade the algorithm using 'n' number of weights of a linear combiner. The algorithm uses iteration based training. In each iteration 'm' samples are used to update the linear combiner weights. A score function is desired to characterize the Wilcoxon norm error term ε having length 'x'. The conventional LMS can be used to update the model weights so as to expel the norm consistently. The score function can be defined as [4, 5, 24, 25],

$$\beta(i): [0,1] \to R \tag{5}$$

Which is non-diminishing such that,

$$\int_0^1 \beta^2\,(i)di < \infty \tag{6}$$

The score related with the score function ∂ can be defined by,

$$=>\boldsymbol{d(j)} = \boldsymbol{\beta}\left(\frac{j}{l+1}\right) \tag{7}$$

Where, $\boldsymbol{l}$ is a positive number. It can be demonstrated that the accompanying cost function which is a pseudo norm on $\boldsymbol{R^l}$.

$$\boldsymbol{J(y)} = \|\boldsymbol{\varepsilon}\|_{\boldsymbol{\omega}} = \sum_{\boldsymbol{k=1}}^{\boldsymbol{l}} \boldsymbol{d}\big(\mathrm{R}(\boldsymbol{\varepsilon_k})\big)\,\boldsymbol{\varepsilon_k}$$
$$= \textstyle\sum_{\boldsymbol{k=1}}^{\boldsymbol{l}} \boldsymbol{d(k)\varepsilon_{(k)}} \tag{8}$$

Where, $\mathrm{R}(\boldsymbol{\varepsilon_k})$ represents the rank of $\boldsymbol{\varepsilon_k}$ among all $\boldsymbol{\varepsilon_1, \dots, \varepsilon_l}$. And it can be sort by $\boldsymbol{\varepsilon_1, \leq \cdots \leq, \varepsilon_l}$ and $\boldsymbol{d(j)} = \boldsymbol{\beta}\left(\frac{j}{l+1}\right)$ and $\boldsymbol{\beta(i)} = \sqrt{\boldsymbol{12}}\boldsymbol{(i-0.5)}$ Now we can call $\|\boldsymbol{\varepsilon}\|_{\boldsymbol{\omega}}$ as in equation (8) as the Wilcoxon norm of the error vector $\boldsymbol{\varepsilon}$.

To determine the Wilcoxon LMS algorithm we need to use the steepest descent method,

$$\boldsymbol{\omega(y+1)} = \boldsymbol{\omega(y)} + \boldsymbol{\mu}\big(\boldsymbol{\nabla_\omega J(y)}\big) \tag{9}$$

Where, $\boldsymbol{\nabla_\omega J(y)}$ can be evaluated as,

$$\frac{\partial J(y)}{\partial \omega_y} = \sum_{k=1}^{l} \boldsymbol{d}\left(\mathrm{R}(\boldsymbol{\varepsilon_k})\right)\boldsymbol{\varepsilon_k} = \sum_{k=1}^{l} \boldsymbol{d}(\boldsymbol{k})\boldsymbol{i_k} \quad (10)$$

3.4. Modified Averaging Wilcoxon Least Mean Square (MA-WLMS) Algorithm

To reduce the computational complexity and to make the system stable instead of conventional algorithms adaptive algorithm with averaging can be considered. For applications where fast converging is required conventional LMS, NLMS algorithms are not applicable [11]. Also WLMS can be adaptable but it has stability issues. Similarly RLS algorithm can also be adaptable but due to its recursive structure it has more complexity. So in order to overcome all the issues above we have presented a modification to WLMS algorithm based on adaptive filtering with averaging so called Modified Averaging Wilcoxon Least Mean Square (MA-WLMS) algorithm. Adaptive filtering with averaging (AFA) can be realized by as followed [6],

Noise can be estimated as,

$$N(n) = \sum_{k=0}^{M} \omega(n) N_1(n-k) \quad (11)$$

Where, M is the filter order and N_1 is the noise component present in the signal.

To minimize the mean square error the filter coefficients are adjusted recursively so as per [8, 11] a standard algorithm can be considered for approximating the vector of filter weights as,

$$\omega(n+1) = \omega(n) + \mu L(n)\varepsilon(n) \quad (12)$$

Here $L(n)$ is the input signal vector, $\omega(n)$ is the adaptive coefficient vector and $\varepsilon(n)$ is the error vector. μ is a positive scalar.

Taking the averages of $\omega(n)$ equation (12) can be transformed to,

$$\omega(n+1) = \overline{\omega(n)} + \frac{1}{n^{\mu}} L(n)\varepsilon(n) \quad (13)$$

Where we can represent the averages of $\omega(n)$ as follows,

$$\overline{\omega(n)} = \frac{1}{n}\sum_{k=1}^{n} \omega(n) \quad (14)$$

The value of μ lies in between 0.5 to 1.

According to the analysis present in the upper given algorithm is not stable initially because only the averages of the coefficients have been considered. So to enhance the stability also the averages of the input signal and the error signal is also considered. So the adaptive filtering with averaging can be obtained as,

$$\omega_k(n+1) = \overline{\omega_k(n)} + \frac{1}{n^{\mu}}\overline{L(n)\varepsilon(n)} \quad (15)$$

Where, $k = 0,1,\ldots,M$

$\overline{\omega_k(n)}$ and $\overline{L(n)\varepsilon(n)}$ can be calculated from their past values, so averaging here does not make extra burden to the calculation. Here covariance matrix is not present so the estimate of covariance is not needed. Automatically computational complexity reduces as well as stability increases.

On application to impulsive noise cancellation from LMS and NLMS algorithm WLMS has better performance. So in order to improve the performance with respect to Signal-to-Noise ratio (SNR) we have modified the WLMS algorithm in corporation with adaptive filtering with averaging by introducing the Wilcoxon norm to it. And the Modified Averaging Wilcoxon LMS (MA-LMS) algorithm can be given by,

$$\omega_k(n+1) = \overline{\omega_k(n)} + \frac{1}{n^{\mu}}\frac{\overline{L(n)\varepsilon(n)}}{\|L_w(n)\|^2} + AVG\left[\frac{1}{n^{\mu}}\frac{\overline{L(n)\varepsilon(n)}}{\|L_w(n)\|^2}\right] \quad (16)$$

The proposed adjustment was evaluated and tested for impulsive noise cancellation in ECG signal.

IV. Result and Discussion

For simulation we have acquired the ECG signal from MIT-BIH database [27]. We have tried to cancel out the impulsive noise by considering the following parameters as given in table- -1.

Table 1 Parameters for Impulsive Noise cancellation

Parameters	Values
$\boldsymbol{\mu}$ for adaptive algorithms	0.08
$\boldsymbol{\delta}$ for NLMS algorithm	0.001
No. of iteration	3600
Tap-weight	16

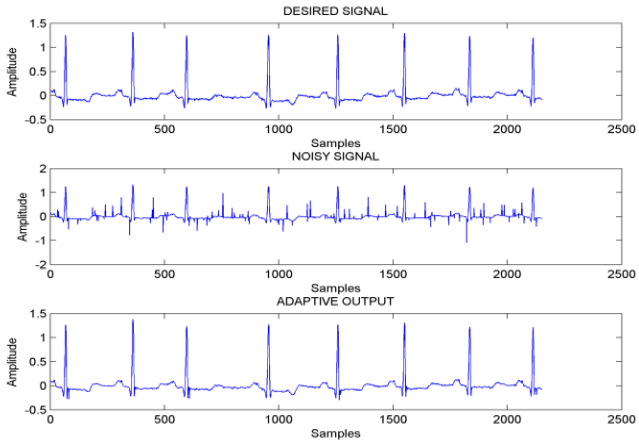

Fig. 2. Impulsive noise cancellation using LMS algorithm

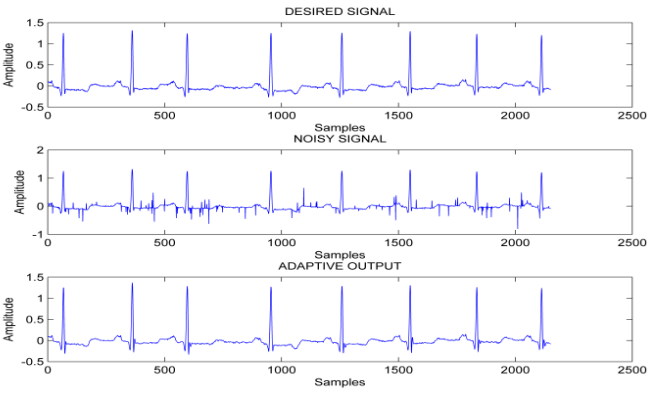

Fig. 3. Impulsive noise cancellation using NLMS algorithm

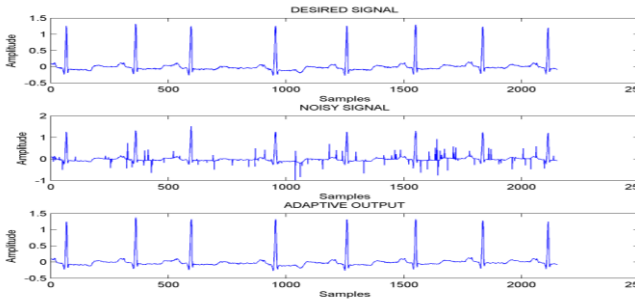

Fig. 4. Impulsive noise cancellation using WLMS algorithm

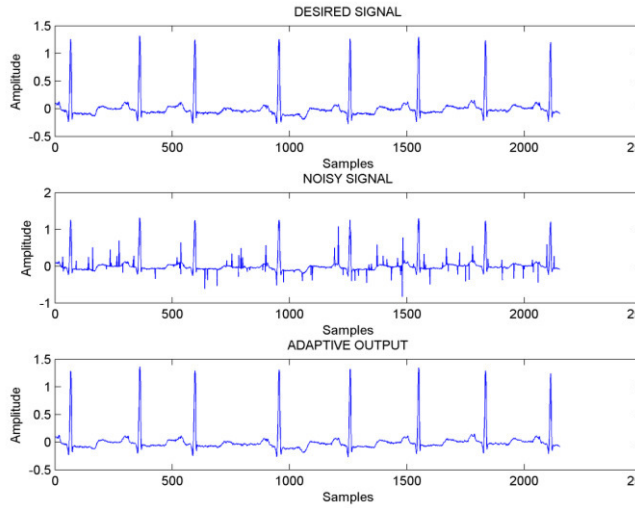

Fig. 5. Impulsive noise cancellation using MA-WLMS algorithm

Fig.2 to Fig.5 demonstrates the impulsive noise cancellation from ECG sign utilizing LMS, NLMS,WLMS and MA-WLMS algorithm separately. In all cases noise is removed so to know which calculation is better we have compared the Mean Square curve of each algorithm.

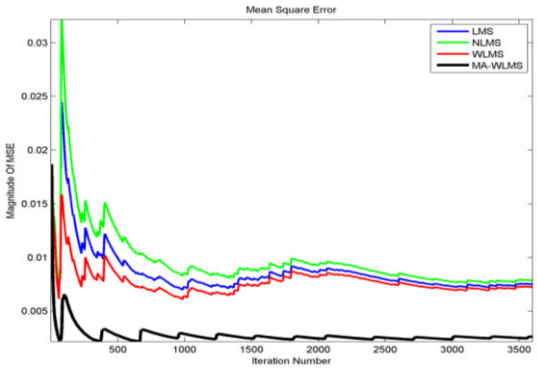

Fig.6. MSE comparison between LMS, NLMS, WLMS and MA-WLMS algorithm.

Also we have obtained the performance of the proposed algorithm with respect to SNR.SNR before filtering and SNR after filtering has beeen calculated an. At that point we have also calulated the SNR improvement.From Table.2 MA-WLMS algorithm has preferred SNR improvement than LMS, NLMS and WLMS.

Table 2: SNR comparison between LMS, NLMS, WLMS and MA-WLMS

FILTER TYPE	SNR BEFORE FILTERING	SNR AFTER FILTERING	SNR IMPROVEMENT
LMS	7.8499 dB	11.3658 dB	3.5159 dB
NLMS	7.0176 dB	12.5551 dB	5.5375 dB
WLMS	7.1397 dB	15.4473dB	8.3076dB
MA-WLMS	7.1086 dB	16.8498 dB	9.7412 dB

V. Conclusion

The proposed algorithm has shown excellency for noise removal. Though impulsive noise is complex, it is removed using the proposed algorithm and the SNR has been improved almost three times than standard LMS algorithms. It is suitable for the sensitive bio-medical applications. The algorithm may be verified for other signals and can be suitably used for real time application. The implementation of the algorithm can be useful for modern medical equipments and can be extended for future work.

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A Comparative study on Cryptographic Image Scrambling

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***Abstract*—In the last few decades, a numerous number of image encryption algorithm has been proposed based on scrambling. Scrambling is the most crucial part of confusion-diffusion based encryption techniques. In the current scenario, the scrambling techniques are used without knowing the cryptographic effect, quality and computational complexity. Hence, an comparative study on scrambling techniques (permutation) is required. In this paper, a comparative study has been done on different scrambling techniques like matrix transformation, bit plane scrambling, 2D mapping and key based row and columns shifting techniques. To determine the quality and efficiency of the scrambling techniques, correlation, entropy, computational complexity have been considered. From the test results it was found that matrix based image scrambling applied on Arnold Transform was the best among the considered techniques in terms of correlation.**

***Index Terms*—Arnold's map, cryptography, Fibonacci series, gray code, scrambling**

I. Introduction

In the past few decades, there has been a drastic change in the working habits, entertainment sources, modes of communication and shopping techniques. Due to this change a lot of multimedia information exchanges are done over the Internet everyday. Secure multimedia communication is increasingly becoming important as multimedia data can be easily intercepted by illegal sources. Law enforcement agents may find it very difficult to stay afloat above the ill intentions of hackers.Therefore, people should pay more attention to the security of media data. Techniques like encryption [10], [11], stanography [15], watermarking [12], secret sharing [13], [9] etc are used to secure data during the transmission over public channel.

Scrambling is widely used in encryption algorithms[16], [14], [8] for adding confusion. Scrambling refers to the permutations of pixel values or permutation of bit values in a bit plane. Transforming a plain image into a meaningless noise to eliminate the high correlation between adjacent is the aim of scrambling. Various image scrambling techniques are used in pay-TV, defense purposes, medical domain, private video conferencing and various other applications [28], [19].

This paper presents a comparative study of some popular cryptographic image scrambling methods like generalized matrix-based scrambling (transformation) [5] using Arnold's transform [1] and Fibonacci transform [27], gray code with bit plane transformation [25], 2D mapping [20], key based row and column shifting[18], [10] and Fu et. al.'s key based row and column shifting with bit-level permutation [3].

Arnold's cat map is a chaotic map named after, Vladimir Arnold who proposed the algorithm, and also applied to Fibonacci transform [28]. Fibonacci transform [27] has a unique property of uniformity. The pixels that are at equal distance from each other in original image remain at equal distances in the encrypted image as well. The adjacent pixels are also spread as far as possible. In addition to having very low correlation this method has low computational overhead.

A quantum image gray-code and bit-plane scrambling [25], [21] is presented in which bit-plane scrambling is one of the famous image scrambling techniques. It is used as one of the basic steps in many encryption algorithm [26]. The values of higher bit planes are XORed with the lower bit planes. The value of lowest bit plane be fixed.

Another image scrambling method based on 2D mapping [22] in which pseudo-randomness, aperiodicity and being sensitive to change with respect to initial conditions make chaotic maps one of the favorite techniques in scrambling. It is also used in scrambling of large amount of data such as video, audio etc [2]. The watermark information of the image is embedded in the amplitude spectrum by 2D mapping [20]. In this algorithm, a random sequence is generated using chaotic map(logistic map [23]). Then, the original image is XORed with the random sequence. Further image mirror mapping interlacing is used to scramble the image.

Key based scrambling for secure image communication is used in[18], [10], a random sequence is generated. Using this random sequence, the rows of the image is swapped. Similarly, the columns are swapped. Further, circular shifting of the rows and columns are done using using the same sequence. [24] also used a method involved row and column shifting with prediction error clustering for image encryption the compression scheme. [7], [17] also uses row and column shifting method for permutation of pixels.

A novel chaos-based bit-level permutation scheme [3] in which the image is extended to bit plane binary image. Chebyshev chaotic map is used to generate random sequences. The rows are permuted according to that random sequences.

Further, the columns are shifted according to the same random sequences. After that, the extended image is divided into 8 blocks of equal sizes and again permutation is applied on each block using generalized Arnold Cat Map. The blocks are then merged to obtain the cipher image [4]. [6] uses a pixel-level permutation and bit-level permutation for image encryption.

Correlation between the original image and the encrypted image, correlation between the current pixel and horizontal, vertical and diagonal pixels, entropy, computational complexity are used as parameters of compare the scrambling techniques.

The next section describes the overview of the schemes compared followed by comparative results in section III. And finally conclusion is presented in section IV

II. Schemes Compared

A. Generalized Matrix-based Scrambling Transformation

The equation 1 transformation is the general model:

$$\vec{V_k} = A\vec{V}_{k-1} \bmod \vec{N}, k \in Z^+ \tag{1}$$

In equation 1, A is a matrix of size $n \times n$. A is called as scrambling parameter matrix. All the entries of A are non-negative integers and $\det(A) \neq 0$, $\vec{V_k}, \vec{V}_{k-1}, \vec{N}$ are $n \times 1$ vectors and $0 < v_{i,j} \leq N_{j-1}$ for $i = k-1, k$ and $j = 1, 2, \ldots, n$ assuming $\vec{V}_{k-1} = (V_{k-1,1}V_{k-1,2}...V_{k-2,n})'$ and $\vec{V_k} = (V_{k,1}V_{k,2}...V_{k,n})'$, $\vec{N} = (N_1N_2...N_n)'$ is called the module vector in which N_j are positive integers representing the upper limit of the corresponding $v_{ij} = (i, j = 1, 2...)$. The scrambling times of the image is denoted by a positive integer k. $^+$ denotes the set of positive integers.
The case with equal module is defined as equi-modulo transformation, i.e., $\vec{N} = (NN...N)'$, then, equation 1 can be transformed into equation 2:

$$\vec{V_k} = A\vec{V}_{k-1} \bmod N, k \in Z^+ \tag{2}$$

1) Matrix based Image Scrambling applied on Arnold Transform: Cat map, also known as Arnold transform was proposed by V.I. Arnold in the research of ergodic theory. A process of splicing and clipping which realigns the digital image matrix is called transform. The 2D Arnold transform is an invertible map described by equation 3

$$\begin{pmatrix} x_{n+1} \\ y_{n+1} \end{pmatrix} = \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} x_n \\ y_n \end{pmatrix} \bmod 1 \tag{3}$$

where $(x_n, y_n) \in [0, 1) \times [0, 1)$

It can be applied to scramble digital images sized $N \times N$ by the discrete form in equation 4:

$$\begin{pmatrix} x_{n+1} \\ y_{n+1} \end{pmatrix} = \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} x_n \\ y_n \end{pmatrix} \bmod N \tag{4}$$

where $(x_n, y_n) \in [0, N-1] \times [0, N-1]$

is the original image's pixel coordinate; N is the height or width of the image processed; (x_{n+1}, y_{n+1}) is the coordinate of the scrambled image. The transform changes the position of pixels, and if it is done several times, a disordered image can be generated.

The Scrambling process:

for each pixel $A(i, j)$ **do**
$\binom{I}{J} \leftarrow \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix} \binom{i}{j}$
$B(I, J) \leftarrow A(i, j)$
end for

2) Matrix based Image Scrambling applied on Fibonacci Series: Fibonacci Series is a special series named after nineteenth-century mathematician Leonard Fibonacci. The following series is called Fibonacci series: $1, 1, 2, 3, 5, 8, \ldots$
Let X and Y be two adjacent Fibonacci numbers, $X = F(n), Y = F(n+1)$. Then, $F(n+2) = X + Y$.
The transformation is known as the Fibonacci Transformation which is represented by equation 5:

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \bmod N \tag{5}$$

where $x, y \in \{0, 1, 2, 3 \ldots, N-1\}$

The Scrambling process:

for each pixel $A(i, j)$ **do**
$\binom{I}{J} \leftarrow \begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} \binom{i}{j}$
$B(I, J) \leftarrow A(i, j)$
end for

B. Quantum image gray code and bit plane scrambling

NEQR, based on FRQI(Flexible Representation of Quantum Image) is a splendid representation for a quantum image. According to the NEQR model, a quantum gray scale image can be described as equation 6

$$\begin{aligned} |I\rangle &= \frac{1}{2^n} \sum_{x=0}^{2^n-1} \sum_{y=0}^{2^n-1} |f(X,Y)\rangle |XY\rangle \\ &= \frac{1}{2^n} \sum_{x=0}^{2^n-1} \sum_{y=0}^{2^n-1} \otimes_{i=0}^{q-1} \left|C^i_{i=0}\right| |XY\rangle \end{aligned} \tag{6}$$

where $|I\rangle$ stands for a $2^n \times 2^n$ image and the gray range of image is 2^q. Then, binary sequence encodes the gray value $f(X, Y)$ of corresponding pixel (X, Y), whose implication is in equation 7,

$$\begin{aligned} f(X,Y) = C^0_{XY} C^1_{XY} \ldots C^{q-2}_{XY} C^{q-1}_{XY}, C^k_{XY} \in [0,1], \\ f(X,Y) \in [0, 2^q - 1] \end{aligned} \tag{7}$$

The Scrambling process: The first operation performed on the image is bit plane slicing. Bit plane information rule states that high bit planes contain most of the information (50.19% information of the pixel is contained in the 8th bit plane) while the lower bit planes contain less information(0.003% information of the pixel is present in the 0th bit plane). According to this rule, the elementary GB scheme adopts the Gray-code transformation in reverse order i.e 0^{th} bit plane is kept fixed.The elementary GB scrambling is denoted by the

following function 8:

$$|I\rangle = \frac{1}{2^n}\sum_{x=0}^{2^M-1}\sum_{y=0}^{2^N-1} GB(|f(X,Y)\rangle)\,|XY\rangle = \frac{1}{2^n}\sum_{x=0}^{2^M-1}\sum_{y=0}^{2^N-1} |g(X,Y)\rangle\,|XY\rangle \tag{8}$$

where $n = (M+N)/2$

The GB in the above equation stands for the elementary GB scrambling operation. The quantum circuit about this method is shown in figure 1 given below: Numbers 1 to 8 represent

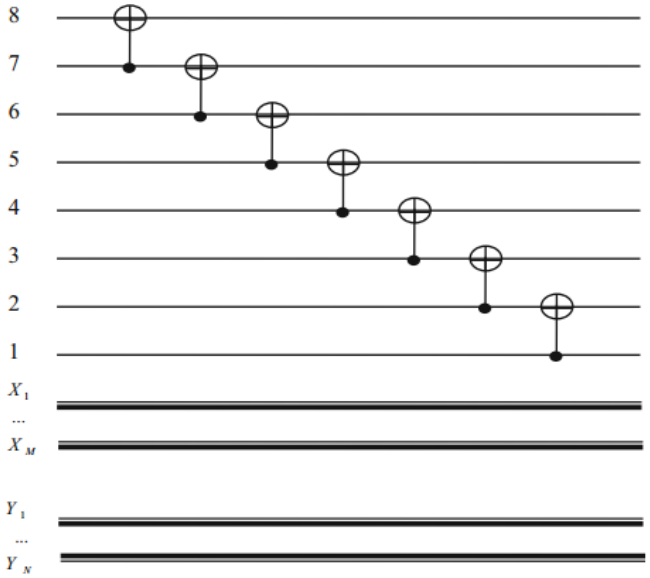

Fig. 1: The quantum circuit

the bit planes. The gates used here is CNOT gates (Controlled NOT gate).

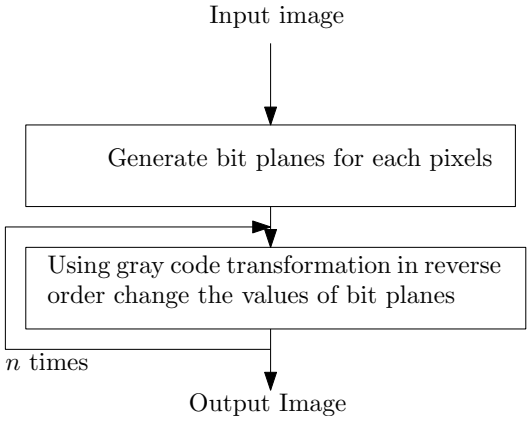

Fig. 2: Flow chart of gray Code scrambling

C. Image Scrambling based on 2D mapping

Assume the original image is $A(M \times N)$, where M represents the height and N represents the width. The pixel value of any coordinate (i, j) is expressed by $A(i, j)$ where $i = 0, 1, 2, \ldots M-1$ and $j = 0, 1, 2, \ldots N-1$. The dimension of the encryption image E is still $M \times N$.

The Scrambling process:

Step1: Generate a two dimensional random sequence R such that $R(i, j), (i = 0, 1, 2, \ldots M-1; j = 0, 1, 2, \ldots N-1)$.

Step2 Since bit-exclusive-or operations are reversible in mathematics, it may be used to realise the counter operation of the algorithm. Chaos sequence R is used to change the original image A's pixel gray level to obtain image A_1. The operation is: $A1(i, j) = A(i, j) \oplus R(i, j)$

Step3: The final encrypted image E is obtained by changing the pixels of A_1. Using image mirror mapping in mathematics reversible can realize the operation of inverse algorithm, and make the symmetrical mirror image mapping to image A_1. Image mirror maps can order around from top-bottom mirror and then left - right mirror, the opposite order can also be. In order to increase the degree of image scrambling, this article uses the image mirror mapping interlacing. First of all, take the image A's vertical median line as the symmetry axis, and then left- right mirror mapping to image A_1's even-numbered columns to obtain image A_2.This left right mirror mapping's formula can be expressed as equation 9:

$$\begin{aligned} A_2(i,j) = A_1(i, N-j+2) \ if \quad \bmod (j,2) = 0 \\ A_2(i,j) = A1(i,j) \ if \quad \bmod (j,2) = 1 \end{aligned} \tag{9}$$

Then the symmetry axis is taken to be the horizontal median line of image A_2, and then top-bottom mirror mapping to image A_2's odd-numbered rows to obtain image A_3. This topbottom mirror mapping's formula can be expressed as equation 10:

$$\begin{aligned} A_3(i,j) = A_2(M-i,j) \ if \ \bmod (i,2) = 1 \\ A_3(i,j) = A_2(i,j) \ if \ \bmod (j,2) = 0 \end{aligned} \tag{10}$$

And image A_3 is the encrypted image E.

D. Key based scrambling by row and column shifting

Key based scrambling algorithm is a very effective and simple method of image scrambling and encryption. In this method, the user specifies a key that forms a sequence of numbers. The content provider uses this sequence to generate another key sequence to scramble the image and transmit it.

Encryption in this method is key-based and subsequently a scrambled image is generated. The method is shown in figure 3.

The Scrambling process:

Step1- A secret key is used to generate a random sequence R that is of the length of the maximum dimension of the image. If an image is 256×128, then the key sequence will have a length of 256.

Step2- Now the key sequence is used to switch the Rows. If the 1^{st} value of the sequence is 66 then the 1^{st} row is swapped with 66^{th} row of the image.

Step3- Use the key sequence to switch the columns. The

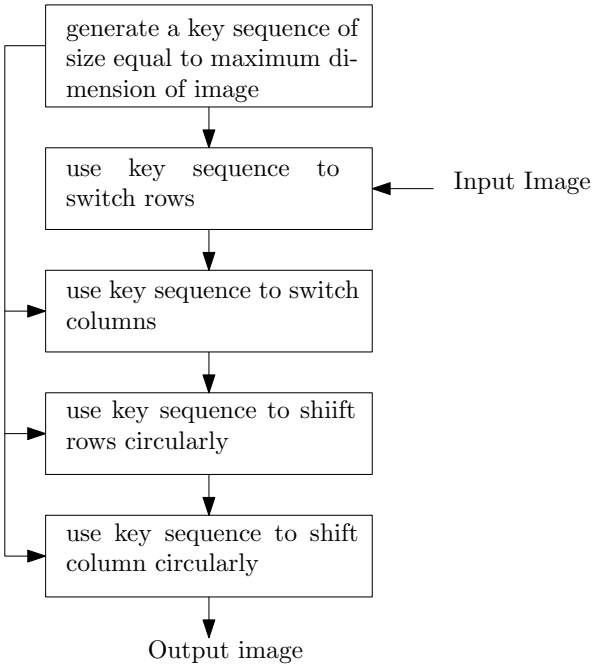

Fig. 3: Flow chart of Key based scrambling [18]

column switching process is similar to the row switching.
Step4- Now the Rows are circular shifted using the same key sequence as the scrambling achieved from row and Column switching is not acceptable.
Step5- Similarly, the columns are also circular shifted using the key sequence.
When the above 5 steps are applied to an image, the scrambled image is obtained.

E. Fu et. al.'s scrambling Scheme

This scheme is based on chaos based bit permutation. The scheme performs shuffling in two steps, first using a chaos sequence based on Chebyshev chaotic map and second using generalized Arnold transform. The scheme is successful in generating a secure image cipher. The steps are as follows:

1) Extend the image of size $M \times N$ to $M \times N \times 8$ bit plane binary image.
2) Generate the chaotic sequences S_0 and S_1 of size M and $N \times 8$ respectively using Chebyshev chaotic map in equation 11.

$$x_{(n+1)} = T_l(x_n) = \cos\left(l.\cos^{-1} x_n\right), \quad x_n \in [-1, 1], l \in [2,] \tag{11}$$

3) Permute the rows of the binary image using sequence S_0.
4) Permute the columns of binary image using sequence S_1.
5) Now, Divide the binary image into 8 blocks of equal size.
6) Permute each block with generalized Arnold cat map (in equation 4) k times.
7) marge the blocks left to right to recover the pixel plane and further generate the Cipher Image.

III. Comparative Study and Results

Four images namely test image 1 in figure 4, test image 2 in figure 5, test image 3 in figure 6, test image 4 in figure 7 were taken for experiment. Those same images were scrabbled using different methods. (b) is scrambled using scheme using Arnold's transformation, (c) is scrambled using Fibonacci transformation, (d) is scrambled using gray code with bit plane transformation, (e) is scrambled using 2D mapping, and (e) is scrambled using key based row and column shifting method and (f) is scrambled using key based row and column shifting method with bit plane permutation.

A. Entropy analysis

Entropy is the measure of randomness and unpredictability in an image. It measures the randomness in the frequency of occurence of pixels with different intensities present in the image. Low entropy anywhere, especially via repeating keys or values, produces measurable statistical correlations, which are the basis of much of cryptanalysis. By contrast, more entropy means a bigger and less predictable key search space, with fewer and more difficult to detect redundancies and correlations. The entropy in a cipher is thus a measure of how difficult it is to break the cipher via brute force.

$$H = -\sum_{i=0}^{2^N-1} p_i \log_2 p_i \tag{12}$$

A good cipher has an entropy closer to 8. The table II shows the entropy of scrambled images.

B. Comparative Computational Complexity

The Comparative numbers of operation are presented in table I. Where k stands for number of iterations of ArnoldFibonacci transformGray bit plane scrambling.

TABLE I: Comparative results of operation

Scheme	Operation
Arnold's transformation	No of mod operations $M \times N \times k$ No of swap operations $M \times N \times k$
Fibonacci transformation	No of mod operations $M \times N \times k$; No of swap operations $M \times N \times k$
gray code with bit plane transformation	No of xor operations $M \times N$; No of mod operations $M \times N \times 2$; No of copy operations $3 \times M \times N$
2D mapping	No of xor operations $7 \times M \times N \times k$
row and column shifting	No of swap operations $M \times N + N \times M = 2 \times M \times N$; Worst Case No of shift operations $\max(M, N) \times M + \max(M, N) \times N$
row and column shifting with bit plane scrambling	No of swap operations $M+N \times 8+M \times N \times 8 \times k$; No of mod operations $M \times N \times 8 \times k$

C. Correlation Coefficient

It tells us how much there is relation between the same pixels of the original and the encrypted image. It is calculated from the formula below eq. 13:

$$r = \frac{\sum_m \sum_n (A_{mn} - \overline{A})(B_{mn} - \overline{B})}{\sqrt{\left((A_{mn} - \overline{A})^2\right)\left((B_{mn} - \overline{B})^2\right)}} \tag{13}$$

Where A and B are the original and the encrypted image respectively. and are their means. The lower the value of the correlation coefficient, the better it is. The values were found to be as shown in table II.

IV. Conclusion

Scrambling is one of the most important part of confusion diffusion based image encryption. A huge number of scrambling techniques are available in literature. Therefor choosing the correct scrambling method for an encryption scheme becomes most crucial. The performance of a an encryption scheme largely depends on the scrambling technique used. In this paper a comparative study on different cryptographic scrambling techniques is done. The study includes matrix based, Fibonacci series based, key based scrambling techniques. Correlation coefficient, entropy and computational complexities are compared in the paper by simulating and testing them on four images.

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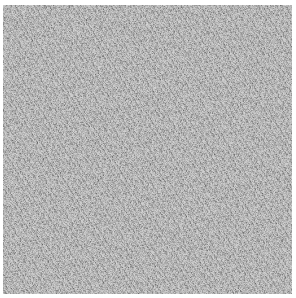
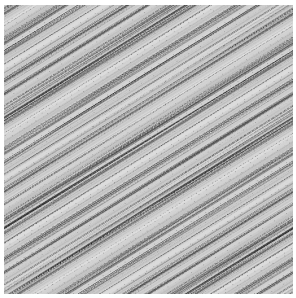
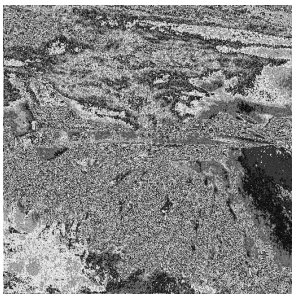
(a) Airplane: Original test image 1



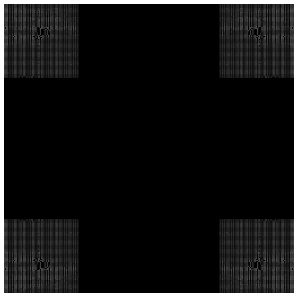
(b) Scrambled by Arnold's transformation



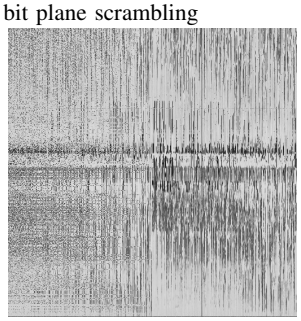
(c) Scrambled by Fibonacci transformation



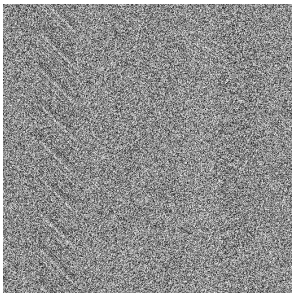
(d) Scrambled by gray code with bit plane scrambling



(e) Scrambled by 2D mapping

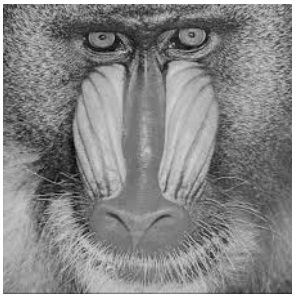


(f) Scrambled by key based row and column shifting

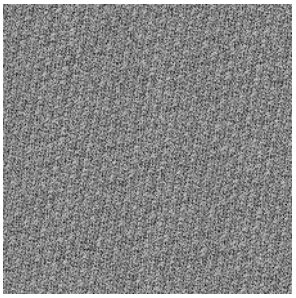


(g) Scrambled by key based row and column shifting with bit plane scrambling

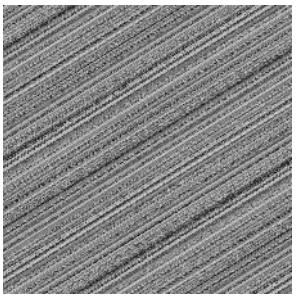
Fig. 4: Results of scrambling using different scrambling techniques on Airplane image: Original test image 1



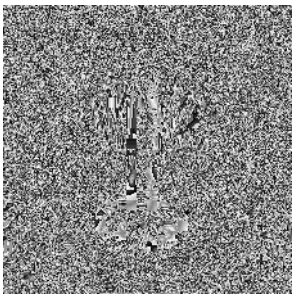
(a) Baboon: Original test image 2



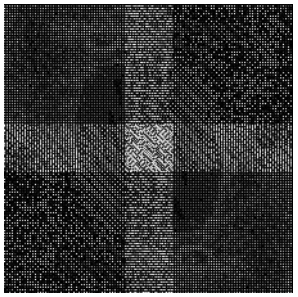
(b) Scrambled by Arnold's transformation



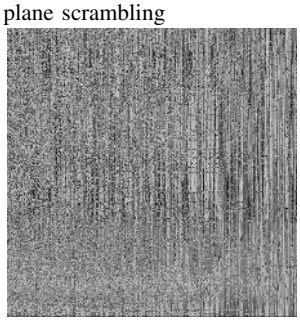
(c) Scrambled by Fibonacci transformation



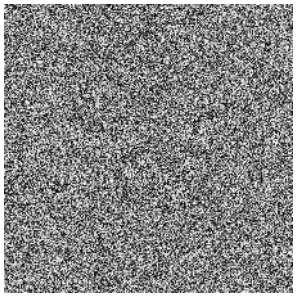
(d) Scrambled by gray code bit plane scrambling



(e) Scrambled by 2D mapping



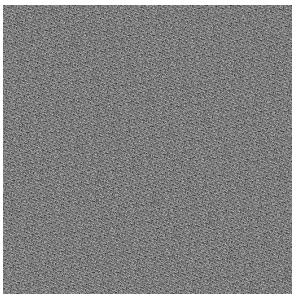
(f) Scrambled by key based row and column shifting



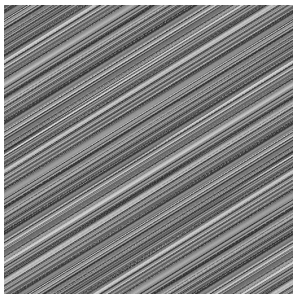
(g) Scrambled by key based row and column shifting with bit plane scrambling

Fig. 5: Results of scrambling using different scrambling techniques on Baboon image: Original test image 2

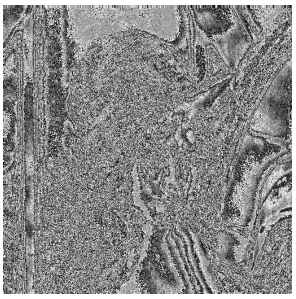
(a) Lena: Original test image 3



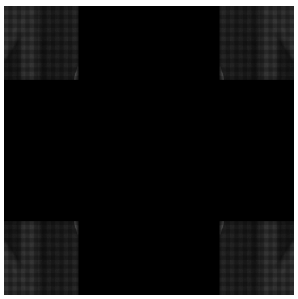
(b) Scrambled by Arnold's transformation



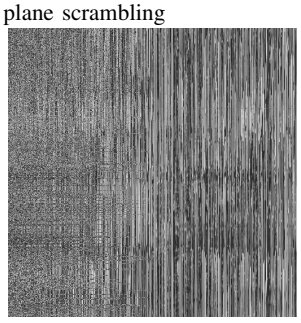
(c) Scrambled by Fibonacci transformation



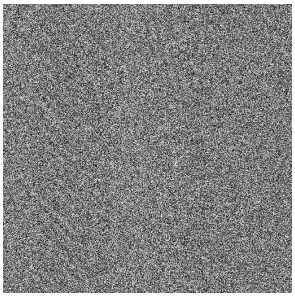
(d) Scrambled by gray code bit plane scrambling



(e) Scrambled by 2D mapping

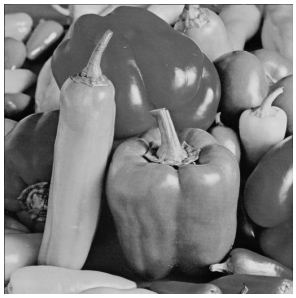


(f) Scrambled by key based row and column shifting

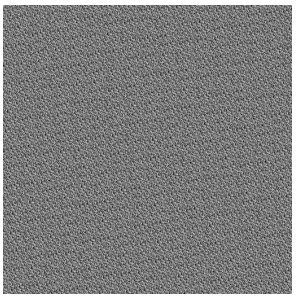


(g) Scrambled by key based row and column shifting with bit plane scrambling

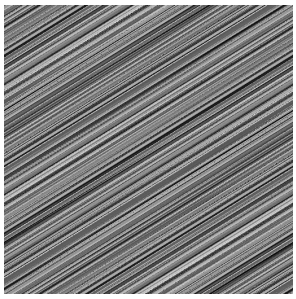
Fig. 6: Results of scrambling using different scrambling techniques on Lena image: Original test image 3



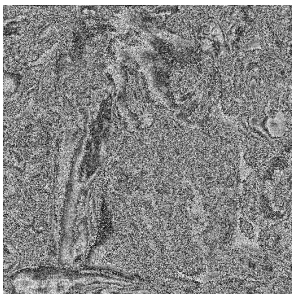
(a) Peppers: Original test image 4



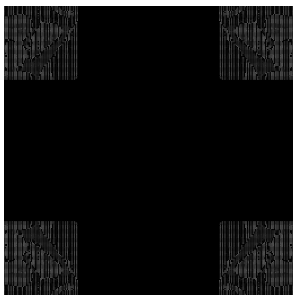
(b) Scrambled by Arnold's transformation



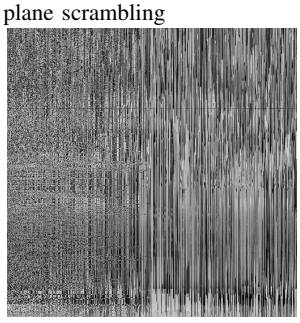
(c) Scrambled by Fibonacci transformation



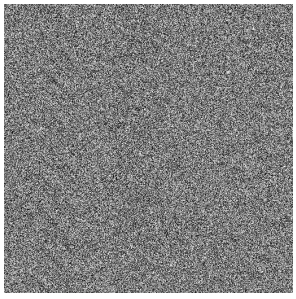
(d) Scrambled by gray code bit plane scrambling



(e) Scrambled by 2D mapping



(f) Scrambled by key based row and column shifting



(g) Scrambled by key based row and column shifting with bit plane scrambling

Fig. 7: Results of scrambling using different scrambling techniques on Pappers image: Original test image 4

TABLE II: Comparative results of correlations and entropy. (Correlation between current pixel and horizontal/diagonal/vertical pixel is found by choosing 1000 random pixels)

Test image	Parameters	Arnold's Transformation	Fibonacci Transformation	Gray code bit plane	2D mapping	row and column shifting	row and column shifting with bit plane scrambling
Airplane image	Correlation (original vs encrypted image)	0.0015	0.0117	0.0505	0.0443	0.0954	0.0016
	Horizontal Correlation	-0.1114	0.4942	0.3177	-0.0553	0.1691	0.0298
	Vertical Correlation	-0.0733	0.3451	0.3573	-0.0538	0.6425	0.0056
	Diagonal Correlation	0.0278	0.3485	0.3008	-0.0550	0.1917	0.0089
	Entropy	6.7025	6.7025	6.7025	0.8236	6.7780	7.9368
Baboon image	Correlation (original vs encrypted image)	4.5970e-04	0.0097	0.0485	0.0033	0.0569	0.0017
	Horizontal Correlation	0.0979	0.3120	0.0485	0.0446	0.0612	0.0481
	Vertical Correlation	0.1232	0.2215	0.0556	0.0722	0.3780	0.0160
	Diagonal Correlation	0.1051	0.0296	0.2883	0.0346	0.0087	0.0090
	Entropy	7.2673	7.2673	3.6133	7.2673	7.1782	7.9523
Lena image	Correlation (original vs encrypted image)	2.4868e-05	3.1170e-05	0.0091	0.0423	0.0139	0.0021
	Horizontal Correlation	0.0327	0.6513	0.1307	0.0626	0.0646	0.0199
	Vertical Correlation	-0.0875	0.4783	0.1676	0.0660	0.6749	0.0165
	Diagonal Correlation	0.1963	0.2036	0.1323	0.0667	0.0680	0.0158
	Entropy	7.4455	7.4455	7.4455	0.7.691	7.4677	7.9976
Peppers image	Correlation (original vs encrypted image)	-0.0110	0.0228	0.0022	0.0380	0.0217	0.0011
	Horizontal Correlation	0.0979	0.5906	0.1134	-0.0434	0.0252	0.0114
	Vertical Correlation	0.0175	0.3675	0.0556	-0.0405	0.6936	0.0050
	Diagonal Correlation	0.1066	0.1561	0.0834	-0.0521	0.0345	0.0398
	Entropy	7.5937	7.5937	7.5937	0.8415	7.6438	7.9966

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MLPNN and kNN Based Classification of sEMG Signal for Myoelectric Control of Upper Limb Prosthesis

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***Abstract*—Analysis of sEMG signal has been an emerging field for the myoelectric control of upper limb prosthesis. The objective of present work is to obtain the performance measures like accuracy, sensitivity, specificity and positive predictivity using MLPNN with back propagation algorithm. Using MLPNN classifier, an average classification accuracy of 93.71% was achieved over ten subjects for the combination of [MAV1, WL, AAC, ZC, and WAMP] features. Next the classification accuracy is obtained with kNN classifier for k= 3, 5, and 7. The results showed that average classification accuracy of 93.06% is achieved using kNN and it is better than MLPNN in terms of time and simplicity.**

***Index Terms*—sEMG; MLPNN; kNN; upper limb prosthesis.**

ABBREVIATIONS

AAC	Average Amplitude Change
ANN	Artificial Neural Network
AR	Auto-Regressive
IAV	Integral of Absolute Value
kNN	k- Nearest Neighbors
LDA	Linear Discriminant Analysis
MAV	Mean Absolute Value
MAVS	Mean Absolute Value Slope
MES	Myoelectric signals
MLPNN	Multilayer Perceptron Neural Network
PCA	Principal Component Analysis
RMS	Root Mean Square
sEMG	Surface Electromyogram
SD	Standard Deviation
SSC	Slope Sign Changes
ULDA	Uncorrelated Linear Discriminant Analysis
VAR	Variance
WAMP	Willison Amplitude
WL	Waveform Length
ZC	Zero Crossings

I. INTRODUCTION

Prosthetic devices play a vital role in rehabilitation for the amputees who have lost their upper limbs due to several reasons. Nowadays, sEMG is the most dominant source of control signal to develop myoelectric upper limb prostheses. The success of myoelectric control for upper limb prostheses greatly depends on the effective feature extraction and the classification methods to achieve classification accuracy.

In 1993, Hudgins et al. [1] demonstrated an approach to control a multi-function prosthesis by using [MAV, MAVS, ZC, SSC, WL] feature set and ANN classifier. Zardoshti et al. [2] investigated [IAV, VAR, ZC, WAMP, v-order, AR model parameters and Histogram] feature set to control the upper extremity prostheses. They used nonparametric kNN classifier to test the quality of features spaces derived from EMG signal. Englehart et al. [3] showed that PCA is more powerful technique of feature reduction than Euclidean distance class separability- feature selection for time-frequency representations based feature sets.

Zecca et al. [4] presented the overview of different methods for controlling the artificial hands using EMG signal. Chan et al. [5] achieved classification accuracy using LDA classifier for RMS and AR coefficients feature sets. They compared two dimensionality reduction techniques- ULDA and PCA. They obtained that ULDA outperforms PCA feature reduction. Al-Faiz et al. [6] used [IAV, MAV, MAV1, VAR, WL, WAMP] features with KNN algorithm to obtain the classification accuracy for virtual data created from EMG signal simulator. Fougner et al. [7] suggested an unambiguous taxonomy for the upper limb prosthesis control problem.

Tello et al. [8] used LDA and kNN classifier for myoelectric control of a prosthetic hand to rehabilitate amputee. Phinyomark et al. [9] performed feature extraction from 1st difference of sEMG time series and concluded that the accuracy was higher as compare to features extracted from original signals. Omari et al. [10] extracted different features from a four channel-sEMG signal and analyzed them using LDA, quadratic discriminant analysis, and kNN. Kalwa et al. [11] used DWT based feature extraction scheme and kNN classifier to classify neuromuscular diseases. In [12], authors have evaluated a number of time- domain features. They achieved the most classification accuracy for the combination of [AR-order4, and WAMP] features and [MAV1, WL, AAC, ZC, and WAMP] features using LDA classifier. In present study authors have investigated the classification performance for the combination of features

[MAV1, WL, AAC, ZC, and WAMP] by using MLPNN and kNN classifiers.

II. MATERIALS AND METHODOLOGY

In this study the eight- channel MES database acquired by Dr. Adrian D. C. Chan, Professor- Carleton University, Ottawa ON is used. MES database consists of sEMG signals for 7- limb motions: Hand-Close, Hand-Open, Pronation, Supination, Wrist-Flexion, Wrist-Extension, and Rest. These sEMG signals were amplified, filtered and finally sampled to produce discrete sEMG signals. Figure 1 shows the electrodes placement used in the eight-channel sEMG data acquisition. The details of the experimental setup and data acquisition are described in [5].

In present study the MES data is taken for ten subjects. For each subject 4- sessions were accomplished on separate days. In each session 6- trials were done. N01S1T1 shows the MES data of first subject for first session and first trial. In this way we used total 240 trials database (from N01S1T1 to N10S4T6) for this study.

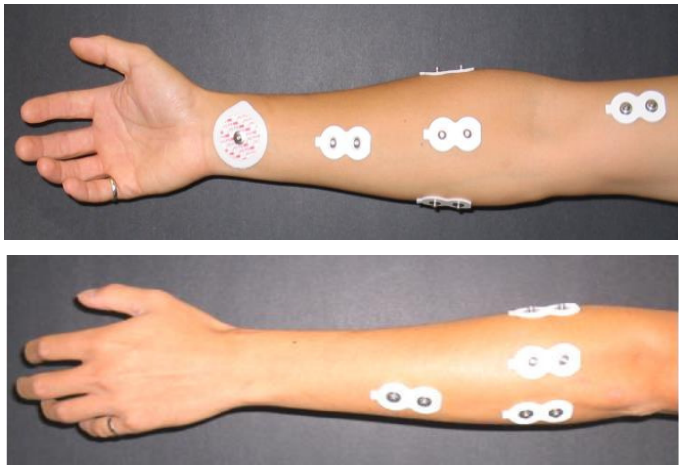

Fig. 1. The electrodes placement used in the eight-channel sEMG data acquisition [5].

The first phase in pattern recognition process is feature extraction; here input signal is converted into set of characteristic signal features. At this stage feature vector set [MAV1/WL/AAC/ZC/WAMP (threshold 0.01)] is obtained; thus we have total 40 feature vectors for eight channel data. Next min–max normalization is used which is defined as [$normfeat_i = (feat_i\text{-}min_i)/ (max_i\text{-}min_i)$]; where $feat_i$ is original feature value, $normfeat_i$ is normalized feature values and max_i and min_i are the maximum and minimum values of every features in each channels.

The classification is next stage in pattern recognition; where the feature vectors are classified into seven classes. In present study the MLPNN and kNN classifiers are used. The commands are generated on the basis of decision made in this stage for controlling upper limb prosthesis.

III. CLASSIFIERS

A. MLPNN Classifier

ANN is a computational system motivated by the learning characteristics and structure of biological neural networks. MLPNN is the simplest and most widely used ANN technique. A logistic sigmoid function is used here as a non-linear activation function. Both training and testing MES data are normalized by using min–max normalization; the training and test target vectors are converted into bipolar form; and then back propagation algorithm is used for training and testing. Then classification performance is obtained in following terms:

$$Sensitivity = \frac{TP}{TP + FN}100\% \quad (1)$$

$$Specificity = \frac{TN}{TN + FP}100\% \quad (2)$$

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}100\% \quad (3)$$

$$Positive\ predictivity = \frac{TP}{TP + FP}100\% \quad (4)$$

Four basic parameters true positive (TP), true negative (TN), false negative (FN) and false positive (FP) are calculated from true class and predicted class data. Then the performance parameters mentioned above in equation 1 to 4 are obtained. Sensitivity is measures of the proportion of positives that are correctly identify positive observations. Specificity is a measure of the proportion of negatives that are truly negative. The accuracy of a test is the ratio of the number of correct assessments to the total number of assessments. The percent of all positive tests that are true positives shows positive predictivity.

B. kNN Classifier

kNN classifier is one of the simplest and the most important algorithm for EMG pattern recognition [2, 6, 8, 10, 11, and 15]. The algorithm consists of three stages: First the distances between a test sample and all training samples are calculated. Next pick out the k-nearest training samples to the test sample. Finally a class label is assigned by applying the majority rule to the k nearest samples [10]. In other words, kNN classifier is to classify unlabeled observations by assigning them to the class of the most similar labeled examples [13]. In kNN algorithm the nearest is defined in terms of a distance metric. Euclidean distance is used here. Euclidean distance between two points in n-dimensional space is defined by equation 5.

$$dist(x_1, x_2) = \sqrt{\sum_{i=1}^{n} (x_{1i} - x_{2i})^2} \quad (5)$$

Where $x_1 = (x_{11}, x_{12}, \ldots, x_{1n})$ and $x_2 = (x_{21}, x_{22}, \ldots, x_{2n})$ are two records with n attributes.

IV. Results And Discussion

The classification performance is obtained for the feature vector set [MAV1/WL/AAC/ZC/WAMP (threshold 0.01)] using MLPNN and kNN classifiers. Table 1 shows the classification performance for ten subjects where the training data is the combination of N01S1T1/N02S1T1/N03S1T1/ N04S1T1/N05S1T1/N06S1T1/N07S1T1/N08S1T1/N09S1T1 /N10S1T1 datasets and the testing is done for all trials in each session (i.e. for all 240 trials). For eight- channels sEMG signal the dimensionality of feature vectors is 40, so we have total 40 input neurons. Corresponding to seven limb motions we have 7 output neurons and the hidden neurons chosen are 10. For 1000 iterations (epochs) and different values of learning rate and momentum factor, the accuracy and mean square error is calculated. Using MLPNN classifier, an average classification accuracy of (93.71±2.91)% was achieved. The time taken by the CPU for training the network was found 6.94 minutes.

Table 1. Classification performance (%) obtained for MLPNN

Learning Rate	Momentum Factor	No. of Hidden Neuron	Mean square error	Performance Parameters (Mean ± SD) (%)			
				Accuracy	Sensitivity	Specificity	Positive Predictivity
0.48	0.11	10	0.4373	93.71 (±2.91)	76.11 (±11.55)	96.65 (±1.56)	78.90 (±10.00)
0.52	0.13	10	0.4352	93.62 (±3.15)	73.33 (±12.94)	97.00 (±1.60)	79.94 (±11.16)
0.31	0.13	10	0.3549	92.96 (±3.13)	70.67 (±12.96)	96.68 (±1.60)	77.67 (±11.15)

Next the classification accuracy is obtained using kNN for same feature set (Table 2). For classification, the first and fourth trials data are used for training purpose and the data from all trials is used for testing purpose. The window size used for feature extraction is 256 ms. Both the training data and testing data have 50% overlap between windows.

Table 2. Classification accuracy (Mean ± SD%) obtained for KNN

K	Class -1 Accuracy	Class -2 Accuracy	Class -3 Accuracy	Class -4 Accuracy	Class -5 Accuracy	Class -6 Accuracy	Class -7 Accuracy	Overall Accuracy
3	90.37 (13.38)	93.61 (10.82)	94.98 (6.54)	97.21 (2.39)	92.35 (10.31)	91.92 (11.10)	91.04 (11.95)	93.06 (6.41)
5	90.32 (12.85)	93.59 (10.39)	94.51 (6.51)	96.86 (2.20)	92.42 (10.05)	92.19 (10.48)	91.12 (11.64)	92.99 (5.99)
7	90.17 (12.72)	93.50 (10.12)	94.26 (6.53)	96.62 (2.25)	92.43 (9.67)	92.13 (10.31)	90.94 (11.39)	92.86 (5.73)

The results showed that for feature set [MAV1/WL/AAC/ZC/WAMP] classification accuracy achieved is (93.06±6.41)%, (92.99±5.99)%, and (92.86±5.73)% for k = 3, 5, and 7 respectively using kNN classifier. The time taken by the CPU for classification was found around 0.16 seconds which is too low as compared to MLPNN. Figure 2 shows the confusion matrix for k=3, 5, and 7 respectively. A confusion matrix is used to summarize the performance of a classification algorithm.

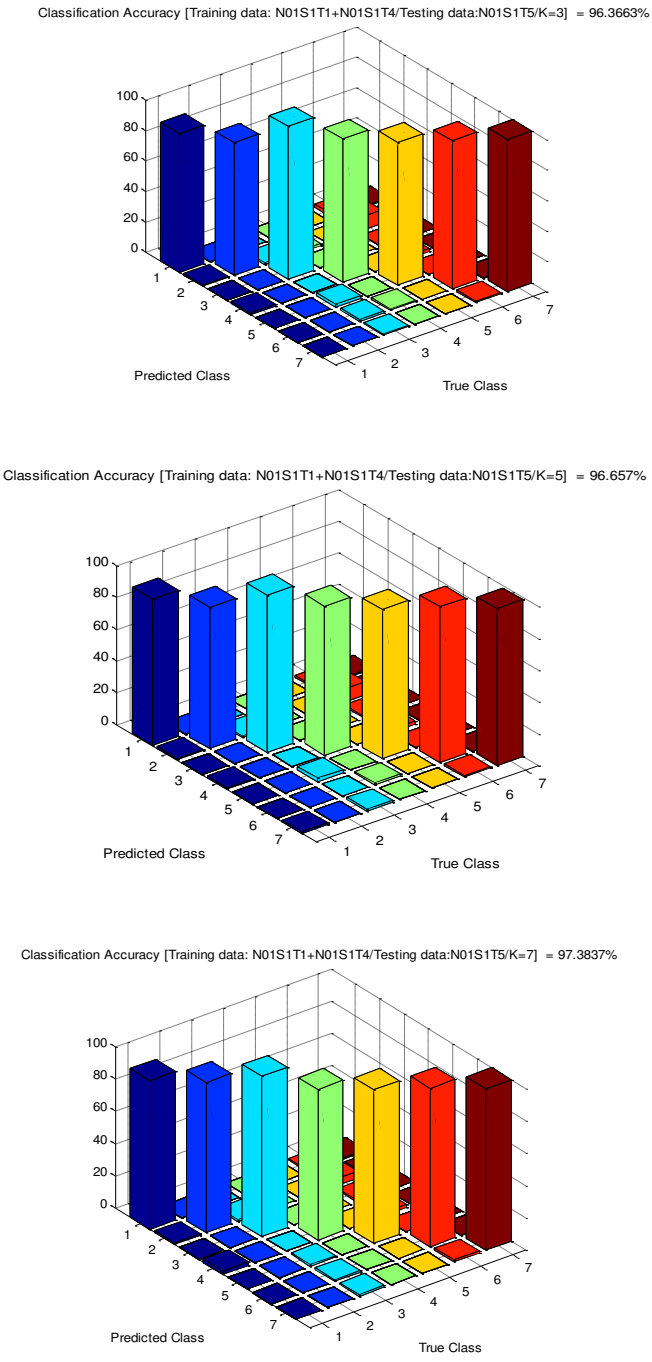

Fig. 2. Confusion Matrix for k=3, k=5, and k=7 [training data N01S1T1+ N01S1T4/ testing data N01S4T5].

If we compare both the algorithms, both classifiers give an average accuracy of 93% but in terms of the time to train

the system kNN give good performance with respect to MLPNN which is important in recognition systems; however one can achieve better accuracy with MLPNN by increasing the number of epochs for training.

V. CONCLUSION

Classification accuracy is obtained for myoelectric control of upper limb prosthesis using MLPNN and kNN classifiers. Using MLPNN classifier, an average classification accuracy of (93.71±2.91)% was achieved over 10 subjects and for kNN classifier, the average classification accuracy achieved was (93.06±6.41)%. In terms of time and simplicity kNN is better than MLPNN.

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Overview: Human-Computer Interaction an Globally Used Technique in Society

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***Abstract*—IThis paper discussed about the basic terms related to human computer interaction which will help us to gather a detail knowledge and review on terms, existing technologies and latest coming technology of the subject which include different configurations. Use of computer always has a question that how to interact with it, if used properly then can help humans to work very efficiently and faster. A brief outline of HCI is displayed. Particular cases of research in the ranges of symbols and menus are then surveyed.**

Study of topics in it covered HCI framework, Existing technologies, Issues, application and trends in HCI.

***Index Terms*—Indian sign Language (ISL), Human Computer Interaction (HCI), Graphical user Interface (GUI)**

I. Introduction

HCI (Human-Computer Interaction) is a technique which defines the ways that how humans interact with computers and how humans can use them efficiently. In simple words, interaction between human and computer defines the term HCI. The term HCI (Human-Computer Interaction) was introduced in one of the book of 1983, The Psychology of Human-Computer Interaction which is based upon a research by Stwart K.Card and Allen Newell of Carnegie University. The term HCI (Human-Computer Interface) is a study that provides the different methods of evaluation, interaction and design for computing systems. HCI is itself a very wide scope and include disciplines like psychology, sociology, anthropology, cognitive science, computer science, and linguistic. In todays, modern world invention of speech interaction with computers is also a part of HCI.

HCI is the term with many alternative terms and also be called as Human-Machine Interaction (HMI), which means the interaction of humans with computers, codes and algorithms are designed by humans which are followed by computers to complete the task in the particular manner they need to follow. Secondly it is referred as Man-Machine Interaction (MMI), which also means the communication of man or human with computer machine to execute different programs formed by man. There is no difference of the meaning if it is referred as Computer-Human Interaction (CHI) too, which indicates the interaction of computer which is a machine with human. The names are given to the term according to its functionality.

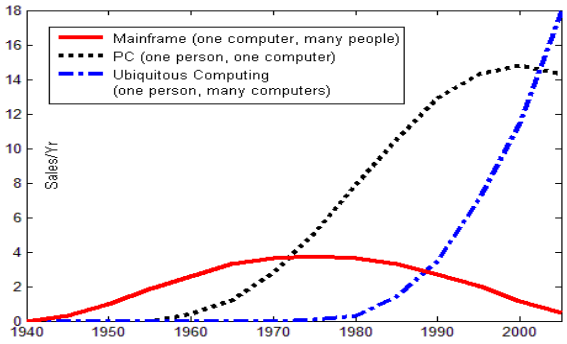

Fig 1: *Major trends in computing*

This Figure deals with the growth of computer and human interaction. The graph shows us how the computers have increased the role in the human life and influence human life. Now days each one of us use computer to complete there day to day work more easily and efficiently. There is an increase in the graph showing the increased number of computer per Human Being.

II. Goals Of Hci

In the beginning, there were humans. 'Computers' came in 1940s and the term **HCI** came in 1980s. What about the time interval 1940-1980. In those days computers were too complicated and to simply that compilation is the man goal of HCI.

A. HCI (HUMAN-Computer Interaction): Terminologies

uman-Computer Interaction is a strong area of research and results into emerging of new technologies, which increase scope of interaction of human with machine. It defines the communication method with which user and computer interact with each other. Loop of interaction can

be known on the basis of flow of information between user and computer.

The loop of interaction between user and computer depends upon many aspects. The basic aspect is task environment, it affect whole interaction process of machine with user depending upon what user want to execute using any algorithm, other are Areas of the Interface on which user want to work with machine, Input flows which user give to the machine, Output which user receive from the computer after providing input, Feedback of the machine depending on the demands of the user and Fit [2].

The most basic terms involve in it are: Functionality and Usability. With the designing of any system the first thing come in mind is what will be its function? What is the use of it? Set of services and actions that are provided to the users are called as functionality of the system. Functionality can only be valued and visible when it is properly used by user. Some functionality by which a system is used is the measure of degree by which a system [3].

Term HCI was first used in 1980 and also was known in 1975.Humans or users get interact with computer majorly due to desktop applications. The limited icons space at desktop tends the user to communicate or interact with computer. The further interaction starts due to trend of internet browsers and handheld computers.

B. The interfaces between humans and computers:

1. GUI (Graphical User Interface)
2. VUI (Voice User Interface)

GUI deals with all graphical interfaces between users and computers, icons, desktops, images all these are dealt through it.

If user wants any kind of speech recognition and systems synthesizing between him and computer then he can use VUI (Voice User Interface) technology [4].

WIMP (Windows, icons, Menus and Pointing devices) interface (Desktop Metaphor of GUI) is also a standard interface between machine (computer) and man.

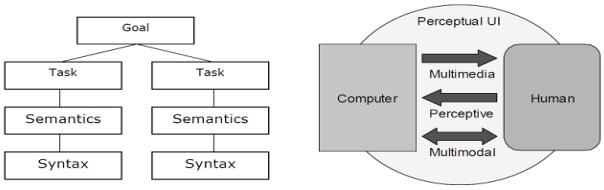

Fig 2: Flowchart of Overview in HCI

This Figure deals with the overview of Human Computer interaction which helps to know how to communicate and share videos, data, and information and exchange various multimedia with the computer. This provides a basic view of Human Computer Interaction.

C. Overview on HCI

In 1970's, information technology professionals and dedicated hobbyists were the only humans who communicate with computer machine. In later 1970's, emergence of personal computing changed the scenario disruptively and include personal computer and personal software resulting increase in potential of computer user and also highlighted the limitations of computer compared to its usability for the users who want them as tools[5].

Computer plays a crucial role in everybody's life and had changed the way people live over the last two decades. HCI technology is becoming so important and changing the lives of humans that in near future no task or ambition can be fulfilled without computing technology.

The module removes highlight from hand picture for signal acknowledgment and extricated elements will be food as info for acknowledgment process. The state of the form is a vital property that can be utilized to recognize hand motions. Forms of hand picture are extricated as highlight. These shapes are put away as form layouts which will be utilized for motion acknowledgment.

Fig 3*: Extraction (Indian sign Language) of Information from Gestures.*

The extraction suggests highlight vector of isolated picture which can be isolated in different strategies for application. Investigator portrayal of highlight extraction and a couple of methodology rely on upon frame and range based shape representation.

4. EXISTING TECHNOLOGIES OF HCI:

The main aspect to be considered is human behaviour and needs to be useful. The focus of this paper is mostly on the advances in physical aspects of interaction can be obtained (Multi –Modal Interaction) and how each method can be improved in performance (Intelligent Interaction) to provide a better and easy interface for the user. The existing physical technologies of HCI basically can be categorized by the relative human sense that the device is designed for. These devices are basically relying on three human senses: vision, audition, and touch [7].

The input devices that rely are either switch-based or pointing devices. The output devices can be any kind of visual display or printing device. Architecture of HCI showcases these inputs and outputs it generates.
Some developing configurations and designs on which interfaces today are based:

1. Unimodal Interaction Systems
   1.1. Audio Based HCI
   1.2. Visual Based HCI
   1.3. Sensor Based HCI
2. Multimodal Interaction Systems [8].

Fig 4: *Canesta virtual keyboard*

5. A glimpse on HCI Issues :

This topic is not considered much but Eason (1991) proposed a three level model for it.
Includes perceptual principles,

I. Legible displays
II. Top-down processing
III. Avoidance of absolute judgment limits
IV. Redundancy gain
V. Similarity causes confusion

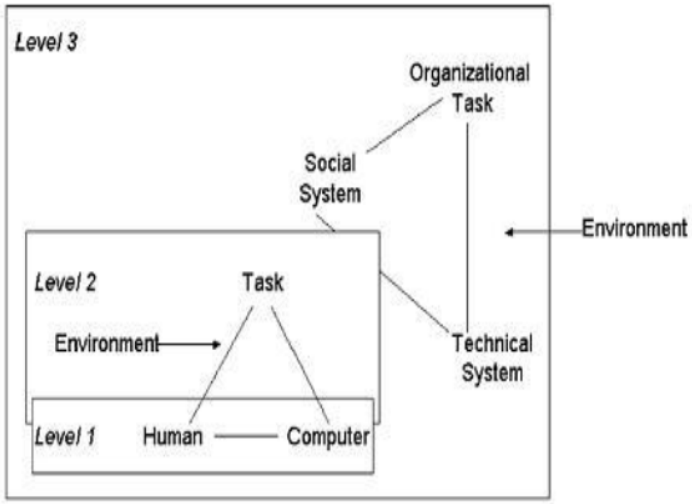

Fig 5: *A Three level model of HCI*

Level 1 consists of two participants' information processing i.e. direst interaction between human-computer. Level 2 shows their interaction with environment to perform different tasks. Level 3 shows effects of these interactions on world.

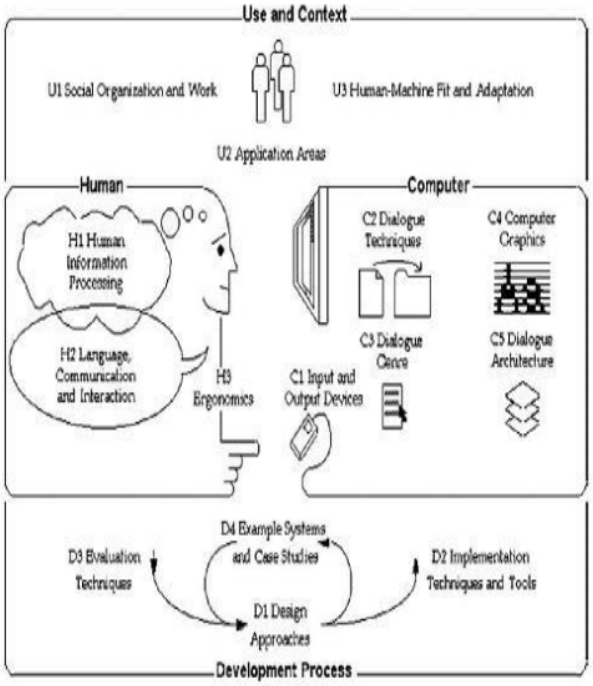

Fig 6: *ACM SIGCHI curricula for HCI*

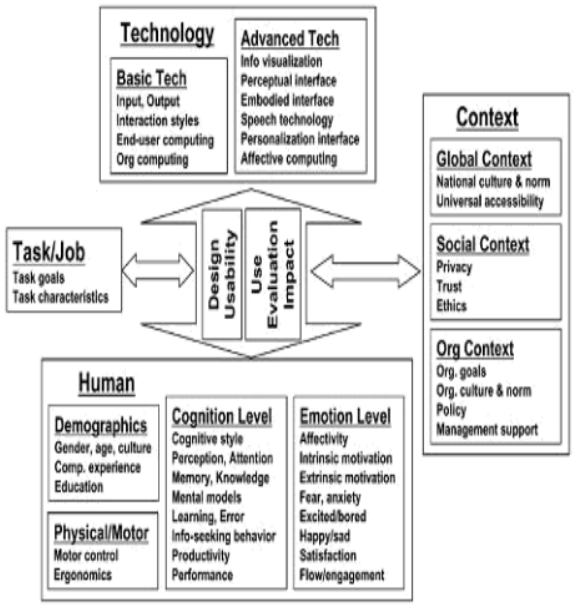

Fig 7: *A framework of broad HCI issues and concerns*.

PEOPLE AND MULTIMEDIA

I. Perceptive User Interfaces
II. Multimodal User Interfaces
III. Multimedia User Interfaces

In order to endow computers with similar capabilities, we need significant progress in several technologies, including:

- Speech and sound recognition
- Natural language understanding
- Computer vision
- Dialog management/planning
- Learning
- User modeling
- Haptic

The motions which are required must be characterized ahead of time. For instance on the off chance that we are utilizing a communication via gestures, the vocabulary should be characterized. Portray every single motion as far as HMM. The structures of the move capacity yield likelihood thickness capacity are assessed in this progression. Preprocessing the information includes transient Fourier change and vector quantization. Here the information is gathered and signal is characterized through preparing information. Hence this information should be spoken to in a brief structure. At that point the estimation procedure is utilized utilizing some calculation for ex. Bacum-Welch calculation. This calculation is utilized to locate the obscure parameters of Hidden Markov Model. After this, the acknowledgment of signal is done utilizing calculation Viterbi calculation (say). This calculation is utilized to locate the no doubt succession of the HMM. It is all the more entirely helpful for utilizing this calculation for the yield.

6. LATEST TECHNOLOGIES OF HCI:

The advancement in technologies of HCI involves recent directions and advances of research in HCI, namely intelligent and adaptive interfaces and ubiquitous computing are presented. These interfaces involve different levels of user activity: physical, cognitive, and affection [9]. Menu designing is the major topic of research under HCI.

Sensor-Based Technologies

It has wide range of applications with at least one physical sensor between user and machine.

1. Pen-Based Interaction
2. Mouse & Keyboard
3. Joysticks
4. Motion Tracking Sensors and Digitizers
5. Haptic Sensors
6. Pressure Sensors
7. Taste/Smell Sensors

AUDIO-BASED HCI

This part of acquiring information deals with different audio signals.
Speech Recognition
Speaker Recognition
Auditory Emotion Analysis
Human-Made Noise/Sign Detections (Gasp, Sigh, Laugh, Cry, etc.)
Musical Interaction

Visual-Based HCI

This area deals with facial expressions.

1. Facial Expression Analysis
2. Body Movement Tracking (Large-scale)
3. Gesture Recognition
4. Gaze Detection (Eyes Movement Tracking)

VII. HCI Research:

Research under HCI concerns that, how people will simplify their task using GUI versus a text-based command-line interface? Second thing is Latency, its presence occur with internet connection. How human will do their task with internet in easier way. It needs to be more concerned about societies and human values.

VIII. Conclusion:

Human-Computer Interaction is the term which is required where computer system is used; they fulfill need of system design, interface of system with user. HCI gives birth to virtual reality. In the near future, VR with HCI will form the common interface to interact with user. It will take the world to its new horizons including intelligence, innovation and interaction techniques. We tried our best to provide the complete overview through this paper.

IX. Trends In Human Computer Interaction :

Human-PC association is a multidisciplinary investigates range concentrated on cooperation modalities amongst people and PCs; once in a while, the more broad term human-machine interface (HMI) is utilized to allude to the UI in an assembling or process-control framework. At the end of the day, the HCI teach the ways to handle the issues related to the interface and framework between user and computer. The main aim of Human-Computer Interaction intrinsically involve different controls over software engineering, the term enhance can be identified with a few angles, including instinct of utilization and interface heartiness. An instinctive, normal, proficient, powerful, and adaptable interface can incredibly diminish the hole across user intelligence modal and the working method of any PC, system, computer, or any robot. In spite of the fact that learns about HCI go back to 1975; late innovative advances in shopper hardware have opened energizing new situations: motions, hand and body postures, discourse, and look are only a couple of normal collaboration modes that can be utilized to outline moderate common UIs (NUIs).

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Password Security Mechanisms: Comparitive Study

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***Abstract*—Nowadays online communication is increasing rapidly, password is provided as a key for communication henceforth there is a strong need to authenticate the online communication. But currently security breach occurs by stealing the password files through various ways of cyber attacks. Different technologies are available to safeguard password. The purpose of this paper is to evaluate various techniques for protection of password like graphical password, text password enhanced by Honeyword, Jumbling and salting approach.**

Keywords—Honeywords; Jumbling; Salting; Capcha; Hashing

I. Introduction

In today's era large numbers of people are getting connected over Internet. Very less amount of Security provided over internet, to overcome this problem, a scheme called authentication is used. This authentication is a strong method for the communication over Internet. On account of protecting the user's delicate information on online services password is the vital identification key. User's identification key is used various places like Banking sector, E-Commerce websites, Online transactions etc. During authorization process all personal details like Email-id, Bank account number; Credit card information of individual user is registered by respective websites. All these user's details are stored in their database in conjunction with security. Password is a protective tool used to guard the crucial information of particular user to avoid the unauthorized access by third person. If passwords are stolen by attacker or hacker without the knowledge of genuine user then critical information of user may be used illegally. Misuse of user's personal details may suffer from huge loss. Some factors are interrelated to user authentication like pin number or password that user already knows, credit card that user posses and biometric authentication, it means human characteristics are used as password [7].Solemnly, user selects the simple password such as birth date, name of beloved thing etc so that it is easy to remember. But it leads to easy cracking of password by attacker using numerous attack like brute force attack, dictionary attack etc. Therefore it is essential to select effective password which should not be guessable. Though there are different authentication mechanisms provided to secure online services hacker is successful in fetching the information of an individual. This paper briefs about the various mechanisms for protecting passwords and comparative analysis is performed based on the effect of different cyber attacks after using the respective technique.

II. Existing Techniques and Algorithms

Hacker is very successful in theft of password file and cracking passwords from file. Weak passwords, simple passwords are also one of the reasons for password cracking. Several popular sites like LinkedIn, Yahoo, and eHarmony have been suffered from high publicity password leaks. SHA-1 algorithm without a salt is used by LinkedIn passwords and MD5 hashes without salt is used by eHarmony passwords. Among all available methods of hashing SHA-2 algorithm is cryptographically strong enough [5].

III. Honeywords For Enhancing Security

Honeywords are used as an alternate approach to store the passwords in file. Honeywords are nothing but decoy passwords or bogus password. For generation of Honeywords Chaffing-With-Tweaking algorithm is used.

A. Chaffing-With-Tweaking Algorithm

In this method, input to generator algorithm is original password and each character of original password is substituted by another character which is selected randomly. During substitution if original character is digit then new substitution is by digit only and it is applicable for letters and special characters also.[1][6].

B. System Overview

There are different stages from user registration, user login to behaviour analysis of user. In Registration phase user enters passwords and system generates the Honeywords. Hash of password is generated .Key is also provided to user for file encryption and decryption of uploaded file. In Login phase if password matches then system allows user to access the system If Password does not match, Hacker is trying to access the system then alert is given to the actual user if hacker uses one of the Honeywords. If Hacker uses the combination for password then access is given to the hacker but with the decoy or fake file. For behaviour tracking user login, the system tracks user operations and track IP Address, Mac address and data size of resources downloaded by each user per session [1]

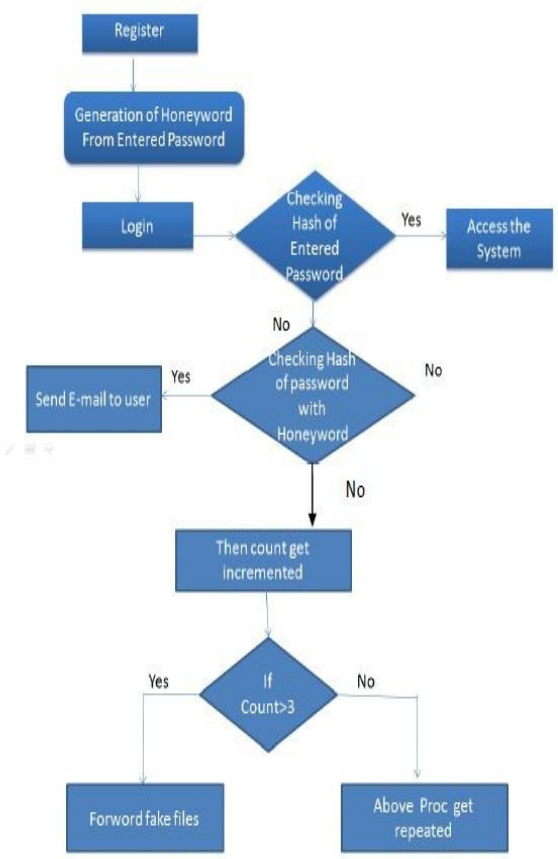


Fig. 1. System Overview

IV. JUMBLING- SALTING FOR PASSWORD ENCRYPTION

There are some predefined hashing algorithms available today like SHA, MD5 that do not offer complete security to the passwords. Simplest way to crack a hash is first guess the password and try hash for every guess. If the hashes are matched, password is easily obtained which is the basic principle of dictionary attack [8].

In this approach to protect the password, Jumbling and Salting technique is developed. This algorithm has majorly two processes namely; jumbling and salting. Jumbling process has three sub process addition, selection and reverse. In salting salt that is random data is selected which increases the length of plain text by adding salt to original string of password. After Jumbling and Salting AES algorithm is applied for encryption of passwords [2].

A. *Jumbling Process*

Process array is the array of the original password. Jumbling process has three sub processes.

a) Addition Sub-block: It generates the random value '1' by using existing mathematical function Random() and updates process array size.

b) Selection Sub-block: By using existing mathematical function Random () for particular password the character set is selected which is different from every password access. Random () function is used because character array size is large and characters from this set is selected.

c) Reverse Sub-block: Based on some predefined condition it reverses the entire process array. The predefined condition is depend on value of 1 if it is odd or even.If it is even the process array is reversed else it is kept as it is.

B. *Salting Block*

Salt is random string which is appended along with jumbled version of password. Salt is nothing but the user's sign-up timestamp value .To make the password more complex to make difficult for the attacker to crack it ,salt is added.

C. *AES*

Predefined encryption and decryption algorithm of AES is used.

V. AN IMPROVED HASHING USING SALTING AND DIFFERENTIAL MASKING

By applying salting techniques to password more security is provided. After appending salt to original password hash value of password is calculated .After hashing differential masking process is applied to generate crash list of real password [3].

a) Differential Masking: In differential masking fake passwords for every user's account is inserted. As a result when an attacker is successful in stealing password file but he is unable to guess the correct password because of many passwords[3].The real password is saved with different mask words to lure the attacker. Here, Differential masking is a result of hashing which generates different permutations of real password. The main purpose of differential masking is to hide the real password with different fake passwords[3].

b) Hashing algorithm: In Hashing process password string is converted into the binary string and i^{th} position character from both side of binary string is interchanged. After interchanging all characters string is reversed by r characters. New string is formed by combination of r no of zero's and one's and XOR is performed with password binary string. After XOR binary string is converted into the hexadecimal string.

c) Salting algorithm: Salting is process of appending the random data to original password. In this process salt is added

to both side of password.Algorithm to generate the salt is as follows

Salting (s)

i. L = length (s)

ii. N = l/8

iii. Now, create a binary string formed by nth bits from left side.

iv. Now, prepend the first four bits to the left of s and last four bits to the right of s[3].

VI. Graphical Password Authentication Scheme(Captcha)

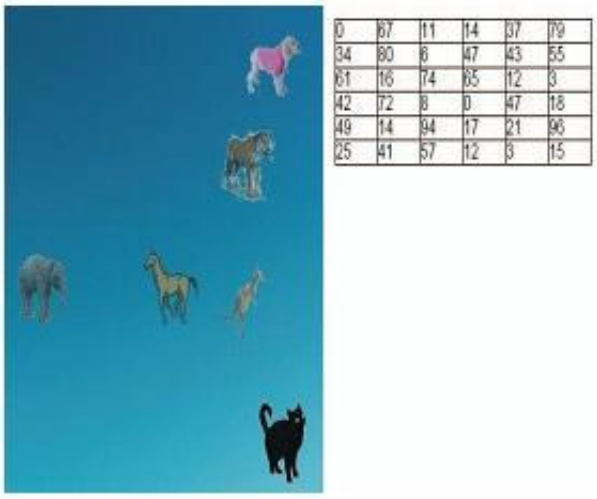
To minimise human guessing attack graphical password is used. It is acronym as CaRP. Image is used as passwords key[4]. Four different schemes are implemented in this approach.

a) Click Text: In this scheme capital letters and special characters are selected and they are randomly arranged in CaRP images which is generated by Captcha engine. To avoid the confusion between same character like 6,9 and o,0 that are kept single. Thus total 40 characters are contained in the password set.To provide password user clicks on any alphabets or numbers in CaRP image. At the time of log-in sequence of clicking the alphabet is very important because server checks same sequence at the time of authentication[4].

b) Animal Grid: User provides password which consist of animal names from the set of 6 animal figures. Each set consists of diverse figures of same animal. One animal figure is selected at random from each set for password formation. Animal figures dataset which has many smaller animal figures.Along with the animal set 6×6 number grid is also provided for password creation. Number grid contains 1-100 numbers, user clicks on number to generate the password. For example password selected is 'cat25'[4].

c) TextPoints4CR: For the formation of password single character of large sized figure is selected and points of same figure are choose by clicking on it at different location. As font size of figure increases, it gives more options for deciding click points[4].

Fig. 2. *ClickText Figure*



0	67	11	14	37	79
34	80	6	47	43	55
61	16	74	65	12	3
42	72	8	0	47	18
49	14	94	17	21	96
25	41	57	12	3	15

Fig. 3. *AnimalGrid Figure*

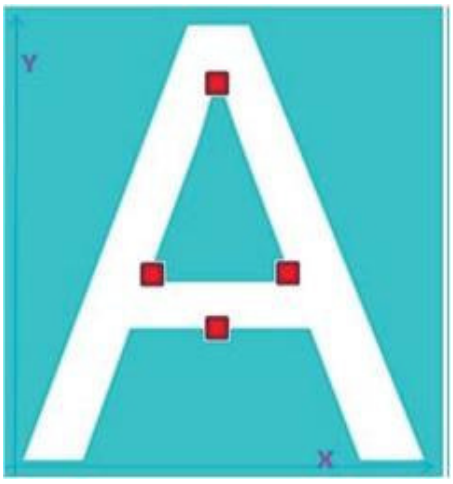


Fig. 4. *Single character Figure*

d) Shuffle Text: This scheme is same like ClickText scheme only difference is user can enter the password in any order like shuffled text etc.

IV. COMPARISON ANALYSIS

TABLE I. COMPARITIVE ANALYSIS

Mechanism/Algorithms	Pros	Cons
Honeywords For Enhancing Security	Removes Brute-force attack to some extent	-Storage cost is major overhead - Only designed to withstand off-line attacks
Jumbling-Salting for Password Encryption	Difficult to crack the encrypted password due to involvement of different randomization processes.	Due to different randomization processes The Encryption time and decryption is more than AES and DES algorithm
An Improved Hashing Using Salting and differential Masking	-Less time complexity -minimizing the DoS vulnerabilities - Brute-force attack is not possible because of High complicated Hashing	-Generation of false alarm by attacker may expose password file.
Graphical Password Authentication Scheme	Effective solutions as far as password security	Very sensitive towards Key Logger Attack

CONCLUSION

The most universally used method for authenticating users to access computer systems and online services is password. Passwords are recurrently targeted by attackers to break into systems. Therefore password security is very important to avoid the cyber crime. Choosing secure password is also very crucial in today's life. Main focus of many organizations is strengthening password security. Various authentications Schemes are available.

By protecting password strongly,vulnerability activities can be avoided which will help to individual from any kind of loss in online system.This analysis makes knowledge about several password encryption techniques which are required to provide password security in online environment as well as in organization

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Emotion Analysis from Speech of Different Age Groups

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***Abstract*—This Recognition of speech emotion based on suitable features provides age information that helps the society in different ways. As the length and shape of human vocal tract and vocal folds vary with age of the speaker, the area remains a challenge. Emotion recognition system based on speaker's age will help criminal investigators, psychologists and law enforcement agencies in dealing with different segments of the society. Particularly child psychologists, counselors can take timely preventive measures based on such recognition system. The area remains further complex since the recognition system trained for adult users performs poorer when it involves children. This has motivated the authors to move in this direction. A novel effort is made in this work to determine the age of speaker based on emotional speech prosody and clustering them using fuzzy c-means algorithm. The results are promising and we are able to demarcate the emotional utterances based on age.**

Keywords: Emotion Analysis; feature extraction; clustering algorithm; Fundamental frequency, speech rate

I. Introduction

Patterns based on gender and age can be obtained from facial expressions, gestures or verbal communication of individual. Among these modalities, this paper emphasizes on the recognition of emotions based vocal communication. The objective is to determine the speaker's emotional conversation pattern based on his/her age. Determination of these will be beneficial to law enforcement agencies in studying criminal psychology and further investigation. Particularly, the speaker's state of mind and emotional attributes will assist the condition of both victim and the culprit during court hearing and prevent confusion. Identification of intimidating calls, false alarms, kidnapping involving influential people, fanatic religious groups, radicals etc. can be made possible with such systems [1]. Further, the recognition system will help in implementing corrective measures in case negative emotional attributes are manifested among children before it is too late. Utterances of speaker colored with emotion and age detection can also help human robotic interfaces, telecommunications, intelligent tutoring, smart call center application etc.

This work was not supported by any organization

The vocal tract and vocal fold of human speech production mechanism is in a growing stage till a child attains adolescent. Selecting suitable features representing age of the speaker thus remains an ever-growing challenge. Recognition systems trained for adult speakers often proved inefficient when these are trained with children utterances [2]. This is because, the core features representing the speech and emotional contents of an utterances vary with age and gender of the speaker. Especially, the fundamental frequency (F0), formants, speech rate, energy etc. vary drastically between a child and an adult [3]. The acoustic models made for research and business requirement thus become ineffective in case the emotional utterances belong to different age group. Speaker's age and gender have been addressed by different literature during last decades although, these studies little emphasized on emotional contents of speech [4] [5]. These authors attempted the Gaussian weight super-vectors with support vector machine (SVM) classifier for age and gender identification. However, no precise study between different age groups or their emotional states has been made by them. Use of mel-frequency cepstral coefficient (MFCC) with different feature selection algorithm such as PCA (principle component analysis), supervised PCA (SPCA) has been attempted for different age groups in [6]. The prominent prosodic features representing speech emotion of children and adults could not be found in these literatures. Absence of a clear boundary among emotions based on age has motivated the authors to move in this novel effort.

The objective is to cluster the features representing emotional utterances of different age groups. Different clustering approaches such as fuzzy c-means (FCM), hierarchical clustering, Partitioning, Density-Based, Grid-Based, Model-Based, K-means clustering has been applied to recognize human emotions [7] [8]. K-means is a hard clustering algorithm, simple and can solve known clustering problems using unsupervised learning. The algorithm is faster than hierarchical clustering producing tighter clusters. The algorithm proved better when compared with fuzzy c-means classifier for speech emotion recognition using

GMM super vectors [7]. This has been chosen for clustering the desired emotions based on age for our purpose.

Section II of this work describes the database used followed by the feature extraction technique in section III. The clustering algorithm chosen has been explained in section IV and the results are shown in section V. Section VI provides the conclusion.

II. EMOTIONAL SPEECH MATERIALS

Collection of database for speech emotions involving different age group is a tedious task. Most of the available databases are confined to a particular segment of speaker. Emotional database of speakers with age spanning a large range is either unavailable or inaccessible. Further, emotional utterances under real-life scenario in such situation are seldom found. Thus, the database desired for this work has been collected from different sources. The utterances are collected over three months of time by placing recording instruments at different locations. Around one thousand utterances of speakers among eight to forty are obtained in total. Out of these, the emotional contents of speech are taken out for simulation purpose. Eighteen utterances of angry, boredom and sad emotions based on the opinion of linguistic experts have been used for further processing. 16 bit quantization with 16 kHz sampling rate was used for recording the utterances. Average duration of an utterance is of 5 seconds. A mobile set of good quality has been used to record the utterances. Format factory software has been used to transform the mobile data into .wav format. The signal is pre-processed to accommodate speaker variability and noise to the minimum before further processing.

III. FEATURE EXTRACTION

Feature extraction and selection is an important aspect of recognition system [8]-[11]. Uses of acoustic features consisting of speech prosody characteristics have been discussed by researcher in the field of speech emotion recognition [12]-[14]. Among these features, the F0, energy or amplitude, speech rate etc. are few features that vary with age of the speaker hence considered in this work. A brief discussion on these features is made in the following section.

A. Fundamental frequency (F0)

Male speakers tend to have lower F0 as compared to both children and female subjects due to larger vocal cord. Older people have lower fundamental frequency as compared to adults when experiment has been conducted between twenty older and twenty younger adults by the author [15]. The fundamental frequency continues to decrease with age for both genders [16] [17]. When speech is coloured with emotions, it is observed that higher arousal emotions such fear, angry have higher F0 as compared to neutral or lower arousal emotions such as sad or boredom [14] [18]. Among different methods of F0 extraction, autocorrelation and cepstral methods are most popular [13] [19]. Autocorrelation method of F0 extraction has been used in this work. Using this technique, the feature can be extracted directly from the speech waveform. It requires less hardware such as a multiplier and an accumulator than other methods. Further, the method is simple and noise immune. For a signal $x(n)$ delayed by τ, the auto correlation coefficients (ACF) is estimated using the relation

$$S(\tau) = \frac{1}{N}\sum_{n=0}^{N-1} x(n)x(n+\tau) \quad (1)$$

Highest value of ACF can be obtained when the condition $s(n) = s(n+\tau)$, is satisfied and is indicated as $S(0)$. The ACF decreases with increase in the signal delay. Denoting the time period of the signal as T, the ACFs will attain its peak at$\tau = IT$, where I is an integer. From these peak locations F0 can be estimated.

B. Log energy

People speak at higher intensity or energy when aroused by certain emotions such as angry, happy or surprise [14] [18]. These emotions have more energy contents at higher frequencies. Energy or amplitude indicates the volume of the speech. The strength of the voice is automatically raised with significant increase in amplitude when people get excited or agitated. Dull voice related to sad or bore emotions often are of low amplitude or energy. Logarithm of energy remains an important feature of emotion that suits logarithmic nature of hearing mechanism. The log energy can be estimated for a signal $s_k(n)$using the relation

$$e_{log}(n) = 10\ log \sum_{k=1}^{w} |s_k(n)|^2 \quad (2)$$

where, w is the analyzing window.

C. Speech rate

Speech rate is an important feature that provides information on speaker's age, gender, language, demographic and cultural profile [20] [21]. The application domains are speech pathology, speech science, behavioural psychology, emotional analysis, neuropsychology etc. Speaking rate signifies the communication time of a message during conversation. It is an indication of the number of syllables or words or spoken units that is uttered per minute or second. It represents the quickness at which a speaker utters an emotional sentence at certain situation. It is a global feature taken over whole length of the signal. Human being speaks faster when gets excited than in cool mood. Thus, angry, fear or high frequency content emotions are likely to have higher speech rate than neutral or sad or low excited voices. For an utterance, the average speaking rate can be estimated using the relation

$$R(s) = \frac{N_V(s)}{D(u)} \quad (3)$$

Where, $N_V(s)$ and $D(u)$denote the number of vowel segment and utterance duration respectively.

IV. K-MEANS CLUSTERING

K-means is hard clustering algorithm more suitable for exclusive clustering task. The objective of the work is to distinguish speaker's emotion based on features that varies with age. Thus, it will be a supportive approach in this case. Let, there are 'P' numbers of features contain all the states of emotions. Using the algorithm, the features are partitioned into Lclusters each having a cluster center $C_l,\ l = 1, 2, \dots, L$. Each cluster center is associated with the corresponding class. With the help of squared error function, the objective function 'b' is minimized in formation of the clusters. Optimal convergence of 'b' will ensure adequate clustering of the desired emotion. The objective function is represented as

$$b = \sum_{l=1}^{L} \sum_{p=1}^{P} \left\| s_p^{(l)} - C_l \right\|^2 \quad (4)$$

where, $\|\cdot\|$ is norm representing the distance between C_l and the data point $s_p^{(l)}$. K-means algorithm has been performed using following steps

1. From each L feature points, select the centroid.
2. Obtain L cluster by iteratively repeating the procedure. In the process, allot all the source data point to the respective nearest centroid.
3. The centroids are updated by estimating the cluster centers iteratively, until further variation in cluster center is manifested.

V. RESULTS AND DISCUSSION

The variation of F0 of children and adults has been shown in Fig. 1. It is observed that, children and female have higher F0 as compared to the adults due to larger vibration of their short vocal tract. The plot formed is in zigzag fashion as the utterances consist of both genders. The value decreases with age due to increase in vocal tract length owing to growth of facial skeleton and lowering of the larynx. Due to higher excitation level, angry state has shown larger pitch for both adult and children compared to boredom and sadness as shown in the Figure. A comparison on different gender independent prosodic features of adult emotional states attempted in literature is given in Table 1. The features extracted in this work are compared among different age group and is tabulated in Table II.

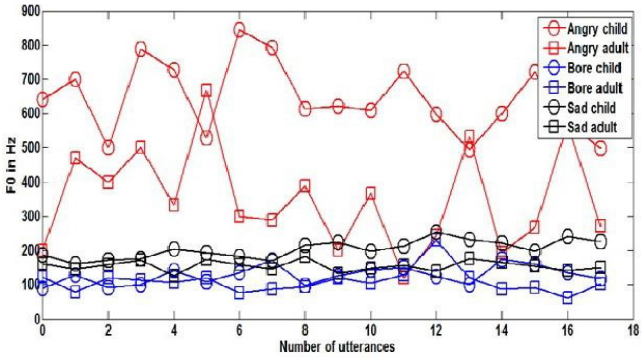

Fig. 1 Variation of F0 with age for different speech emotional states

The observed results indicate a higher value of mean, maximum, and minimum F0 values for children speech as compared to the adult utterances. This is found to be true across all classes of speech emotions chosen in this work. Pitch variation and the mean value have been tested for different gender independent adult emotions [22]-[24]. The pitch mean found to be highest for angry emotion followed by happy and bore state as claimed by these authors.

TABLE I.

Comparative study of the state of art age and gender independent feature extraction techniques

Features	**Emotions**					
	Angry	**Sad**	**Fear**	**Happy**	**Bore**	**Disgust**
Speech rate [21]	↑↑	↓↓	↑↑↑	↑	↓	↓↓↓
F0 mean [22] [23]	↑↑↑	↓	↑	↑↑	↓↓	↓↓↓
F0 Variation [22][23]	↑↑↑	↓	↑	↑↑	↓↓	↓
Energy [9][18]	↑↑↑	↓↓	↑	↑↑	↓↓	↑↑
F1 [12][21]-[24]	↑↑↑	↓↓	↑	↑↑	↓	↑↑
Duration [24]	↓↓	↑↑↑	↑	↑	↑↑	↓
Spectral centroid [24]	↑↑↑	↓↓	↑	↑↑	↓↓↓	↓

↑= increase, ↓= decrease

TABLE II.

Comparison of features based on different age group

Features	**Child**			**Adult**		
	Angry	Sad	Bore	Angry	Sad	Bore
Pitch (mean)	643.5	204.2	127.9	350.7	155.3	109.3
Pitch (max)	844	255	175	667	183	231
Pitch (min)	495	162	89	120	126	61
Speech rate(mean)	0.54	0.28	0.23	0.34	0.17	0.19
Speech rate(max)	0.86	0.36	0.27	0.58	0.24	0.36
Speech rate(min)	0.37	0.24	0.19	0.20	0.14	0.13
Log energy(mean)	32.1	24.6	28.8	18.5	13.9	15.2
Log energy(max)	36.1	29.3	31.7	25.9	16.8	20.2
Log energy(min)	17.8	18.5	24.9	12.7	10.2	10.5

Energy or intensity indicates the arousal level of an emotion. The calculated value indicates higher energy for higher arousal emotional states such as angry, happy, and fear. Bore is found to have the lowest energy among all the states tabulated. The presence of higher frequency components increases the energy level of angry state than that of bore and sad emotion. Computations of spectral energy by different authors are worth noting to support the findings in this work [21] [23]. The log-energy features of both children and adults are plotted for these emotions in Fig. 2. The feature extraction technique is so chosen to approximate human hearing system that acts non-linearly at different bands of the signal. The energy founds to be higher for children than their adult counterpart as observed from the figure. The log-energy in dB is compared in table II for adult and children utterances. The result indicates a larger mean, maximum, and minimum energy for children speech utterances. Children are inherently more excited and enthusiastic to abnormal situations than well matured and

judgmental adults. This makes the children over expressive with larger arousal states than the adults.

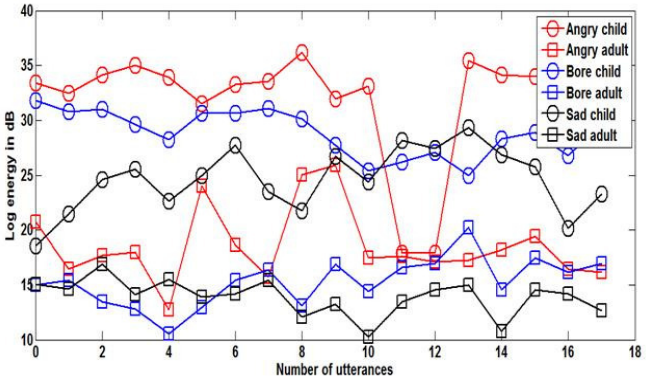

Fig. 2 Variation of log-energy features with age for different speech emotional states

Fig. 3 provides the variation in speech rate of children against that of adult speakers up to 40 years of age. It is observed that, a child takes more time during conversation as compared to adults. These may be attributed to reading disorder and social anxiety that is normally found with children. The neuro-muscular and biological factors are other aspects that tend to decrease the speech rate of children. As child reaches to adulthood, he or she develops the oral-motor skills and linguistic skills like lexical, semantic and phonological parameters. Increase in motor planning specificity of growing children increases the articulation rate. Due to cognitive development with age, the fluency in speech increases. These factors make the speech rate of adults higher than that of children. On contrary, limited exposure to the environment and language makes children to ponder between suitable words or vocabulary during expression of emotions. They invent their own words rather than learned words used by adults using associative skills and imagination to certain situations. This leads to reduction in reaction time and decrease in speaking rate. The emotional utterances are taken in a natural background where, the conversations are task dependent. This may be the reason of variation in speech rate. It has been evidenced with higher mean, maximum, and minimum speech rate for children utterances as shown in table II. This is true across all the emotional classes.

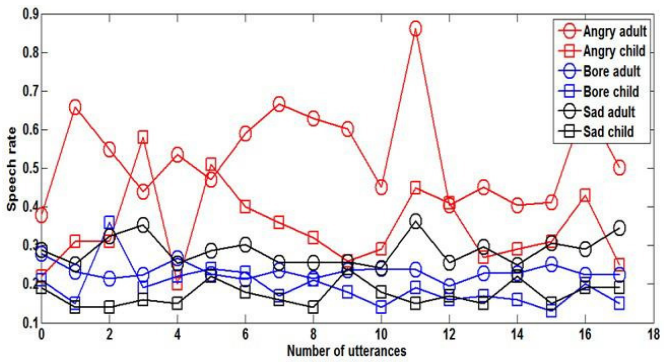

Fig. 3 Variation of speech rate with age for different speech emotional states

The speech rate is highest for fear and angry state than that of sad and bore states as shown in Fig. 3 similar to other observation made in literature [21]. The reason may be attributed to higher energy (or high frequency components) that inherit high arousal emotions. While comparing the duration feature to investigate emotional cues of speakers, few authors provide similar trends [24]. It can be concluded that, due to lower speech rate, the utterance duration tends to be longer for sad emotion followed by bore state. A close observation of duration feature reveals that human being takes lager time to express emotions having lower energy as compared to aggressive states.

An attempt is made in this work to cluster different age group using K-means clustering with the chosen feature sets. K-means is more suitable for exclusive clustering of data. Cluster of angry speech emotion based on three age groups as 8-14 years, 19-24 years and 30-40 years using speech rate features is shown in in Fig. 4. It is observed that, the cluster groups of 19-24 years and 30-40 years are more closure. These groups are similar and thus described by features of similar magnitudes. On the contrary, the clustering of the features representing these groups is widely separated from that of children falling in the age group of 8 to 14 years due to quite distinct feature values.

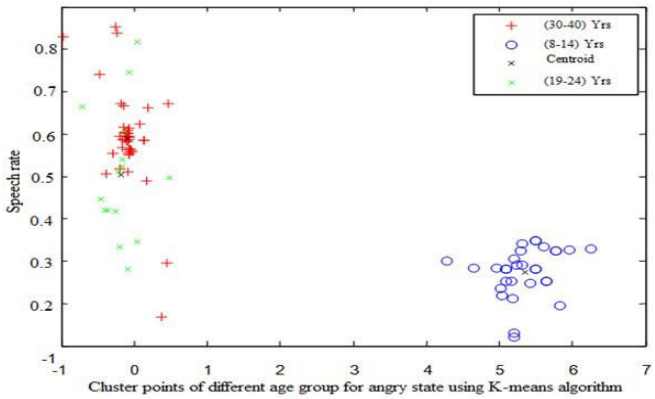

Fig. 4 K-means clustering of angry speech emotion for different age groups using speech rate.

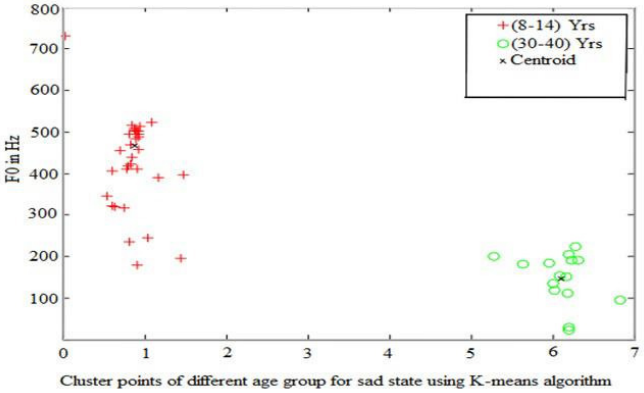

Fig. 5 K-means clustering of sad speech emotion for different age groups using F0 features

A similar comparison with K-means clustering is done using F0 features of sad emotion in Fig. 5. In this case, the older adult group (30-40 years) is compared with the youngest group (8-14 years). A widely separated cluster

has been observed between these two classes using sad emotional state. This may be due to the reason explained in previous paragraph.

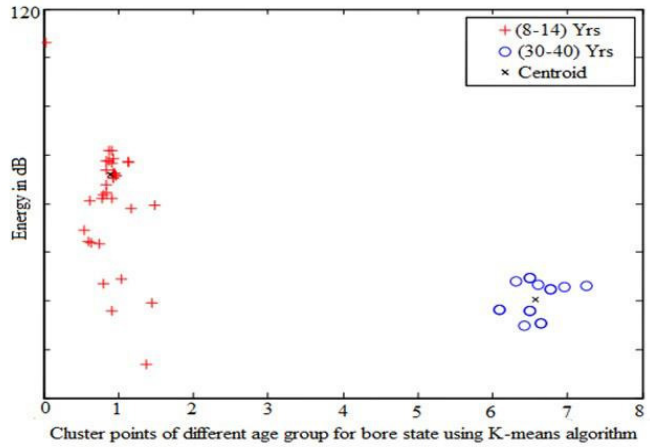

Fig. 6 K-means clustering of bore speech emotion for different age groups using log energy features.

Children and an adult group between 30 to 40 years of age using log energy features have been analyzed. This is shown for bore emotion using the chosen clustering algorithm in Fig. 6. It is found that, the children have more energy as compared to that of adults. Further the clusters are widely separated for the chosen emotional state as shown in this Figure.

VI. Conclusion

A system dividing speaker's emotion based on age may help industries dealing with computer games, on-line tutoring, robotics and multi-media. There have been few speech enabled application such as Windows Phone app, World search, the European Portuguese version of the app have provided manual adjustment by speakers based on age. However, these systems remain cumbersome. Hence, an automatic detection system based on age will provide a new direction in this field. A more entertaining, fun and engaging way can be developed by manufacturers in case the users involved are children. Similarly, more polite and judgmental systems will help multi-media industries concentrating on adults.

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An AI Approach to Locate Cluster Centre in Wireless Sensor Networks

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***Abstract*—Wireless sensor networks, which consist of a immense number of sensor nodes have emerged as an inevitable, effective and important technology in tele-communication field. Sensor nodes can be deployed in any harsh environment for health monitoring, industrial monitoring, structural analysis, detecting intruders etc. Since it works in battery, the major challenge is to improve the lifetime of sensor node by effectively reducing energy consumption. Otherwise, it is very difficult to frequently replace the sensor nodes. For this, many routing protocols have been proposed in which cluster based routing protocol plays a vital role. In cluster based routing protocol, entire WSN network is divided into several groups or clusters. Then for each cluster a cluster head (CH) is selected. Sensors sense the data and forward it to their corresponding CH where the entire data of that cluster get aggregated and transmitted to base station (BS). The clustering technique offers more benefit than existing flat based routing protocols since the data is transmitted via CH rather than directly by each sensor nodes. Thus the selection of CH is very important. Here we proposed a method named firefly based nearest neighbor chain algorithm to select the centre of cluster based on which CH selection can be done.**

***Index Terms*—WSN; energy consumption; cluster based routing protocol; CH selection.**

I. Introduction

Developments in electronics field paved the way for introducing low cost, small sized and easily deployable sensors which became an important computing technology for environment monitoring. WSN which consists of a huge number of sensor nodes is not only a simple sensing network but also storage, processing and efficient communication network. It provides services in healthcare, structure and environment monitoring [1]. Sensor nodes collect data and send to BS via CH. It is tedious task to frequently replace the battery once a sensor node is deployed. So it is necessary to find out a technique that will reduce the energy consumption of sensor nodes for improving the network life time.

Based on network structure, the routing protocols in WSN are classified in to flat based routing protocol and cluster based routing protocol [2]. In flat based routing protocol, each sensor node independently forwards the data to BS irrespective of its position. But in cluster based routing method, data sensed by each sensor node is collected by corresponding CH and then forwarded to BS. This will reduce the overall communication overhead and energy consumption.

Some protocols adopt single hop communication whereas others adopt multihop communication to transfer the data to BS [3]. CH selection is an important step in cluster based routing protocol. Normally CH is selected based on energy, centrality etc. It is the CH which aggregates the data in the network and forwarded the same to the destination. It is better to select a node located at the centre of cluster as CH. This is because; other nodes can communicate with this cluster head with minimal energy.

Here in this paper, we are integrating nearest neighbor chain algorithm with firefly algorithm to find the centre of clusters with the most optimal neighbour nodes present. For this we have to calculate the distance between each sensor nodes and attractiveness of firefly. Using an equation we can calculate movement of firefly which is attracted to another firefly. Algorithm works for several iterations. Distance and movement of the firefly can be updated at each iteration.

This paper is organized as follows: Section II describes related works that inspired and motivates us to this work. Section III explains proposed firefly based nearest neighbour algorithm to find the centre of cluster and section IV concludes the paper with future enhancements.

II. Related Work

Different cluster based routing protocols with energy efficiency have been proposed by researches to improve and enhance the network longevity of wireless sensor network.

The first clustering protocol named Low Energy Adaptive Clustering Hierarchy (LEACH) [4] protocol uses a distributed clustering algorithm in which CHs are selected based on a predetermined probability. Each other nodes select their cluster based on the distance to CH. But leach does not provide a uniform distribution of cluster head and sometimes same nodes became CH in more than one round repeatedly. This will abruptly reduce the energy of that particular node and creates an energy hole. Hybrid Energy-Efficient Distributed clustering (HEED protocol)

[5], which uses energy and communication cost for cluster head formation restricts the selection of two nodes within the same transmission coverage. It provides flexible CH selection and inter-CH connectivity. This protocol introduces an extra communication overhead or cost since each node should constantly communicate with its neighbours for specific number of rounds. Thus it is uncomfortable large –scale networks.

Another protocol named Distributed Energy Efficient Clustering (DEEC) [6] proposed by researchers selects CH based on the probability of ratio of residual energy to the average energy of the network. It computes the reference energy that each node expend based on which a value of network lifetime is estimated. It induces an overhead in the network topology and failed to calculate the average energy precisely. LEACH-C [7], enhancement from LEACH adopts a centralized approach by sending its id, position and energy value to the BS for CH selection.

PEGASIS [8] proposed by S.Lindsey suffers delay for forming a chain to transfer the data to BS. It requires a complete overview of network. This method constructs chain instead of clusters and selects a leader for that chain. Nodes will transfer the data through the chain to the leader and later leader will forward the aggregated data to BS. TEEN [9] proposed by A.Manjeshwar, et al; will reports data only when the sensed attribute reaches a particular threshold. Thus it can't be used for periodic report application. As a solution to this, they later implemented APTEEN [10] which can be used in proactive and reactive conditions.

The paper proposed by Jung et al. mention CCS [11] in which an integrated approach of PEGASIS and cluster-based method is formulated. Here the entire network is divided into various clusters and in each cluster a chain is formed by selecting a leader without considering the residual energy. It makes unbalanced distribution of nodes in each cluster. TL-LEACH introduced by Loscrì et al. [12] suggests a two-level hierarchy where there is primary CH and secondary CH compete themselves. Here selection of CH is done without considering residual energy of nodes. A lot of message passing introduces communication overhead and affects network lifetime.

EECS proposed by Ye et al. [13] needs global knowledge about distance between BS and each CH for making the network more energy efficient. Here the nodes compete themselves to beat others and win as CH. For this, each node send its residual energy to their neighbours and choose the one with highest energy as CH. LEACH-M [14] proposed by D. S. Kim, et.al; introduces node mobility which results in large number of packet losses while moving CH before selecting a new CH for the next iteration.

Base-Station Controlled Dynamic Clustering Protocol (BCDCP), proposed by Muruganathan et al. [15], is not suitable for large distance communication since it uses single hop routing strategy with centralized approach. In [16], Wu et al; introduces a sleep/wake scheduling protocol that preserves energy by keeping the radio transceivers to sleep periodically. But it suffers scheduling and synchronizing overhead.

To improve the efficiency of clustering and to mitigate the energy consumption problem we propose a new method to determine the centre of cluster for selecting a best CH. This approach uses combination of firefly algorithm and nearest neighbour method to effectively choosing the centroid of cluster. The attractiveness of fly is calculated and updated in each round. Also we are calculating the distance between each node by using Euclidean distance formula. Based on both theses parameters a best values is selected as cluster centre.

III. FIREFLY BASED NEAREST NEIGHBOUR CHAIN ALGORITHM

Sensor nodes which are battery operated are most often constrained in energy due to difficulty and inability to replace or recharging the nodes. Thus one of the most challenges in designing a protocol is energy consumption. A WSN network should be self-organized and distributed by which each sensor node can detect changes in the environment effectively. With respect to flat based and location based routing protocol, the cluster based routing protocols provides much longer network longevity. Here the entire network is divided into several numbers of clusters and one node from each cluster is selected as CH.CH collects data from each cluster, aggregates it and forwarded to the sink. The major role in clustering is to divide the entire network into groups and select suitable CH. Here we are suggesting a method to find the centre of cluster based on which a CH can be selected.

The proposed method uses combination of firefly algorithm with nearest neighbour approach to find the centroid of cluster. Each iteration attractiveness of fly and distance between nodes are calculated and updated. At last, we select most suitable value as centre of cluster based on which CH is selected.

Two main parameters are considered in this approach: attractiveness and distance. Attractiveness implies the similarity of nodes present in the network. Distance between nodes is calculated based on the Cartesian distance of the nodes using Euclidean formula. In this phase, we combined firefly algorithm with nearest neighbour chain algorithm to find the centre of cluster with most optimal neighbour nodes present in the topology.

The attractiveness of the firefly can be calculated as:

$$\beta(r) = \beta_0 e^{-\gamma r^2} \tag{1}$$

where β_0 is the attractiveness at $r = 0$ and γ is the light absorption coefficient.

The Cartesian distance between any two sensor nodes can be determined by:

$$D(x,y) = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2} \quad (2)$$

where x_i and y_i denotes the (x,y) coordinates of node i whereas x_j and y_j denotes the (x,y) coordinates of node j.

The movement of the firefly i, which is attracted to firefly j is estimated by:

$$X_i = x_i + \beta_0 e^{-\gamma r^2}(x_j - x_i) + \alpha(rand - 0.5) \quad (3)$$

Objective function which is used to find the centre of the clusters with the proposed FNNC algorithm can be formulated as follows

$$Objective\ \ function = Dis(X,Y) = \sqrt{\sum_{i=1}^{d}(X_{pi} - Y_{ji})} \quad (4)$$

where X_{pi} is the p^{th} data path vector and Y_{ji} is the distance vector of cluster j.

The aim is to find minimum value for objective function after the entire iteration completed. During each iteration, the movement and distance of the firefly gets updates. Distance can be updated by using the formula:

$$D(x_{best}, y_{best}) = \sqrt{(x_i - x_{gbest})^2 + (y_i - y_{gbest})^2} \quad (5)$$

Updation of firefly movement can be expressed as:

$$X_{i+1} = x_i + \beta_0 e^{-\gamma r^2}(x_j - x_i) + \beta_0 e^{-\gamma r^2_{i,gbets}}(x_{gbest} - x_i) + \alpha(rand - 0.5) \quad (6)$$

The steps in the proposed clustering algorithm can be explained as follows:

Algorithm FNNC(K ,D)
//Let K and D be the random population and number of cluster centers respectively. The term'T' denotes the iteration value. MAX denotes maximum number of iterations.
Initialize T=1
Initialize MAX=100
Initialize fireflies with K and D.
If (T < MAX)
Calculate $Objective\ \ function = Dis(X,Y) = \sqrt{\sum_{i=1}^{d}(X_{pi} - Y_{ji})}$
If(D[i][j] > D[i][i]) then
Move firefly i toward j based on
$X_{i+1} = x_i + \beta_0 e^{-\gamma r^2}(x_j - x_i) + \beta_0 e^{-\gamma r^2_{i,gbets}}(x_{gbest} - x_i) + \alpha(rand - 0.5)$
to update the locations
End if
T= T +1
End if

Algorithm 1: Steps in FNNC Algorithm

From the above proposed algorithm, the following inference is made:

The most important parameter in firefly algorithm is γ (Absorption coefficient), it plays very crucial role in determining the speed of convergence and how FA algorithm behaves. Theoretically, γ ∈ [0, ∞) but in actual practice, the value of γ is taken as 1. So for almost all the applications it varies from 0.01 to 10. Light intensity I_i of a firefly u_i at location x_i is determined by the objective function. For our proposed method, firefly and the location express in terms of node and location of the node in WSN respectively.

IV. CONCLUSION AND FUTURE WORKS

Cluster based routing protocol plays a major role in WSN communication. This type of network topology is easier to implement, manage and deploy. Data aggregation at each CH reduces redundancy and mitigates the communication overhead. The major concern is to select a node as CH for communication to the BS. This paper mainly focused on how to find out the centre of cluster for selecting a CH. Because an efficient selection CH makes the communication overhead lower and improve the network lifetime. The proposed method uses firefly algorithm with nearest neighbour chain method to calculate the centroid. It achieves the aim by considering two parameters: attractiveness and distance. At each iteration, attractiveness or firefly movement and distance of nodes get updated. We are comparing the global best value with current best and initialize cluster centre with global best value. This process continues until maximum iteration reached.

As future work, Genetic Algorithm based Harmony Search algorithm can be implemented for optimal CH selection. Here initially the entire nodes can be considered as population for which we are calculating fitness value. Then those which having highest fitness values are taken and crossover each other. By using this method best nodes can be selected as CH.

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Application of Variational Mode Decomposition on Speech Enhancement

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***Abstract*— Enhancement of speech signal and reduction of noise from speech is still a challenging task for researchers. Out of many methods signal decomposition method attracts a lot in recent years. Empirical Mode Decomposition (EMD) has been applied in many problems of decomposition. Recently Variational Mode Decomposition (VMD) is introduced as an alternative to it that can easily separate the signals of similar frequencies. This paper proposes the signal decomposition algorithm as VMD for denoising and enhancement of speech signal. VMD decomposes the recorded speech signal into several modes. Speech contaminated with different types of noise is adaptively decomposed into various components is said to be Intrinsic Mode Functions (IMFs) by sifting process as in Empirical Mode decomposition (EMD) method. Next to it the denoising technique is applied using VMD. Each of the decomposed modes is compact. The simulation result shows that the proposed method is well suited for the speech enhancement and removal of noise by restoring the original signal.**

Keywords—Variational Mode Decomposition; Empirical Mode Decomposition; Intrinsic Mode Functions; Speech Enhancement

I. Introduction

Analysis of signal is a vital part for industry, research and academia. It is the great challenge for researchers in current decade. Different types of analysis can be performed based on users requirement. Signal estimation as well as estimation of its parameter is able to identify and confirm the model to be used, where noise is mostly contaminated with it. For enhancement of signal, it is highly essential to either remove or reduce the noise from it. More often we encounter these difficulties due to nonlinearities in signal and due to its nonstationary nature. For such purpose spectral analysis is an alternative. But accuracy level has to be taken care. Fourier transform is a popular and efficient tool for this purpose along with wavelet transform. Sometimes these methods are effective for specific cares and specific signals. But always it does not work. Also, for different signals different types of analysis is required. Consideration of Fourier transform may not work properly to its limitations, stated as follows:

For the nonstationary type of signal it fails to prove its efficiency. Also it cannot offer the temporal and spatial information clearly. Though it can be solved using wavelet transform, still it has certain demerits. One such example of nonstationary signal is speech and is considered in this piece of work.

The empirical mode decomposition of signal is an adaptive method and a powerful substitution to the Fourier and wavelet transform. It was proposed by Huang et al. He has suggested the technique for nonlinear and nonstationary signals. After decomposition of the signals, it can be reconstructed as the sum of the components along with the amplitude and frequencies parameters [1]. It can be said that the multi resolution method to perform space-spatial frequency decomposition as time-frequency analysis [2]. It is done empirically by removal of enhancement of the signal and IMF. Next to it the signal can be saved and used. This technique is self- adaptive. It can be used for an effective way of analysis of the instantaneous frequency of signals. The hidden information and structures can be obtained for further work. It has not been used by the researchers in mathematics and engineering. Though EMD has used by many researchers, it cannot be most popular due to its demerits in terms accurate mathematical model. Also choice of interpolation, sensitivity to noise and sampling are the factors of demerits. Therefore the birth of VMD occurred by Dragomiretskiy and Zosso as an alternative of EMD and can overcome the demerits of EMD. Its basic principle is same as EMD, but the center frequency of the mode has to be found so that the bandlimited modes can represent the original signal. This is explored in this work and applied for speech enhancement, though some others have used the same for different applications like classification and detection. To improve the quality of speech for hearing aid is highly essential and then the process is said to be the speech enhancement process. It occupies a great challenge for speech and signal processing researchers. Due to this process also further work can be performed such as classification, recognition, detection, coding, mobile communication and machine based approach. Many researchers have applied different types of algorithm for enhancement purpose. Speech enhancement is an active area of research in recent years. The algorithms used for this purpose may be listed as follows: spectral subtraction, statistical-model [3]. Estimation of noise spectrum is subtracted from spectrum of speech to estimation of clean speech spectrum [4-5]. But this method has drawbacks in case of musical noise. In case of

subspace or statistical – model based technique, decomposition of noise with noise signal vector space into speech subspace and noise subspace. Then the resultant speech is enhanced by projecting it into the speech subspace [6]. Also different adaptive algorithms have been used for enhancement application [7-8].

Speech quality might be degraded in the presence of background noise. To improve the voice quality, it is essential to include the Speech enhancement (SE) technique for different applications. Various methods have been studied in the literature, such as Spectral subtraction (SS), Wiener filtering (WF), Kalman filtering, and model-based methods. Similarly multiband spectral subtraction method for speech enhancement has been proposed in [9]. In that case authors are considered the colored noise contaminated with speech. Another filter named as Ephraim Malah filtering has been proposed in [10]. HMM based method also has been applied for speech enhancement in [11]. Though different methods as given in literatures along with wavelet and DCT domain have been applied by researchers the proposed method has the significance to apply in this work.

There are many applications in speech enhancement based on adaptive filtering algorithms. Many methods have been used by different researchers from several decades. Some of them are summarized below. An adaptive β-order generalized spectral subtraction method was proposed by Junfeng Li *et.al* [12]. The characteristics of the speech signal changes very rapidly. So the adaptive algorithms are required to reduce the noise or enhance the signal quality. To reduce noise from the speech signals, Sayed. A. Hadei and M. Lotfizad have used fast affine projection algorithm and fast Euclidean direction search algorithm [13]. To reduce the matrix operations used in general Kalman filtering, in [14] a fast adaptive Kalman filtering was used for enhancing the speech signal. The calculating time was reduced in the proposed algorithm. The Convex Combination of WSLMS (CC-WSLMS) algorithm was proposed to improve the adaptive filter performance. According to the variance of the output power, the filter weight vectors were modified [15].

Speech is one type of biomedical signal and its nature is nonstationary. For different biomedical signals, authors have approached for detection and classification with many methods as in [16-17]. EMD method is also used for feature extraction of EEG signal. Neural network with fuzzy algorithm is also used for testing the performance of different features. An incremental feature analysis technique is also used for feature selection and classification [18-19].

This paper is organized as follows: Section I introduced the work along with some related literature. Method for enhancement is explained in section II. It follows the result in section III and section IV concludes the work.

II. VMD ALGORITHM FOR SPEECH ENHANCEMENT

Different methods have been used for speech enhancement as described in literature in section I. Mode decomposition is one of the efficient methods and has been used by the name of EMD, EWD (Empirical Wavelet Decomposition) and VMD. But these are not used for speech enhancement. Like EMD, VMD helps in decomposition of a signal resulting different IMFs (Intrinsic Mode Functions) which are basically depends on the number of level taken into consideration. Further out of these modes decomposition algorithms, VMD found better than other two for which authors in this work are applied the same for speech enhancement.

Empirical Mode Decomposition (EMD) and Empirical Wavelet Transform (EWT) methods are widely used for decomposition of signal and image. These methods have some drawbacks like other decomposition technique. Basically major disadvantage of EMD is that it is mode mixing and being affected by noise. Wavelet filters are used in EWT and from that it is easy to extract IMFs. Here, filters are used for perfect reconstruction of signal. VMD is an adaptive method and helps in decomposition of the signal into N number of intrinsic mode functions. The modes are extracted concurrently in VMD technique. It is a non-recursive mode decomposition technique. The ensemble band-limited intrinsic modes of center frequencies reproduce the input signal. The following steps are involved in speech enhancement using VMD method.

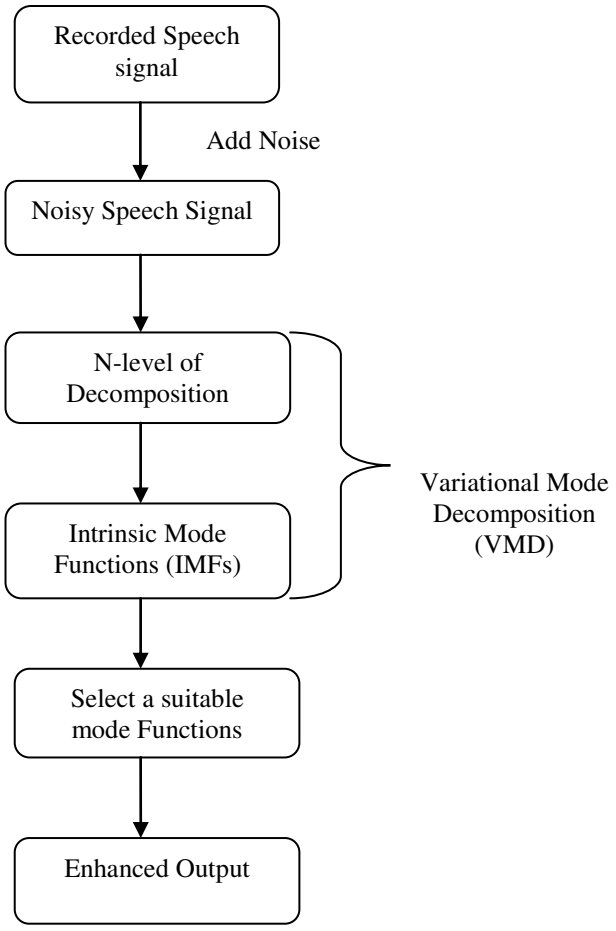

Fig.1. Speech Enhancement using Variational Mode Decomposition method

Each mode is assumed as seeking k modes i.e. $m_{k.}$ Minimizing the estimated bandwidth of each mode, and its constraint is sum of each mode equal to the input signal. Now configuration steps are as follows:

(1) To obtain the single frequency spectrum for each mode $m_{k,}$ the analytic signal is computed by using the Hilbert transform as follows:

$$(\delta(t)+\frac{j}{\pi t})*m_k(t) \tag{1}$$

(2) The frequency spectrum is shifted to 'baseband' for each m_k by combining with exponential component $e^{-j\omega_k t}$ as:

$$[(\delta(t)+\frac{j}{\pi t})*m_k(t)]\,e^{-j\omega_k t} \tag{2}$$

(3) Squared L^2-norm of the gradient of the demodulated signal can be computed as:

$$\min_{\{m_k\},\{\omega_k\}}\left\{\sum_k\left\|\partial_t\left[\left(\delta(t)+\frac{j}{\pi t}\right)*m_k(t)\right]e^{-j\omega t}\right\|^2\right\} \tag{3}$$

Where $\sum_k m_k = f$

$$\{m_k\}=\{m_1,....,m_k\}$$

And $\{\omega_k\}=\{\omega_1,\ldots,\omega_k\}$

In this work, VMD is applied for speech enhancement. The voice signal affected by noise is decomposed into three modes giving rise to an enhanced signal after third level of decomposition. So VMD is an effective method for decomposition of a voice signal. VMD process basically includes three important concepts i.e Wiener filter, Hilbert transform and frequency mixing.

Main aim of VMD is to decompose the input signal into different modes of IMFs. Voice signal for "Hello, one one one", is added with noise and then that noisy signal of voice "Hello, one one one", decomposed into three levels.

III. Results and Discussion

Initially the voice signal is collected in a closed room. The signal is partially noisy and shown in Fig. 2. A random noise of variance 0.1 is added to the recorded signal for the test purpose and is shown in Fig. 3 as the noisy speech signal. The utterance is shown for "Hello, one one one". Different types of noisy signal have been generated and also collected from [7]. The noisy voice signal undergoes variational mode decomposition to produce three decomposed voice signal as the number of modes initialized as K=3(Where, K is the number of modes). First level of decomposition provides the noise in the signal which is more as compared to second level of decomposition as shown in Fig. 4(top two signals). But third level of decomposition which separates the noise resulting in enhanced signal as in Fig 4 (bottom one). The level of noise reduction for different noisy speech signals are measured in terms of SNR.

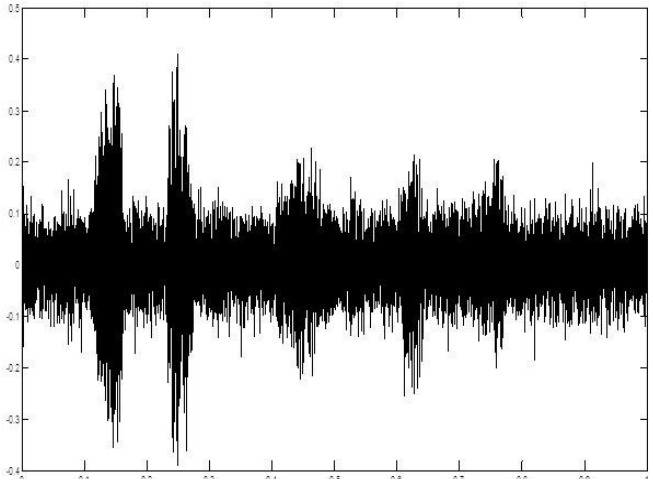

Fig. 2. Voice signal for "Hello, one one one"

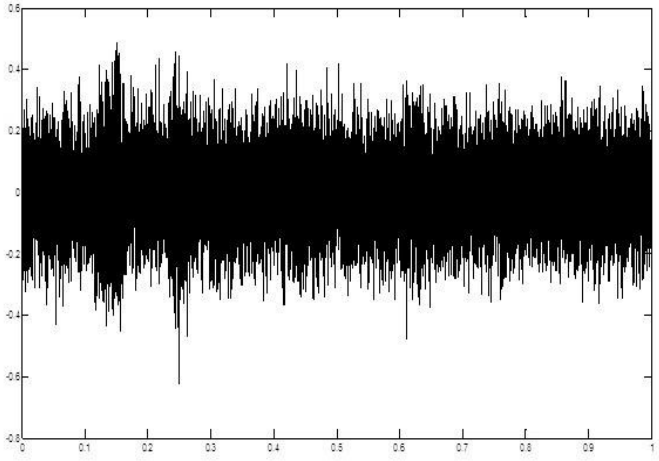

Fig. 3. Noisy signal of "Hello, one one one"

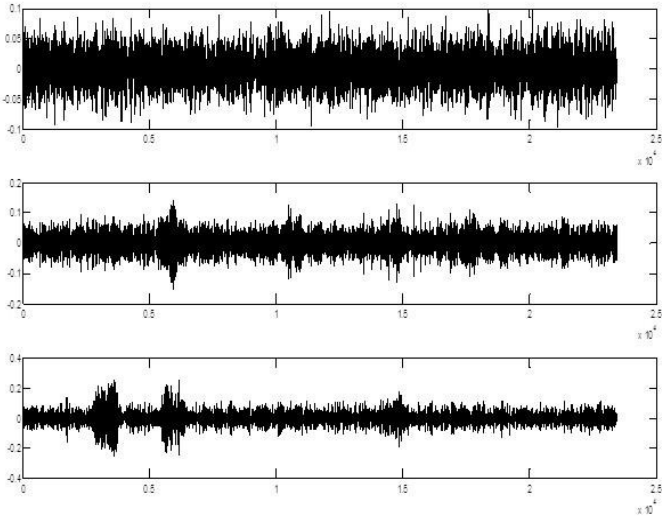

Fig. 4. Decomposed enhanced signal

Signal to noise ratio is an important criterion for determining the quality of Speech. It is represented as

$$(SNR)_{dB} = 10\log_{10}\left(\frac{S_0}{N_0}\right) \quad (4)$$

Where S_0 is the total signal energy and N_0 is the total noise energy.

Due to lack of space, all the experimental voices are not given in figure. For sample, one of the figures is shown. For other voices the tables are given as follows. Table-I shows the SNR level for different voice samples contaminated with different types of noise. The SNR level before enhancement and after enhancement using proposed method is shown.

For the sake of comparison, the proposed method is compared with different methods approached earlier. It is shown in table II. The improvement of SNR is 23.7143 dB for VMD which is much greater than the other methods. The listening tests are also performed for different enhanced output signals. The more clear sound is obtained from VMD.

TABLE I. VOICE SIGNAL WITH DIFFERENT NOISE LEVEL ENHANCEMENT

Voice with different Noise	SNR before enhancement (dB)	SNR after enhancement (dB)
Random noise	11.2342	16.6292
Babble noise	10.0478	15.7152
Train noise	12.3608	17.2894
Airport noise	11.7143	17.0376

TABLE II. COMPARISON OF PROPOSED METHOD

Methods	SNR Improvement (dB)
Spectral Subtraction (SS) [7]	4.1407
Least Mean Square (LMS) [7]	6.5245
Recursive Least Square(RLS) [7]	14.3883
VMD	23.7143

IV. CONCLUSION

This paper proposes the speech enhancement scheme. The proposed approach for enhancement has been applied successfully. At the time of training the noisy speech has been applied directly, the effects of this algorithm comprises of different steps to enhance a noisy speech signal and have been demonstrated in the result section. Results obtained for speech signal shows that the enhancement using VMD method is more effective than the other methods. The proposed method is a promising method in the area of signal and speech enhancement and can be used further. As the Wiener filter is included in VMD, so least square method is more suitable than the average mode based technique and the maximum average technique. These may be analyzed and can be kept for future work. For better signal reconstruction the effect of sampling as well as interpolation technique has to be taken care and kept for a future work.

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Process of finding defects in software testing

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***Abstract*—Software testing is the most significant stage of the Software Development Life Cycle. Projects underneath testing goes through different stages such as test analysis, test planning, test case, test case review process, test execution process, requirement traceability matrix (RTM), defect tracking (bug logging and tracking), test execution report and closure.**

In terms of software, defects means whenever expected results not meet actual results. Generally defect is known as a bug. It talks about the complete life cycle of a bug right from the stage it was found, fixed, re-test, and close.

This paper basically deals with entire process of bug life cycle and how to avoid the bug. To avoid the bug, Test Engineer should prepare the bug report template which consists of various steps.

***Index Terms*—defects; software testing; bugs; request for enhancement.**

I. Introduction

Software testing is an essential procedure in almost each and every new developing project. It is also known as debugging the software. Debugging is the method of discover and dropping the fault in a computer program. Debugger is a debugging tool which helps to recognizing coding mistakes at various software progress stages.

Software testing is the major activity of estimating and accomplishing product with an observation to find out faults. It is the procedure where the system constraints and system modules are implemented and estimated manually or by using automation tools to figure out whether the system is fulfilling the specific requisites or not [1].

In our research we have acknowledged the implications of number of rejected defects in software products and then accessed the facts over number of incorrect reports that cascade in recognized classes of reasons for bug rejection. Our research provides a statistical analysis over the relationship among number of reported bugs and rejected bugs.

The rest of paper bifurcated as problem statement in section II.

II. Problem Statement

The objective of testing is to discover the problems and provide the better solution to avoid such types of problems. Software testing typically represents 40% of a software development budget. To start any testing process first of all test engineer should have to prepare test document and test plan.

Before starting the test execution process as a test engineer, we should prepare some necessary documents so that we do not forget the scenarios/flow/values that need to be tested.

We should prepare document so that if old test engineer leaves and the new person comes without wasting much time, he can start testing by referring to test document. Also if he prepared the documents we can maintain test consistency whenever we go for test execution process.

On the other hand, Test plan is a dynamic document that derives entire testing activities. It is prepared in the beginning as soon as the requirement is gathered. Following are the attributes of test plan.

A. Objective: It shows that,what is the aim of writing the test plan. This test plan is written to test the functionality of product.

B. Scope: It consists of two sub part:

(i) inscope i.e, features which needs to be tested.

(ii) out of scope i.e, features which need not to be tested.

C. Test Methodology: It defines the types of testing which needs to be performed by test engineer for start particular release. Testing types are shown as below:

(i) Start with smoke testing (test basic and critical features of an application.)
(ii) Functional testing
(iii) Integration Testing
(iv) System Testing
(v) Regression Testing
(vi) Compatibility Testing

D. Approach, Test Environment, Templates, Roles and Responsibilities, Effort estimation, Entry and exit criteria, Schedule, Automation, Defect tracking, Assumption, Deliverables, Risks, Mitigation/Backup/Contingency plan.

Bug life cycle is a complete life cycle of a bug. Whenever a bug is fixed, we retest the bug and change the status accordingly. It might be closed or re-open. We get bugs because of

- **Wrong code** i.e., logic of the program is wrong or functionality does not work according to the requirement.
- **Missing code** i.e., developer has forgotten to develop that particular feature and it is not available in the application.
- **Extra coding** i.e., developer has created a feature which is not available in the requirement but exists in application.

Following are the entire process of bug life cycle:

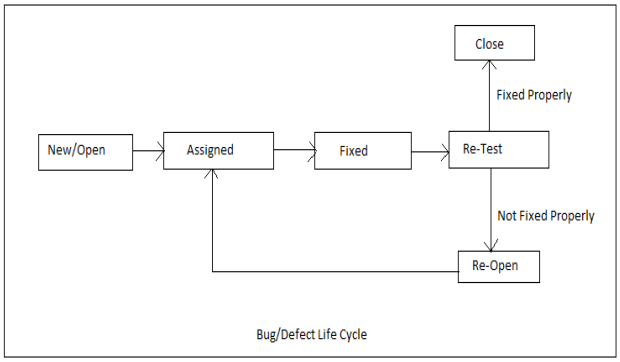

Figure 1.1

STEPS:-

- As soon as we get a bug status of bug is "**New/Open".**
- The bug is reported to the concerned person by changing the status as "**Assigned".**
- Once developer gets the bug, first he is going to go through the bug i.e., check if it is valid or not then if it is valid bug start re-producing the bug i.e., perform the actions on the application according to steps mentioned in the bug report and then change the code.
- Once the code changes are done, the developer changes the status to "**fixed".**
- The test Engineer starts re-testing the bug and if it is fixed properly then changes the status to "**closed".** Else if bug is still exists then status is change to "**re-open"** and assign it back once again to the developer. This process continues until the bug is "**fixed"** or "**closed".**

III. CLASSIFICATION OF DEFECTS

A defect in software testing is an error in programming or logic that causes a program to failure or to produce wrong/unexpected outcome.

Following are the different types of defects/bug:

A. Invalid or rejected bug

Whenever scenario is wrong and developer does not accept it as a bug then it is called invalid/rejected bug.
This bug generally occurred due to the following cases:

Case 1:- if Test Engineer misunderstood the requirement and may log the bug then developer will change the status to **invalid**. Then again Test Engineer go through it and if he also feel that it's invalid and closes the bug by keeping the status as **close.**
Case 2:- if developer misunderstood the requirement and changes the status to **invalid** after go through. The Test Engineer will go through the bug and he also may reproduce it and if the bug exists really he changes the status from **invalid** to **re-open.**

B. Duplicate bug

When same bug is found by different Test Engineer then it is known as **duplicate bug.** This bug is occurred because of following reasons:

- Common features (modules) which is access by both the Test Engineer.
- Dependent features.

Solution for avoid the duplicate bug:

i. Search in bug repository, if bug already exists, do not log (report) a bug. If bug does not exist, log (report) a bug and store in bug repository.
ii. Send it to developer and carbon copy to all test engineers.

C. Not-Reproducible bug

Developer accepts the bug but not able to find the same bug after following the navigation steps mentioned in the bug report.

Reasons for not-reproducible bug:

- **Platform mismatch**
  - **i. Server mismatch**

    Test Engineer tests the application in one server and developer may reproduce the bug in another server, to avoid this mention server name in bug report.
  - **ii. Environment mismatch**

    Test Engineer tests the application in different operating system and browser and developer may reproduce the bug in different operating system and browser, to avoid this mention platform name in bug report.
- **Data mismatch**

  Scenario may be correct, but for testing an application, Test Engineer use different data and developer may use different data for reproducing the bug, to avoid this mention test data in bug report.
- **Build mismatch**

  Test Engineer got a bug in one build and developer reproduce the same bug in different/another build due to time constraint it is known as build mismatch.

D. Can't fix bug

Developer accept the bug, also able to reproduce it but not able to perform code changes due to some reasons. These reasons are as follows that's why developer can't fix the bug:

1. Core of code (bug is in the core of code)
2. No technology support
   If there will be major changes in bug then developer can't say that can't fix that bug. **Can't fix bug** should be minor bug but all minor bug cannot be **can't fix bug.**

E. In-consistent bug

In first time Test Engineer found a bug but after that he is not able to find the same bug in next time, so to avoid the inconsistency Test Engineer should take the screenshot and follow the following steps:

1. As soon as Test Engineer got the bug first to take the final screenshot of that bug.
2. Re-confirm the bug whether it is consistent or not.
3. If bug is consistent then search the bug in bug repository. If bug report is not found then prepare the bug report and send it to the developer.

F. Deferred/Postpone bug

Even though there is a bug, it is postpone to the future releases due to time constraint. Due to time constraint developer going to make it to deferred i.e. he will fix it in next release.
In the initial builds, bugs can't be deferred but in the later stages due to the time limit he can deferred the bug. But the test engineer will check that bug can be really deferred or not. Deferred bug can be minor bug but the entire minor bug cannot be deferred. We cannot close the bug until it is fixed in next release.

G. Requests for Enhancement

These are the suggestion given by the test engineer towards the enhancement of the application.

IV. RESULT ANALYSIS

To avoid various types of bug, test engineer should uses relational database for its repository and prepare a test case template as well as bug report template which are shown as follows:

Test Case Template

HEADER:

Test Case Name/ID:	
Test Case type	Functional/Integration/System
Requirement #:	
Module:	
Status:	
Severity:	Critical/Major/Minor
Release:	
Version:	
*Pre-Condition:	
*Test Data:	
Brief Description:	

BODY

Step#:	
Description:	
Inputs:	
Expected result:	
Actual result:	
Status:	
Comments:	

FOOTER

Author:
Date:
Reviewed by:
Approved by:

Table 1.1

BUG REPORT TEMPLATE	
1. Bug #/ID :	
2. Test Case Name:	
3. Module:	
4. Requirement # :	
5. Date:	
6. Reporter :	
7. Assigned to :	
8. Status :	
9. Severity :	
10. Priority :	
11. Server :	
12. Platform :	
13. Test Data :	
14. Build # :	
15. Attachment screenshot :	
16. Brief Description :	
17. Steps to reproduce :	
18. Observation :	
19. Expected result :	

Table 1.2

In table 1.1, severity means what kind of bug and its impact on application whereas priority means the order in which the bug has to be fixed by the developer team.

Pre-Condition is the minimum data configuration that needs to be created by Test Engineer before starting the test process.

In table 1.2, build defines a piece of software which consists of set of features, bug fixes and needs to be tested for stability or check whether build is stable or not.

V. Conclusion

With the help of Testing we can reduce the bug from the software but it cannot prove that there is no remaining bug or software is bug free.

The main reasons for bug rejections are improper bug reports and inadequate information of test engineer over the developed project. To avoid such kind of bug we should prepare a proper bug report. To start the testing process firstly test engineer should have a clear knowledge of requirement. After that he can clearly identify the bug. He should prepare the test document and test plan as per the requirement. Based on these test plan further test engineers can prepare the test case where all the positive as well as negative scenarios are included. And prepare test case, test scenario, bug report template in such a way that any other person can easily reproduce the same scenario or identify the bug without wasting time over reviews and rework. Development team as well as testing team should be a part of requirement gathering team for enhanced understanding of software requirements. It will help the project team to have a proper proposal of scope and restrictions to avoid rework.

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Design of Z-Shape Compact Antenna for Next Generation Wireless Network

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***Abstract*—The wireless communication technology is developing day by day so that various generations are taken birth. The fifth generation is considered as the next generation network and awaiting for implementation. Considering this scenario, compact antenna plays a vital role to make this dream to be realized. In this research work authors have taken a strive to design such required antenna where the bandwidth has been enhanced. The two different frequencies range covers up to fourth generation networks and beyond. Similarly, the bandwidth has been enhanced up to 75 MHz and 112.5 MHz which is approximately doubles the value of the current bandwidth. The antenna has to be pasted in the mobile circuit to maintain the data transfer in seamless mode. For suitability of the space Z-shape micro strip antenna has been developed. The result shows the achievement in terms of bandwidth, return loss, VSWR, directivity and gain. It is of C- band/ S-band satellite communication for application in wireless communication.**

***Keywords*—Next generation Network, Micro strip antenna, dual band antenna, broadband antenna, wireless communication**

I. Introduction

THE patch radiators are in demand for their enchanting properties such as small profile, easy fabrication, low weight and compatibility with Monolithic Microwave Integrated Circuits (MMICS). Due to compact and planar structures [1-3], the microstrip patch radiators are used in mobile and satellite communication, wireless and in wide range of microwave equipments. The disadvantage of it is narrow band width due to resonant creation of the radiating element shape. The rigorous experimentation has been developed for bandwidth enhancement of patch antenna [4-6]. The common techniques for bandwidth enhancement are heightening substrate thickness, addition of parasitic elements to radiating element, lower dielectric substrate, use of different impedance matching and feeding methods, by several resonators and slot radiator geometry are innumerable and familiar techniques [7-10]. The work has been performed by Ansoft High Frequency System Simulator (HFSS).

In this work the two wide rectangular slits are inserted at the opposite faces of the non radiating edges of patch which is approximately equal to the length of patch. The two slits of separation are placed symmetrically w. r. t the patch center line (axis of x and y). So, for the wide slits there are three parameters ($L_7 = L_1$, $L_6 = L_2$ and separation) used here to mainly perturb the excited patch surface current path. When slot is inserted at centre of the patch the flow of current density will go by diverting the direction, in which bandwidth will be more compared to conventional patch.

The rest of the work is arranged as follows: section II dispenses design procedure for Z- shape patch antenna, details of simulation results are stated in section III and at last section IV concludes the work.

II. Antenna Design

A. Method of Design

Microstrip patch antenna consists of a very thin of $t << \lambda_0$ metallic strip called radiating element placed on a dielectric substrate of height restricted by the height $0.0003\ \lambda_0 \le h \le \lambda_0$ where λ_0 is the free space wavelength. The microstrip radiator is devised so that its maximal radiation pattern is normal to the patch. For a rectangular microstrip radiator length (L) of the radiating element is generally $\frac{\lambda_0}{3} < L < \frac{\lambda_0}{2}$ .The dimension has major impact on operating frequency [11-14].

B. Design Procedure

Using proper choice of thickness, properties of dielectric substrate and antenna shape, the radiator bandwidth is mainly deliberated. To reveal the band width in plain planar structures and to give standard basis in terms of space and bandwidth, rectangular microstrip patch radiator has been first developed. The dimensions of the radiator can be derived from empirical formulas [1], [4].

(a) Width of Patch: $W = \frac{c}{2f_0}\sqrt{\frac{2}{\epsilon_r + 1}}$

(b) Effective Dielectric Constant:

$$\epsilon_{reff} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2}\left[1 + 12\,\frac{h}{W}\right]^{\frac{-1}{2}}$$

(c) Due to fringing effects the change in dimension of length:

$$\Delta L = 0.412\,h\frac{\left(\epsilon_{reff} + 0.3\right)\left(\frac{W}{h} + 0.264\right)}{\left(\epsilon_{reff} - 0.258\right)\left(\frac{W}{h} + 0.8\right)}$$

(d) Length of Patch: $L = \frac{c}{2f_0\sqrt{\epsilon_{reff}}} - 2\Delta L$

Where ϵ_r = Dielectric constant

h = Substrate thickness, f_0 = Resonant frequency

One of factors for bandwidth controlling is increasing antenna width. Nevertheless, to get acceptable result with simple rectangular microstrip patch antenna is very difficult So, Z-shape geometry is proposed to widen the antenna impedance bandwidth while keeping reasonable dimensions. Multiple resonances are generated due to change in distribution of surface current density.

The aim of antenna design at 3.3 and 4.2 GHz was to get better performance for next generation wireless network application. The width of the radiating element is usually chosen to be larger than length of the patch to get higher bandwidth. To design patch antenna lower dielectric constant is used because in case of lower dielectric constant of the substrate, surface wave losses are more severe and dielectric and conductor losses are less severe. Table 1 shows the specifications for the proposed microstrip patch antenna.

C. Design of Z-shape micro strip patch antenna

The width (W), length (L) of radiating element, transmission line width and length are most important features for the designing of antenna. The patch is fed by a 50 Ω inset feed. The two wide rectangular slits are of lengths L_1 and L_7 and of width L_2 and L_6 are inserted at the opposite faces of the non radiating edges of patch which is approximately equal to the length of patch. The two slits of separation are placed symmetrically w. r. t to the patch center line (axis of x and y). So, for the wide slits there are three parameters ($L_7 = L_1$, $L_6 = L_2$ and separation) used here to mainly perturb the excited patch surface current path.

TABLE 1. DIMENSIONS OF PROPOSED ANTENNA

Parameter	**Value**
Substrate	FR4- epoxy
Center frequency (f_r)	2.32 GHz, 3.62 GHz
Substrate height (h)	1.6 mm
Loss tangent	0.02
Dielectric constant (ε_r)	4.4
Width of radiating element (W)	38.04 mm
Length of radiating element (L)	29.44 mm
Feed width (w_0)	1.8 mm
y_0	5 mm
x_0	0.6 mm
Dimensions of Z-shape patch antenna	
Parameter	**Value**
L_1	30 mm
L_2	5 mm
L_6	6 mm
L_7	32 mm

When slot is inserted at centre of the patch the flow of current density will go by diverting the direction, in which bandwidth will be more compared to conventional patch. The geometry and configuration of Z-shape microstrip patch radiator is presented in Fig. 1 and Fig. 2. The length of the I-shaped slot is 30 mm which is symmetrical to x- axis and width of patch is approximately equal to the length of L_1 and L_7 which is calculated from the relation

$$L < \frac{\lambda_0}{2}$$

Because the slot length depends on the centre frequency, substrate dielectric constant.

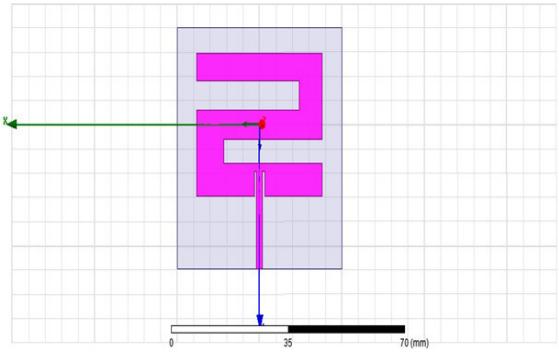

Fig 1. Z- Shape microstrip patch antenna

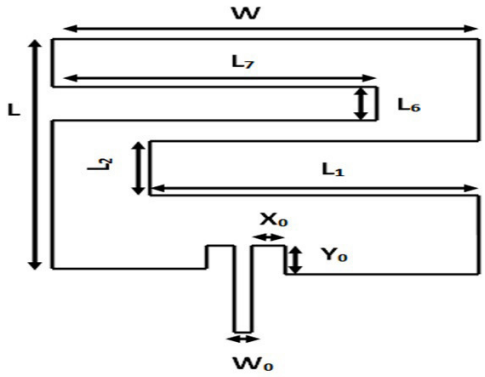

Fig. 2. Configurations of Z- shape microstrip patch radiator

In patch antenna, the resistance at the edge of the radiating element and feed line impedance (50 ohm) are always same which are usually few hundred ohms that depend on dimensions of radiating element and types of substrate used. As a result the maximum power is not being transferred and input mismatch influences the antenna performance. The input impedance of the rectangular patch radiator determines the matching among feed line and radiating element. As per transmission line theories, the resistance of the radiating element varies as a cosine squared function across the length of the radiating element. Following to theoretical calculations for the rectangular microstrip patch radiator, the proposed antenna Z – shape patch antenna is used for the desired output.

The steps of the design of Z- shape patch antenna are as follows.

1st step: The center frequency (f_r), Dielectric constant (ε_r) and height (h) of substrate are invaded in patch calculator which is programmed by MATLAB.

2nd step: The outputs W and L are used for designing Z-shape radiator in High Frequency Structure Simulator.

3rd step: The implementation of designed radiator is analyzed in terms of S_{11}, VSWR.

III. Simulation Results

The Z-shape patch antenna resonates at two bands of frequency at 3.3 GHz and 4.2 GHz which are related to the dimensions L_1, L_2 and L_6, L_7. These parameters are associated due to 50Ω impedance matching of single excitation point with two resonant frequencies. Rectangular patch radiator has been designed, simulated in high frequency structure simulator (HFSS) tool and performance of the designed Z-shape patch antenna (Fig. 1) are analyzed.

Return Loss: For better performance at resonance frequency the return loss should be minimal. The return loss plot for the designed Z- shaped patch antenna are shown in Fig.3. The Z-shape patch exhibits return loss of -25.3 decibel at 3.3 Gigahertz and -15.7 decibel at 4.2 Gigahertz. The calculated value of Z- shape patch comes out to be 3.3 GHz and 4.2 GHz with the antenna dimensions as given in table 1and matches well with the observed value $f_0 = \frac{c}{\lambda_0} = c/\,kL$

Where k varies from 2, 2.1……, 3.

$$f_1 = \frac{c}{3L} \text{ and } f_2 = \frac{c}{2.3L}$$

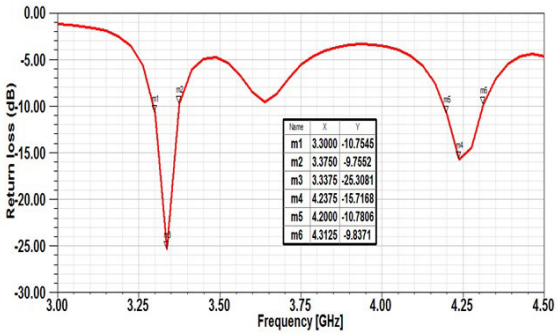

Fig 3. Return loss plot of Z- shape patch antenna

VSWR: Fig.4 shows the resultant VSWR of the intended optimized model. From Fig. 4 it is understandable that the Z- shape patch radiator has VSWR of 1.1, 1.8 at 3.3, 4.2 GHz.

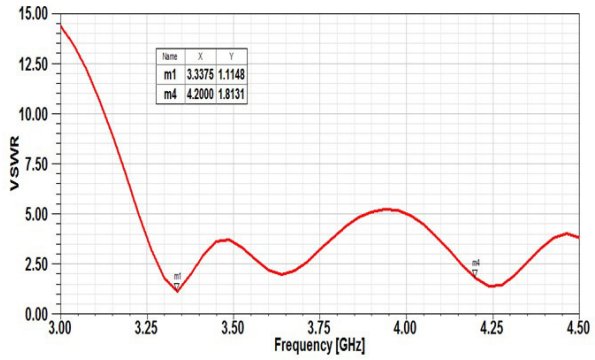

Fig. 4. VSWR Vs frequency plot of Z- shape patch antenna

Directivity: Fig. 5 shows the radiation pattern of the proposed antenna. For Z- shape patch antenna, the maximum directivity achieved is 6.31 dB. 2-D Radiation pattern polar plot for Φ=0° at the frequencies for Z-shape patch antenna is shown in Fig. 5.

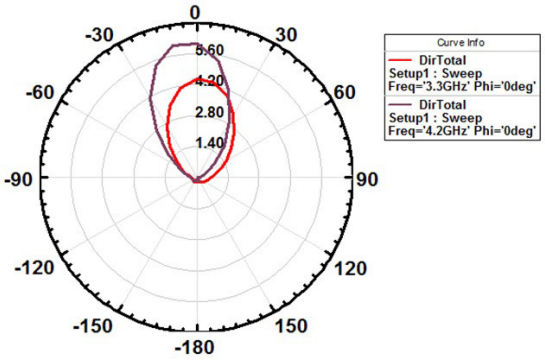

Fig 5. 2-D radiation pattern (polar plot) directivity of Z- shape patch radiator at 3.3 and 4.2 GHz

Gain: Fig. 6 exhibits the radiation patterns of the intended radiator. The gain versus frequency of the intended radiator is depicted in fig. 7 having maximum gain 2.8 dBi at 4.4 GHz. Basically the gain of antenna can be uniform or non uniform. The parameter antenna gain is nearly equivalent to directivity which is how much concentrates its energy in one direction leaning to radiation in other directions. For 100 percent antenna efficient, the directivity and gain would be same and the antenna would be an isotropic radiator.

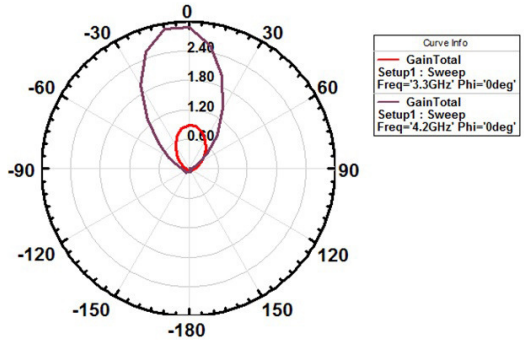

Fig 6. 2-D radiation pattern (polar plot) gain of Z- shape patch antenna at 3.3 and 4.2 GHz

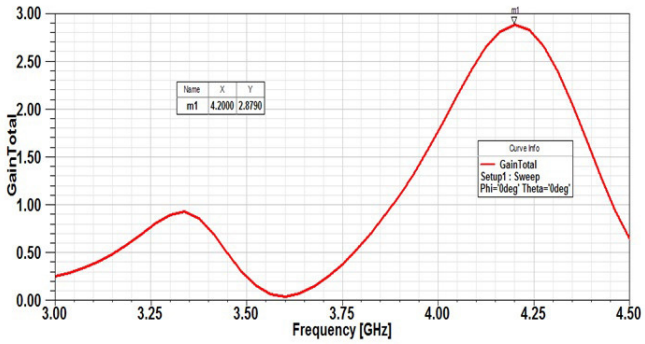

Fig 7. Gain versus frequency of Z- shape patch antenna 3.3 and 4.2 GHz

IV CONCLUSION

The proposed antenna Z-shape patch antenna will work in 3.3 and 4.2 GHz frequency range which covers the frequency of operation of S- band and C- band satellite application. It supports the 4G, 5G and NG wireless communication systems. The simulated radiation pattern is partially Omni directional

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Short-Term Variable—Head Hydrothermal Generation Scheduling for Heuristic Search Method

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***Abstract*—This paper based on Heuristic method to solve the short-term variable head hydrothermal generation scheduling problem. It uses Heuristic search method to find the result of all thermal and hydro power plants optimization. Numerical experiment show, this method to solve the non-linear problem with its available of constraints in acceptable time.**

***Index Terms*—Variable Head Hydro-thermal generation system, Heuristic search method and maximum iterations.**

1. Introduction

The optimum hydro and thermal generation scheduling of an electric power system is the find of the generation for every generating station such that the total system optimum generation cost is minimum while satisfying the constrains. However due to insignificant operating cost of hydro plants the scheduling problem essentially reduces to minimizing the fuel cost of thermal plants constrained by the generation limits, available water, and the energy balance condition for the given period of time.

This paper is based on hybrid based on a Heuristic search method which finds the optimization schedules of all hydroelectric and thermal power plants optimization without decomposition. The computational results with hydrothermal test system demonstrate that programming is an efficient and advantageous optimum method to solve the short-term planning task.

2. Heuristic Search Method

This method is not found the best solution but guaranteed the find good solution in reasonable time, and increases the efficiency, useful in solve the problems which, Could not be solved any other way, and Solutions take an infinite time or very long time to compute.

3. Problem Formulation

This problem formulates and solve in mathematically

Fi(Pik) The cost of a fuel function of thermal power generating in the Interval k.

S_j — Reservoir surface area of j^{th} reservoir.

t_k — Duration of the k^{th} sub –interval.

P_{Dk} — Load demand during the k^{th} sub-interval.

V_j —Available water for whole period for j^{th} hydro unit.

P_{ik} —Power plant of i^{th} thermal generation in k^{th} interval.

P_i^{max} —Maximum energy of i^{th} generating thermal and hydro unit in MW.

P_i^{min} —Maximum energy of i^{th} generating thermal and hydro unit in MW.

a_i, b_i, c — Coefficients of cost the i^{th} thermal units.

x_j, y_j, z_j — Coefficients of Discharge the j^{th} hydro plant.

$\alpha_j, \beta_j, \gamma_j$ – Discharge coefficients of head of the j^{th} hydro plant.

F_i – Thermal cost of the i^{th} unit.

q_{jk}-the discharge rate from the j^{th} hydro in the k^{th} interval.
h_{jk}-Head of j^{th} hydro unit during k^{th} sub interval.
I_{jk} -Inflow in j^{th} hydro plant in k^{th} interval.
P_{Lk}-Transmission losses during the k^{th} interval.
r_k - Penalty parameter.
j- Index for hydro units.
i-Index for thermal units.
k- Index of time period.
B- Coefficients of transmission losses.
Y- Mutation factor.
M- Number of hydro plants.
T- All period for generation scheduling.
N- Number of thermal units

$$Minimize\ J \sum_{k=1}^{T} \sum_{i=1}^{N} t_k\, F(P_{ik}) \ \ldots\ldots\ldots\ldots \quad (1)$$

1. Energy continuity equation
$\sum_{i=1}^{N+M} P_{ik}\, P_{Dk} P_{Lk}$ $\ldots\ldots\ldots\ldots\ldots\ldots (2)$
2. Water continuity equation

$$\sum_{k=1}^{T} t_k q_{jk} = V_j \ldots (3) \quad (j = 1,2.....M)$$

.....(3)

3. Minimum and maximum limit on discharge

$$q_{min} \leq q \leq q_{max} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

4. Maximum and minimum limit on hydrothermal generation

$$P_i^{max} \leq P \leq P_i^{min} \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

5. Maximum and minimum limit storage on reservoir

$$h_{min} \leq h \leq h_{max} \ldots\ldots\ldots\ldots\ldots (6)$$

6. Total water discharge for 24 hrs = Vt .....(7)

3. APPLICATION OF ALGORITHM TO THE variable head hydrothermal scheduling

Parent function is generating by use random numbers is given below.

$$P_{ik} = P_i^{min} + rand_{ik}[0,1]\left(P_i^{max} - P_i^{min}\right)$$

$i = 1,2, \ldots N+M; \quad k = 1,2, \ldots, T$)

4. COMPUTER IMPLEMENTATION

Implementation of program written in Matlab Version 2013 Institute of Technology Gopeshwar, Chamoli to run on Acer Pc compatible. Have tested.

5. PROBLEM

The system test consists of hydro and thermal generation plant as
The operating cost is given by-

$$F_1(P_{1k}) = aP_{1k}^2 + bP_{1k} + C1 \qquad Rs/h$$

$$F_2(P_{2k}) = aP_{2k}^2 + bP_{2k} + C_2 \qquad Rs/h$$

The variation rates of discharge of hydro generating station are given by quadratic function of effective head and active hydro power.

$$\phi(W_{3k}) = x_1 W_{3k}^2 + y_1 W + z_1 \qquad Mft^3/h$$

$$\phi(W_{4k}) = x_2 W_{4k}^2 + y_2 W_{4k} + z_2 \qquad Mft^3/h$$

$$\psi(h_{1k}) = \alpha_1 h_{1k}^2 + \beta_1 h_{1k} + \gamma_1 \qquad ft$$

$$\psi(h_{2k}) = \alpha_2 h_{2k}^2 + \beta_2 h_{2k} + \gamma_2 \qquad ft$$

The reservoirs have small capacity and vertical sides. The coefficients of fuel cost, discharge coefficients of hydro plants, constant of proportionality, water available, surface area, initial height of the head, maximum and minimum power limits, load demand and water inflow are given in respectively. The B coefficients of the power system network are given by
B=

$$\begin{bmatrix} 0.000140 & 0.000010 & 0.000015 & 0.000015 \\ 0.000010 & 0.000060 & 0.000010 & 0.000013 \\ 0.000015 & 0.000010 & 0.000068 & 0.000065 \\ 0.000015 & 0.000013 & 0.000065 & 0.000070 \end{bmatrix}$$

MW^{-1}

Table 5.1 Thermal unit cost function coefficient

Unit	a_i (Rs/MW^2h)	b_i (Rs/MWh)	c_i (Rs/h)
1	0.0025	3.20	25.0
2	0.0008	3.40	30.0

Table 5.2Water discharge rate hydro generation function

Unit	x_i (Mft^3/MW^2h)	y_i (Mft^3/MWh)
1	0.000216	0.306
2	0.000360	0.612

Table 5.3 Water discharge rate head function

Unit	α_i (ft/h^3)	β_i (ft/h^2)
1	0.00001	-0.0030
2	0.00002	-0.0025

Table 5.4 Reservoir data

Unit	Constant of proportionality K_j	Volume of water V_j (Mft^3)	Surface area S_j (Mft^2)	Initial height h_{j0} (ft)
1	1	2850	1000	300
2	1	2450	400	250

Table 5.5 Power generation limits

Unit	Minimum Limit (MW)	Maximum Limit (MW)
1	135	281
2	316	759
3	252	439
4	11	184

Table 5.6 Load demand and water inflows

Interval (hrs)	Load demand W_D (MW)	Water inflow I_1 (Mft^3/h)	Water inflow I_2 (Mft^3/h)
1	800	1	0.1
2	750	2	1.3
3	700	2.75	1.75
4	700	2.9	1.95
5	700	3	2
6	750	3.25	2.25
7	800	3.4	2.4
8	1000	3.75	3
9	1330	2	2.95
10	1350	3.5	3
11	1450	4.2	3.25
12	1500	3	3
13	1300	4.3	4.3
14	1350	4.5	3.3
15	1350	4.7	3.1
16	1370	4	3.5
17	1450	4	3.7
18	1550	4.8	3
19	1430	5	4
20	1350	4.2	4.2
21	1270	6.5	4.5
22	1150	6.5	5.5
23	1000	6.5	5.5
24	900	5.4	5.5

6. OPTIMAL SOLUTION FOR TEST SYSTEM

The solution of hydrothermal generation scheduling of power systems presented here. The various parameters like population size is taken 20, variable-head hydro and thermal scheduling problem having two hydro unit and two thermal units has been solved using heuristic search method. Other different

parameters maximum iterations are set to 200, the obtained value of objective function using heuristic search method algorithm is Rs 69588.9087 and obtained generation scheduled is given in Table 6.7. Result for variable head thermal and hydro generation with given load Table 6.8. Hydro and thermal acceleration coefficient ζ is 2.75.

Table 6.7 Result for Variable Head Thermal and Hydro Generation With Given Load Demand

Interval (hrs)	W_D (MW)	W_L (MW)	W_1 (MW)	W_2 (MW)	W_3 (MW)	W_4 (MW)
1	800.0	22.47132	163.40860	386.98810	260.05160	12.02233
2	750.0	19.65746	156.18010	347.52210	254.93180	11.02260
3	700.0	16.97471	136.03970	317.86830	252.00000	11.06584
4	700.0	16.97495	136.05280	317.57830	252.00020	11.34275
5	700.0	16.97157	135.40800	316.02360	253.57790	11.96125
6	750.0	19.50838	135.01970	339.64540	274.29460	20.54816
7	800.0	22.28995	145.30900	376.02120	268.45810	32.50109
8	1000.0	35.34188	175.68420	474.64360	318.14480	66.86886
9	1330.0	53.15791	234.28890	620.79690	397.02150	131.04980
10	1350.0	66.36123	260.80870	628.88100	394.29370	132.37710
11	1450.0	77.09708	274.19940	676.72330	426.15330	150.02020
12	1500.0	82.77505	275.58760	710.92650	436.08850	160.17160
13	1300.0	61.19148	228.01030	625.71790	374.68120	132.78160
14	1350.0	66.29919	225.77350	647.49660	377.79110	165.23690
15	1350.0	66.44700	260.49210	614.01740	384.76340	157.17320
16	1370.0	68.39734	258.99710	647.36740	397.60600	134.42620
17	1450.0	77.15711	266.61690	700.33310	389.99330	170.21340
18	1570.0	91.20895	280.90600	759.00000	438.99750	182.3046

			0			0
19	1430.0	74.89027	262.11180	667.05350	403.90630	171.81820
20	1350.0	66.26812	236.00910	627.32050	400.30470	152.63300
21	1270.0	58.32116	238.50250	598.31820	368.70100	122.79860
22	1150.0	47.32835	200.10430	532.94000	348.79880	115.48450
23	1000.0	35.51199	201.66370	469.31200	317.64420	46.89117
24	900.0	28.49180	175.80570	410.10490	297.68770	44.89268

Table 6.8 Hydro and thermal acceleration coefficient ζ is 2.75.

Interval (hrs)	$Y(Rs/h)$	$q_1(Mf/h)$	$q_2(Mf/h)$	$h_1(ft)$	$h_2(ft)$
1	2080.23100	84.94306	13.14447	300.00000	250.00000
2	1893.94900	82.99728	12.16616	299.91600	249.97210
3	1698.17800	81.87936	12.20703	299.83580	249.94900
4	1697.09600	81.85790	12.47607	299.75690	249.92660
5	1688.52100	82.42547	13.07883	299.67840	249.90480
6	1779.72000	90.22420	21.50776	299.59800	249.88080
7	1964.36100	87.97879	33.37463	299.51200	249.83450
8	2488.36900	107.26730	68.38697	299.42830	249.76240
9	3360.97400	139.84610	137.27010	299.32570	249.60140
10	3514.22900	138.61530	138.52630	299.18990	249.27020
11	3787.62500	152.36590	158.03580	299.05630	248.93440
12	3948.23500	156.67760	169.24230	298.91040	248.55560
13	3355.26400	130.11870	138.23400	298.76030	248.14600
14	3441.79900	131.36800	174.39470	298.63020	247.80360
15	3447.48800	134.25060	164.90570	298.50060	247.37250
16	3587.80600	139.65220	139.26860	298.36840	246.96590
17	3859.39100	136.34570	179.07230	298.23110	246.62520
18	4192.63400	157.54370	192.51660	298.09770	246.18500
19	3689.46500	142.15400	180.11710	297.94350	245.71120
20	3397.19500	140.54550	158.20740	297.80560	245.26920

21	3281.08600	127.15690	125.30370	297.66820	244.88240
22	2834.65400	118.91500	117.28840	297.54470	244.57670
23	2573.85900	106.36080	46.63707	297.42980	244.29390
24	2223.75300	98.51138	44.63926	297.32790	244.19110
The period time is scheduled for 24h			V_1 = 2850.0008 Mft3		
Total operating cost=Rs 69785.88			V_2 = 2450.0007 Mft^3		

Table 6.9 Total system operating cost w.r.t mutation factor

POPULATION	TOTAL SYSTEM OPERATING COST (Rs)		
	F is 0.8	F is 0.85	F is 0.90
10	69824.04	69885.60	69871.73
20	69808.22	69841.59	69815.34
30	69801.53	69800.95	69795.78
40	69792.07	69799.72	69797.91
50	69802.09	69829.59	69787.35
60	69793.34	69804.51	69805.88
70	69797.02	69796.89	69796.13
80	69785.88	69798.11	69803.26

XI=39 ZETA=0.26 ITERATIONS=100

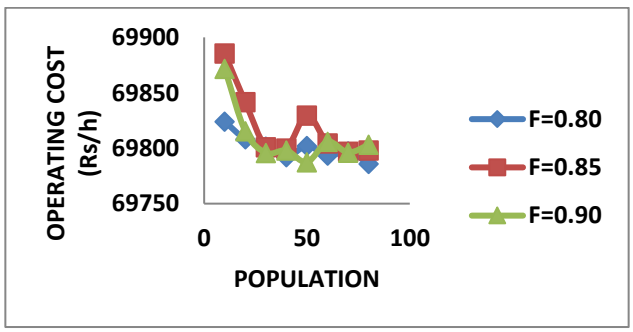

Fig. 6.1 Operating cost over the population at different mutation factors

Table 6.10 Total system operating cost w.r.t maximum iteration

POPULA-TION	TOTAL SYSTEM OPERATING COST (Rs)		
	Generation (Iterations) is 100	Generation (Iterations) is 150	Generation (Iterations) is 200
10	69824.04	69824.04	69824.04
20	69808.22	69808.22	69808.22
30	69801.53	69801.53	69801.53
40	69792.07	69792.07	69792.07
50	69802.09	69802.05	69802.04
60	69793.34	69793.34	69793.33
70	69797.02	69796.84	69796.84
80	69785.88	69785.42	69785.42

XI=39 ZETA=0.26 F=0.8

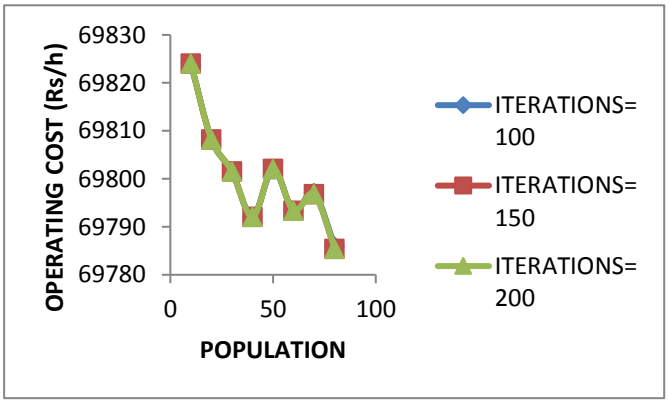

Fig. 6.2 Operating cost over the population at different maximum iterations

Table 6.11 Comparisons of results

Method	Operating cost (Rs)
Newton-Raphson	69801.08/-
Heuristic search method	69785.88/-

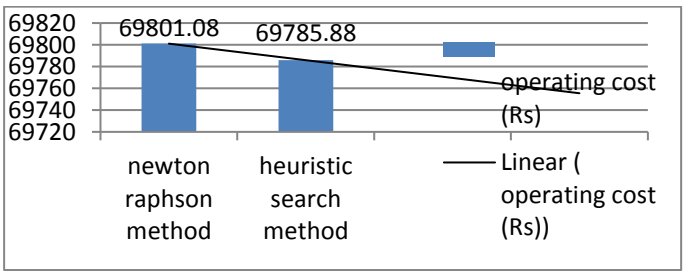

Fig 6.3 Comparison Chart

The total cost obtained from the heuristic search method is less as that of newton-rapson method [6].

Thus it can be concluded that heuristic search method technique provides optimum results the newton-rapson method. It is better to use heuristic search method because newton-rapson method cannot be applied to the hydrothermal scheduling problem having prohibited zone constraints.. While implementing heuristic search method there is no need of initial guess of power and water discharge. Hence it is better to use heuristic search method.

7. Conclusion

The heuristic method is based and used to solve the variable-head hydrothermal scheduling problem. A hydrothermal model has been implemented to find the optimum power generation schedule considering the transmission power losses. The heuristic search technique is having dynamic characteristics function utilized to update the solution vector and improves the convergence properties of the algorithm.

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Overview of Object Detection and Tracking based on Block Matching Techniques

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***Abstract* - Object tracking is one of the vital fields of computer vision that detects the moving object from a video sequence. Object detection is used to detect the object present in the video and to find the exact location of that object. The object tracking can be applied in various fields that include video surveillance, robot vision, traffic monitoring, automated civil or military surveillance system, traffic monitoring, human-computer interaction, vehicle navigation, biomedical image analysis, medical imaging and much more. The object tracking algorithm requires tracking the object in each frame of the video. A common approach is to use the background subtraction, which eliminates the common static background, resulting into foreground region showing the presence of the desired object. Block matching technique is the most popular technique for computing the motion vectors between the two frames of video sequences and different searching techniques are available to compute motion vectors between frames. Still, there is a scope for improvement in modifying or developing a new shape pattern for block matching motion estimation to find out and track the object in the video. This paper presents the several object detection and tracking methods and how block matching can be used to track object from a video.**

Keyword- Object Tracking; Object Detection; Background Subtraction; Block Matching

I. INTRODUCTION

Detection of an object is typically the first step towards tracking process. The tracking methods need an object detection mechanism, either in sequence of frames or when the object first appears in the frame of the video. Object tracking means the process of locating the object of interest from a video sequence. The object is tracked based on monitoring the motion of an object in the video. Videos are the collective and sequential representation of the image frames. Each of the frames can be divided into two set of objects, foreground and background objects. The foreground objects are the moving objects which can be a bird, car, person, *etc*. and the background can be the static things. The complete process of object tracking can be categorized into the following three steps, object detection, object classification and object tracking as depicted in Figure 1.

Object detection: It is done to find out the region of interest from the frames of the video. Various methodologies are present for object detection from a video sequence. The object detection techniques used are frame differencing, optical flow and background subtraction. Out of three major classes of moving object detection techniques, namely, frame differencing, optical flow, and background subtraction, the last is somewhat robust, as compared to the others [1] [2].

Object Classification: The detected object then can be classified as various moving objects. There are many approaches to classifying the moving objects shape-based classification, motion-based classification, color-based classification, and texture-based classification.

Object Tracking: Aim is to generate a trajectory of an object by locating its position in every frame of the video. The approaches to tracking the object are point tracking, kernel tracking, and silhouette tracking.

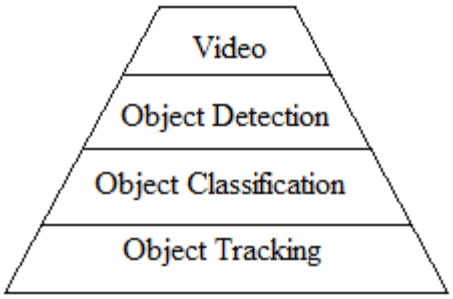

Figure 1: Steps in Object Tracking

Keeping track of the moving object is a challenging issue. Lots of factors are responsible for making tracking of object difficult [3]. Object tracking can become complex due to-noise in image; complex motion of objects; also information loss is caused while projection of 3D world on a 2D image, *etc.* [3]

The paper constitutes various sections organized as follows: An overview of object detection is given in section II. Section III describes an overview of object tracking. Section IV describes the related work on object tracking. An overview of block matching technique is given in Section V. This section elaborates the different block matching

techniques and the cost functions associated with block matching algorithms. Section VI describes a related work on object tracking using block matching. Section VII discusses and roundup the conclusion from the studied existing approaches of object tracking and block matching. Ultimately, the paper ends with the future scope in section VIII followed by references.

II. Overview of Object Detection

Detecting the object from the video is the first step to tracking an object. Detection of an interesting moving object can be achieved by different existing techniques such as frame differencing, optical flow, background subtraction, segmentation, point detectors [3] as shown in Figure 2.

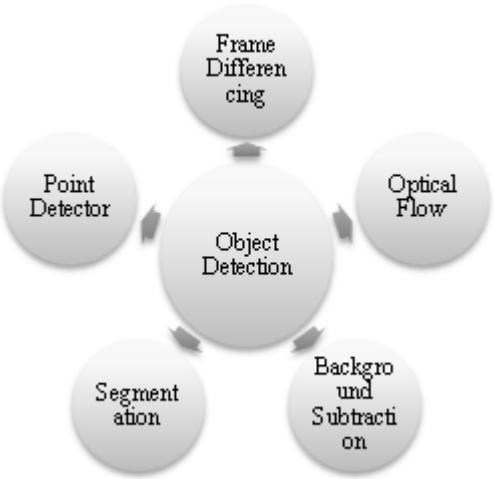

Fig.2. Object Detection Techniques

Displacement position of the objects are the only fundamental source of information. Detailed explanation for various methods is as follows:

Frame di erencing: Difference between two consecutive frames is determined to find the moving object. This calculation is easy and simple to implement.

Optical ow: This method [1] is used to calculate the images optical flow field and do clustering process agreeing to the characteristics of optical flow distribution of images. Optical flow presents complete information about the movements and can detect the moving object from the background better.

Background subtraction: It is achieved by building a background model and then finding deviation from each incoming frame [3] [4]. The change with respect to the background model denotes the moving object. The background frame without any object is captured, afterward, when a moving object enters, the second picture is formed [2]. Subtracting the second frame from the first background frame gives the dissimilarity between two frames and the position of moving object can be obtained as shown in Figure 3. Background subtraction technique can be divided into two categories: recursive and non-recursive technique [1] [4]. The recursive technique does not maintain a buffer for background evaluation. On the contrary, they recursively update a single background model based on each input frame[1]. Recursive techniques require less storage. On the other hand, a non-recursive technique makes use of a sliding-window approach for background estimation. A buffer of previous video frames is stored, and tally the background image based on the changes of each pixel within the buffer. Non-recursive techniques are independent of the history beyond those frames stored in the buffer.

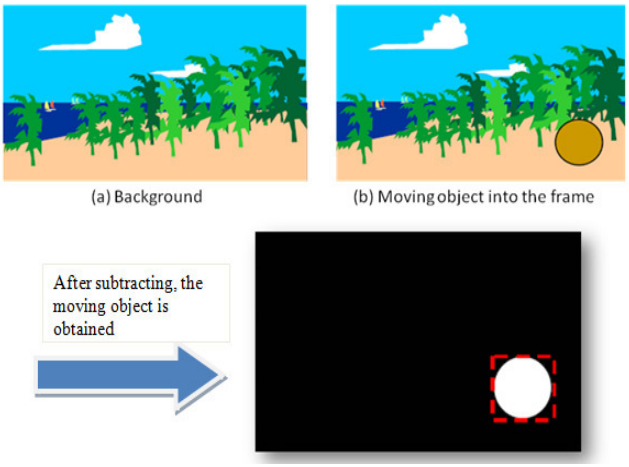

Fig.3. Background Subtraction [18]

Segmentation: The intention of image segmentation is to divide the image into similar regions. The two major problems faced by segmentation are, (i) the standard reference for a good partition and (ii) systematic way for achieving efficient partition. Mean shift clustering, segmentation using graph cuts and active contours are the different segmentation techniques [3].

Point detectors: They are used to detect the points of attention in images which have an effective texture. These interest points are used in the context of motion, stereo, and tracking [3].

III. Overview of Object Tracking

Object tracking is locating the position of the object of interest in each of the sequence of frames. Sequence of frames combines to form a video. Each frame undergoes the process of object tracking. Object extraction, recognition, tracking and decision about tracking can be done by object tracking. Object tracking can be categorized as point tracking, kernel tracking, silhouette tracking [1]. These three methods can be categorized into subtypes as depicted in Figure 4.

Point tracking: The moving objects in the image are portrayed as feature points during the tracking process. It involves detection in every frame. The relation of detected objects is served as points across the frames. The point correspondence seems to be a difficult problem- principally in the existence of occlusions, false detections [3]. Point tracking is divided into deterministic and statistical methods [3].

(1) Deterministic Method: This method works on qualitative motion heuristics by forming a connection between each object in the previous frame with the single object in the current frame. This is performed with the assistance of a set of motion constraints. This method for point correspondence associates a cost of each object in frame (f–1) to a single object in frame (f), using a set of motion constraints [3].

(2) Statistical Method: It is also called as Probabilistic Method. This method works by determining the position of an object in the frame with detection mechanism. A probabilistic method considers the object's measurement and uncertainties so as to establish the relation. The statistical methods resolve the tracking problems like the noise present in the measurements. Object motions can undergo disturbance.

Kernel tracking: It is computed by representing the moving object's region from frame to frame. It is based on the object's motion. Based on the object's representation, shape and appearance, the number of objects tracked, the kernel tracking method are divided into two subcategories as template based and multi view model.

(1) Template based models: This method is based on searching the image, for the object template defined in the previous frame. Templates and density-based appearance models are commonly used due to its simplicity and low computational cost.

(2) Multi-view appearance models: It is the new approach used for objects that have different views in different frames of the video. There are some difficulties faced in another method to track object from different views. This model represents the information gathered through the most recent observations of the object. The object appears different from different views and if the view of object changes during tracking, then this model is invalid.

Silhouette-based tracking: Complex objects such as hand, fingers are difficult to define by geometric shapes. This method provides shape descriptors for the object. And aims at finding the object region in each frame with the help of an object model generated using the previous frames. The model can be in the form of an object edge or the object contour and color histogram. Shape matching and contour tracking are two main categories of silhouette tracking [3].

(1) Shape Matching: It is somewhat similar to the template-based tracking in kernel approach. It can be performed by tracking where an object silhouette and its associated model are present. In this approach, the search is done by means of checking the similarity of the object with the model generated from the two successive frames.

(2) Contour Tracking: Contour tracking method repeatedly unfolds a primary contour in the preceding frame to its new position in the present frame [1]. This tracking method requires some overlapping part of the object in the current frame with the object area in the previous frame. Tracking by contour tracking method can be performed using two different approaches. (i) The state space models to model the contour shape and its motion. (ii) Minimizing the contour energy using direct minimization techniques like gradient descent.

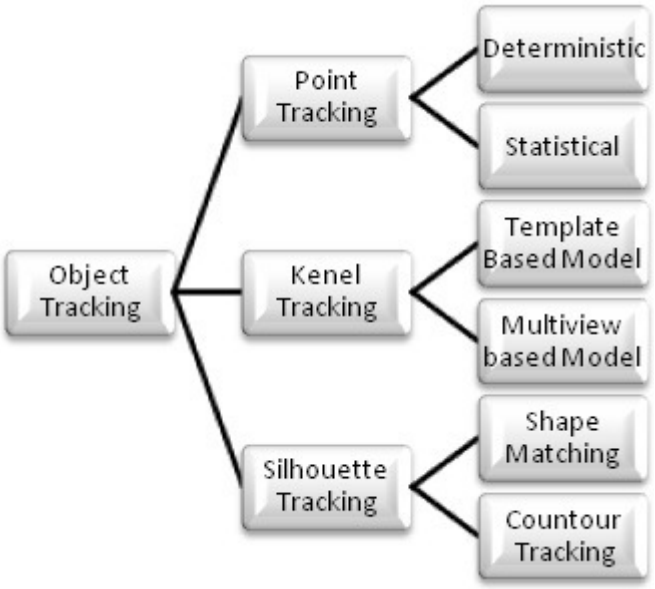

Figure 4: Object Tracking Methods and Types

IV. RELATED WORK ON OBJECT TRACKING

Parekh *et al.* [1] have suggested various methods for detecting an object and tracking an object from a video sequence. The different approaches to detecting the objects are briefly explained which include frame differencing, subtracting the background and optical flow. Each of these objects detecting methods has advantages and drawbacks. Also, the moving objects can be classified based on its shape, color, texture-based, and motion. The actual object tracking approaches suggested by authors include the point tracker, kernel-based tracking, and silhouette based tracking. From these available and suggested methods, background subtraction is the simplest and easy method that provides the complete information about the object rather than the other methods. A brief review of object tracking methods is presented by Yilmaz [3]. These tracking methods are divided into three categories based on object representation and require detecting the object at some point. They have categorized as point correspondence, primitive geometric model, and contour evaluation. The later focus was moved towards the object detection approaches which include the point detectors, background subtraction, and segmentation and supervised learning. The issues related to object tracking like occlusion, view through multiple cameras are also discussed. Background subtraction is a widely-used approach for detecting moving objects from static cameras [2]. Humans can easily detect the objects present in an image or video. But it is not so easy for the machine to do the same, for this, we require more intelligent machines. One way is to use the concept of Steiner tree [5]. The method that is widely used to detect a moving object is background subtraction

method and is simple, accurate and takes less computational time [6, 7]. Karasulu et al. [4] and Zhang and Ding [11] have enlightened with the background subtraction method, mean-shift method, mean-shift filtering method and temporal differencing for object detection. This study is then followed by the challenges like the dynamic background, occlusion, illumination, presence of shadow, the speed of moving an object, weather, etc. that occur during tracking an object from a video. Object tracking has lots of application. One of the applications is applied by Singla [9] which explains motion detection using the frame differencing method. The objective of this approach is to detect the moving objects from the difference between the current frame and the reference frame. The frame difference method adopts pixel-based difference to find the moving object. Another approach for object detection and tracking is introduced by Zhang and Ding [11] in which, initially, a median filter is used to obtain the background image of the video and remove noise from the video sequence. Followed by the use of adaptive background subtraction algorithm for detecting and tracking the moving objects. Adaptive background changing is briefly stated in this paper. A classification of tracking algorithms along with the advantages and challenges of each method is presented by Chau et al. [12]. The trackers are divided into three categories giving the complete overview of the tracking algorithm, point tracking, appearance tracking and silhouette tracking. Object detection and tracking can be applied for the video surveillance. The technique focuses on the real-time object detection and tracking. The design of a video surveillance system is based on an automatic identification of events of interest. A video surveillance system includes three phases of processing, the extraction of moving objects, followed by object tracking and recognition [13].

V. Overview of Block Matching Technique

A block matching algorithm (BMA) is a technique, where similar blocks in a sequence of frames of the video are located for the purposes of motion vector estimation. Motion estimation is the process of determining motion vectors from the neighboring frames in a video sequence. The purpose of a block matching algorithm is to find a matching block from a frame in some other frame. Block matching involves partitioning the current frame into a number of macro blocks and compares each macro block with the corresponding block. A vector is created that maps the movement of a macro block from one location to another. These motion vectors provide the displacement in the block. The difference in the displacement is used to unfold the temporal redundancy in the video sequence that will increase the chances of motion detection. The various block matching algorithm are-Three step search (TSS); New three step search (NTSS); Simple and efficient search; Four step search (FSS); Diamond search (DS) etc. Block matching algorithms make use of an evaluation metric to determine whether a given block in frame matches the search block in the frame. An evaluation metric for finding a matching macro block with another macro block is based on a minimum cost function criteria. Some of the most popular cost functions in terms of computational expense are:

Mean difference or Mean Absolute Difference (MAD): The mean absolute di erence or the MAD is the "average" or "Mean", of the absolute di erence of two variables *X* and Y independently. Mathematically it is given by:

$$\text{MAD}= \frac{1}{N^2}\sum_{i=0}^{n-1}\sum_{i=0}^{n-1}|C_{ij}-R_{ij}|$$

Mean Squared Error (MSE): The mean squared error (MSE) calculates the average of the squares of the errors and is given by:

$$\text{MSE}= \frac{1}{N^2}\sum_{i=0}^{n-1}\sum_{i=0}^{n-1}\left(C_{ij}-R_{ij}\right)^2$$

In the equation, N is the size of the macro-block, and C_{ij} and are the pixels being compared in current macroblock and reference macro block, respectively.

*Peak signal-to-noise ratio (PSNR):*The image with motion is created using the motion vectors and macro blocks from the reference frame is characterized by Peak signal-to-noise ratio (PSNR) and given by:

$$\text{PSNR}= 10\log_{10}\frac{(peaktopeakvalueoforiginaldata)^2}{MSE}$$

To track the object from the video sequence, background subtraction is performed as shown in Figure 3. Now, if the existence of moving object occurs in both the adjacent frames, the tracking area will be overestimated as shown in Figure 5.

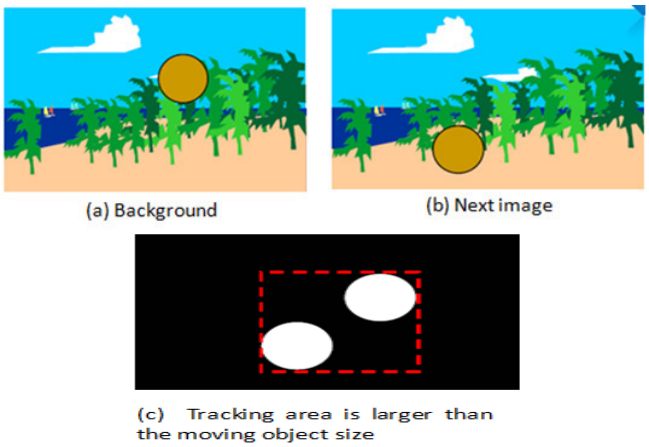

Figure 5: Background Subtraction without Block Matching Algorithm [18]

Figure 5 represents the generation of the redundancy in the video sequence. To overcome this redundancy, the Block matching algorithm is used in which motion estimation is applied to adjust the tracking area size. The basic concept of BMA applied is that dividing the current frame into small blocks, of equal size. Then for each of the small block we find

the adjacent block from the search area of the last frame that matches mostly to the current block. Hence the matched block from the previous frame is selected as the motion source of the current block and the resulting position of these two blocks gives the motion vector (MV) that needs to be found. When all the motion vectors of the tracking area have been computed, the most frequently occurred motion vector is selected for correcting the tracking area as shown in Figure 6.

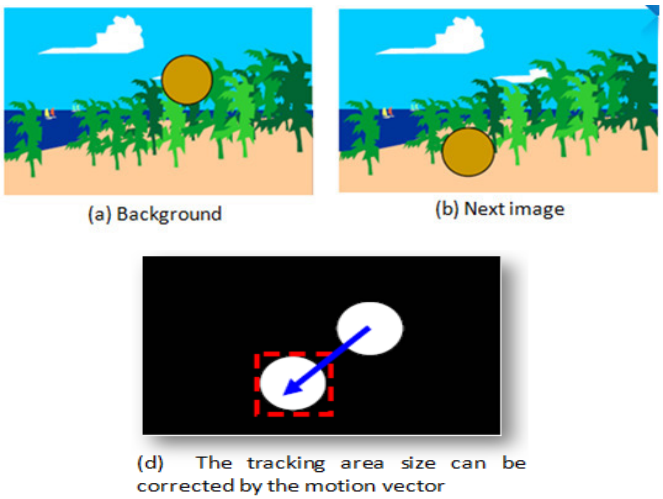

Figure 6:Object Tracking using Block Matching Algorithm [18]

VI. Related Work on Object Tracking using Block Matching Algorithm

Block matching is a standard technique for encoding motion in video compression algorithms and explores the abilities of the block matching algorithm when applied for object tracking [15]. Gyaourova et al. [15] carried out an experiment to reach goal having two aspects: (i) exploring the performance of the motion estimation algorithm and (ii) improving the motion estimation/detection performance by using different block matching algorithms (BMA) for gaining good object tracking results. A comparative approach for block matching is discussed by Hussain and Haque [17]. Various block matching algorithms are discussed, implemented and compared six different types of block matching algorithms, starting from the basic Exhaustive Search to the recent and fast adaptive algorithms like Adaptive Rood Pattern Search [16, 17]. Various block matching algorithms are explained and implementation of full search motion estimation and three step search motion estimation is carried out and the comparison is done between these two algorithms on basis of computational complexity and PSNR. At last, it is concluded from the result that computational complexity of three step search is 10 times less than the full search algorithm [18]. The comparison among fast block matching algorithms (FBMAs) for motion estimation and object tracking are derived from the experiment by Sherie et al. [20]. A fast BMA is developed that was best from the rest and efficient and compared with other BMA. The resemblances are discovered for both motion estimation and object tracking over the standard test data sets. Another object tracking approach using block matching algorithm is introduced in [21], new object tracking technique is presented. The aim of the presented method is to enhance tracking exactness while keeping the tracking process fast. This technique is based on finding motion vectors. The modified block matching algorithm considers solely the area of motion and thus reduces the computational cost [21]. Based on the various methods and categories available for object detection and tracking, Sugandi et.al [22] has designed an object tracking methodology, which describes the region based tracking. The region-based tracking algorithms track objects based on the modifications of the image regions that corresponds to the moving objects. Regions with motion are detected by deducting the background from the current image [22]. The diamond search algorithm and its modified algorithm for motion estimation consist of a small diamond shape pattern (SDSP) and large diamond shape pattern (LDSP) used in video processing [23, 24, 25]. Diamond search is the basic algorithm which is extended into the cross-diamond search and novel cross diamond search. All these algorithms differ in terms of their searching points. Less the number of searching points, more efficient is the algorithm. Block matching motion estimation is the most popular and efficient techniques used to removes the temporal redundancy present between the two frames, the current frame is divided into blocks and for each block one searches for the best-matched block in an available previous frame. Motion Vector (MV) is the displacement between the candidate block and the best matched in the previous frame. The motion estimation is a technique [30], which tries to minimize the temporal redundancy between the successive frames of the video. Motion estimation is computationally very expensive and consumes about 75% of the computational cost during motion estimation process. The three-step search (TSS) and its improved algorithm for block matching algorithm are defined in terms of the search points required [32]. Block matching algorithm are popular for their simplicity and effectiveness in processing. Block matching algorithms are widely adopted due to the motion analysis of objects, tracking the objects and also in video compression and processing [28] [34]. Block matching motion estimation is used for the video compression and fractal coding [33, 34]. The standards for video compression are utilized for the video coding. Motion estimation and compensation are employed in accomplishing the minimal temporal redundancy between the frames of the video. Motion estimation means finding motion vectors of an object in an image. Data compression is achieved on sequential images with the help of the information of the moving object. Several techniques are available to estimate the motion between two frames. Motion is the important feature in tracking an object from the video. The motion estimation includes a lot of challenges like the computational complexity etc. An approach for reducing the time complexity is possible by creating small block size, parallel computation of the motion vectors [35, 36, 37]. These approaches may help in speeding up the process of finding the motion vectors.

VII. DISCUSSION AND CONCLUSION

Obtaining correct track of the object of interest is crucial in object tracking approaches. This paper summarizes the different approaches to object detection and tracking followed by the block matching algorithm for motion estimation. The different stages/phases of object tracking have been studied. Various methods for object detection are frame difference, optical flow, and background subtraction. Object tracking can be done by using Kalman filter, particle filter, etc. The background subtraction is a simple and efficient technique to provide the complete information regarding the object of interest. Also, motion plays very important role in detecting the object. Among the all motion estimation methodologies, the block matching received very much attention in terms of their simplicity and regularity. The different block matching motion estimation techniques are studied: FS, TSS, NTSS, FSS, DS, CDS, etc and we conclude that the object tracking can be upgraded and improved by applying the block matching technique.

VIII. FUTURE SCOPE

Developing a new way of tracking object from the video scene by combining the object detection approach with the block matching algorithm gives a scope of improvement to existing object tracking techniques. An extended version of the block matching algorithm can be designed for finding out the motion vectors of the object from the video and specific focus on faster tracking of the object. In future, we can develop the block matching algorithm by combining the existing block matching algorithm for increasing its efficiency to track the objects in a video.

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Design of Diagnosis and Monitoring System of Heart Related Diseases using Fuzzy Inference System

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***Abstract*—Human desire increases day-by-day in different aspects. It requires the technology to be compatible accordingly. Fast and user friendly access are major challenges for different applications. One of the applications is hospital management for patient care, diagnosis and treatment. Modern health care provide different type of provision for people using electronic media. Recently research explores the cardiac diagnosis and care using modern equipment and facilities. In this paper an approach has been considered to diagnose heart diseases in an intelligent manner. The model is designed using fuzzy logic in which the rule based principle is applied to satisfy the objective. Keeping view on multi agent system the model is developed. The diagnosis of the patient is performed using Fuzzy Inference System (FIS). Once the pathological test results are obtained these will help to form the rules of the model and it works for the diagnosis in convenient way. Further the result of detection is communicated through internet or SMS for monitoring and post care purpose. The simulated result shows its performance that can be helpful to the physicians as well as the patients from distant places.**

***Keywords*—Multi Agent System, Fuzzy Inference System, Diagnosis, Fuzzy Rule Base**

Introduction

Intelligent techniques are applied in many application areas to improve the reliability and smart service. One of the most important applications is health care system. Researchers are trying to improve these units to provide better service to patients. The outcomes can support the physicians also in a better way in comparison to the previous methods. It tends towards multi agent system concept and its research has been spread over most of the areas such as Computer science, Engineering, Medicine, and business organizations etc. The system comprises with a set of models based on the knowledge base of related field .These models may be reaching and revised. Though the objective of multi agent system is for compression and co-ordination between agents it requires refinement according to the desire of the client agents. The system has four types of features like

1. Communication among agents
2. Autonomy
3. Agent behavior
4. Heterogeneity.

Each feature can be developed through software modules for particular environment. To form the system agents are the software design paradigms based on the environment. The authors have tried to develop the module of diagnosis and monitoring subsystems of e-health care system.

Health consciousness has expanded the life span of the human being. To improve the quality of life in the society smart health service is indispensable. E-health is the substantial way to fast service. By this technology we can address and collect a database of the most common chronic diseases and their complications which could potentially help to elucidating the main reasons and reducing the risk of their occurrence. E healthcare plays a vital role in this area. By virtue of this quality health service can be provided in rural areas which are far from reach of the medical facility. Also the home monitoring of health care can save both time as well as the expenses of the patient [1]. E-Health technologies have a significant future impact on patient for empowerment in health maintenance and decision making supporting self-care.

The healthcare units consists of several factors and some of the agents as the healthcare communicate in smart way and also provide support to different agents like patient, patho-care, physicians, hospitals and also to rural areas. It is termed as e-health. It is inter changeable with health information in most of the cases these are useful to store the health records support for telemedicine and services to the consumers. Due to the population in rural area, are more than the urban area the e-health service can be useful for the patients and practitioners. The system may take the help of

wireless communication or internet or mobile based system. So another issue is there of multiple health records of the patient in different health care units based on their problems. It is necessary to access that information from different sources and to manage the flow for treatment. So for this treatment also the system may use the e-prescription and suggestions to the patient of different places. So it became a great challenge for researchers with insufficient infrastructure. So this is helpful to the patients and can be allotted to the critical patients. To detect and monitor cardiac disease in intelligent way is a great challenge in the present scenario. Establishment of co-ordination among health care units such as patient, physician, health records, diagnostic centers etc. can disburse the service effectively.

A complex system can be understood and managed in a better way by modeling and simulation. An agent is a single entity having knowledge, objective and capability of carrying out certain task. An interoperable self- independent co-operative multi agent system can address the complex environment involved in healthcare [2]-[6]. In the field of computational intelligence design Fuzzy Logic has proved itself as a powerful tool for developing an intelligent knowledge base system in healthcare. Various bio sensors fitted to the body of the patient provide physical parameters to the fuzzy logic controller. The fuzzification of these data is transformed into fuzzy variables. These fuzzy variables are easy to understand and its modeling helped to reduce the human error in prediction [6] [7].

Communication is an inevitable tool in this system. Transfer of health record without loosing it's originality a great challenge. Researchers have tried for communication among all the agents using various techniques [6]-[10].The research on this field encouraged us to implement fuzzy logic for detection of the cardiac disease and the information regarding the communication is established with the help of a microcontroller based module.

In this work we have considered one of the chronic diseases as the cardiac problem that may occur due to aging effect. In section 2 some of the related works have been cited and the proposed methodology is explained in section 3 .The possible outcome is shown in section 4 and section 5 concludes this piece of work.

Though different approaches have been made since a long period, still there is a gap of implementation and accuracy. Based on the literature our proposed work is explained in the following section.

RELATED LITERATURE

For the development of e-health care system, researchers have been tried since a long period. Some of them focused on multi-agent system whereas most of them analyze the diagnostic center. Attention has been given to the field of signal and image processing along with telemedicine system [2-4, 7-13]. This section provides the related work in this field. A little amount of works on this area has been approached by many authors. Some of those are cited in this section to review the literature.

In [11], authors have developed a processor for transmission of signals from a patient over a Bluetooth link to a mobile telephone. Various algorithms were introduced to reduce the number of rules, searches with high predictive accuracy for heart diseases. Models were proposed for feature selection of clinical data for detection of patients with CHD. Imaging technique was utilized to coronary angiography for predicting the risk factors of CHD. Particle swarm optimization (PSO) was used for optimization for better accuracy of 99.73% . Adaptation and efficient utilization of suitable algorithm in development of effective healthcare systems has been a major challenge as the Information recovered from the wearable devices in e-health care system is complex in nature. Using suitable algorithm it can be represented to the physicians for decision and detection of diseases. Considerable inputs on development of suitable healthcare system including Electromechanical Wave Imaging (EWI) and Wearable Smartphone based platform for detection and diagnosis of critical diseases has been investigated by different authors [12]-[13].Detection and proper identification of diseases desires the selection of efficient classification methods. Among different classifiers, Relative Associated Density (RAD) method, Artificial Neural Network (ANN) and Decision Tree Method etc. has been quite effective in this direction. ANN is a class of classifier that resembles the biological neurons of human being and can describe complex input and output relations efficiently. Few of the classifiers such as RAD, ANN, k-NN (k nearest neighbor) and decision tree has been utilized to detect the cardiac diseases successfully, has been the major influence in the field of health care [14]-[16].The authors have attempted for cost-sensitive k-NN for the patients subjected to high-risk heart disease [16]. Features representing these signals received from the testing machines have to be robust and reliable so as to describe the symptoms of these diseases. Different feature extraction techniques and algorithms have been experimented for monitoring complicated health related issues. Use of software tools and suitable feature extraction methods dealing with testing and measurement for abnormal heart sounds has been investigated in [17]. Prediction algorithm that can detect these diseases is one of the major tasks. Efficient prediction algorithm that can suitably describe the symptoms of the diseases from the signals received during testing of the patients has been an area needs further exploration. In the work of Lakshmi *et.al* a comparison of different data mining techniques and application of android concept that can predict cardiac disease has been mentioned [18] [19]. Classifiers such as random forest classifier and support vector machine classifier (SVM) used to recognize heart beat signal to explore for Hypertrophic Cardiomyopathy Identification [20]. The application of Mobile Phone Based e-Health Monitoring, displaying of ECT signals, Continuous and intelligent monitoring of ECG signal and its' classification can provide potential inputs to medical persons and the patients has been the major work found in [21].

Similarly, details on E health care system using multi-agent platform and fuzzy-logic based healthcare system for smart delivery of health service has been proposed for the patient receiving treatment from their home [22-27].

PROPOSED MULTI-AGENT SYSTEM

For The proposed system is shown in Fig. 1. It consists of intelligent agents to detect the disease. Once the abnormalities are detected it will communicate to the physician as well as to the patient.

Next to it the different agents are defined that follows the intelligent detector using Fuzzy Logic.

Patient Agent- Patient who is suffering will communicate to the hospital registration with the help of a communicating device like mobile phone or PC.

Hospital Registration-The hospital registration will store the parameters in the server and forward the parameters to the doctor1 agent for recommendation of pathological tests.

Doctor1- The doctor 1 agent acts like the OPD of the hospital. It uses the fuzzy If Then rules for suggesting the pathological tests required for the patient.

Diagnostic Centre Agent-The data generated from the patient is sent to the diagnostic agent for analysis and prediction of the disease. The server sends as well as receives the data from this unit.

Doctor 2 or Specialist Agent-This is communicated with doctor. It will send email/SMS to the doctor regarding the abnormality for getting the prescription. The prescription is generated and delivered to the patient. If the Doctor requires investigating any medical history of the patient or time to time variation of the parameters of the patient, he can be able to access the server for monitoring purpose.

Server Agent- Server serves the information to all. It sends the data for diagnosis to diagnostic centre and receives the report. Similarly the reports are sent to the physician. The decision of data flow and management of overall operations is done by it.

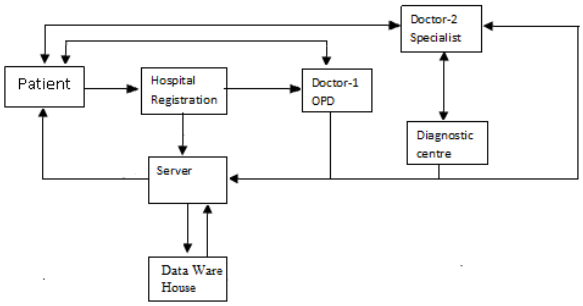

Fig. 1 Multi-agent Structure for Patient Consultancy Using Fuzzy System

Fig. 2 describes the data flow in diagnostic agent. The patient is advised to send his symptoms to the diagnostic center .Based on those data the diagnostic center analyze for prediction of the disease. In this work we have used fuzzy inference system for detection of heart related disease.

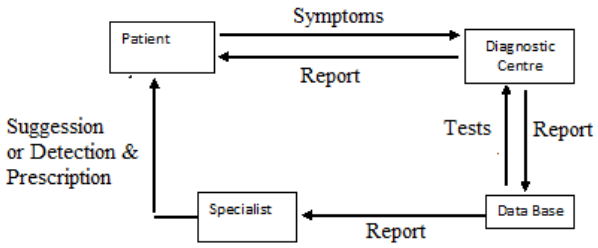

Fig.2 Diagnostic Centre Structure

Fig. 3 describes the agent based consultancy of the patient. The patient uploads his symptoms as well as his parameters to the server through hospital registration. The uploaded data are forwarded by the server for testing at the diagnostic center. If it is found that the condition of the patient is normal then an email or SMS is sent to the patient along with remedial steps to be taken by him depending upon his health condition.

If any abnormality is observed then the diagnostic center agent will inform the concerned specialist i.e. Doctor 2 for immediate action. Here the fuzzy IF THEN rules is implemented for providing information to the doctor. The doctor can check the reports of the patient by sending a request to the server.

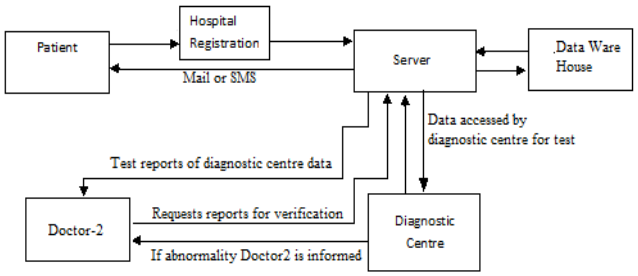

Fig. 3 Information Centre

HEART DISEASE DIAGNOSIS USING FUZZY INTERFERENCE SYSTEM

Rule based fuzzy system acts as the diagnosis center. The test and result are analyzed using if-then-elselogic.

The fuzzy set is defined as$A = \Sigma xi \in X \mu A(xi)/xi$, if X is a collection of discrete objects, and $A = \int X \mu A(x)/x$, if X is a continuous space [36].For the design of the system, triangular membership function is used and is explained as follows.

It is specified by three parameters those can be formulated for the specific problem.

Let the set of parameters are $\{a, b, c\}$

$$\begin{aligned} \text{Triangle}(x;\ a,b,c) &= 0 \ if\ x \le a; \\ &= (x-a)/(b-a)\ if\ a \le x \le b; \\ &= (x-b)/(c-b)\ if\ b \le x \le c; \\ &= 0\ if\ c \le x \end{aligned} \quad (1)$$

The rules can be implemented for the triangular membership function. If-then rule is of the form “If x is A then y is B”

where A and B are linguistic values defined by fuzzy sets on universes of discourse X and Y, respectively. "$x$is A" is called *antecedent* and "y is B" is called *consequent*.

The problem for diagnostic agent is formulated as follows.

For the adaptive cardiac disease detection using the fuzzy inference system, the following parameters are taken

- BP taken here in the range 90 to 190(in mm Hg)
- Serum Cholesterolin the range 120-560 (Mg/dl)
- FBS 110 (Mg/dl)
- ECG ST-T wave abnormality

The above inputs are chosen for the following reason

- The function of heart is normal if BP is normal. If BP rises abnormally then this indicates the patient may suffer from cardiac disease. So BP is concerned with the heart disease detection.
- Deposition of TG narrows the blood circulation path. Excess of Cholesterol in blood gradually narrows the circulatory path and the patient is detected suffering from cardiac disease.
- Sugar is the silent killer. If exists beyond the normal value then there are chances of heart disease.
- ECG signal is the best predictor of heart disease. If ST-T wave abnormality is observed the though all the above tests show normal still then the patient is detected as cardiac

The fuzzy inference system that uses the above mentioned parameters, BP, FBS, Cholesterol and ECG ST-T abnormality, as its inputs, and Detection as its output. A schematic diagram of our system is shown in Fig.4. The linguistic variables used with fuzzy sets with different data such as ECG, BP, FBS etc. has been tabulated in Table I through Table IV.

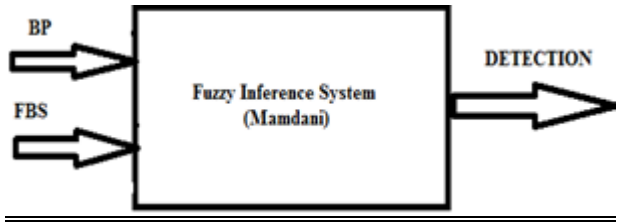

Fig. 4 schematic diagram of fuzzy inference system

TABLE I
LINGUISTIC VARIABLES VERSUS FUZZY SET FOR BP AND FBS

Linguistic variable	Fuzzy set
BP	{ Low, Normal, High }
FBS	{ Low, Normal, High }
Detection	{No, Yes}

The membership functions input BP Range
Low [40/90 -70/100]
Normal [70/110-80/120]
High [90/130 and above]

The membership functions input FBS Range
Low [60-70]
Normal [70-120]
High [120 and above]

The fuzzy inference system that uses the above mentioned parameter, ECG, as its input, and Detection as its output. A schematic diagram of our system is shown in Fig. 5.

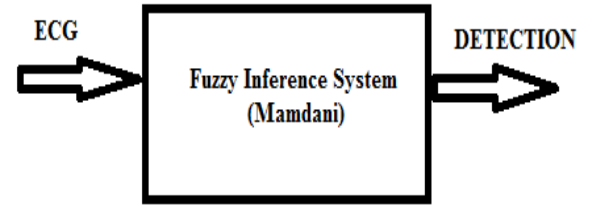

Fig. 5: schematic diagram of fuzzy inference system

TABLE II
LINGUISTIC VARIABLES VERSUS FUZZY SET FOR ECG

Linguistic variable	Fuzzy set
ECG	{Low, Normal, High}
Detection	{No, Yes}

The membership functions input ECG Range
Low [0]
High [1]

The fuzzy inference system that uses the above mentioned parameters, ECG,FBS, and BP as its inputs, and Detection as its output. A schematic diagram of our system is shown in Fig. 6.

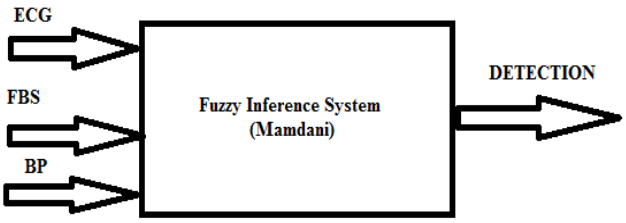

Fig. 6: schematic diagram of fuzzy inference system

TABLE II
LINGUISTIC VARIABLES VERSUS FUZZY SET FOR ECG, BP AND FBS

Linguistic variable	Fuzzy set
ECG	{Normal, Abnormal}
BP	{ Low, Normal, High }
FBS	{ Low, Normal, High }
Detection	{No, Yes}

The membership functions input ECG Range
Low 0
Normal0.5
Abnormal 1

The membership functions input BP Range
Low [40/90 -70/100]
Normal [70/110-80/120]
High [90/130 and Above]

The membership functions input FBS Range
Low [60-70]
Normal [70-120]
High [120 and above]

The fuzzy inference system that uses the above mentioned parameters, ECG,FBS,BP and Cholesterolas its inputs, and Detection as its output. A schematic diagram of our system is shown in Fig. 7.The membership function of different data inputs such as BP, FBS, cholesterol and ECG has been graphically shown in Fig. 8 through Fig. 11.

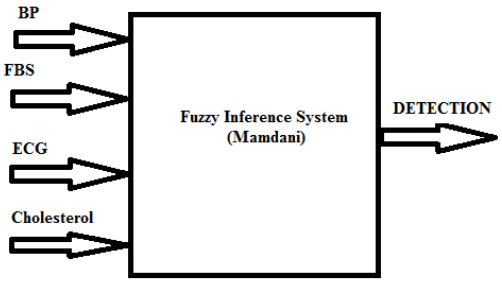

Fig. 7 Schematic diagram of fuzzy inference system

TABLE III
LINGUISTIC VARIABLES USED WITH FUZZY SET FOR ECG, BP AND FBS

Linguistic variable	Fuzzy set
ECG	{Low, Normal, High}
BP	{ Low, Normal, High }
FBS	{ Low, Normal, High }
Cholesterol	{ Low, Normal, High }
Detection	{No, Yes}

The membership functions input ECGRange

Low	0
Normal	0.5
Abnormal	1

The membership functions input BP Range

Low	[40/90 -70/100]
Normal	[70/110-80/120]
High	[90/130 and above]

The membership functions input FBS Range

Low	[60-70]
Normal	[70-120]
High	[120 and above]

The membership functions input Cholesterol Range

Low	[130]
Normal	[130-230]
High	[230 and above]

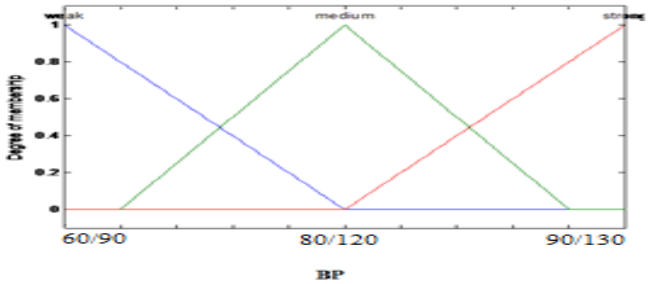

Fig. 8 Membership Function of input BP

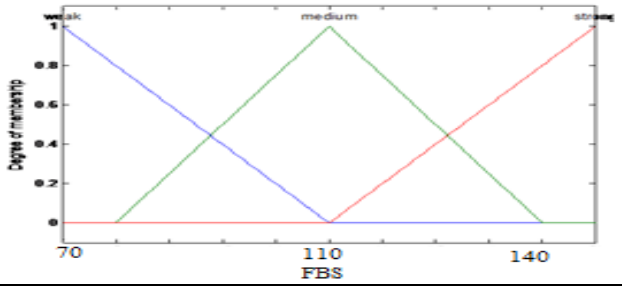

Fig. 9 Membership Function of input FBS

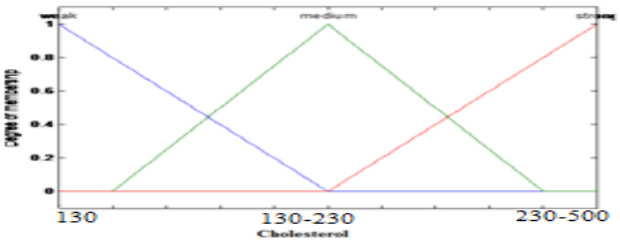

Fig. 10 Membership Function of input Cholesterol

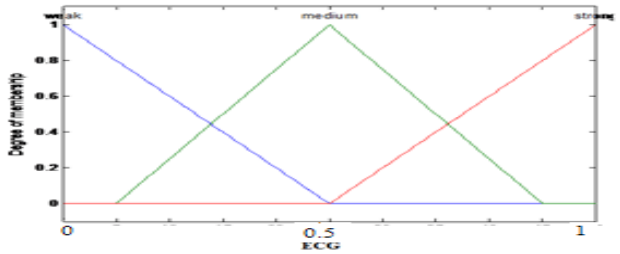

Fig. 11 Membership Function of input ECG

Once the detection is performed it has to be communicated to different agents. The communication module may consist of either internet technology or the mobile network or of the both through the smart devices. The digital mobile communication systemis widely useddue to its high reliability.SMS (Short Message Service)as it is accessible by everyone those having mobiles. Also it is possible to have internet in smart mobile system as well as the computer terminal. In case of computer terminal a modem is required as an additional device. In this case it has been verified for both and the result shown in the result section.

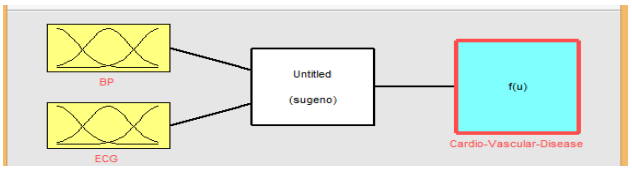

Fig. 12 FIS editor window showing the inputs and outputs

The FIS editor window shown the inputs and outputs has been shown in Fig. 12. The fuzzy rule viewer for BP and ECG for detection of Cardio-Vascular disease is shown in Fig. 13 and the rule formation in Fig. 14.

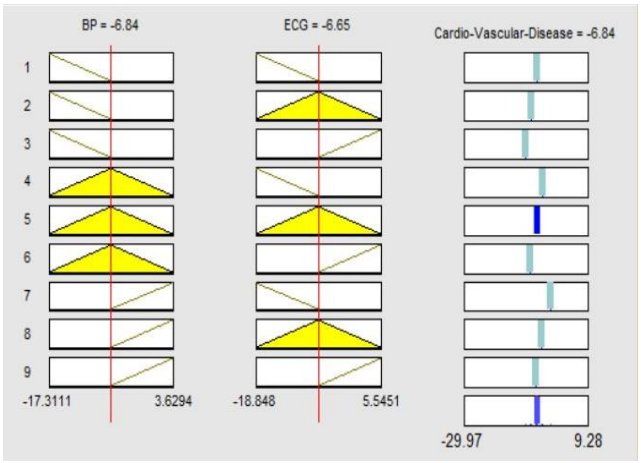

Fig. 13 Fuzzy rule viewer for BP and ECG for detection of Cardio-Vascular disease

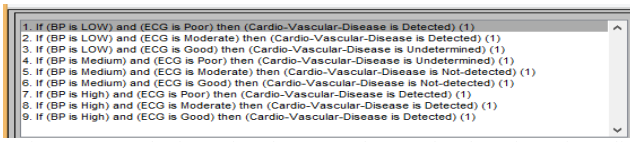

Fig. 14 FIS rule formation for BP and ECG for detection of Cardio-Vascular disease

RESULTS

The accessed data is represented in table-V and popup menu at the time of sending and receiving mail is shown in Fig. 16. From this report it can be diagnosed. As the data shown it appears to be the patient is suffering from cardiac problem.

Table V

BP	Cholesterol	FBS
95/160	400	250
90/140	350	190

Similarly the snapshot of accessed data in MATLAB environment is shown in Fig. 15.

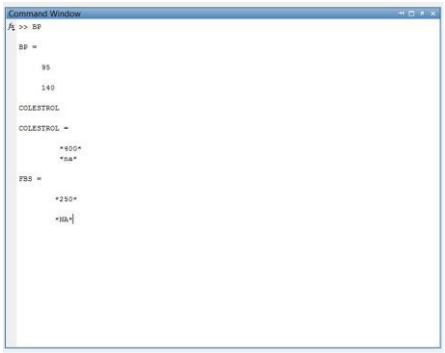

Fig.15Snapshot of Data in MATLAB Environment

Further the data can be sent/received through mail service using popup menu as shown in Fig. 16.The report is sent through the mobile message. The Popup menu shows the structure of FIS.

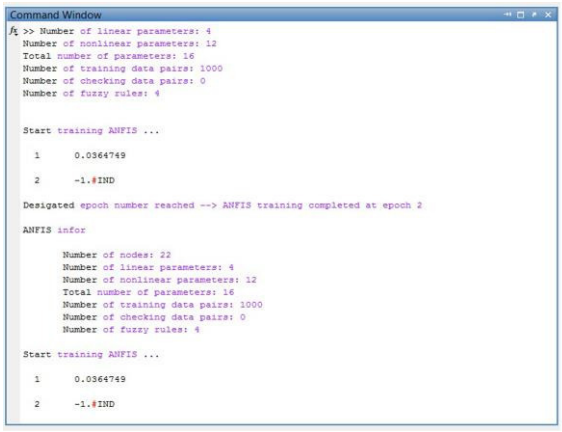

Fig. 16Snapshot for Popup menu at the time of sending and receiving the mail

Similarly the SMS service using GSM module is represented in Fig.17 as follows. Depending upon the various parameters sent by the patient it is detected that the patient is normal. So status of the patient is intimated as OK.

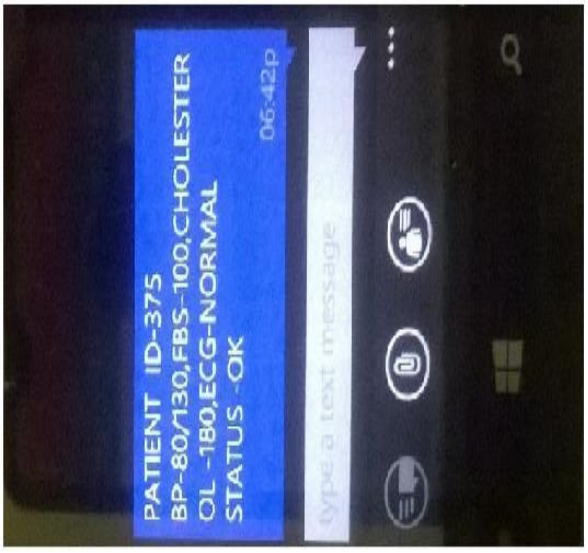

Fig. 17 Snapshot of SMS received from the server

CONCLUSION

We have proposed this model for disease detection and monitoring patients at remote locations. The distributed agents are proposed to act on a common platform using internet for the benefit of the society. The system database store all the attributes for future reference and implementation of Fuzzy Inference system for diagnosis saves the time of physicians as well as save the travelling cost of the patient. This ingenious idea can be implemented to other crucial areas for future work like disaster management, green house monitoring, food and agriculture industry, etc.

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Analysis of Saturated Synchronous Machine considering d-q Axis Coupling Reactance

B Singh, and A. K. Chandel, *Member, IEEE*, Arvind Kumar

***Abstract*— The present paper describes a study of small signal performance of synchronous machines connected to a large power system network through transmission line under steady-state operation by considering influence of saturation with cross-magnetizing phenomenon between d- and q-axis circuits. In the method, mutual reactance X_{dq} due to the cross magnetizing phenomenon can be consider on the basis of *d-q* axis magnetic field analysis. The quantitative accuracy requires the magnetic coupling between d- and q-axis circuits be considered. Subsequently, steady-state reactances are analyzed by considering mutual reactances X_{dq} due to cross magnetizing phenomenon. Synchronous machines have a nonlinear characteristic due to saturations and cross-magnetization phenomena, so that *d-q* axes inductances vary depending on the current amplitude and the load angle. Therefore, usually the un-coupled *d-q* model with constant parameters might not be suitable to represent accurately the performance of the electrical machine.**

***Index Terms*— Synchronous Machines, Turbine Generators, Saturated Synchronous Machines, Saturated Synchronous, Reactances, Cross-Magnetizing Phenomenon.**

A, B	State equation matrices.
λ_d, λ_q	dq -axis flux linkage [V.s]
$\lambda_{ad}, \lambda_{aq}$	dq - axis magnetizing flux linkage [V.s]
L_l	Leakage inductance [H].
i_d, i_q	dq -axis current [A].
i_{fd}	d-axis field current [A]
λ_{fd}	Field flux linkage in d-axis [V.s]
L_{df}	Field flux inductance in d-axis [H].
L''_{ad}, L''_{aq}	Equivalent magnetizing inductance of dq -axis [H].
L_{1d}, L_{1q}	Inductance of dq axis damper bar 1 [H].
L_{2q}	Inductance of q-axis damper bar 2 [H].
L_{dq}	dq -axis coupling inductance [H]
p	Power developed by machine [MW]
$\Delta\omega$	Speed deviation in pu.
$\Delta\delta$	Rotor angle deviation in pu elec. rad.
$\Delta\lambda_{fd}$	Change in d-axis field flux linkage in pu
$\Delta\lambda_{1d}$	Change in d-axis damper bar 1field flux linkage in pu.
$\Delta\lambda_{1q}, \Delta\lambda_{2q}$	Change in q-axis damper bar 1&2 field flux linkage in pu.
ΔT_m	Change in input torque to the turbine shaft in pu.
ΔE_{fd}	Change in field flushing voltage to the generator in pu.
K_D	Damping torque coefficient in pu torque /pu torque deviation.
K_S	Synchronizing torque coefficient in pu torque/rad.
ω_0	Rated speed in elec. rad/s.

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I. Introduction

ACCURATE determination of circuit constants is necessary to predict steady-state and transient characteristics of synchronous generators. Generally, as a method to describe characteristics of synchronous generators, the reactances defined on the dq coordinate system have been used. But as power density of synchronous machines is steadily increased, the variation of synchronous reactances by magnetic saturation becomes large. Therefore, accurate determination of saturated d- and q-axis synchronous reactances has been studied extensively.

Due to the nonlinearity introduced by the saturation permeability pattern around d-axis is nonsymmetrical so results dissymmetric in flux linkages, d-axis flux produced q-axis flux linkages and vise-versa. This effect is secondary in nature so

many of the researchers do not conceder.

The synchronous machine with damper bar under saturation condition, consider the cross magnetizing effect and various factor associated with machine on system stability. In addition to the state space representation and model analysis, block diagram representation and torque angle relationship to analyze the system stability. [6].

There are many reports about the saturation of reactance, and many calculating methods have been presented. Use of unsaturated and saturated reactances is widely applied to current electric design and power system simulation, though the distinction between unsaturated and saturated values is a classical expression of reactance variation affected by magnetic saturation [1]. Although the state space model is provided with an equivalent circuit and magnetic saturation [4], the cross-coupling phenomenon is not considered. Reactance calculation methods have been proposed using numerical magnetic field analysis which considers changes of such reactances more precisely [2]-[6]. Those methods are based on a conventional expression of d- and q-axis equations that do not consider magnetic coupling between d- and q-axis circuits. However, this magnetic coupling has been shown experimentally, and a calculation of synchronous reactances that considered the coupling has also been presented [7] [8]. It was pointed out that coupling between d- and q-axis circuits cannot be ignored when magnetic saturation becomes large.

The magnetizing path saturation is represented – either a nonlinear element or by adjusting the magnetic branch inductance [10]. In this paper, the cross- coupling due to the saturation does not consider.

In this paper, the steady state analysis of synchronous machine considering the cross-magnetization effect under saturation and some calculation examples are shown. Furthermore, synchronous reactances calculated according to a conventional definition are compared with the equivalent synchronous reactances that considered the mutual reactance between d- and q-axis circuits for various load conditions. It is seen that equivalent synchronous reactances are smaller than conventional synchronous reactances with higher load because mutual reactance between d- and q-axis circuits becomes large. [1], the conventional equation for the machine voltage and flux linkages in dq- axis is modified, the equivalent equation is given.

II. Steady-State Reactance Analysis

A. *dq* Axis Equations Considering Magnetic Saturation

The proposed method calculates field current deviation and introduced steady state reactance under a load by using the d-q axis equations of a synchronous machine. In this section, the d-q axis equations are shown. Equations leading to them are shown as per unit system.

Generally, time variations of reactance, looked at with an armature coordinate system, depend on both saliency and magnetic saturation. Considering only saliency, values of self and mutual reactance are largest on the d-axis, and are smallest on the q-axis. At the presence of the saturation considering cross- magnetization phenomenon the equation given in [1], based on [3], is get modified as

$$\lambda_{adequ} = -\left[L_{ad} + \frac{L_{dq}}{(i_d - i_f)} i_q \right](i_d - i_f) + \mathrm{L}_{ad}\, i_{1d}$$
$$\lambda_{adequ} = -\left[L_{ad}(i_d - i_f) + L_{dq} i_q \right] + \mathrm{L}_{ad}\, i_{1d} \quad (1)$$

Here the value of the i_f field current, i_{1d} d-axis damper winding current is [3].

Thus equation yields;

$$\lambda_{aqequ} = L''_{aq}\left(-i_q + \frac{\lambda_{1q}}{L_{1q}} + \frac{\lambda_{2q}}{L_{2q}} \right) - L_{dq}\frac{L''_{aq}}{L_{aq}} i_d$$
$$\lambda_{aqequ} = \lambda_{aq} - L''_{qd} i_d$$

$$\lambda_{qequ} = \lambda_{aqequ} - L_{ls} i_q = \lambda_{aq} - L''_{qd} i_d - L_{ls} i_q \quad (2)$$

Where λ_{ad} and λ_{aq} are the magnetizing flux linkages in d-axis and q-axis respectively.

$$\lambda_d = -L_l i_d + \lambda_{ad};\ \lambda_q = -L_l i_q + \lambda_{aq}$$
$$\lambda_{ad} = L''_{ad}\left(-i_d + \frac{\lambda_{fd}}{L_{fd}} + \frac{\lambda_{1d}}{L_{1d}} \right);\ \lambda_{aq} = L''_{aq}\left(-i_q + \frac{\lambda_{1q}}{L_{1q}} + \frac{\lambda_{2q}}{L_{2q}} \right)$$

$$L''_{ad} = \frac{1}{\frac{1}{L_{ad}} + \frac{1}{L_{fd}} + \frac{1}{L_{1d}}};\ L''_{aq} = \frac{1}{\frac{1}{L_{aq}} + \frac{1}{L_{1q}} + \frac{1}{L_{2q}}}$$

$$L''_{dq} = L_{dq}\frac{L''_{ad}}{L_{ad}};\ L''_{qd} = L_{dq}\frac{L''_{aq}}{L_{aq}} \quad (3)$$

Here, λ_{adequ}, λ_{aqequ} is the equivalent magnetizing flux linkages, λ_{dequ}, λ_{qequ} are the total equivalent flux linkage in d- and q-axis respectively. And L_{dq} is the cross coupling inductance due to the saturation [1]. In the above equation L_{fq} is [1] and L_{aq} is the inductance of the q axis magnetizing branch [3].

Where i_d and i_q are the d-axis and q- axis armature currents, and i_f is the field current. λ_d, λ_q and λ_f are the flux linkage in d-axis, q- axis and field windings respectively.

According to synchronous machine model of IEEE Standard model of type 3.3 the equations are:-

d- Axis voltage expressed as:-

$$V_d = -R_a \cdot i_d - \omega \cdot L_q \cdot i_q + \frac{d\lambda_d}{dt} \tag{4}$$

q- Axis voltage expressed as

$$V_q = -R_a \cdot i_q + \omega \cdot L_d \cdot i_d + \frac{d\lambda_q}{dt} \tag{5}$$

On the other hand, the un-symmetry in permeability distribution of a synchronous machine, which is influenced by magnetic flux distribution. Considering permeability distribution of stator and rotor cores by magnetic saturation at on-load operation, values of self and mutual reactances are not largest on d-axis, and are not smallest on q-axis. Accordingly, expressions of flux linkages that consider magnetic saturation can be get modified and expressed as follows

$$\begin{aligned} V_{ds} &= -R_s \cdot i_{ds} - \omega\lambda_{qequ} + \frac{d\lambda_d}{dt} \\ V_{qs} &= -R_s \cdot i_{qs} + \omega\lambda_{dequ} + \frac{d\lambda_q}{dt} \end{aligned} \tag{6}$$

Substituting the equation (3) – (2) in (6) yield

$$V_{ds} = -R_s \cdot i_{ds} - \omega\lambda_{qeu} + \omega L''_{qd} i_d + \frac{d\lambda_d}{dt} \tag{7}$$

$$V_{qs} = -R_s \cdot i_{qs} + \omega\lambda_{deu} - \omega L''_{dq} i_q + \frac{d\lambda_q}{dt} \tag{8}$$

Where L''_{qd} and L''_{dq} is equivalent mutual inductance between d and q axis circuit and it is introduce when saturation take place, the value of, i_d , i_q and i_f which change with saturation condition. Further solving the above equation (7)-(8)

$$\begin{aligned} V_{ds} &= -R_s \cdot i_{ds} + \omega L^{"}_q i_q - \omega\left(L^{"}_{aq}\left(\frac{\lambda_{1q}}{L_{1q}} + \frac{\lambda_{2q}}{L_{2q}} \right) \right) + \omega L''_{qd} i_d \\ V_{qs} &= -R_s \cdot i_{qs} - \omega L^{"}_d i_d + \omega\left(L^{"}_{ad}\left(\frac{\lambda_{fd}}{L_{fd}} + \frac{\lambda_{1d}}{L_{1d}} \right) \right) - \omega L''_{dq} i_q \end{aligned} \tag{9}$$

Active power is expressed as

$$p = v_d i_d + v_q i_q \tag{10}$$

B. *State space representation of single machine infinite bus system*

The deviation in the speed and rotor angle with the change in field flux linkage under saturation condition with damper bar effect and considering the cross coupling between d-q axis field. The state space matrix is [3].

$$\dot{x} = Ax + Bu \tag{11}$$

These equations get modified by considering the cross magnetizing phenomenon is:

In the above equations λ_{ad} and λ_{aq} are the air- gap flux linkages under saturation condition.

The air gap torque is

$$\begin{aligned} T_e &= \lambda_d i_q - \lambda_q i_d \\ &= \lambda_{ad} i_q - \lambda_{aq} i_d \end{aligned} \tag{12}$$

With $\frac{d}{dt}\lambda_d$ and $\frac{d}{dt}\lambda_q$ term i.e. (transient term) neglected.

C. *Network equation*

The machine, as network equations, can be expressed in terms of one reference frame of the machine because there is only one machine. So the machine and infinite bus terminal voltage can be resolved in terms of d and q axis components are.

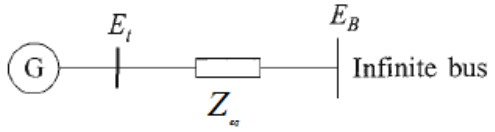

Figure 1. Machine connect to the infinity bus

The d-axis and q- axis voltage i.e. V_d , V_q and the expression for λ_{ad} , λ_{aq} then obtain i_d and i_q in terms of state variables λ_{fd} and δ the rotor angle [3].

$$i_d = \frac{X_{Tq} E_{qN} - [\mathrm{R}_T + \mathrm{X}_{dq}]\mathrm{E}_{dN}}{D'} \tag{13}$$

$$i_q = \frac{[\mathrm{R}_T + \mathrm{X}_{qd}]\mathrm{E}_{qN} + X_{Td} E_{dN}}{D'} \tag{14}$$

where

$$E_{bd} = E_b \sin\delta; \quad \text{and} \quad E_{bq} = E_b \cos\delta \tag{23}$$

$$\begin{aligned} &X_{dq} = \omega L''_{dq} = \omega L_{dq} \frac{L^{"}_{ad}}{L_{ad}};\ X_{qd} = \omega L''_{qd} = \omega L_{dq} \frac{L^{"}_{aq}}{L_{aq}}; \\ &\text{and } D' = (R_T + X_{dq})(R_T + X_{qd}) + X_{Tq} X_{Td} \end{aligned} \tag{15}$$

$$\begin{aligned} &X_{Td} = X_E + X''_{ds};\ X''_{ds} = \omega\left(L^{"}_{ad} + L_l\right);\ R_T = R_s + R_E; \\ &X_{Tq} = X_E + X''_{qs};\ X''_{qs} = \omega\left(L^{"}_{aq} + L_l\right); \end{aligned} \tag{16}$$

Here, X_{Td} , X_{Tq} is the total reactance, of machine with infinity bus in d- axis and q- axis respectively, R_s is the armature resistance of machine and R_T total resistant of system.

$$E_{bd} = E_b \sin\delta;\ E_{bq} = E_b \cos\delta$$

$$\mathrm{E}_{qN} = \mathrm{E}''_q - E_{bq} = \mathrm{E}''_q - \mathrm{E}_b \cos\delta;\ \mathrm{E}''_q = \omega L''_{ad}\left(\frac{\lambda_{fd}}{L_{fd}} + \frac{\lambda_{1d}}{L_{1d}}\right) \quad (17)$$

$$\mathrm{E}_{dN} = \mathrm{E}''_d + E_{bd} = \mathrm{E}''_d + \mathrm{E}_b \sin\delta;\ \mathrm{E}''_d = \omega L''_{aq}\left(\frac{\lambda_{1q}}{L_{1q}} + \frac{\lambda_{2q}}{L_{2q}}\right)$$

The reactance X''_{qs} and X''_{ds} are the saturated values in per unit. Now the equation (13) and (14) is written in linearization for state space model.

$$\Delta i_d = m'_1\Delta\delta + m'_2\Delta\lambda_{fd} + m'_3\Delta\lambda_{1d} + m'_4\Delta\lambda_{1q} + m'_5\Delta\lambda_{2q} \quad (18)$$

$$\Delta i_q = n'_1\Delta\delta + n'_2\Delta\lambda_{fd} + n'_3\Delta\lambda_{1d} + n'_4\Delta\lambda_{1q} + n'_5\Delta\lambda_{2q} \quad (19)$$

The expression for $\Delta\lambda_{ad}$ and $\Delta\lambda_{aq}$ are given by

$$\Delta\lambda_{adequ} = L''_{ad}\left(-\Delta i_d + \frac{\Delta\lambda_{fd}}{L_{fd}} + \frac{\Delta\lambda_{1d}}{L_{1d}}\right) - L''_{dq}\Delta i_q$$

Substituting from the above equations

$$\begin{aligned}\Delta\lambda_{adequ} = {} & \left(m'_1 L''_{ad} - n'_1 L''_{dq}\right)\Delta\delta + \left(L''_{ad}\left(\frac{1}{L_{fd}} - m'_2\right) - n'_2 L''_{dq}\right)\Delta\lambda_{fd} \\ & + \left(L''_{ad}\left(\frac{1}{L_{1d}} - m'_3\right) - n'_3 L''_{dq}\right)\Delta\lambda_{1d} + \left(-m'_4 L''_{ad} - n'_4 L''_{dq}\right)\Delta\lambda_{1q} \\ & + \left(-m'_5 L''_{ad} - n'_5 L''_{dq}\right)\Delta\lambda_{2q}\end{aligned} \quad (20)$$

$$\Delta\lambda_{aqequ} = L''_{aq}\left(-\Delta i_q + \frac{\Delta\lambda_{1q}}{L_{1q}} + \frac{\Delta\lambda_{2q}}{L_{2q}}\right) - L''_{qd}\Delta i_d$$

From the above equation

$$\begin{aligned}\Delta\lambda_{aqequ} = {} & \left(-n'_1 L''_{aq} - m'_1 L''_{dq}\right)\Delta\delta + \left(-n'_2 L''_{aq} - m'_2 L''_{dq}\right)\Delta\lambda_{fd} \\ & + \left(-n'_3 L''_{aq} - m'_3 L''_{dq}\right)\Delta\lambda_{1d} + \left(L''_{aq}\left(\frac{1}{L_{1q}} - n'_4\right) - m'_4 L''_{dq}\right)\Delta\lambda_{1q} \\ & + \left(L''_{aq}\left(\frac{1}{L_{2q}} - n'_5\right) - m'_5 L''_{dq}\right)\Delta\lambda_{2q}\end{aligned} \quad (21)$$

The expression for the electromagnetic torque developed by air gap by equation (12) is further solving for linearization as;

$$\Delta T_e = \lambda_{ad0}\Delta i_q + i_{q0}\Delta\lambda_{ad} - \lambda_{aq0}\Delta i_d - i_{d0}\Delta\lambda_{aq} \quad (22)$$

Substituting the value from equation (3), (18), (19),(20) and (21) in the equation (22)

$$\Delta T_e = \mathrm{k}'_1\Delta\delta + \mathrm{k}'_2\Delta\lambda_{fd} + \mathrm{k}'_{21}\Delta\lambda_{1d} + \mathrm{k}'_{22}\Delta\lambda_{1q} + \mathrm{k}'_{23}\Delta\lambda_{2q} \quad (23)$$

From the speed-motion equation

$$\frac{d}{dt}\Delta\omega_r = \frac{1}{2H}\left[\Delta T_M - \Delta T_e - \Delta K_D\Delta\omega_r\right] \quad (24)$$

The value of ΔT_e from equation (23) is putting in the above equation

$$\begin{aligned}\frac{d\Delta\omega_r}{dt} = {} & \mathrm{a}_{11}\Delta\omega_r + \mathrm{a}_{12}\Delta\delta + \mathrm{a}_{13}\Delta\lambda_{fd} + \mathrm{a}_{14}\Delta\lambda_{1d} \\ & + \mathrm{a}_{15}\Delta\lambda_{1q} + \mathrm{a}_{16}\Delta\lambda_{2q}\end{aligned} \quad (25)$$

Similarly do for all state space equation [3]

$$\frac{d\Delta\lambda_{fd}}{dt} = \frac{\omega_0 R_{fd}}{L_{fd}}\Delta E_{fd} - \omega_0 R_{fd}\frac{1}{L_{fd}}\left(\Delta\lambda_{fd} - \Delta\lambda_{ad}\right)$$

$$\begin{aligned}\frac{d\Delta\lambda_{fd}}{dt} = {} & \mathrm{a}_{31}\Delta\omega_r + \mathrm{a}_{32}\Delta\delta + \mathrm{a}_{33}\Delta\lambda_{fd} + \mathrm{a}_{34}\Delta\lambda_{1d} \\ & + \mathrm{a}_{35}\Delta\lambda_{1q} + \mathrm{a}_{36}\Delta\lambda_{2q}\end{aligned}$$

The state matrix is:

$$\dot{x} = Ax + Bu \quad (26)$$

D. Equation Expressed by Equivalent Synchronous Reactance

Equivalent synchronous reactances are transformed equation into the form of equation (1), (2) so that it expressed at the time of saturation considering cross-magnetizing phenomenon.

$$\lambda_{deq} = -\left[L_{deq}\left(i_d - i_f\right) + L_{ls} i_f\right] \quad (27)$$

$$L_{deq} = L_{adeq} + L_{ls} = \left[L_{ad} + \frac{L_{dq}}{(i_d - i_f)} i_q\right] + L_{ls}$$

$$\lambda_{adeq} = \left[L_{ad} + \frac{L_{dq}}{(i_d - i_f)} i_q\right](i_d - i_f)$$

$$\lambda_{adequ} = L''_{ad}\left(-i_d + \frac{\lambda_{fd}}{L_{fd}} + \frac{\lambda_{1d}}{L_{1d}}\right) - L''_{dq} i_q \quad (28)$$

$$\lambda_{adequ} = \lambda_{ad} - L''_{dq} i_q$$

$$\Delta\lambda_{adequ} = L''_{ad}\left(-\Delta i_d + \frac{\Delta\lambda_{fd}}{L_{fd}} + \frac{\Delta\lambda_{1d}}{L_{1d}}\right) - L''_{dq}\Delta i_q$$

(29)

$$\lambda_q = -L_{qeq} i_q \quad (30)$$

Where L_{deq} is

$$L_{qeq} = L_{aqeq} + L_{ls} = \left[L_{aq} + L_{dq}\frac{i_d}{i_q} - L_{fq}\frac{i_f}{i_q}\right] + L_{ls} \quad (31)$$

$$\lambda_{aqeq} = \left[L_{aq} + L_{dq}\frac{i_d}{i_q} - L_{fq}\frac{i_f}{i_q}\right] i_q \quad (32)$$

$$L_{qeq} = L_{aqeq} + L_{ls}$$

$$L_{aqeq} = L_{aq} + L_{dq}\frac{i_d}{i_q} - L_{fq}\frac{i_f}{i_q} \quad (33)$$

$$\Delta\lambda_{aqequ} = L''_{aq}\left(-\Delta i_q + \frac{\Delta\lambda_{1q}}{L_{1q}} + \frac{\Delta\lambda_{2q}}{L_{2q}}\right) - L''_{qd}\Delta i_d \quad (34)$$

III. RESULTS AND DISCUSSIONS

The effect of field flux variation (i.e. armature reaction) adds a damping torque component and thus to reduce synchronizing torque slightly.

With saturation effect: The change in air gap torque is from the eigenvalues at complex frequencies we get computing the value of synchronizing torque and Damping torque component. The system instability due to lack of synchronizing torque .This is reflected in the real eigenvalue becoming slightly positive which representing a mode of instability through a non–oscillatory mode.

Without saturation effect: The system is on the verge of instability. Rotor angle is approximate to 90 deg. With constant voltage if the value of and is used to compute initial operating condition are the same as the values used to relate incremental flux linkage and Current. The effect of amortisseurs with cross coupling is to increase the damping ratio from 0.0265 to 0.0491 and reduced the frequency very slightly.

A. *Speed deviation*

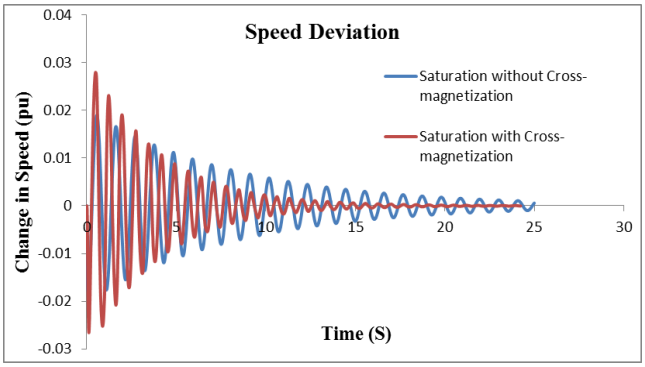

Fig. 1. Speed deviation as a function of time. Under the saturation considering cross-magnetization effect and without cross- magnetization effect.

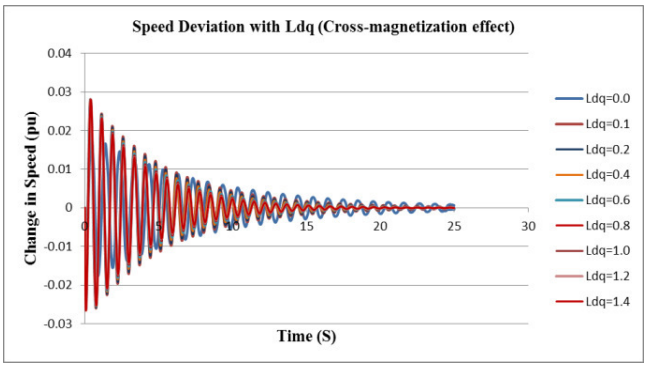

Fig. 2. Speed deviation as a function of time. Under the saturation considering cross-magnetization effect at various cross-coupling inductances.

B. *Rotor angle deviation*

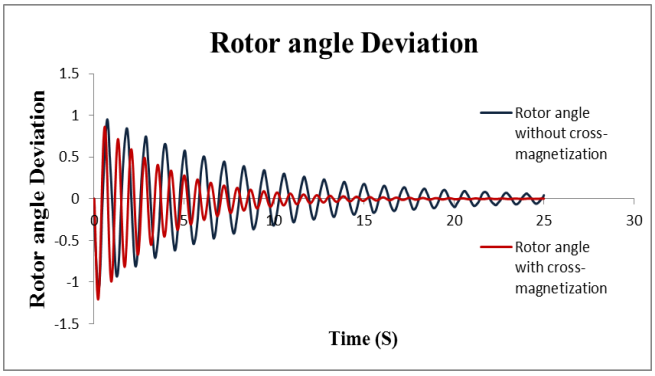

Fig. 3. Rotor angle deviation in pu as a function of time. Under the saturation without cross-magnetization and with cross- magnetization effect.

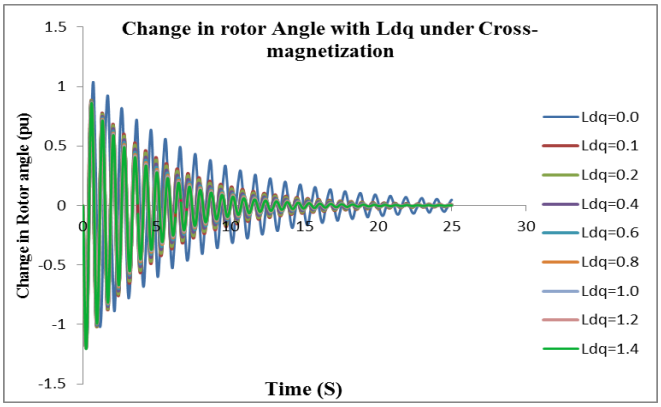

Fig. 4. Rotor angle deviation as a function of time. Under the saturation considering cross-magnetization effect at various cross-coupling inductances.

TABLE I
PARAMETERS OF PROPOSED MODEL WITH SATURATION AND WITHOUT SATURATION

Model	**P(±0.25pu) Limit**	**Q**	E_b	δ (deg)	E_f	Eigen-values
Propos-ed Model with Satura-tion	1.3847	0.4625	1.1413	79.1126	3.3	–0.29321 ± *j*5.9632 0.00142 .
Propos ed Model without Satura-tion	1.0137	0.3458	1.0275	89.60	2.49	–0.162 ± *j*6.08 - 0.00006

TABLE II

SUMMARY OF FREQUNCY OF ROTOR OSCILLATION, DAMPING RATIO, K_S AND K_D, WITH DIFFERENT TYPE OF MODEL BASED ON RESULTS

Model	**Classical Model**	**Constant E_{fd}**	**Proposed Model with cross-magnetization**
λ_1, λ_2 eigenvalues	$j6.41$	$-0.11 \pm j6.41$	$-0.29321 \pm j5.9632$
ω_d	1.02 Hz	1.07 Hz	0.94907 Hz
ω_n	-	6.47 rad/s 1.03Hz	5.9704 rad/s 0.96 Hz
ξ	0	0.017	0.049111
K_s	0.757	0.763	0.80719
K_d	0	1.53	0.21522

C. *Discussion*

By considering cross-magnetization effect under saturation condition, the change in speed, rotor angle deviation and change in field flux linkage of a synchronous machine, due to this magnitude is increased slightly. And the time of oscillation is reduced.

Change in the flux linkage of d-axis damper bar remains same in both cases i.e. saturation and saturation with cross-magnetization effect.

IV. CONCLUSION

The work presents an integrated perspective on synchronous machine modeling, considering the cross-magnetization effect under the saturation condition that gives the actual representation of machine. The model retains the computational efficiency of the single machine to infinite bus system under saturation and *dq*-axis theoretical framework.

This model gives the state space representation. And suitable for small and large signal time domain simulation for the power system.

APPENDIX-I

Table-IV

Synchronous machine Parameters used for Simulation

Sr. No	Symbol	Parameters Name	Value (pu)
1	R_s	Armature Resistance	0.003
2	R_{fd}	Field winding Resistance	0.0006
3	R_{1d}	d-axis Damper winding Resistance	0.0284
4	R_{1q}	q-axis Damper winding 1 Resistance	0.00619
5	R_{2q}	q-axis Damper winding 2 Resistance	0.02368
6	L_{ad}	d-axis Magnetizing Inductance	1.66
7	L_{aq}	q-axis Magnetizing Inductance	1.61
8	L_{ls}	Leakage Inductance	0.15
9	L_{fd}	Field Inductance	0.165
10	L_{1d}	d-axis damper bar Inductance	0.1713
11	L_{1q}	q-axis damper bar 1 Inductance	0.7252
12	L_{2q}	q-axis damper bar 2 Inductance	0.125

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Symmetric Key Encryption With Many Secret Keys

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***Abstract*—One of the essential practices in the field of secured communication between two people is Cryptography. It confirms features like availability, authenticity, integrity and confidentiality of information. Also it enhances the mechanism of data security. For the purpose of encryption and decryption, in cryptography we have symmetric and asymmetric cryptography. Out of these, symmetric is the simplest and used widely due to its speed and feasibility in decrypting bulk messages, and requirement of limited computer resources. Symmetric key technique uses one secret key for cryptography, which opens the door for different kinds of security attacks. Through this paper I would like to introduce a Novel Symmetric key encryption and decryption using multiple secret keys. Here in this approach I am using different secret keys to encrypt different original texts.**

***Index Terms*—Symmetric and asymmetric cryptography, Information security, secret keys, block cipher.**

I. Introduction

Inoformation security is one of the key feature which requires due diligence and care to ensure the information security from various activities like unauthenticated access, modification, destruction, disclosure and use. Information security has the responsibility to make sure the security of the information throughout its life cycle, which means from the generation/creation of the information through its disposal. Irrespective of the state of the information it should be secured. If the access to information is protected then that kind of data should be restricted to a certain set of authorized persons who has enough access to that. In such cases, if the secured information is inside some device, say for example inside a computer, then proper security measurements should be applied to that computer device as well. In other words, some control access mechanism is required for those cases.

Encryption is the technique which transforms the original usable data to another form of the same data, which is not usable to unauthorized persons. Likewise the decryption is the process of transforming the encrypted data into its normal form through the help of a secret key, which can be done only by authorized users.

Basic types of cryptography are Symmetric key and asymmetric key cryptography. Same secret keys will be used in the Symmetric key cryptography; where as a private and public key is used in case of asymmetric key cryptography. Almost the entire encryption algorithm is based on the replacement technique, in which each letter will be mapped with another element.

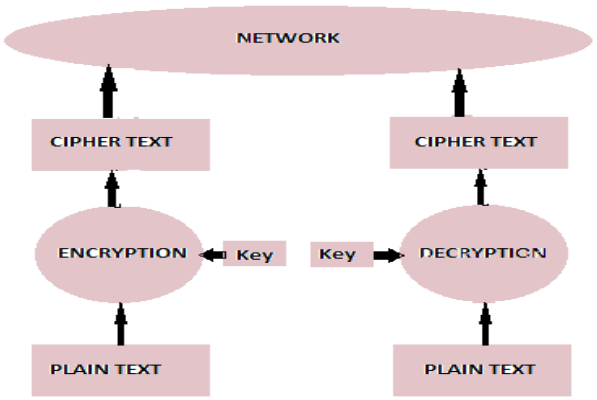

Fig 1:- Simple Cryptography Model.[7]

Asymmetric key or public key cryptography has a pair of keys, one public and one private. Both keys are used for the encryption and decryption purposes. Private Key is a secret key, which will not be shared with anybody. It is the owner's responsibility to keep this key safe. In Public key cryptography, the key will be accessible to all the users using that system. The advantage of Asymmetric key is its convenience and increased security. In this case, the private key will be kept as secret and will not be shared with anyone, while the public key will be used for encryption purpose. Disadvantage of the asymmetric key encryption is its slowness and the low feasibility for bulk message decryptions.

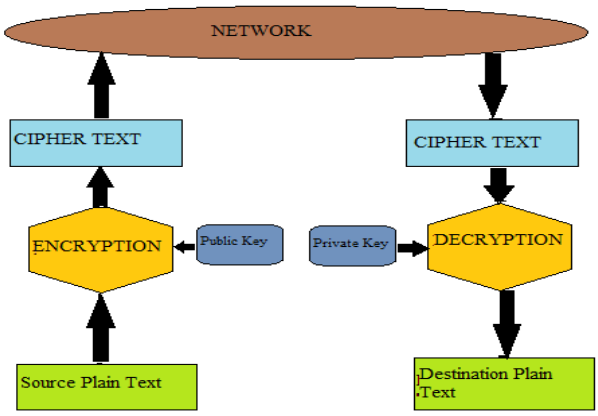

Fig 2:- Asymmetric Cryptography Model.[7]

Secret key is used in secret key encryption for encrypting & sending the plain text to the receiver end. The same key will

be used at the receiving end for decrypting the cipher text. Other name of secret key encryption is symmetric key encryption because the same key is used on both the sides. The mandatory rule for this cryptography is that the secret key should be known to both the sides of the cryptography. The advantages of symmetric key encryption are feasibility and the speed in cryptography and also it's a feasible way to decrypt bulk messages. When comparing with asymmetric key cryptography, symmetric key cryptography is vulnerable to chosen plain text attacks, since the same secret key is shared among both sides.

In this paper I have tried to introduce the Novel Symmetric Key Cryptography, where multiple random keys will be in use to encrypt different message blocks. This paper is organized in the following order: symmetric key cryptography description, key distribution in the existing and the proposed symmetric key cryptography, symmetric key algorithm, the results and the conclusion of this study.

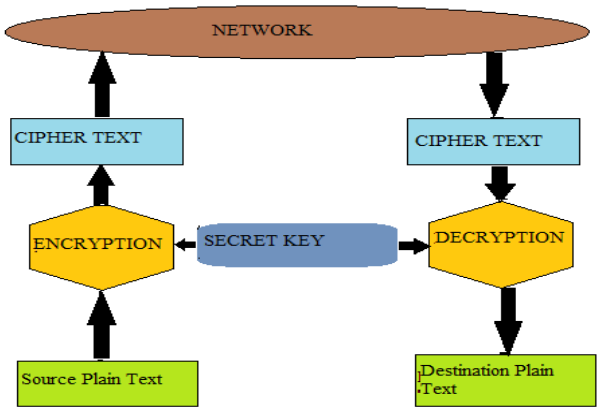

Fig 3:- Symmetric Cryptography Model.[7]

II. SYSTEM STUDY

A. SYMMETRIC CRYPTOGRAPHY

The symmetric key cryptography can be categorized into two: block cipher and stream cipher. As the name implies, the stream buffer transforms one bit at a time, and different keys will be generated for each bit. Two types of stream ciphers are there: synchronous stream buffer and self synchronizing stream buffer. In self synchronizing stream buffers, each bit is calculated as a function of the previous n-bits in the key stream. While in Synchronous stream buffer, the key stream generated by it will be independent of the message stream but will be using the same key stream functions on both the sides. This will not propagate any transmission errors and is also periodic in nature, so there are possibilities to repeat the key stream.

TABLE I. STREAM CIPHER ENCRYPTION

Plain Text P:	Encryption E:	Secret Key K:	Cipher Text C:
P1	E	K1	C1
P2	E	K2	C2
P3	E	K3	C3
P4	E	K4	C4
P5	E	K5	C5
P6	E	K6	C6
P7	E	K7	C7
P8	E	K8	C8

In block cipher, the same key will be used by each of the blocks. In a block cipher, the same plain text will be encrypted in to the same cipher text. There are four types of block cipher. They are Output Feedback, Cipher block Chaining, Electronic Code Book and Cipher Feedback Mode. Data Encryption Standard or DES is one of the common secret key cryptography methods used in the recent days. DES operates on 64-bit blocks, and employs 56-bit key. Software side implementation is slow while the hardware side implementation is faster. Some of the common secret key cryptography algorithms are TwoFish, CAST-128, RC2 and RC5.

TABLE II. BLOCK CIPHER ENCRYPTION

Plain Text P:	Encryption E:	Secret Key K:	Cipher Text C:
P1P2	E	K1	C1C2
P3P4	E	K2	C3C4
P5P6	E	K3	C5C6
P7P8	E	K4	C7C8
P9P10	E	K5	C9C10
P11P12	E	K6	C11C12
P13P14	E	K7	C13C14
P15P16	E	K8	C15C16

B. KEY DISTRIBUTION

Existing System

Key distribution technique is the key strength of any cryptographic system. Key distribution technique is defined as the technique that delivers a key for those parties who wish to exchange the data, without revealing the key to each other. If

three parties are involved in a network, and if there is a requirement to transfer the data between the first two parties, then we can achieve this by employing an encrypted connectivity between the first two parties, so that the third party won't be able to see the data that is being exchanged between first two parties.

Two kinds of keys are required for this: Session key and Permanent key. Session key is used for the cryptographic functions like encryption/decryption of user data during the communication between two parties. For the distribution of the session keys, permanent key is used. The configuration consists of the following elements: Key distribution Center and Front-end Processor. The former is used to grant the permission for the systems for establishment of connection and for providing the one time session key for the specific function. The latter provides the end to end encryption and obtains the session key on behalf of the host / terminal.

If one host needs to establish a connection with another host, then the system transmits a connection-request packet. At that time, the front end processor receives the packet, saves and confirms the KDC for permission to establish the connection. FEP to KDC communication is encrypted using the master shared key. On approval of the connection request at the KDC, a session key will be generated and delivered to the two front end processors. Also it will make sure that a unique permanent key will be there for each front end. Hence the requesting front end processor can release the connection request packet, along with a connection setup between two end systems. Using the session key, the front end processor encrypts the data during the exchange of data.

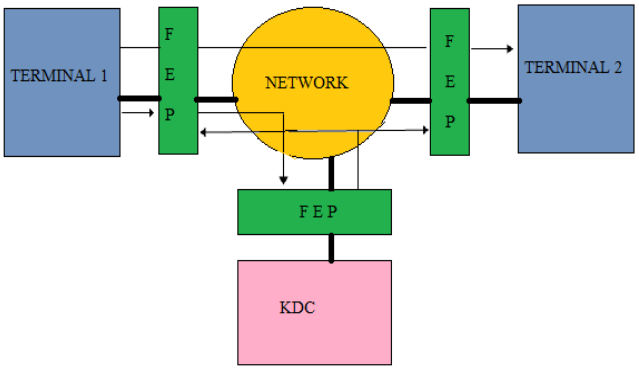

Fig 4:- Existing system's key distribution.

Steps involved in the existing key distribution system are:

1. Terminal1 sends a packet, to request the connection.
2. Front end buffer packets, requests the KDC for the session key.
3. KDC shares the session key with both the front end buffers.
4. Transmitting the encrypted packet.

Proposed System

In the proposed system, the connection establishment is almost same as that of the existing system. The key difference between the existing and proposed system is the difference in the key distribution center. The former system is using the Key Distribution Center (KDC), and the latter is using Random Key distribution center.

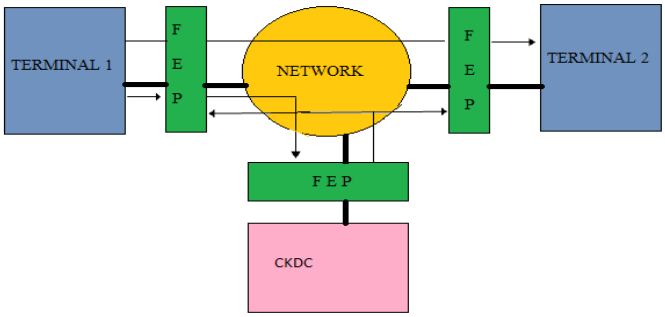

Fig 5:- Proposed system's Key Distribution

1. Terminal1 sends a packet, to request the connection.
2. Front end buffer packets, requests the KDC for the session key.
3. CKDC shares the session key with both the front end buffers.
4. Transmitting the encrypted packet.

COMPOUND RANDOM SECRET KEYS

In the symmetric key cryptography, same key is used at the source and the destination end systems. In this case anybody who can identify the key and the encryption algorithm can capture the message and decrypt the information exchanged between the end systems. But, if the secret key is different for the source and destination, the problem of symmetric cryptography can be resolved. To accomplish these random keys should be generated each time, and used in each message transactions.

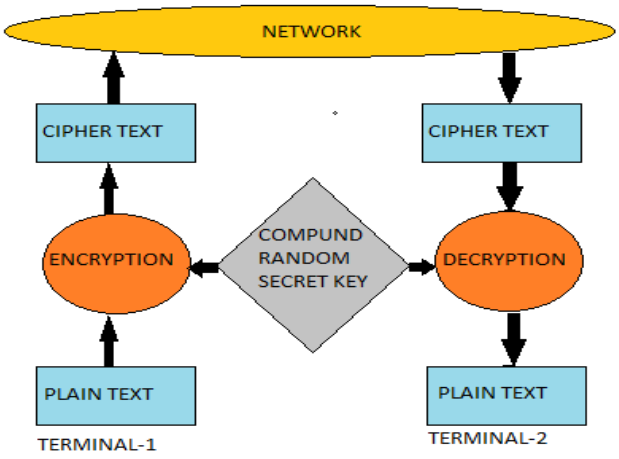

Fig 6: Proposed model for the cryptography

If a terminal wishes to establish a connection with another terminal, it will send a connection request packet to the CKDC. When the connection request is approved, it will send the message which is encrypted on both the terminals. Four values will be there in that encrypted message, namely x, y, m

and c. Sizes of the x, y, and c are of the equal size. The value of m will vary from 1 to 9. With the above 4 values, we need to generate compound secret keys using the key generation algorithm. The equations used to generate the compound secret key are

$$z = y + x$$
$$x = mx + c$$

z is the compound secret key that we are generating. We need to execute the above two statements repeatedly for each and every message exchange. For each message exchange the value of x and z will also change, but the length of the item should be equivalent to the secret key length. New secret keys should be generated each time message transfer occurs in the system. The advantage of this technique is its easiness in finding out the missing packets in the message transfer if any.

PROPOSED ALGORITHMS

Encryption Algorithm

The steps involved in the encryption procedure are:

1. Map the secret key with the characters in the input string.
2. Find out the ASCII character value for the input string.
3. Find out the sum of each ASCII value and the secret key digit.
4. Find out the modulus of the sum of the above value with the digit 128.
5. Find out the respective character for the above ASCII value.

The result we obtain from the step 5 will be out cipher text.

Decryption Algorithm

The secret key will be the same as that we used in the encryption algorithm. The steps involved in the decryption process are as follows.

1. Map the cipher text characters with the secret key numbers.
2. Get the ASCII value of each character in the cipher text.
3. Deduct the secret key numbers from the above numbers.
4. Get the modulus result by using the value 128.
5. Convert the result to the characters.

III. RESULTS

I implemented the proposed algorithm as a Windows application by using Microsoft Visual Studio – 2013. The symmetric key encryption and decryption are shown in the below figures.

Fig 7: Key Generation Page: Test 1

Fig 8: Encryption: Test 1

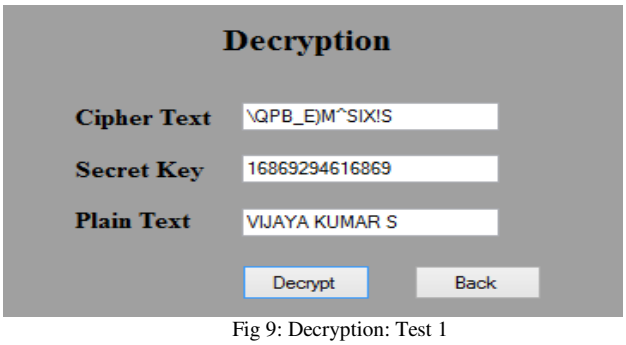

Fig 9: Decryption: Test 1

Fig 10: Key Generation: Test 2

Fig 11: Encryption: Test 2

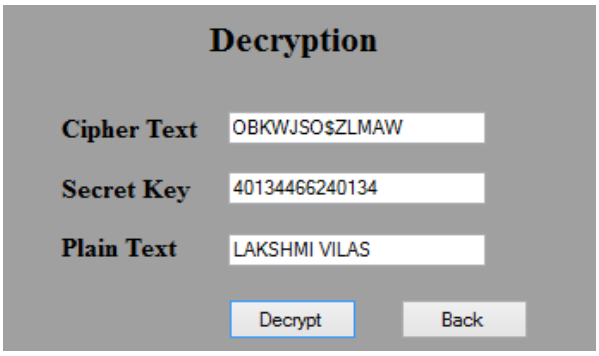

Fig 12: Decryption: Test 2

VI. CONCLUSION

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

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Smart City: IOT Based Prototype for Parking Monitoring and Management System Commanded by Mobile App

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***Abstract*—This paper introduces a prototype for IoT based smart parking system that attempts to automate vehicle parking system that leads to minimize vehicle parking problem. Traffic congestion caused by vehicles is an alarming problem at a global scale and it has been growing exponentially. Searching for a parking space and buying tickets for their parking from ticketing machines is a routine activity for many people in cities around the world. We propose a prototype that would monitor the parking spaces availability through the emerging Internet of Things (IoT) technology and automate the ticketing system from smart phones by mTicketing system.**

***Index Terms*—Parking monitoring, Parking reservation, Internet of Things (IoT), Smart Mobile App**

I. Introduction

Internet of Things is the interconnectivity between things, people and cloud services via internet which enables new business models. As a result of these communications, huge volumes of data are being intelligently generated, and the generated data is sent to cloud based server via internet and that data isbeing processed and analyzed, resulting in meaningful and timely actions for monitoring the vehicle parking.

The major problem that is emerging recently at a global scale and growing exponentially is the traffic congestion problem caused by vehicles. Amongst that car parking becomes the predominant contributor and is still becoming a major threat with increase in number of vehicles and very confined parking spaces in urban cities. Searching for a parking space and buying tickets for their on street parking from ticketing machines is a routine activity for many people in cities around the world.

A study on this search for parking space says it burns about one million barrels of the world's oil every day. The problem will worsen as the population continues to urbanize and without a well-planned on-street car parking mechanism. According to a report, Smart Parking could result in 2,20,000 gallons of fuels saving till 2030 and approx. 3,00,000 gallons of fuels saved by 2050 , if implemented successfully.

Smart Parking system obtains the information such as availability of the parking space, the time when the vehicle parked in, the time when the parking vehicle left. It involves the smart sensors that could be fixed in street lights for every parking space, collection of real-time data, a web-based portal to monitor the parking spaces and a mobile app which will enable user to reserve a parking space and make online payment from their mobile app for their parking.

Thus deployed, this smart parking reduces the need for people to needlessly circle city blocks searching for parking and that results in reduction of car emissions. It also helps the cities in controlling the non-payment parking.

II. Related Work

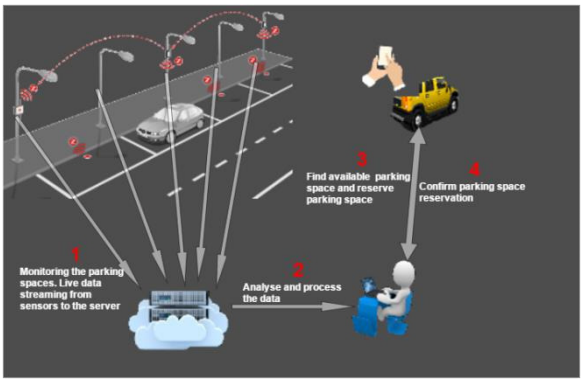
As the technology changes with time, the source to generate information for car parking system has also been changed. Today, the wireless sensor networks are the major sources of generating diverse information. Various approaches has been carried out to find a better way for smart parking system and these include technologies like Wireless networks, GSM based parking management, image processing technique, RFID, number plate recognition and so on.

In this paper we proposed an approach to monitor the demarcated on-street car parking system based on IoT technology and help the public to reserve their parking spaces through a mobile App. We have considered major factors like effective elimination of need for search of parking spaces, effective parking monitoring system and cost effectiveness. The mobile application would be much more useful in terms of user-friendliness, quick and simple way to reserve the parking spaces with online payment facility. The parking monitoring is based on IoT which streams the live data to the cloud based server. When it comes to IoT, the most primary thing would be the source, the sensors to generate information. And, the biggest barrier would be the cost involved in installing the same. Considering the cost effectiveness, in our approach the wireless sensors could be installed in the street lights and hence no separate infrastructure set up is required.

III. PROPOSED PROTOTYPE

A. Basic Architecture

Below is the proposed architecture that puts forth the ideology behind.



As the first step, the sensors which help us to detect the vehicle occupancy state will stream the live data to the cloud based server. The sensor transmits the vehicle's geolocation, the time it arrived at the parking space and the time when the vehicle leaves the parking space. The parking management system monitors the parking space with the help of live streaming from the cloud based sever. The public then could use the mobile app that communicates with the parking management system to know the availability of parking spaces when they are nearby a parking area.

This would drastically reduce the time for searching a parking space. Also, since the user could buy tickets for their parking from within the app it could be a real hassle-free parking experience for them. It would also result in preventing accidents as the user while parking would have their focus on finding a parking space rather than focusing the road. On the other side it would help the local authority to monitor the occupancy and payment yielding in reduction of non-payment users benefiting revenue generation for the city.

B. Data Generation

The proposed architecture is primarily focused on stream lining the demarcated on-street parking system where every parking space will be clearly identified. There are multiple approaches for the sensor installation and we have chosen to install the wireless sensors in street lights considering the cost effectiveness. Each sensor will be configured with a geo fence based on the geo location of every parking space. The parking availability/occupancy state for a particular parking space will be detected by sensor based on the geolocation of the parking space.

Through web socket connection, the sensor will start the live streaming of data to the data center whenever an event takes place in a parking space. Each sensor will be associated with an ID. The data such as the sensor id, the parking space status whether it is available or occupied, the geo-location of the parking space, the time of arrival or departure based on the nature of event will be transmitted to the server through socket connection.

C. Cloud Based Server

The data generated through the sensors will be transmitted to the cloud based server through the socket connection. The web socket keeps the connection alive and when parking space state changes the data will be streamed to the cloud based server instantly.

The cloud based server could be typically an Amazon elastic server which is easy to scale up and scale down based on the rate of generation of data. Also, this cloud based server acts as the source of data for the parking management system.

D. Parking Monitoring & Management System

The parking monitoring and management system is connected to the cloud based server. The communication between them happens through the socket connection.

i. Parking Monitoring System

The system monitors all the demarcated on-street parking space states by means of data it has from the data server. The total number of parking spaces, the total number of available parking spaces, and the total number of occupied parking spaces can be monitored. Also, the states of parking spaces can be rendered in Google maps as the parking spaces geolocations are also been transmitted to the system from the data server.

ii. Parking Management System

The parking management system communicates between the data server and the mobile application to help the users to reserve the parking spaces. The system is correlated with a fixed pricing schema. It comes with a structure that has fixed prices on hour basis. This system benefits in terms of revenue generation for the smart city. The users who are parking without payment could be found easily by using this system. The local authority could be provided with a mobile app who can easily track the non-payment parking spaces.

E. Mobile App

Today the technology is all around mobility as the number of mobile users has increased and increasing enormously. The technology solutions are all around

mobile. And following the same, the mobile app is the smartest way for a hassle-free parking solution to the users. The users can look around for a free parking space and start their reservation as soon as they arrive at the parking space. This will tremendously reduce the parking searching time and helps grow our city green as the pollution will also be reduced obviously.

The mobile app communicates closely with the parking management system to render the live states of parking spaces. The users can see the occupied parking spaces and the available parking spaces in Google map when a user is nearby that zone. And when the user occupies a free parking space, the sensor will detect it and notify the same to the parking monitoring and management system via the cloud based server through web socket communication.

The user can then reserve the parking space after arriving at the spot from the mobile app. Based on the pricing schema structured by parking management system rate card on hour basis will be shown to the users. Then user can proceed with the online payment facility. Once the transaction is successful the parking will be confirmed to the users.

If the user has not vacated before the parking time allotted, the user will be notified through their mobile app when the hours for parking is about to expire to vacate the parking space. The parking management system keeps track of the parking spaces and hence when a vehicle overstays in a parking space they can easily spot it and he local authority can proceed with the next steps. Once the vehicle leaves the parking space the sensor will notify the system about the parking state change instantly.

IV. Conclusion

In this paper we proposed a prototype for providing a better solution for smart city mainly focusing on assisting the public for hassle-free parking and which also helps the local government in revenue generation.

Future work is planned to perform experiments on the ideas discussed.

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Object Motion estimation using edge detection and background subtraction with block matching algorithm

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***Abstract*:—Detection of an object motion is the growing research field of image processing which revealed the several applications. Several techniques (including the proposed one) are discussed so far in literatures. In this paper the edge detection and frame differencing also known as background subtraction technique with block matching algorithm has been implemented to detect the object motion. The object taken for experimentation is arbitrary having no fixed shape and size. The MATLAB output result showing the practicability of the both algorithms.**

***Index Terms*—edge detection, block matching, filtering, Thresholding**

I Introduction

Following a object is characterized as procedure of finding the element of interest for a video stream and monitoring its movement, introduction and so forth outline by casing in whole video stream. Following item in edges require arrangement of division ventures to detach the question from its environment or foundation. Such comparable strides of edge recognition and edge differencing with layout coordinating were utilized as a part of the calculation, which are portrayed in detail later in this paper. Recognition of question in the video stream is the initial move towards extraction of significant data in numerous PC vision application, including activity observing, video observation and following individuals. Object following is the essential progressing research range in the field of PC vision and mixed media. Object following manages assortment of clients, for example, human PC communication, reconnaissance and security, pressure, restorative imaging and so on. For the most part object following is tedious process because of the measure of information required to be prepared. Henceforth, time of handling is kept low by utilizing calculation. Promote, many-sided quality is added because of the need of acknowledgment of object in every edge of video.

II Methodology

MATLAB provides us various toolboxes to make our work easier. Two such toolboxes are image/video processing toolbox and image/video acquisition toolbox [1]. Since the completion of this research work requires both the toolboxes. Object detection is a process of detecting object in a video or live feed. Challenges are met in object detection due to many variations in visual appearance. For example, vehicles vary in shape, size color and in small details like tiers, grills, etc. over a wide range. Appearance of an object also depends on environment. Light source may vary in intensity or may be changing position with respect to object and in addition varying shadows may affect the intensity of object in different frames. The appearance also depends on stance of an object like man could be standing or sitting; front view of face is different than side view, etc. Object detection must occur even if there is change in stance in different frames of video. Hence to get rid of the anomaly two part strategy is used for object detection.

There are various methods available for object detection like; Statistical Method for Object Detection, and Robust Real-time Object Detection

Background Subtraction: According to the name of this method it recommends that, it is the way toward isolating the forefront and foundation of the picture. Here it is expected that closer view contains the objects of intrigue. Everything with the exception of a question is said to be a foundation. For instance leaves, trees, structures and so on are the foundation. In a given picture (generally prone to be a video outline), we need to recognize the frontal area questions in that picture. By and large, items are of intrigue, not the scene i.e. the articles in a video other than the objects of intrigue are of no utilized. Foundation subtraction is a generally utilized approach for identifying moving articles in recordings from static cameras. The reason is that of identifying the moving articles from the distinction between the present casing and a reference outline, called foundation display. The foundation picture must be a representation of the scene with no moving items and must be kept consistently overhauled in order to adjust to the changing illuminating presences conditions and geometry settings [2]. The more straightforward calculation processes the distinction between the present edge and the foundation, relegating a name: either 0 if the question has a place with the foundation or 1 if the object is in forefront. The outcomes would be tasteful if the articles shading, being on the scene, was not the same as foundation. In the event that another object enters in the zone

marked as closer view, it won't identify and name accurately. Another negative part of this is the accompanying: if a foundation object moves, both the genuine question and its apparition are identified. In addition, Foundation Subtraction is extremely touchy to enlightenment and foundation changes and it doesn't deal with camera developments despite the fact that we have attempted to limit the imperatives. Technique for frontal area extraction is contrast picture strategy.

***Image differencing*:** In this method the difference of images is used in order to find object which is moving and the object which is not moving. The result of the difference is store as another grey image called the difference image [3]. Three types of difference images are defined.

- Complete accumulative subtraction or difference image is given by

  $f(x, y) = f(x, y) + 1$ ……..$if\ |g(x, y, t_{i+1}) - g(x, y, t_i)| > T$

- Positive accumulative subtraction or difference image is given by

  $f(x, y) = f(x, y) + 1$ ……..$if\ g(x, y, t_{i+1}) - g(x, y, t_i) > T$

- Negative accumulative subtraction or difference image is given by

  $f(x, y) = f(x, y) + 1$ …….. $if\ g(x, y, t_i) - g(x, y, t_{i+1}) > T$

A consistent and strong background subtraction methodology algorithm should take care of the abrupt or regular illumination changes, High frequency, recurring motion in the background i.e. tree leaves, fog, polluted surrounding, body heat and Long-term outlook changes like a vehicle is parked for a month.

III Algorithms

A. Edge Detection

Edge ditection is the most widely recognized way to deal with get the most significant discontinuities in intermittence values. Such discontinuities are identified utilizing first and second request subsidiaries [4]. The fig. 1 is demonstrating the yield consequence of edge discovery.

The main request subordinate of decision in picture preparing is inclination. We rehash the germane conditions here for comfort .The inclination of 2D capacity f(x, y) is characterized as a vector.

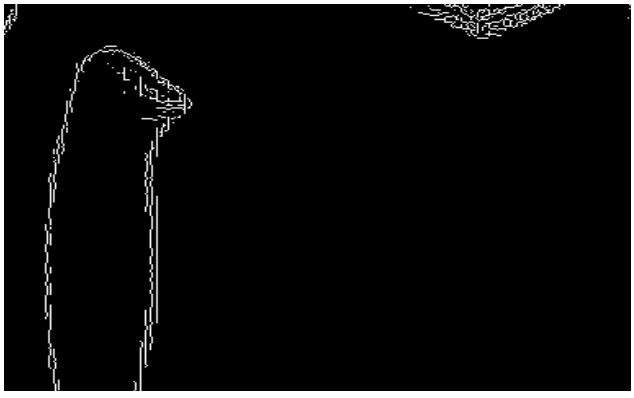

Fig.1: output of edge detection algorithm

$$\Delta f = \begin{bmatrix} G_x \\ G_y \end{bmatrix} = \begin{bmatrix} \frac{\partial f}{\partial x} \\ \frac{\partial f}{\partial y} \end{bmatrix} \text{.....(1)}$$

The magnitude of vector is

$$\nabla f = mag(\nabla f) = [G_x^2 + G_y^2]^{1/2}$$
$$= [\left(\frac{\partial f}{\partial x}\right)^2 + \left(\frac{\partial f}{\partial x}\right)^2]^{1/2} \text{.....(2)}$$

To simplify computation this quantity is approximated sometimes by omitting the square root operation:

$$\nabla f \cong G_x^2 + G_y^2 \text{.....(3)}$$

These estimation still behaves as derivatives i.e. they are zero in areas of continuous intensity and their values are proportional to degree of intensity change in areas whose pixel values are variable[5]. It is common practice to refer to magnitude of gradient or its approximation simply as 'gradient'. The fundamental property of gradient vector is that it points to direction of maximum rate of change of coordinate f(x, y).

2nd Order derivative of function f(x, y):

$$\nabla^2 f(x,y) = \frac{\partial^2 f(x,y)}{\partial x^2} + \frac{\partial^2 f(x,y)}{\partial y^2} \text{.....(4)}$$

They are computed using laplacian. In MATLAB this is done by function 'edge'.

[g t]=edge (f, 'method', 'parameter')

Where f is image and method is one of the procedures

A. Frame Differencing

The frame differencing is a strategy where the PC checks the contrast between two video outlines. On the off chance that the pixels have changed there obviously was something changing in the picture (moving for instance). Most strategies work with some obscure and limit, to particular genuine development from clamor. Casing could vary when light conditions in a room change (and camera auto center, shine adjustment and so forth). On the off chance that the foundation is stationary, the face area can be secluded from the foundation by first catching the foundation picture and after that subtracting it from each consequent picture. Districts of the distinction picture with high plentifulness are thought to be face areas [6].

Firstly the image is investigations by the system, which is taken by the camera, for identification of any moving article. The Edge Differencing calculation is utilized for this reason, which gives as yield the position of the moving article in the picture. This data is then used to separate a square picture layout (of settled size) from that locale of the picture. The formats are

created as and when the presence of the object changes essentially. The Fig.2 is the yield of the edge differencing calculation.

B. Thresholding

Thresholding is a non-straight operation that changes over a dark scale picture into a parallel picture where the two levels are appointed to pixels that are beneath or over the predetermined edge esteem. It is however significantly more productive to utilize the Picture [7]. Fig. 3 demonstrates the yield of thesholding. Thresholding operation, which likewise give a strategy to finding the "ideal" limit an incentive for a given picture. One technique that is moderately straightforward, does not require much particular information of the picture, and is hearty against picture clamor, is the accompanying iterative strategy

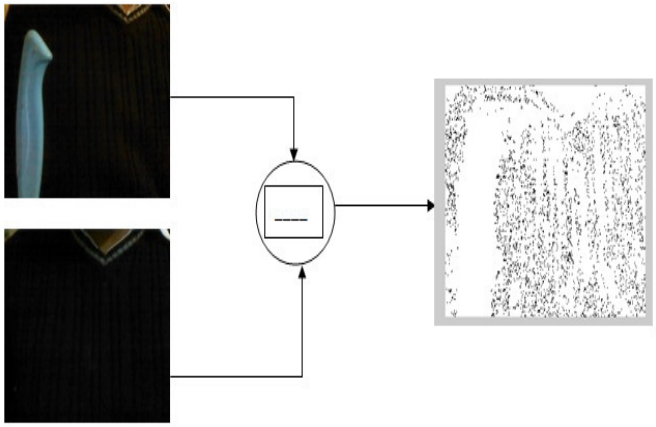

Fig 2: Result after Frame Differencing

1. Initially threshold (T) is chosen; this can be done arbitrarily or done according to any other desired method.
2. Image is divided into the object and the background pixels as described above, creating two sets:
    1. G_1= {f(m, n):f(m, n)>T} (object pixels)
    2. G_2= {f(m,n):f(m,n)<T} (background pixels)

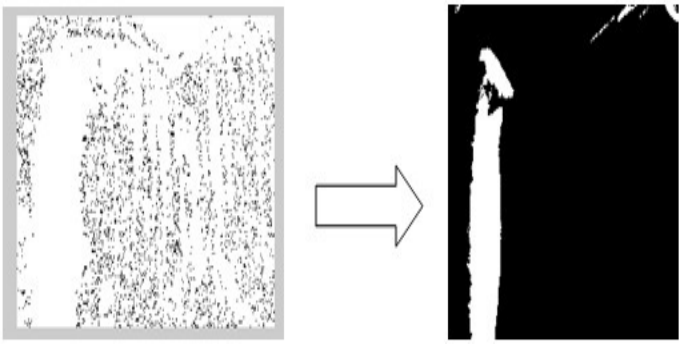

Fig 3 Image after Thresholding

C. Median Filtering and morphological erosion

Among the various type of filtering techniques available for improving the quality of our image the most the median filtering is used to avoid any flicker noise. Further, morphological erosion operation is performed on the thresholed image to remove any variation in background which might have slipped into the thresholded image [8]. Fig.5 showing the result of morphological erosion it is clear from the visual inspection that the variation due to external element is removed by this algorithm.

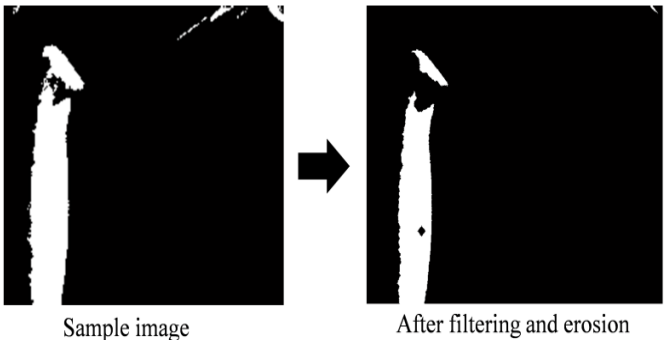

Fig 4: image after morphological erosion

D. *Generation of Centroid*

The vast majority of these techniques give therefore the in all probability focal pixel of each recognized question, either specifically by method for a channel reaction or in a roundabout way by method for the centroid of all focuses on the limit shape. At the point when the places of the items should be known with sub-pixel exactness, a precise and strong gauge can be gotten by figuring its focal point of gravity [8]. In the event that the acknowledgment calculation brings about a paired yield (pixel having a place with the question or not), the focal point of gravity of every object is decreased to registering the normal arrange along the (x, y and potentially z) tomahawks among the pixels or vexes that are connected with the perceived question. At the point when, then again, the recognition brings about an arrangement of yield qualities circulated in an area around the question focus (e.g., a channel reaction) and the yield esteem is directly identified with the separation to the object focus, the weighted focal point of gravity may bring about a more correct question area. In the wake of distinguishing the question from the video we have to keep a track on the object we are occupied with.

E. Calculation of Centroid

Estimation the center of gravity (COG) or centroid of a binary image needed a set of two integers C(cog_x ,cog_y) which determines the position of the moving object in the given scene.

The COG is calculated by:

$$cog\_x = cog\_x + x \ldots\ldots(1)$$

$$cog\_y = cog\_y + y \ldots\ldots(2)$$

$$Total = Total + 1 \ldots\ldots\ldots(3)$$

For each pixel where x, y is the current location of picture, the resulting COG is then divided by the Total value:

$$cog\_x = cog\_x/Total \ldots\ldots(4)$$

$$cog\_y = cog\_y/Total \ldots\ldots (5)$$

Fig. 5 Centroid identification

F. Template matching

The layout picture has solid components, an element based approach might be viewed as; the approach may demonstrate facilitate helpful if the match in the hunt picture may be changed in some mold [9]. Since this approach does not consider the sum of the format picture, it can be all the more computationally proficient when working with source pictures of bigger determination, as the option approach, layout based, may require looking possibly a lot of focuses keeping in mind the end goal to decide the best coordinating location.

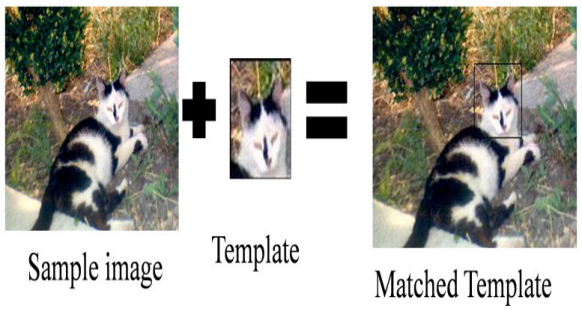

Fig.6. Template matching

V CONCLUSION

A strong and effective computerized single object following framework is introduced. The framework has been executed utilizing a calculation in view of casing differencing and element format coordinating. The calculation has tentatively been appeared to be very precise and viable in recognizing a solitary moving article even under awful lighting conditions or impediments. Such a mechanized question following framework can be utilized as a part of utilizations where exact following is required yet great lighting conditions can't be given. The framework is additionally especially appropriate to zones like reconnaissance and video conferencing. Future work concentrates on following numerous items in the meantime and also on enhancing tracker exactness amid camera movement

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A Review of Educational Data Mining in Higher Education System

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Abstract

The discovery of hidden patterns in educational data is a promising research in Educational Data Mining.The students achievement rate were reduced continuously is the major problem in higher education. To increase the success rate of students the early forecast technique will help the management to counsel the poor students at right time. To discover the new patterns from various data the data mining approach is widely used. Likewise here the data mining is used in educational field to extract hidden patterns. Classification is used to classify the records based on the preparation set and also it uses the pattern to categorize the new records.This paper aims to show the various techniques of Educational data mining that guides the management to take better action on students at risk.

Keywords: Educational Data Mining (EDM), Classification, Data Mining, Prediction.

I. INTRODUCTION

The financial system of the country is directly depends on the students education which makes an impact in industries. The excellence of educational institutions is viewed by the success rate of students and the skill set of the institutions will be measured by retained rate of students at risk. The different aspects like individual, social and psychological will be useful to measure student academic performance. This may lead to discover the students who are in risk and it help the management to take timely action. The student academic performance will be measured by their socio-economic and previous academic performances. This process will be performed by using educational data mining techniques. The determination of classes will be made before examining the data so it is also referred to as supervised learning.

Based on the previous academic performances and Socio-economic situations the student performances were measured through Data mining techniques.

Classification maps the data into predefined sets or groups of classes. It is often referred to as supervised learning because the classes are persistent before examining the data. Patterns that are discovered by Data Mining methods from educational data can be used to enhance decision making in terms of identifying students at risk, decreasing student drop-out rate, increasing student's success and increasing student's learning outcome. The main objectives of this study are identification of different factors which affects a student's learning behavior and performance during academic career. Construction of a prediction model using classification data mining technique on the basis of identified predictive variables and extract valid information from existing students to mange relationships with upcoming students. And also to improve the performance of the student and validation of the developed model for higher education students studying in Universities or Institutions.The educational data mining methods are used to discover the patterns for improving the decision making to identify the students at risk. And also it is used to increase the students learning outcome and todecrease the drop-out rate of the students [1].

Educational data mining is emerging as a research area with a suite of computational and psychological methods and research approaches for understanding how students learn. Education Data Mining in data mining retrieve hidden knowledge by applying various techniques of data mining like clustering, rule mining, web based mining, test mining, neural network,Bayesian network, and many others which gives us a final result and if it need some requirement to changes then again the raw data if filtered according to need. Data collected from education institute can be aggregated over large numbers of students and can contain many variables that data mining algorithms can explore for model building. Data mining is also known as knowledge discovery in databases is a technology used in different discipline to search for significant relationship among variables in large database. It extract knowledge form hidden data base and find the necessary information according to the requirement. These tasks are done by applying various algorithm of data mining on training

dataset. These dataset passes through various steps of data mining and finally the filtered data is used by the user according to the requirement. It plays an important role in education institute. Measuring the student performance will help the placement officer to guide the student to decide their carrier in accurate path.According to the company's perceptive they expect the ability from the students like technical, communication, percentage, positive attitude and good performance.If the educational planners will conduct the awareness program in advance it may protect the students from risk in earlier and also it improve the overall productivity [2]. The learning needs are different among student groups and it can view by using educational data mining techniques [3].

II. EDUCATIONAL DATA MINING TECHNIQUES

The various techniques are used to acquire the hidden information in Educational data mining. They categorized into four groups:

A. Decision trees

To understand easily and to identify the most promising variables in fastest way the decision tree techniques are more liable. It is also used find the relativity between two or more variables.The new variables or features can be generated by the decision trees to predict the target variable.The algorithms used majorly in decision trees are ID3, CART, C4.5, Random tree and CHIAD.

B. Bayesian Classifier

This is very easy and simplest technique that requires less amount of data preparation to calculate the parameters.The unrelated features are insensitive and also the classifier is well-organized to deal both real and distinct data. The class conditional independencies are clear between subsets of variables in Bayesian classifier.A graphical model of causal relationship will provide to perform the learning process.

C. Neural Networks

By deriving the meaning from complex data to identify the trends and extract the risky patterns is the huge ability of neural networks. Discovering tasks based on the given data for training or preliminary experience is one the main advantage of neural networks.The Neural network has the capability to identify all possible interactions of the variables among various predictors. This is the main reason of using neural network in Educational data mining [4].

D. Clustering Techniques

It is a process of constructing a group of abstract objects into classes of parallel objects. The set of data into groups are partition first and then based on data comparison cluster analysis were made. Next mentioning labels to all groups and also here the data objects are treated as separate set.This techniques is flexible to make changes and it helps out individual positive features to distinguish different groups are main advantages of clustering in classification. The different areas like data analysis, pattern recognition and image processing are mainly focused by clustering techniques.

III. STUDENT ADVISORY SYSTEM FRAMEWORK

A. Framework Description

A student from particular branch is assured for recommendations of both classification and clustering techniques. This process needs an educational dataset to initiate the task. This framework is used to represent the student academic and non-academic attributes in higher education to hold complete information about students.

B. Classification Phase

To discover an efficient classifier in the educational dataset the classification algorithm is used. The recommended course must be viewed for the student is the main role of classifier. The current level failed student records are removed in this classification phase. The different classification algorithms were applied by using this training dataset with course attribute to improve the student performance.

C. Clustering Phase

Based on marks resemblance the student records are partition into number of clusters by applying clustering algorithm on educational dataset.The number of clusters is decided and previous grade attributes are removed in this phase. To identify the clusters and distribution of the each course percentage is identified using K-means algorithm.

D. Request an Output from the System

This phase will describe the procedure about how the data will be entered by the new student in the system.Here the system will read the data and check whether the data will be valid for the process or not.The classification phase will predict the department with certain norms and regulations which is already declared [6].

IV RELATED WORK

In [1], K.R.Kavyashree, LakshmiDurga has proposed that a country's growth is strongly measured by the quality of its education system. Education sector has witnessed sea change in its functioning. Today it is recognized as an industry and as an industry it is facing challenges. The challenges of higher education being decrease in students' success rate and their leaving the course without completion. An early prediction of students' failure may help the management provide timely counselling as well as coaching to increase the success rate and student retention. Data mining are widely used in educational field to find new hidden patterns from student's data which are used to understand the problem. Classification is one of the prediction type classifiers that classifies data based on the training set and uses the pattern to classify a new data. Aim of the project is to develop an internetworking application that uses data mining technique to predict the students' performance based on their behaviour. This paper explored the link between emotional skills of the students along with the socio economic and previous academic performance parameters using Naive Bayes Classifier technique.

In [2],TriptiDwivedi, Diwakar Singh has proposed that the survey of student background history which helps academic planners in institute to give right direction to student. If the class of student is predicted in midsession of institute in final year then it will be easy for the academic planner to plan some important workshop for the enhancement of performance of student which helps it in placement at the end of academic session. In educational institute data mining techniques plays an important role in each activities of institute whether it is academic, cultural, examination and training and placement etc. in which Educational Data Mining which is a field of data mining helps a lot to find the actual filtered data in various field of department in institute. Hidden knowledge through data mining techniques is extracted from large database which helps to predict the pattern in such activities. It plays a great role in predictions of student data for placement and performance.

In [3], AbdulmohsenAlgarnihas proposed that the data mining techniques are used to extract usefulknowledge from raw data. The extracted knowledge is valuableand significantly affects the decision maker. Educational datamining (EDM) is a method for extracting useful informationthat could potentially affect an organization. The increase oftechnology use in educational systems has led to the storageof large amounts of student data, which makes it importantto use EDM to improve teaching and learning processes. EDMis useful in many different areas including identifying at-riskstudents, identifying priority learning needs for different groupsof students, increasing graduation rates, effectively assessinginstitutional performance, maximizing campus resources, andoptimizing subject curriculum renewal. This paper surveys therelevant studies in the EDM field and includes the data andmethodologies used in those studies.

In [5], Amirah Mohamed Shahiria, WahidahHusaina and Nuraini Abdul Rashidahas proposed that the Predicting students performance becomes more challenging due to the large volume of data in educational databases.Currently in Malaysia, the lack of existing system to analyze and monitor the student progress and performance is notbeing addressed. There are two main reasons of why this is happening. First, the study on existing prediction methodsis still insufficient to identify the most suitable methods for predicting the performance of students in Malaysianinstitutions. Second is due to the lack of investigations on the factors affecting students achievements in particularcourses within Malaysian context. Therefore, a systematical literature review on predicting student performance byusing data mining techniques is proposed to improve students achievements. The main objective of this paper is toprovide an overview on the data mining techniques that have been used to predict students performance. This paperalso focuses on how the prediction algorithm can be used to identify the most important attributes in a students data.We could actually improve students achievement and success more effectively in an efficient way using educationaldata mining techniques. It could bring the benefits and impacts to students, educators and academic institutions.

In [6], Heba Mohammed Nagy, Walid Mohamed Aly, Osama FathyHegazyhas proposed that the educational data mining is a specific data miningfield applied to data originating from educational environments, itrelies on different approaches to discover hidden knowledge fromthe available data. Among these approaches are machine learningtechniques which are used to build a system that acquires learningfrom previous data. Machine learning can be applied to solvedifferent regression, classification, clustering and optimizationproblems.In their research "Student Advisory Framework"that utilizes classification and clustering to build an intelligentsystem. This system can be used to provide pieces of consultations toa first year university student to pursue a certain education trackwhere he/she will likely succeed in, aiming to decrease thehigh rate of academic failure among these students. A real casestudy in Cairo Higher Institute for Engineering, Computer Scienceand Management is presented using real dataset collected from2000−2012.The dataset has two main components: pre-highereducation dataset and first year courses results dataset. Results haveproved the efficiency of the suggested framework.

In [7], Monika Goyal and RajanVohrahas proposed that the data analysis plays an important role for decision supportirrespective of type of industry like any manufacturing unit andeducations system. There are many domains in which datamining techniques plays an important role. This paper proposesthe use of data mining techniques to improve the efficiency ofhigher education institution. If data mining techniques such asclustering, decision tree and association are applied to highereducation processes, it would help to improve studentsperformance, their life cycle management, selection of courses,to measure their retention rate and the grant fund management ofan institution. This is an approach to examine the effect of usingdata mining techniques in higher education.

In [8], U.K.Pandey and S.Pal has proposed that from ancient period in India, educational institution embarked to use class room teaching. Where a teacher explains the material and students understand and learn the lesson. There is no absolute scale for measuring knowledge but examination score is one scale which shows the performance indicator of students. So it is important that appropriate material is taught but it is vital that while teaching which language is chosen, class notes must be prepared and attendance. This study analyses shows the impact of language on the presence of students in class room. The main idea is to find out the support, confidence and interestingness level for appropriate language and attendance in the classroom. For this purpose association rule is used.

In [9], Dr. MohdMaqsood Ali has proposed that the Universities either public or private and its colleges enroll thousands of students into various courses or programs every year. They collect information from students at the time of admissions and store the same in computers. Understanding the benefits of data is essential from business point of view. Data can be used for classifying and predicting the students' behavior, performance, dropouts as well as teachers' performance. Therefore, this paper"Role of data mining in education sector" examines the role of data mining in an education sector. In addition, laysemphasis on application of data mining that contribute to offer competitive courses and improve their business.

V EDUCATIONAL DATA MINING APPLICATIONS

A. Visualization of facts

Inserting a common term in a visual context is to guide the people to identify the significance of the data is known as data visualization.According to usertrends the reports were generated monthly or weekly schedule. Using of materials, studying topics sequence, studying activity patterns and time schedules are noted as usage summary. It is very easy to know about patterns and correlations in visualization software, which are hidden in text-based data [7].

B. Predicting Student Performance

The Marks, knowledge and student performance are frequently predicted values in educational data mining. To improve the learning and teaching procedure, the performance of students will be predicted to guide the learners and educators in correct way.The percentage and grade are mostly used in educational data mining by the researchers.
This technique is used to combine the labeled items based upon the quantitative traits and training sets which are gathered earlier in the process [5].

C. Enrolment Management

To structure the enrolment of the college to achieve the goals the enrolment management is used in higher education.The data analysis is used in enrollment management for achieving desired results of the management is the traditional way of educational data mining techniques. The educational institutions are planned to perform set of activities to influence frequently over the students enrolments will lead to reduce the drop-outs in higher education [8].

D. Grouping Students

The student groups are formed according to the personality and efficiency to improve the system.To construct a learning system to support the group learning methodology will make the learning techniques are more effective and easier for the students to develop themselves. Discover the student groups in related learning which is based on huge sequences are performed by clustering algorithm [7].

E. Predicting Students Profiling

At the time of admission the information collected by the management from students will hold the details like demographic, geographic and psychographic individual of the students. The best technique to identify the different types of students individuality is Neural networking [9]. The prediction of student performance are possible by using different techniques like Bayesian networks, decision trees and neural networks will make the management to take appropriate decisions to improve the students performance in higher education.
The prediction about final grade and course completion are major things found in this student profiling techniques to view the success rate of students [10].

F. Planning and scheduling

The Educational process like planning, course scheduling, resource allotment and going for new courses will make idea for admissions and counseling. These are the important aspects for the management to make an impact in the educational system.While planning the course activities the decision trees and link analysis are used to find course completion rates and preferences. To find the course classifications in educational training the clustering analysis, decision trees and back-propagation neural networks techniques are used to improve the student level in higher education [7].

VI. TYPES OF DATA CAN BE MINED

- **Flat files**: Flat files are actually the most common data source for data mining algorithms, especially at the research level. Flat files are simple data files in text or binary format with a structure known by the data mining algorithm to be applied. The data in these files can be transactions, time-series data, scientific measurements, etc.

- **Relational Databases**: Briefly, a relational database consists of a set of tables containing either values of entity attributes, or values of attributes from entity relationships. Tables have columns and rows, where columns represent attributes and rows represent tuples. A tuple in a relational table corresponds to either an object or a relationship between objects and is identified by a set of attribute values representing a unique key.

- **Data Warehouses**: A data warehouse as a store house, is a repository of data collected from multiple data sources (often heterogeneous) and is intended to be used as a whole under the same unified schema. A data warehouse gives the option to analyze data from different sources under the same roof.

- **Transaction Databases**: A transaction database is a set of records representing transactions, each with a time stamp, an identifier and a set of items. Associated with the transaction files could also be descriptive data for the items. For example, in the case of the video store, the rentals table.
- **Multimedia Databases**: Multimedia databases include video, images, audio and text media. They can be stored on extended object-relational or object-oriented databases, or simply on a file system. Multimedia is characterized by its high dimensionality, which makes data mining even more challenging. Data mining from multimedia repositories may require computer vision, computer graphics, image interpretation, and natural language processing methodologies.

- **Spatial Databases**: Spatial databases are databases that, in addition to usual data, store geographical information like maps, and global or regional positioning. Such spatial databases present new challenges to data mining algorithms.

- **World Wide Web**: The World Wide Web is the most heterogeneous and dynamic repository available. A very large number of authors and publishers are continuously contributing to its growth and metamorphosis, and a massive number of users are accessing its resources daily. Data in the World Wide Web is organized in inter-connected documents. These documents can be text, audio, video, raw data, and even applications. Conceptually, the World Wide Web is comprised of three major components: The content of the Web, which encompasses documents available; the structure of the Web, which covers the hyperlinks and the relationships between documents; and the usage of the web, describing how and when the resources are accessed.

- **Time-Series Databases**: Time-series databases contain time related data such stock market data or logged activities. These databases usually have a continuous flow of new data coming in, which sometimes causes the need for a challenging real time analysis. Data mining in such databases commonly includes the study of trends and correlations between evolutions of different variables, as well as the prediction of trends and movements of the variables in time.

VII. POWERFUL EDM TOOLS

Data mining has a wide number of applications ranging from marketing and advertising of goods, services or products, artificial intelligence research, biological sciences, crime investigations to highlevel government intelligence. Due to itswidespread use and complexity involved in building data mining applications, a large number of Data mining tools have been developed over decades. Every tool has its own advantages and disadvantages. Within data mining, there is a group of tools that have been developed by a research community and data analysis.

They are offered free of charge using one of the existing open source licenses. An opensource development model usually means that the tool is a result of a community effort, not necessary supported by a single institution but instead the result of contributions froman international and informal development team. This development style offers a means of incorporating the diverse experiences data mining provides many mining techniques to extract data from databases. Data mining tools predict future trends, behaviors,allowing business to make proactive, knowledge driven decisions. The development and application of data mining algorithms requires use of very powerful softwaretools. As the number of available tools continues to grow the choice of most suitable tool becomes increasingly difficult [11].

A. RapidMiner (YALE)

Rapid Miner is a software platform developed by the company of the same name that provides an integrated environment for machine learning, data mining, text mining, predictive analytics and business analytics. It is used for business and industrial applications as well as for research, education, training, rapid prototyping, and application development and supports all steps of the data mining process. Rapid Miner uses a client/server model with the server offered as Software as a Service or on cloud infrastructures.

It is released on 2006 and the latest version available is Rapid miner 6. It is licensed by AGPL Proprietary and it is cross platform i.e. can be installed on any operating system. And also language independent it can be downloaded from www.rapidminer.com.

The general features of rapid miner are an environment for machine learning and data mining processes.It represents a new approach to design even very complicated problems by using a modular operator concept which allows design of complex nested operator chains for huge number of learning problems. Rapid miner uses XML to describe the operator trees modeling knowledge discovery process. It has flexible operators for data input and output file formats.It contains more than 100 learning schemes for regression classification and clustering analysis.Rapid miner supports about twenty two file formats.Rapid Miner has a lot of functionality, is polished and has good connectivity. Rapid Miner includes many learning algorithms from WEKA. It is solid and complete package. It easily reads and writes Excel files and different databases. We can program by piping components together in a graphic ETL work flows. If you set up an illegal work flows Rapid Miner suggest Quick Fixes to make it legal.

RapidMiner provides support for most types of databases, which means that users can import information from a variety of database sources to be examined and analyzed within the application. Specialized for Business solutions that include predictive analysis and statistical computing.

Advantages:

- It has the full facility for model evaluation using cross validation and independent validation sets.
- Over 1,500methods for data integration, data transformation, analysis and, modelling as well as visualization – no other solution on the market offers more procedures and therefore more possibilities of defining the optimal analysis processes.
- RapidMiner offers numerous procedures, especially in the area of attribute selection and for outlier detection, which no other solution offers.

Limitations:

- InRapidMiner are suited for people who are accustomed to working with database files, such as in academic settings or in business settings.
- The reason for this is that the software requires the ability to manipulate SQL statements and files.

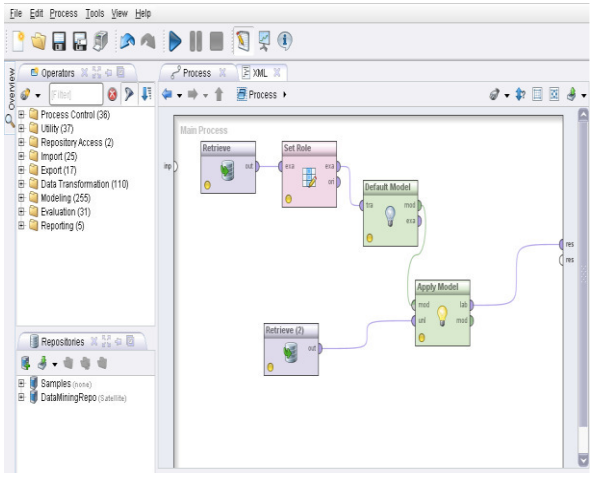

Fig 1. Flow diagram for RapidMiner

B. WEKA

Weka means Waikato Environment for Knowledge Analysis. It is a collection of machine learning algorithms for data mining tasks. This Tool is very useful and it is majorly used by the data mining researchers for predictive modeling and fact analysis. While compare this with rapidminer it have several advantages and supports standard educational data mining tasks like clustering, classification,

visualization, data preprocessing, regression and selection features. These algorithms can either be applied directly to a data set or can be called from your own Java code. The Weka (pronounced Weh-Kuh) workbench contains a collection of several tools for visualization and algorithms for analytics of data and predictive modeling, together with graphical user interfaces for easy access to this functionality.

It is first released in 1997. Latest version available is WEKA 3.6.11. It has a GNU general public license. It is Platform independent software and supported by Java. The general features are it is a Java based open source tool data mining tool which is a collection of many data mining and machine learning algorithms, including pre-processing on data, classification, clustering, and association rule extraction. Weka provides three graphical user interfaces i.e. the Explorer for exploratory data analysis to support preprocessing, attribute selection, learning, visualization, the Experimenter that provides experimental environment for testing and evaluating machine learning algorithms, and the Knowledge Flow for new processmodel inspired interface for visual design of KDD process. A simple Command-line explorer which is a simple interface for typing commands is also provided by weka.

Weka is best suited for mining association rules. It is stronger in machine learning techniquesand Suited for machine Learning.

Advantages:

- It is suitable for developing new machine learning schemes.
- Weka loads data file in formats of ARFF, CSV, C4.5, binary.
- Though it is open source, Free, Extensible, Can be integrated into other java packages.

Limitations:

- It lacks proper and adequate documentations and suffers from “Kitchen Sink Syndrome” where systems are updated constantly.
- Worse connectivity to Excel spreadsheet and non-Java based databases.
- CSV reader not as robust as in Rapid Miner. It is much weaker in classical statistics.
- It does not have the facility to save parameters for scaling to apply to future dataset.
- It does not have automatic facility for parameter optimization of machine learning or statistical methods[11].

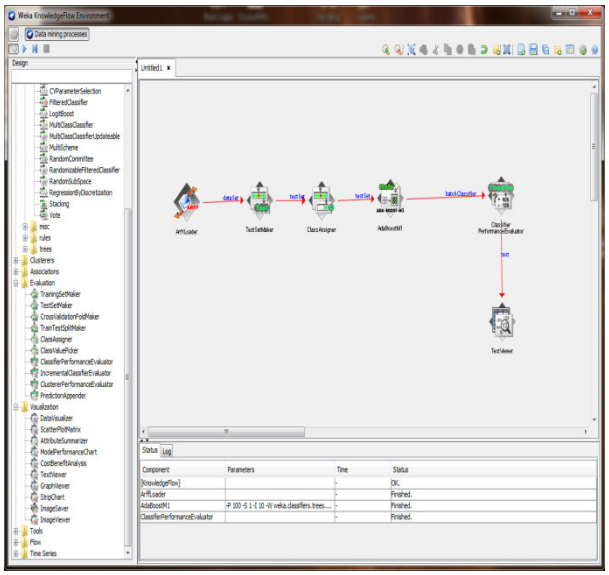

Fig 2.Flow diagram for WEKA.

C. R-Programming

The R-Programming is written in C, Fortran and the modules are written in R-Programming itself. To develop the data analysis and statistical software the R-Programming language is used and this software is used in the middle of the data miners.Graphical, statistical, time series analysis, classification and clustering are the major techniques performed by R-Programming in Educational data mining to improve the student performance.

Revolution is a free software programming language and software environment for statistical computing and graphics. The R language is widely used among statisticians and data miners for developing statistical software and data analysis. One of R's strengths is the ease with which well-designed publication-quality plots can be produced, including mathematical symbols and formulae where needed. It is first released in 1997 and the latest version Available is 3.1.0. It is licensed by GNU General Public License, cross platform. The R project is a platform for the analysis, graphics and software development activities of data miners and related areas.

R is a well-supported, open source, command line driven, statistics package. There are hundreds of extra “packages” freely available, which provide all sorts of data mining, machine learning and statistical techniques. It allows statisticians to do very intricate and complicated analyses without knowing the blood and guts of computing systems.

It has a large number of users, in particular in the fields of bio-informatics and social science. It is also a free ware replacement for SPSS. And it is suited for statistical computing.

Advantages:

- It is very extensive statistical library.
- It is a powerful elegant array language in the tradition of APL, Mathematica and MATLAB, but also LISP/Scheme.
- Ability to make a working machine learning program in just 40 lines of code.
- The Numerical programming is better integrated in R and it has better graphics.
- R is more transparent since theOrange are wrapped C++ classes.
- Easier to combine with other statistical calculations.Import and export of data from spreadsheet is easier in R, spreadsheet are stored in a data frames that the different machine learning algorithms are operating on.
- Programming in R really is very different, you are working on a higher abstraction level, but you do lose control over the details.

Limitations:

- It is less specialized towards data mining.
- There is a steep learning curve, unless you are familiar with array languages.

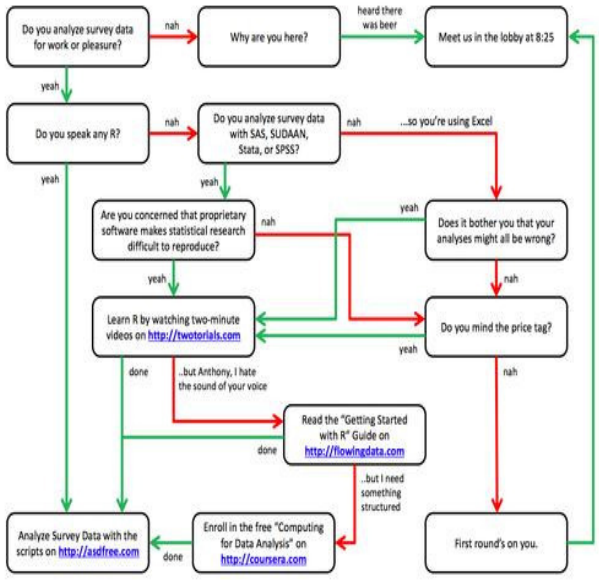

Fig 3. Flow diagram for R-Programming

D. Orange

The Orange is open source tool for educational data mining researcher and it is Python-based.The machine learning mechanism and the few features are added to bioinformatics and text mining is the main advantage of Orange tool. Orange is a component-based data mining and machine learning software suite, featuring a visual programming front-end for explorative data analysis and visualization, and Python bindings and libraries for scripting. It includes a set of components for data preprocessing, feature scoring and filtering, modeling, model evaluation, and exploration techniques. It is implemented in C++ and Python. Its graphical user interface builds upon the cross-platform framework. It is developed in 2009. The Latest version available is Orange 2.7 and Licensed by GNU General Public License. It is Compatible with Python, C++,C.

The General features are it is component-based data mining and machine learning software suite. It includes a set of components for data preprocessing, feature scoring and filtering, modeling, model evaluation, and exploration techniques. Data mining in Orange is done through visual programming or Python scripting. It is open source data visualization and analysis for novice and experts.It contains components for machine learning and add-ons for bioinformatics and text mining.

Along with it's also packed with features for data analytics [11]. It is specialized for data visualization along with mining. The several advantages of Orange tool are open source data mining package build on Python, NumPy, wrapped C, C++ and Qt. Works both as a script and with an ETL work flow GUI.Shortest script for doing training, cross validation, algorithms comparison and prediction. Orange the easiest tool to learn and it is Cross platform GUI. It is written in python hence is easier for most programmers to learn. Scripting data mining categorization problems is simpler in Orange. Orange does not give optimum performance for association rules.

The limitations are it is not super polished.The install is big since you need to install QT. Limited list of machine learning algorithms. Machine learning is not handled uniformly between the different libraries.Orange is weak in classical statistics; although it can compute basic statistical properties of the data, it provides no widgets for statistical testing. Reporting capabilities are limited to exporting visual representations of data models.

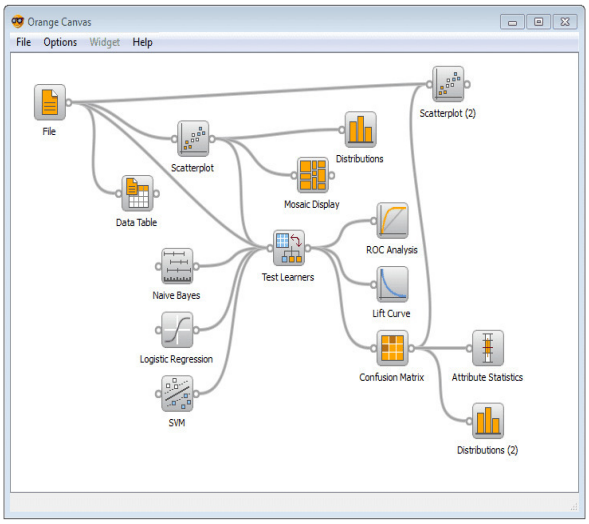

Fig 4: Flow diagram for Orange Tool.

E. KNIME

This KNIME tool is based on Eclipse and written in java. Transformation, extraction and loading are the powerful components of data preprocessing technique were performed well in this tool. The KNIME tool will permit the assembly of nodes for data processing through graphical user interface concept. The Business intelligence, financial data analysis, reporting, integration platform and data analytics were in open source scheme.Here it is easy to extend, add plug-in and to include the core version of data integration modules.

Konstanz Information Miner, is an open source data analytics, reporting and integration platform. It has been used in pharmaceutical research, but is also used in other areas like CRM customer data analysis, business intelligence and financial data analysis. It is based on the Eclipse platform and, through its modular API, and is easily extensible. Custom nodes and types can be implemented in KNIME within hours thus extending KNIME to comprehend and provide first-tier support for highly domain-specific data format. It is released on 2004. The latest version available is KNIME2.9 and licensed By GNU General Public License. Compatible with Linux ,OS X, Windows and written in java.

The general features are it is designed data mining tool that runs inside the IBM's Eclipse development environment. It is a modular data exploration platform that enables the user to visually create data flows (often referred to as pipelines), selectively execute some or all analysis steps, and later investigate the results through interactive views on data and models. The Knime base version already incorporates over 100 processing nodes for data I/O, preprocessing and cleansing, modeling, analysis and data mining as well as various interactive views, such as scatter plots, parallel coordinates and others.

Integration of the Chemistry Development Kit with additional nodes for the processing of chemical structures, compounds, etc. Specialized for Enterprise reporting, Business Intelligence, data mining. The main advantages are it integrates all analysis modules of the well-known. Weka data mining environment and additional plugins allow R-scripts to be run, offering access to a vast library of statistical routines. It is easy to try out because it requires no installation besides downloading and un archiving. The one aspect of KNIME that truly sets it apart from other data mining packages is its ability to interface with programs that allow for the visualization and analysis of molecular data.

The Limitations are having only limited error measurement methods. Have no wrapper methods for descriptor selection. Does not have automatic facility for Parameter optimization of machine learning/statistical methods.

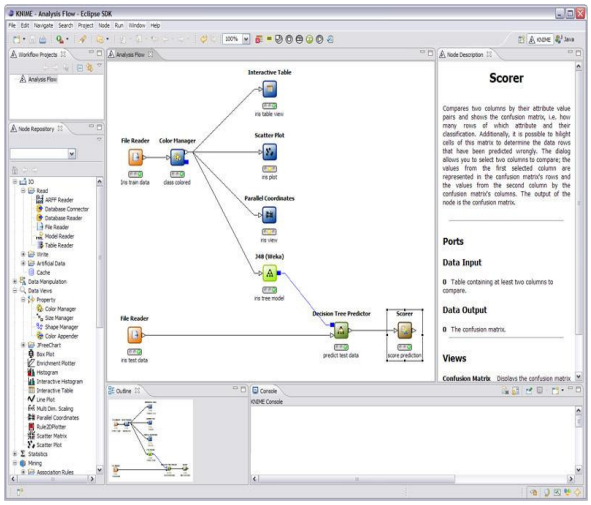

Fig 5. Flow diagram for KNIME

CONCLUSION

The development of Educational data mining techniques makes explosive growth in the field of education. The most promising tools and techniques in educational data mining for future are discussed in this paper. Now a days the academic success of students is the major issue for the management in all professional institutes. So the early prediction to improve the student performance through counseling and extra coaching will help the management to take timely action for decrease the percentage of poor performance by the students. The classification and clustering operations are used to predict more accurate results for improve the level of success rate of the students in higher education. To develop a decision support system and help the authorities to timely

actions on weak students these Educational data mining techniques were used.

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OFS: Online Feature Selection Based on Regression Analysis and Clustering method along with its Application

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***Abstract*—Feature Selection is one of the important techniques in the Data mining. For the purpose of reducing the computational cost and reduction of noises to improve the accuracy of classification, the feature selection is very important technique for large-scale dataset. The result of feature selection has restricted to only batch learning. Different from batch learning technique online learning has selected by a motivational scalable, well-organized machine learning algorithm which has been used for large-scale dataset. In many defined techniques are not always conveniently helpful for the large-scale dataset. The real-world applications has huge amount of data which are having very long capacity or it costly to bring the entire set of attributes. Focusing on this loophole the concept of Online Feature Selection (OFS) is established. For every occurrence the online learning technique should be retrieve complete features/ attributes from large scale dataset volume. In OFS technique it is hard to online learner to keep a classifier that consist minimum and exact number of features. The OFS technique has primary defiance that, how to make accurate prediction from a large-scale dataset of iterations by using a fixed and small number of actively working features. In this article two different ways of OFS techniques are used its main work is to acquire minimum number of features. In first task a learner has allowed with the access of all the features to elect the subset of active features, and in the second task, a learner has allowed with access of only limited number of features for every iteration. We have used Differential Evolutionary (DE) algorithm in this study. By using new techniques such as Multiclass classification, DE algorithm, Correlation and clustering method the system is implemented to solve many real-world applications, problem and give their imperial performance analysis of the large-scale dataset.**

Keywords — Online Feature Selection (OFS), Differential Evolutionry Algorithm (DE) Online Learning, Large-scale Dataset, Data Mining, Classification, Correlation, Clustering Method

I. Introduction

Feature Selection (FS) is an important step in successful data mining applications. The accomplishment of data mining applications Feature Selection (FS) has one of the intrinsic steps. In batch learning technique features selection process has increasingly used. For removing the irrelevant and redundant features of large-scale dataset the data dimensionality has reduced very adequately. Under the data mining technique the FS is a mechanism of selecting a group of original features according to certain norm; generally FS is significant which is mainly used for dimensionality subtraction or reduction technique of data mining. In many real-world applications, the dataset contains many data so their size is very large. Learning of that data is not work properly as well before eliminate the redundant features or attributes.

Feature selection can works eliminating the number of features, also eliminate irrelevant, redundant, or noise full data that carry immediate effects for large-scale dataset of many applications. Running time of a learning algorithm is automatically reduced when the number of unwanted attributes highly reduced and returns the many generic concepts [2]. For implementing the impressive prediction model the FS is very important. To choose a subset of related features that is the main goal of feature selection method. Online feature selection has increases performance analysis of the prediction model for removing unrelated and repeated features in large-scale dataset. By also reducing the curse of dimensionality, build up the generalization performance, speeding of the When problems are arises for processing of high dimensional dataset that time FS has many use for implementing the applications in different domains. The example like speeding up a mining algorithm and receive best performance of the algorithm such as approximate, predictive accuracy and also result transparency. Feature selection distributed in to 3 methods they are filter method, wrapper and embedded method. The goal of OFS is to discover the explanation of feature selection issue in an online learning form by exploring online learning method. In online learning method the attributes and features are needs at the time of

training instance. The online learning method OFS goal is to choose a smallest exact number of features for multiclass classification. The framework of algorithm has two aspects. We first work on every iteration by unconstrained gradient descent step. After that we solve an optimization problem that is for minimization of a regularization term at the same time the result of the first phase to keep closeness to each other. In large-scale dataset the feature selection takes only labeled data. For batch penalized risk minimization and online learning the simple valid algorithms are used [11]. Such examples medical diagnosis, forensic science, fraud detection they are cannot taken for granted for real world applications because their labeled data are very hard to recognize. So, this issue finds the "semi-supervised feature selection" to the optimal subset of features or attributes gives both types of data that is labeled and unlabeled problems and their result gives exact classifier for many learning algorithm [12]. OFS has to gives two different category in different environment: the first task of OFS by learning with full input data, this task contains learning with all data in to the high dimensional dataset and find the subset of effective features, the second task contains OFS by learning with partial input data, this task contains the access of limited features of large dataset.

Differential Evolutionary (DE) is one of the algorithms for optimization which is constructing to use distinct number of logic, distinct model and also their own merits and demerits. To increase the solution with regard to a given measure of aspect the differential evolution is a technique for optimizing a problem by iterative form. In very large space of dataset many techniques are generally known as not assumption round the problem being optimized. FS has been found wide applications in various fields, mainly for the problems having large-scale approach for high dimensional data. To collect the all information of training data such suppositions may not always correct for real-world applications. Bioinformatics is one of the examples of FS, which consist set of features or attributes and for each iteration it is expensive because high cost of conducting experiments. Finding the relationship between two or more feature here the correlation is best. Correlation method is one of statistical class of statistical relationship which involves dependence between common features. For clustering purpose Nearest Neighboring Algorithm is used it is easy to implement and executes quickly. In present research data mining is most popular method for the purpose of analyzing read accident data.

The aim of this study is to find out effective way to select the best suitable distance metric to cluster the series of counts is expected that to provide a better clustering result. It is observed that in many practical applications online and batch algorithms has heavy data with missing features. Online setup has comparison hypothesis which is fixed throughout any given iteration and extending the standard setting. In case of batch setup imputation function which are used to fill in value of missing features with classification hypothesis are find by convex relaxation of non-convex problem.

II. RELATED WORK

This research work is mainly related to studies of online learning of two tasks and their feature selection. The reviews on related important work are as follows. First OFS: Online Feature Selection based on Regression Analysis and Clustering Method with its application. Second Online Feature Selection with its applications [1]. Recently, many numbers of online learning algorithms has proposed. Here Correlation has used to find the relation between two or more features. The relation between pair of features to each other can be studied by correlation statistical method. Consider one example i.e. height and weight both are related to each other, taller people look heavier than shorter people, this relation is perfect by correlation. For finding the predictive relationship between features the correlation is mainly used, i.e. for example production of electricity may get vary depends on whether conditions. The more or heavy use of electricity is for heating or cooling is depend on extreme weather conditions. In this example it shows that the correlation is not sufficient to demonstrate presence of casual relationship. In mathematical conditions/methods of probabilistic independence do not satisfy random variables of any conditions referred by the dependence. Correlation works on many random variables from independence relationship, and also works on several types of relationship arise in between mean values of variables. For combination of most related features there is clustering technique used which is contain group of related attributes. Nearest neighbor clustering algorithm used because it takes nearest related attribute for clustering .Nearest neighboring is a part of supervised learning that has used in so many applications in the field of data mining, pattern recognition, image processing and many other applications. OFS technique has two different types of tasks which are as follows:

1) Using OFS, learner can read with full input of dataset and
2) Using OFS, learner can read with partial input of dataset.

In the first task of OFS, learner can access all the features which are involved in to the dataset of training data, and find the exact number of features that are used for accurate prediction. The second task is also same but in this task learner is allowed to access only minimum and fixed number of features for each training data instance of large dataset to find the subset of related features [2]. Clustering method based on a fitness function that relies on a distance measure and usually tries to develop "tight" clusters. Nearest neighboring algorithm has simple and powerful rule. It runs fast and gives proper output for the clustering. It has requires lot of training data and reduces the noisy data. Also reduce the redundant data from large dataset. After the clustering of related features has done then evolutionary optimization has done. The algorithms that allow optimization of fitness function of different variables. Online learning algorithms have become especially popular in natural language processing for tasks including classification, tagging, and parsing [5].

In feature selection technique, how the algorithm and training set interact with each other, is depends on the best performance analysis with a particular learning algorithm on a particular training set of the large-scale dataset. The optimal feature subset selection method and related wrapper method both are related to each other and having in good relationship. Both methods are used to search an optimal feature subset to a particular algorithm and particular domain [7]. The large applications methods that have already been implemented in the machine learning and so many data mining fields, but some particular applications such as bioinformatics have to be implemented in a wealth of newly proposed method [8]. Budgeted learning has three variants, such settings in which the learner allowed to access a small and exact number of features from training data in large-scale dataset. The first setting is "local budget", in which the design of an efficient algorithm for linear predictors that actively work for selecting the features of each training instances. In the second setting contains the "global budget", in that overall numbers of features are taken for accessing the training data [10].

A. *Differntial Evolutionary (DE) Algorithm*

In high dimensional dataset at the time of analysis the objective of feature selection is to select the features from dataset which has no target variables or features. All selected features are found at the possible targets which are derived from the complete large dataset and also from subset of it.
The accuracy and complexity of prediction model is based on the dataset which are reduced by using feature selection or any other technique, and comparison is done with in both technique and also those complete large-scale dataset. The final analysis of dataset shows the similarity in the correlated features which was chosen by using the supervised (filter) technique and change the consistency those which are selected by the clustering techniques i.e. nothing but unsupervised method. In large part of dataset the number of features distribution is based on correlated features from many features groups and also learning algorithms selected by as per the user need [9].

The Differential Evolutionary (DE) algorithm is mainly used for large population based dataset i.e. also same like genetic algorithm for optimization, both are use the same operators such as crossover, mutation and selection process. Finding the better solution for the problem is common in both algorithms but genetic algorithms based on crossover function only and DE is based on mutation operator. The main work of both algorithms is based on the differences in between randomly selected pairs of solutions in large-scale dataset. DE algorithm uses the purpose of a search method i.e. mutation operation and for purpose of direct search in to the specified area i.e. for use the selection operation. The components of the present dataset members that are construct the many trial vectors; in that crossover is the operator for recombination. It shuffles data from search space for finding the best solution. For representation of D-dimensional search space the optimization process consist of D parameters. In DE algorithm the solution of data is successfully improved by using mutation operator, crossover and selection operators. For using crossover operator that can take child node parameter from one parent node i.e. is done from many others node.

DE algorithm has some important steps they are as follows:

1. Initialization of data from Evaluation
2. Repeat above step
3. Mutation Recombination process
4. Evaluation Selection Until target termination criteria are met

The real-world applications such as problems have many objective functions i.e. non-linear, noise full data, flat and multi- dimensional problems they are difficult to solve analytically but by using global optimization this can be done very efficiently. For finding the approximate solutions in high dimensional dataset DE is mainly used:

i. DE is an Evolutionary Algorithm for optimization
ii. This class also includes Genetic Algorithms which is used for optimization, Evolutionary Strategies also Evolutionary Programming

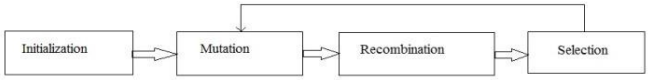


Fig 1: General Evolutionary Algorithm Procedure

B. *How To Calculate Correlation Matrix*

Correlation matrix provides the relations between features it is a type of matrix, which is also provides the correlation between whole pairs of data sets in a matrix. It should use at the time of optimization in DE algorithm.

Sum of squared matrix

$$1/(a-1)\begin{vmatrix} PP_{XX} & PP_{XY} & PP_{XZ} \\ PP_{YX} & PP_{YY} & PP_{YZ} \\ PP_{ZX} & PP_{ZY} & PP_{ZZ} \end{vmatrix}$$

Where,
a=N * N Matrix value

$$PP_{XX} = \Sigma (X_i - \bar{X})^2 \quad (1)$$

$$PP_{XY} = \Sigma (X_i - \bar{X}) * \Sigma(Y_i - \bar{Y}) \quad (2)$$

Similarly

$$PP_{XZ} = \Sigma (Y_i - \bar{Y}) * \Sigma(Z_i - \bar{Z}) \quad (3)$$

Correlation Matrix

$$\begin{vmatrix} 1 & S_{XY} & S_{XZ} \\ S_{YX} & 1 & S_{YZ} \\ S_{ZX} & P_{ZY} & 1 \end{vmatrix}$$

Where,
a = N * N

$$S_{XY} = PP_{XY} / \sqrt{(PP_{XX} * PP_{YY})} \quad (4)$$

Based on eq. (1), (2), (3) and eq. (4) the correlation matrix is calculated that can be used for at the time of DE optimization. That contains the relations between variables or features. In many research areas there are many real-world applications for which has large datasets that contains hundreds or thousands of features, so the research focuses mainly on

feature selection. The research areas of online feature selection include the text processing of internet documents, microarray gene expression analysis, and also combinational chemistry. The main goal of feature selection is done for three reasons:

1. For improving the prediction performance of the predictors.
2. Provides faster and more cost-effective data for predictors.
3. Also provides a better understanding of the process that generates the data [6].

C. Online Feature Selection (OFS)

The real-world applications has deal with series of training data with high dimensionality at that time the OFS technique is very important and useful. The online spam classification tasks, for this example the traditional batch feature selection technique cannot be use directly. This research introduces the problem of online feature selection for multiclass classification datasets, by using correlation, clustering method and also DE algorithm. Feature selection can be done by using two tasks of OFS they are as follows:

1) OFS: Learning with Full Input data

This task of OFS technique contains the DE algorithm. In this the learner can access all the input from start to end and select the features from large-scale approach with in high dimensional dataset. The primary goal is to find an exact number of relevant features for accurate prediction or analysis and removes the noisy, unwanted data from the dataset.

2) OFS: Learning with Partial Input data

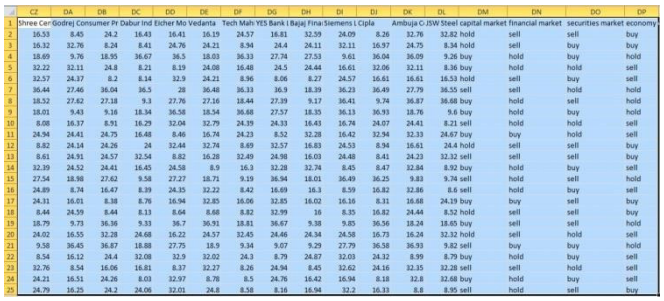
This second task of OFS technique, the learner is works same like the first task i.e. learning with full input, but in this task learner is allowed to access partial input only. This task contains partial data of the each training instance. In the form of percentage the data is given that shown in the following example.

III. RESULTS

This result section contains an extensive set of real-world examples to perform the proposed OFS technique and DE algorithms. OFS tasks works on several applications from machine learning repository which has multiclass classification dataset. In this the multiclass stock market data set has considered for demonstrating the result of OFS technique. The dataset has related to stock market in that daily up, down values stored. The data should be in numerical form. That data will distributed in four fields. The class values are hold, buy and sell. There are two tasks where the OFS runs:

A. OFS Learning with partial input data from the dataset

This task contains all input data, so the user or learner can enter any percentage of data. After entering any percentage of data we get approximate same accuracy.



	C2	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP
1	Shree Cer	Godrej	Consumer Pr	Dabur Ind	Eicher Mo	Vedanta	Tech Mah	YES Bank (	Bajaj Fina	Siemens L	Cipla	Ambuja C	JSW Steel	capital market	financial market	securities market	economy
2	16.53	8.45	24.2	16.43	16.41	16.19	24.57	16.81	32.59	24.09	8.26	32.76	32.82	hold	sell	sell	buy
3	16.32	32.76	8.24	8.41	24.76	24.21	8.94	24.4	24.11	32.11	16.97	24.75	8.34	hold	sell	buy	buy
4	18.69	9.76	18.95	36.67	36.5	18.03	36.33	27.74	27.53	9.61	36.04	36.09	9.26	buy	hold	buy	hold
5	32.22	32.11	24.8	8.21	8.19	24.08	16.48	24.5	24.44	16.61	32.06	32.11	8.36	buy	hold	hold	sell
6	32.57	24.37	8.2	8.14	32.9	24.21	8.96	8.06	8.27	24.57	16.61	16.61	18.53	hold	sell	buy	sell
7	36.44	27.46	36.04	36.5	28	36.48	36.33	36.9	18.39	36.23	36.49	27.79	36.55	sell	sell	hold	hold
8	18.52	27.62	27.18	9.3	27.76	27.16	18.44	27.39	9.17	36.41	9.74	36.87	36.68	buy	hold	sell	hold
9	18.01	9.43	9.16	18.34	36.58	18.54	36.68	27.57	18.35	36.13	36.93	18.76	9.6	buy	hold	buy	hold
10	8.08	16.37	8.91	16.29	32.04	32.79	24.39	24.33	16.43	16.74	24.07	24.41	8.21	sell	hold	hold	sell
11	24.94	24.41	24.75	16.48	8.46	16.74	24.23	8.52	32.28	16.42	32.94	32.33	24.67	buy	buy	hold	sell
12	8.82	24.14	24.26	24	32.44	32.74	8.69	32.57	16.83	24.53	8.94	16.61	24.4	hold	sell	sell	buy
13	8.61	24.91	24.57	32.54	8.82	16.28	32.49	24.98	16.03	24.48	8.41	24.23	32.32	sell	sell	sell	buy
14	32.39	24.52	24.41	16.45	24.58	8.9	16.3	32.28	32.74	8.45	8.47	32.84	8.92	buy	hold	buy	sell
15	27.54	18.98	27.62	9.58	27.27	18.71	9.19	36.94	18.01	36.49	36.25	9.83	9.74	sell	hold	sell	hold
16	24.89	8.74	16.47	8.39	24.35	32.22	8.42	16.69	16.3	8.59	16.82	32.86	8.6	sell	hold	buy	sell
17	24.31	16.01	8.38	8.76	16.94	32.85	16.06	32.85	16.02	16.16	8.31	16.68	24.19	buy	buy	sell	buy
18	8.44	24.59	8.44	8.13	8.64	8.68	8.82	32.99	16	8.35	16.82	24.44	8.52	hold	sell	sell	buy
19	18.79	9.73	36.36	9.33	36.7	36.91	18.81	36.67	9.38	9.85	36.56	18.24	18.65	buy	sell	sell	hold
20	24.02	16.55	32.28	24.68	16.22	24.57	32.45	24.46	24.34	24.58	16.73	16.24	32.32	hold	sell	hold	sell
21	9.58	36.45	36.87	18.88	27.75	18.9	9.34	9.07	9.29	27.79	36.58	36.93	9.82	sell	buy	buy	hold
22	8.54	16.12	24.4	32.08	32.9	32.02	24.3	8.79	24.87	32.03	24.32	8.99	8.79	buy	hold	buy	sell
23	32.76	8.54	16.06	16.81	8.37	32.27	8.26	24.94	8.45	32.62	24.16	32.35	32.28	sell	sell	hold	sell
24	24.21	16.51	24.26	8.03	32.97	8.78	8.5	24.76	16.42	16.94	8.18	32.8	32.68	buy	hold	buy	sell
25	24.79	16.25	24.2	24.06	32.01	24.8	8.58	8.16	16.94	32.2	16.33	8.8	8.95	sell	hold	sell	buy

Fig.2: Stock market dataset

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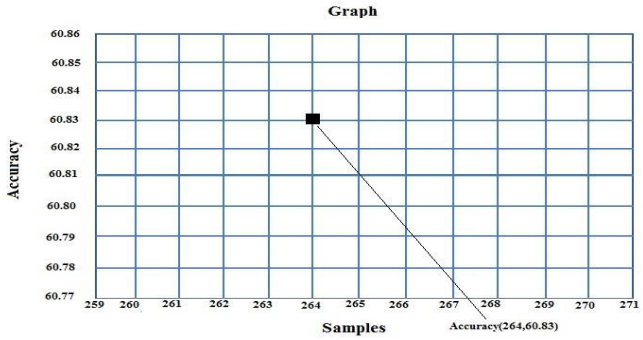

Fig.3: Accuracy graph for 90% of data

In Fig.3 shows the accuracy of selected features within stock market dataset. The data that is under the 90% is considered 264 rows which has taken for the processing the OFS technique. Correlation finds the relation between the dependent variable after that nearest neighboring algorithm used which finds near value for creating the cluster depends on clusters DE algorithm optimize the values with in large dataset. The following Table 1 shows the different percentage of data gives the same accuracy so selected features accuracy has fixed for any number percentage of data.

Table 1: Accuracy and time

Percentage of data given for OFS.	No. of rows within dataset taken for processing the OFS.	Accuracy of selected features.	Time(ms) for selected features.
90%	264	60.83	70ms
45%	140	60.81	25ms
48%	142	60.81	26ms
50%	139	60.27	29ms
80%	225	60.57	55ms

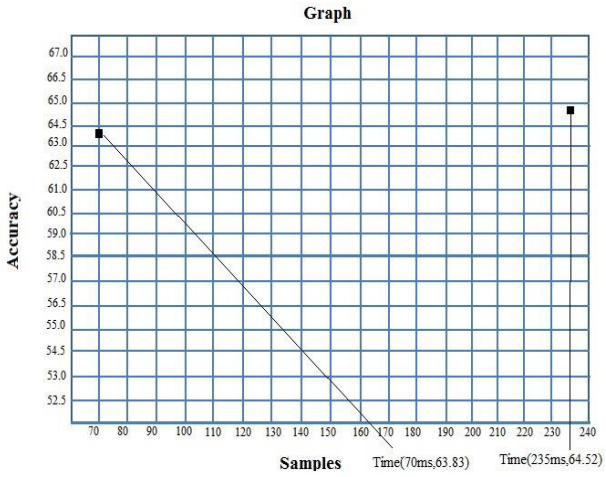

Fig.4: Displaying selected or remaining all features accuracy and their processing time.

The Fig.4 shows the accuracy of selected features and their processing time. In graph shows two plots first contains the time and accuracy for selected features and second plot shows the time and accuracy for all features with in the dataset. This above graph shows the comparison of selected features accuracy and all features accuracy which is approximately near to each other. Here using OFS technique if their accuracy is nearly same then, user can easily select the minimum features and that used for any purpose. By using this technique, improving performance of prediction model and also increasing the speed of processing model is easy. User also reduces complexity of prediction model.

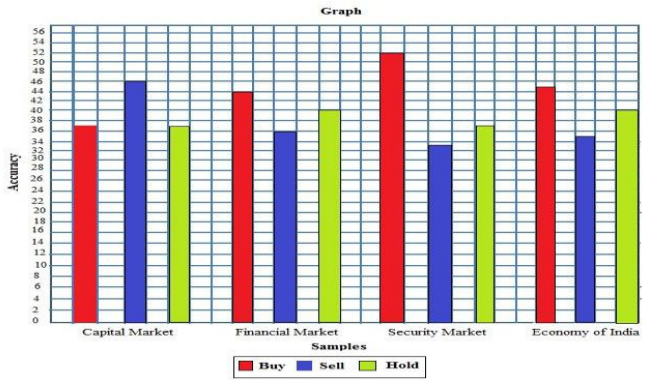

Fig.5: Selected features for analysis.

The Fig.5 shows the use of selected features. For any purpose that is analysis, prediction or any application development selected features used. In stock market, daily updates are arrived for every company. The values changed tries in day. When we have to predict or do some analysis for future work and we need to calculate the value for buy, sell and hold in minimum time for the daily stock that time we can easily use this OFS method for multiclass classification shown in Fig.5.
In this by using two task of OFS method we can select the minimum features that is nothing but minimum companies and calculate their accuracy if their accuracy is near to 100%. Then it gives approximate prediction on Buy, Sell and Holding of the data which has shown in Fig 4. The Table 1 contains the percentage of data and their no. of rows within the dataset which is use for processing the OFS techniques. The minimum average accuracy for any percentage of data that is near to 60% and their processing time is also near to each other which calculated in macro second.

B. OFS Learning with Full input data from the dataset

In task the working of OFS is similar to the partial input learning it takes the total percentage of data that is 100%. Afterward it will show the total number of features and their counts. It also shows the selected features accuracy and their time.

Table 2.: Comparison of Selected Features Accuracy and All Features Accuracy.

Percentage of data given for OFS.	Number of selected features	Accuracy of selected features	Time (ms) for selected features	Accuracy of all features	Time (ms) for selected features
90%	55	60.83	70ms	64.55	235ms
94%	49	64.28	68ms	64.52	429ms
78%	62	64.150	67ms	64.525	258ms
68%	50	64.28	44ms	64.52	177ms

In Table 2. Shows the comparison between selected features accuracy and all features accuracy or their processing time.
The accuracy of selected features or all features is approximate same so by using OFS technique user can easily do their future work in minimum time for large-scale dataset. In case of large dataset user have to more time for processing the dataset but by use of OFS technique user can take minimum time for finish their work or processing the large-scale dataset.

IV. CONCLUSION

This research work implements, online feature selection (OFS) which selects a small and fixed number of features for multiclass classification. The OFS technique has two ways in two different directions which are used for selecting the features in online fashion of the dataset. 1) OFS technique by learning with full inputs of all the features/attributes, and 2) OFS technique by learning with partial inputs of the features in large scale approach for high dimensional dataset. The OFS algorithms are used to solve each of the OFS tasks in multiclass classification data, and gives theoretical analysis on the numerical data from the high dimensional dataset. It also extensively shows proposed OFS techniques are mainly works for solving the real-world applications problem such as neural network, microarray gene expression, CPU Performance: introducing Numeric Prediction in computer vision, and also works on microarray gene expression analysis in bioinformatics.

In this its result analysis shows that algorithm is effectively works for feature selection tasks of many real-world online applications, this OFS algorithm is scalable and capable for handling large dataset. Future work can extend this framework to other settings, such as online feature selection for numerical, textual classification and it can also be extending for image classification

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