Simple Blog Searching Framework Based on Social Network Analysis

Iwona Dolińska
University of Economics and
Computer Science in Warsaw
Stokłosy 3, 02-787 Warsaw, Poland
Email: iwona.dolinska@wsei.pl

Abstract—**Blogs are very popular Internet communication tools. The process of knowledge sharing is a very important activity in the contemporary information era. Blogs are used for knowledge sharing on any subject all over the world. Knowledge gathered on blogs can be used in personal e-learning, which is a more informal and personal way of learning than the one offered by traditional e-learning courses. However, it is not easy to find valuable knowledge in the huge amount of invalid information. In this study the Simple Blog Searching framework is proposed to improve the blog searching process. The social network analysis methods of centrality measuring help to choose more easily the best results form the long list of hits, received from a blog search tool. To incorporate social network analysis methods, the blog searching have to be expanded with the blog links searching.**

I. Introduction

BLOGS are one of the most popular of the contemporary Internet communication tools. Blogs make an easy Internet publishing available to everybody. They are used for knowledge sharing. Some blogs are authored by very active and knowledgeable bloggers focused on specific knowledge domains [1]. Any kind of information on every subject can be found in the blogosphere.

Knowledge sharing is an activity through which knowledge (i.e. information, skills, or expertise) is exchanged among people, e.g. friends, or members of a family, a community or an organization. For knowledge sharing to happen, opportunities for interaction must be present. Blogs are very good tool for such kind of interaction.

Knowledge gathered on blogs can be used in personal e-learning, which is a very important aspect of present day life [2]. In the era of the knowledge economy many workers have to improve and extent their personal knowledge almost every day.

Everyone, who wants to learn anything can use knowledge collected on blogs [1], [2]. Blogs offer high searchability, because each post can be tagged with a category and can be retrieved easily by a simple search within that specific chosen category. But there is one fundamental problem with searching the blog content – the huge amount of hits, even using a specialized blog search tool. It can be very time consuming and frustrating for the learner to browse a long list of sources to find the relevant one.

To overcome this problem a simple search blog framework idea has been elaborated and will be presented in this article. The social network analysis (SNA) methods are used in this framework to improve search efficiency. SNA methods of centrality measuring allow to choose easily the best results form the long list of hits, received from a blog search tool.

II. The role of blogs in knowledge sharing

A. Knowledge sharing evolution

We can observe the rapid expansion of the process of information exchange and information sharing during the last few years. The industrial economy is replaced by the knowledge economy. Information technology continues to infiltrate all aspects of activities in a human society, such as business, schooling etc. Nowadays, more and more information builds the human knowledge. On the other hand, the human knowledge is build not only from information. Human knowledge is build also by sharing experiences and skills. People often learn from others. The knowledge has to be properly managed to remain being accessible and to be shared among people. For knowledge economy to function well, good knowledge workers are the foundation [1]. The good knowledge worker is a person possessing a decent understanding of knowledge searching and having the skills to convey knowledge sharing effectively.

Knowledge sharing is in some aspects similar to e-learning. Both are incorporating an Internet and multimedia technologies, both can use shared knowledge repositories, accessible by web tools and finally both of them are types of technology supported learning [3].

For knowledge sharing to happen, opportunities for interaction must be present. Traditionally, people communicate to share their learned lessons, experiences, insights and best practices through face-to-face meetings. Knowledge is usually shared by telling stories. However, these methods are practical only, when community is small and immobile. These methods are not effective for connecting the minds of people dispersed around the globe [1].

Nowadays only the Internet technologies are relevant for globally sharing of knowledge and experiences among people. Chat tools enable people to meet and discuss topics of their interest in a synchronized manner, i.e. simultaneously, when all engaged parties are on-line. Internet fora allow to discuss different subjects by writing text posts to the post list. All discussion members can read and answer the posts. Blogs provide much more possibilities and are the most con-

venient and the most advanced tool for knowledge sharing and distance learning.

B. Blogs supported knowledge sharing

Blogs allow to publish posts with rich content, tagged with categories [2]. In their posts authors can place links to another posts or another information gathered on the Web. Many blog providers support a blogroll – a list of links to other blogs or sites, used or recommended by the blog author. On the other hand, blog readers can place comments and reviews, often with links to their own blogs or another Web content. All these kinds of links are presented in Fig 1. In the other words, blogs offer bidirectional communication between authors and users on the scale, which is impossible to be achieved with earlier communication tools, i.e. e-mail, discussion lists, static personal websites or even Internet forums [3].

With all these kinds of links, blogs has formed a giant network, which is called blogosphere. Blogosphere is a collective term encompassing all existing blogs and their interconnections. It is often perceived that blogs exist together as a connected community (or as a collection of connected communities) or as a social network [5].

There are several purposes for writing blogs and corresponding types of blogs in blogosphere [7]. Blogs, which serve as diaries are called personal blogs. Blogs providing commentary and opinions are called issues blogs. And blogs, which articulate ideas through writing or serve as community forums are called topical blogs [7]. From the point of view of knowledge sharing the last type is more important than the others. The blogs with significant amount of knowledge collected on them are also called as knowledge blogs (or k-blogs) [8].

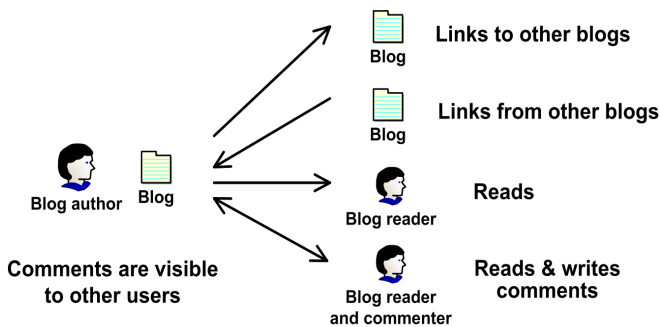Blogs create a context for dialogues between bloggers and

Fig 1. Bidirectional communication offered by blog, based on [4]

readers. Through conversations initiated by bloggers and engaged with by readers, blog platforms build a solid base of shared experiences and mutual relationships [2]. The interaction between bloggers and other users is also reflected by the role conversion of bloggers. Initially, bloggers receive information. During this process, bloggers are data consumers. Then, bloggers absorb the knowledge they have gained and publish new knowledge on their blogs. In this case, bloggers act as knowledge publishers [6].

Computer-mediated discourse is shaped both by specific technology features and afforded by social practices of

users. To better characterize blogging discourse, it is helpful to compare blogging briefly with other CMC (computer-mediated communication) fora. Blogging shares some features and practices with social networking applications within the technologies under the Web 2.0 umbrella, but it also has some distinct characteristics [8]. RSS (real simple syndication) and mashup applications, for example, allow users to summarize information items and access only updated information from multiple sources and to combine multiple sources of information into a single outlet. Bloggers, in contrast, usually develop their own content, even when referencing MSM news sources or other blogs or searching for content to create lists of links to interesting websites. Blog readers can use RSS and syndicate their favorite blogs in order to access only the latest posts [8].

III. Blogs as a knowledge source in personal e-learning

The traditional e-learning environment is asymmetric, with clear distinction between the roles of a teacher and a student [9]. Traditional learning theory emphasize mainly the teacher's point of view. The teacher is the person who prepares the curriculum, learning aids and points out learning path. The students' role is more passive in such situation – they learn from materials prepared earlier and accomplish exercises and quizzes. This traditional approach has been used for a long time in formal university e-learning courses. E-learning systems, which can be briefly categorized as learning management systems (LMS) or learning content management systems (LCMS), still concentrate on the knowledge delivery by lecturers only [9].

In the last years the need of more informal learning has been arisen. Many university programs require numerous informal learning activities, which are difficult to be achieved with LMS or LCMS systems. On the other hand, the Web 2.0 expansion brought new tools, like wikis, blogs, news readers, communication tools etc. They allow for new possibilities, like learning with people, controlling the learning resources, managing the student activities, and integrating the formal learning with informal learning [10].

The traditional asymmetric learning environment, with its clear distinction between the roles of instructors and students, is becoming more symmetric and based on communities of practice. Students will no longer passively consume learning materials but actively create and disseminate knowledge. Personal learning environments (PLEs) emphasize symmetric connections with a range of services in both formal (instructor-led) and informal (student-led) learning, work, and leisure. Rather than integrating tools within a single context, PLEs coordinate connections between users and a wide range of services offered by organizations and other individuals [11].

Personal learning environment can be defined from different points of view. For some, the PLE concept facilitates choice and control by students, allowing the selection and combination of informal and formal learning opportunities from a variety of sources. Others see the PLE as an extension of the portfolio, providing a learner-centered environ-

ment in which students can record achievements and plan and work towards new goals [10].

But in spite of these differences, personal e-learning environments are well adapted to the life-long learning, which is very important activity in the nowadays information world. Personal learning includes a progress of knowledge identification, knowledge acquisition, knowledge development and knowledge utilization [12]. The stages of identification and acquisition of knowledge can be supported by using knowledge gathered on blogs. But the most valuable and innovative knowledge is hard to be found, and it lies within distributed communities and networks.

IV. SEARCHING IN BLOGOSPHERE

A. Blogosphere searching problems

Everyone, who wants to learn about any subject can use knowledge gathered on blogs [1], [2]. Blogs offer high searchability, because each post can be tagged with a category and can be retrieved easily by simply searching within that specific chosen category. But, like it was mentioned above, there is one fundamental problem with searching in blogs – the huge amount of hits (low query selectivity), due to tremendous dimension of the blogosphere. There are specialized blog search tools like Google Blog Search, Yahoo API Search, Blog Pulse (http://www.blogpulse.com/), Blog-Catalog (http://www.blogcatalog.com/), and others in blogosphere. These tools allow users to search for data in blogs by tipping some keywords. But even using such specialized blog search tool does not make the search result list shorter. They all give extremely long lists of results. It can be very time consuming and frustrating for the student to break through such list of sources to find the most relevant ones. The most valuable knowledge is usually hard to be found.

The researchers have already worked out some solutions to solve the problem of searching in blogs. Blog searching has usually a specialized research purpose. The blog searching methods incorporate different techniques, depending on the domain of use. One part of these methods are based on blog ontology, another is based on clustering methods and finally some of them incorporate social network analysis methods.

B. The solutions developed in blog searching domain

The example of using blog ontology is described in [13]. Campos and Divino give a strict definition of the formal specification of structured Social Web data to express the information contained blog data sources [13]. The semantic structure provided in the blog ontology can be used by users and applications to state semantic tagging to blog resources. It can help then to retrieve relevant resources, to categorize and to organize content, and to navigate it meaningfully. The authors of this study propose also a framework for Blog Visualization System, which is based on the blog ontology. This tool can help users to track and analyze the spreading of memes through blogs. The term "meme" refers to a unit of cultural information (including deities, concepts, ideas, theories, opinions, beliefs, practices, habits, dances and moods) that is transmitted verbally or by demonstration

from one mind to another mind [13]. So this is a specialized tool for visualization of meme spread path in the blogosphere.

Agarwal, Galan, Liu, and Subramanya present the blog clustering method in [14]. Blog site clustering helps better organize the information. This method also allows for optimizing the search engine by reducing the search space. So the search results are obtained faster [14]. Presented method of clustering incorporates a collective wisdom, gathered by bloggers on Blog Catalog directory, which allows bloggers to label the blogs under a given hierarchy. The collective wisdom is the wisdom generated by bloggers, when they tag and catalog their posts. Clustering method is applied to the labels rather than to blogs [14]. It means that the authors cluster blog categories. Such approach is time sensitive and adaptive to the current interests. But this method is difficult to use by an individual user.

A blog mining framework described in [7] is another very interesting example of blogosphere analysis. This framework consists of blog spider, blog parser, blog analyzer and visualizer [7]. Blog spider monitors and downloads content from multiple bloghosting sites. Blog parser extracts information from blogs, it is a specialized tool for blog content analysis. Blog analyzer extracts particular key phrases by using text mining technics. The blog analyzer is also capable of analyzing the network relationships among bloggers. And finally the blog visualizer presents content and network analysis [7]. Described framework allows to make complex analysis of the blogosphere on specified domain, like politics, business, cultural studies, and others [7].

C. Social network analysis in blogosphere searching

Many researches use social network analysis for the blogosphere exploration. But this method is used to find particular blogger groups rather than for blog searching.

Pikas studied the communities within the science blogs network [15]. She applied social network analysis to yield an understanding of the topology of the science blogosphere, basing on the blogs gathered on ScienceBlogs.com. The research started with an initial list of blogs, from which the blogroll links were gathered. Another list of links was selected from links in comments. Obtained lists of blogs were used to create a blog network and then social network analysis methods were applied to detect and describe network communities of scientists owning blogs [15].

Social network analysis is also used for finding friend groups in blogosphere, like it is described in [16]. S.-T. Kuan, B.-Y. Wu, and W.-J. Lee present a pre-processing algorithm based on n-clique extension for social network. After the pre-processing of social network the cliques can be directly found. These cliques can be formed into some representative friend groups [16].

V. SIMPLE BLOG SEARCHING FRAMEWORK

A. The simple blog searching framework overview

Social network analysis, as it is mentioned, is often used to analyze blogosphere content, to describe relationship between bloggers or to find influential bloggers in the net-

work. The fact that influential bloggers usually possess good knowledge blogs is the basis of the presented research. A blog of influential blogger, from the SNA point of view, has a high centrality value. As a simple centrality measure the in degree value can be used. In the blogosphere the in degree value denotes the number of links pointed at this blog. In the other words, the in degree value corresponds to the number of the links from other blogs to this blog. These links can be placed on blogroll or in posts. The fact that a blog has the high in degree value means, that many other bloggers regard this blog as a valuable one. Such blog can be useful in e-learning [17].

To find links pointed at the blog, the other blogs have to be searched and links from their blogrolls have to be collected. All these links form a social network, which can be visualized in the form of a graph and than can be analyzed with SNA methods. If knowledge blogs with the high in degree centrality are found in the blogosphere, these blogs could be used in e-learning.

The entire blogosphere can be represented as a directed graph, so any graph node (i.e. blog) can have not only the in degree measure, but also the out degree measure and the out degree centrality. The out degree value denotes the number of links from this blog to the other blogs. If a blog has a high out degree value, it means, that many links pointed out to another blogs are gathered on this blog. This fact is also incorporated in the described framework. High out degree value usually means, that the blogger, possessing his blog, has surfed a lot through the blogosphere and that he has gathered many interesting links and a lot of information on the blog. So such blog can be useful in e-learning as well [17].

For directed graph the all degree value for node can be calculated as a sum of in degree and out degree values. All degree centrality can be also used in blog searching process. It could be used as a additional criterion, confirming the value of a blog for e-learning.

In this article the simple blog searching (SBS) framework is proposed to enable users to make the process of searching in the blogosphere easier than with search tools described in the previous chapter. The scheme of this framework is presented in Fig 2. In this framework all the centrality measures, described above, are used to find the most valuable knowledge blogs.

B. The simple blog searching framework modules

The simple blog searching framework consists of four modules: BL Search Tool, SNA Analyzer, Network Visualizer and K-Blogs List. All of them are working in a pipe manner, i.e. the output of one module is the input for the next one.

The first module of SBS framework is BL Search Tool. BL means that this module is searching for the blogs and for links connecting these blogs. The links between blogs are needed for the next step, i.e. SNA analysis.

In the presented framework the blog searching process starts from finding the blog list with a blog searching tool. User has to define the selected category for this search. This category is specified by one or more blog tags or post tags. Additional criteria can include a time range or a blog language. After that, from the obtained blogs, all blogroll links are gathered and then passed to the next step of the analysis. To obtain a better result, i.e. better connected network, the blogroll link gathering can be repeated several times. The initial list of blogs for each repetition is a result list from the previous repetition. This means that newly found blogs (pointed by links originating from the initial blog list) are added to the intermediate result. The number of link search steps can be one of the parameters of the module. The BL Search Tool can be implemented as a specialized script.

The next SBS part, SNA Analyzer is the module, in which SNA methods are used to form the network graph and then to find important network nodes. First, SNA Analyzer analyzes the list of blogs and links connecting them, obtained from the first module. All the data is formed into the directed graph, representing obtained social network of blogs. Then SNA Analyzer finds the nodes with the high values of in degree centrality and the out degree centrality measure. The nodes with the high all degree centrality measure can be found next, as a sum of two previous centrality values. The nodes with the high centrality value can be selected in two manners. User can choose the nodes with a degree greater than the configured threshold value or he can choose n nodes with the highest degree value, where n is a configured number of nodes.

In the current version of the SBS framework, Pajek [18] works as SNA Analyzer and Network Visualizer. Implementation of these two steps is of course not restricted to this tool only. One can use another social network analysis tools, like Graphviz [19], R [20] or Ucinet [21].

The last SBS framework step is K-Blogs List, module presenting the final results of blog search to the user.

VI. APPLICATION OF THE SBS FRAMEWORK

A. Data Gathering

For the purpose of this research it is assumed that potential framework user wants to learn about e-learning methods and practice, so blogs about "e-learning" (Pol. e-learning) and "distance learning" (Pol. nauczanie na odległość) were searched for. Data gathering was performed in April and May of 2010. Data gathering started with an initial list of blogs acquired from a specialized blog search tool, described in section IV.A. The search was limited to blogs written in Polish only. Blog searching included two cate-
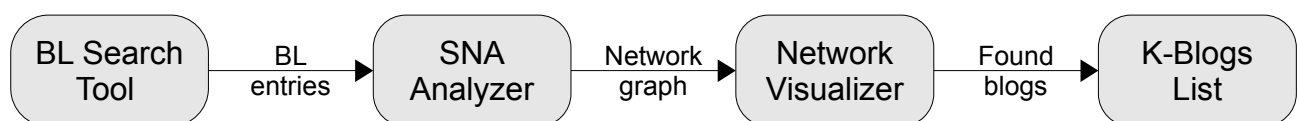

Fig 2. Simple Blog Searching framework scheme

gories, defined by tags "e-learning" and "nauczanie na odle-głość".

The obtained list of blogs was then manually visited with the web browser (Firefox was used) to verify the value of the knowledge featured. Commercial blogs were left out. For the purpose of this research the small sample of Polish blogs about e-learning was finally chosen. After finishing the initial list creation, all blogs from this list were visited again to gather the blogroll links. And this step was repeated once again, as it was explained in section V.B. The first module of the SBS framework, the BL Search Tool, finished its work with the network file, containing the list of blogs and links connecting these blogs.

B. Data Analysis

The obtained blogs and links, i.e. BL entries, were then forwarded to the SNA Analyzer, and that to Network Visualizer. As it is mentioned above, Pajek was used in this example to analyze and visualize the network. The resulting network is presented in Fig 3. It turned out that there is a very small number of blogs about e-learning written in Polish in the blogosphere. The resulting network graph of the e-learning blogs network is weakly connected, so the density of the network is very small (0.05). But even such a simple sample is still sufficient for showing different aspects of using the SBS tool.

The first step of network analysis is finding the nodes with the highest in degree value. Fig 3 presents the result of this step (green point represents the blog with the highest in degree value, blue points represent the second places, red points represent the remaining blogs). Table 1 contains the five nodes with the highest in degree values. The first and second column of this table contains the data obtained from SNA analysis: node number (NN) and its in degree value, i. e. in degree centrality measure (InD). Following two columns contain blog name and blog address. The fifth column shows the effect of manual checking of the blog content to judge its quality for usage in classroom scenario. This inspection was done to verify the SNA analysis result. In the Table 1 the most valuable (with the highest in degree centrality value) is the node number 5. Manual checking shows it is a very well written blog and a good source of knowledge. In this paper author's opinion the first and the second blog could be quite easily used in classroom scenario. The three following blogs also contains useful information and their parts could be used as a supplementary lecture.

The second step of network analysis is finding the nodes with highest out degree value. Fig 4 shows the result of this step (green point represents the blog with the highest out degree value, blue points represent the second places, red points represent the remaining blogs). Table 2 contains the three nodes with the highest out degree values. The meaning of the table columns is the same as for Table 1, with exception for the second column, containing out degree values for nodes ($OutD$). The first blog in this category, blog number 7, has the highest out degree in the presented example, because its author prepared a rich blogroll. In this paper author's opinion all three blogs could be used in classroom sce-

nario, but the second (number 1) in some topics only (a very good blog about cognitive science).

Both described steps of searching (for the highest in degree value and for the highest out degree value) give good results for established task of knowledge blogs finding. It means that a user can also take into account the result of the all degree value, which can be the next step of analysis. The result is presented in Fig 5 (point colors like in Fig 4). The best blogs in this classification are presented in Table 3. The result of this classification is the combination of the best results in first and second stages of analysis. It points out, that it is good criterion.

This research shows additionally that, from the point of view of presented method of blog searching, the connection making between blogs is a very important activity of the blog authors. The more connections from and to the blog, the more easily the potential student will find and use this blog.

The single nodes visible in Fig 3, are blogs with a very few information about e-learning or rarely updated blogs, but found by the search tool, because they have posts labeled with "e-learning" tag. The method of searching implemented in the SBS framework efficiently eliminates such nodes. They have zero in degree and out degree value. So they can be filtered out by such searching method.

Generally all blogs gathered in this research are valuable source of knowledge in the area of "e-learning".

VII. CONCLUSIONS

The process of knowledge sharing is a very important activity in the contemporary information era. This process can be effectively supported by good and useful technologies like blogs. The huge amount of knowledge is gathered on blogs, but the most valuable and innovative knowledge is hard to be found, and it lies within distributed communities and networks. This study presents a framework for simple blog searching, to make the process of knowledge gathering easier.

Simple Blog Search framework consists of four modules. SNA measures of in degree centrality and out degree centrality are used to help user in searching the blogosphere. The all degree centrality could be an additional searching criterion, confirming the blog usefulness. To use such a method the connections between blogs, constructing the network (i.e. hyper-links), must be used. To incorporate social network analysis methods, the common blog searching (i.e. searching with one or many tags) have to be extended with the blog links searching. In presented example links between blogs were gathered from blogrolls only. It is an easier way, but it can lead to weakly connected network, like shown in Fig 3. To create better connected network, links from comments and posts should be also collected. This is the subject for future work, because it demands more advanced scripts for links searching and collecting.
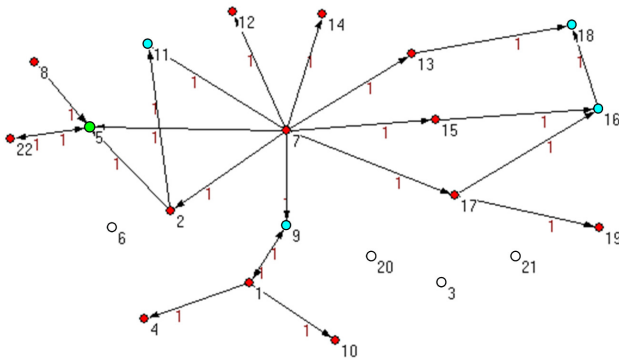
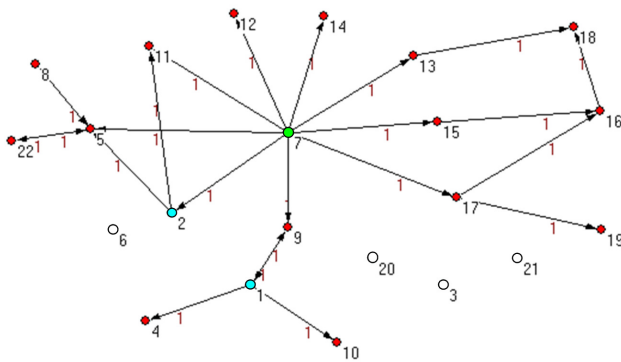Fig 3. The acquired social graph of the e-learning blog network with in degree partition marked [17]

Fig 4. The out degree partitions of the e-learning blog network [17]
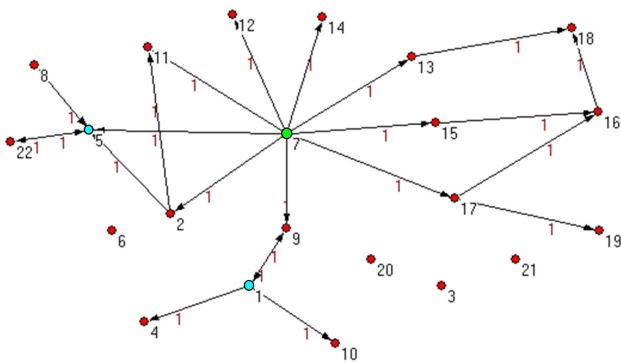

Fig 5. The all degree partitions of the e-learning blog network

Also the core of this method, i.e. centrality measuring manner (in degree and out degree centrality) will be replaced in the future research by more advanced measures of centrality and prestige measure calculation. To better confirm presented method of blog searching the English sites will be used in the future. It allows to extend the example sample and probably get more interesting result.

TABLE 1. THE NODES WITH THE HIGHEST IN DEGREE VALUE

NN	InD	Blog name	Blog address	Blog usefulness
5	4	Elearning 2.0	http://elearning-20.blogspot.com/	good source
9	2	E-learning według Bartka	http://e-learning.blog.pl/	good source
11	2	Edukacja-online	http://edukacja-online.pl/	good parts, supplement
16	2	Edunews	http://www.edunews.pl/	good parts, supplement
18	2	e-mentor	http://www.e-mentor.edu.pl/	good parts, supplement

TABLE 2. THE NODES WITH THE HIGHEST OUT DEGREE VALUE

NN	Out D	Blog name	Blog address	Blog usefulness
7	9	Mentor Online	http://mentor.sceno.edu.pl/	good source
1	3	Mechanika umysłu	http://www.mechanikaumyslu.pl/	good source
2	2	eLearning dla opornych	http://elearning2.blox.pl/	good, basic level

TABLE 3. THE NODES WITH THE HIGHEST ALL DEGREE VALUE

Node number	All degree	Blog name	Blog address
7	9	Mentor Online	http://mentor.sceno.edu.pl/
5	5	Elearning 2.0	http://elearning-20.blogspot.com/
1	4	Mechanika umysłu	http://www.mechanikaumyslu.pl/

REFERENCES

[1] A. A. Nasr, M. M. Ariffin, "Blogging as a means of knowledge sharing: Blog communities and informal learning in the blogosphere," *International Symposium on Information Technology*, vol. 2 2008, pp. 1–5.
[2] Y.-J. Chang, Y.-S. Chang, C.-H. Chen, "Assessing Peer Support and Usability of Blogging Technology," *Third International Conference on Convergence and Hybrid Information Technology*, 2008, vol. 1, pp. 184–189.
[3] I. Dolińska, "Blogs as a distance learning tool" in *Computer Aided Technologies in Science, Technique and Education*, A. Jastriebow, Ed. Radom 2009, pp. 281–284.
[4] I. Dolińska, "The role of blogs in e-learning and knowledge sharing," in *E-education advancement*, L. Banachowski, Ed. Wydawnictwo PJWSTK, Warsaw 2010, pp. 173–181.
[5] "Blogosphere" in Wikipedia, available: http://en.wikipedia.org/wiki/Blogosphere, accessed 05/09/10.
[6] X. Zhao, "Research on the Knowledge Transfer in Academic Blog," *Second International Symposium on Intelligent Information Technology Application*, 2008.
[7] M. Chau, P. Lam, B. Shiu, J. Xu, C. Jinwei, "A Blog Mining Framework," *IT Professional*, 2009, vol. 11, no. 1, pp. 36–41.
[8] E. Davidson, E. Vaast E, "Tech Talk: An Investigation of Blogging in Technology Innovation Discourse," *IEEE Transactions on Professional Communication*, March 2009.
[9] H.-Y. Chiu, S.-Z. Wen, C.-C. Sheng, "Apply Web 2.0 Tools to Constructive Collaboration Learning: A Case Study in MIS Course," *Fifth International Joint Conference on INC, IMS and IDC*, 2009, pp. 1638–1643.
[10] C. D. Milligan, P. Beauvoir, M. W. Johnson, P. Sharples, S. Wilson, and O. Liber, "Developing a Reference Model to Describe the

Personal Learning Environment," *Innovative Approaches for Learning and Knowledge Sharing*, Springer Berlin 2006, pp.506-511.

[11] M.M. Organero, C.D. Kloos, P.M. Merino, "Personalized Service-Oriented E-Learning Environments," *IEEE Internet Computing*, vol. 14 , no. 2, 2010, pp. 62–67.

[12] H. Li, X. Yang, S. Zao, "Research on Postgraduate's Personal Knowledge Management Based on Blog and RSS," *International Symposium on Knowledge Acquisition and Modeling*, 21-22 Dec. 2008, pp. 191–195.

[13] A. Campos, R. Dividino, "Blog Ontology (BloOn) & Blog Visualization System (BloViS)," *First International Workshop on Ontologies in Interactive Systems*, 2008, pp 83–88.

[14] N. Agarwal, M. Galan, H. Liu, S. Subramanya, "Clustering Blogs with Collective Wisdom," *Eighth International Conference on Web Engineering*, 2008, pp. 336–339.

[15] C. K. Pikas, "Detecting Communities in Science Blogs," *IEEE Fourth International Conference on eScience*, 7-12 Dec. 2008, pp. 95–102.

[16] S.-T. Kuan, B.-Y. Wu, W.-J. Lee, "Finding Friends Groups in Blogosphere," *22nd International Conference on Advanced Information Networking and Applications - Workshops,* 25-28 March 2008, pp. 1046–1050.

[17] I. Dolińska, "The application of SNA methods in thematic blog searching for the purpose of distance learning," *X Conference Virtual University- model, tools, practice*, Warsaw 2010, submitted for publication.

[18] "Pajek—Program for Analysis and Visualization of Large Networks," available: http://pajek.imfm.si/doku.php, accessed 05/14/10.

[19] "Graphviz - Graph Visualization Software," available: http://www.graphviz.org/, accessed 05/14/10.

[20] "The R Project for Statistical Computing," available: http://www.r-project.org/, accessed 05/14/10.

[21] "UCINET," http://www.analytictech.com/ucinet/, accessed 05/14/10.