Some Thoughts about the Past and the Future of the IFAC Workshops on Real-Time Programming.
Welcome Address of the Founder

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Abstract: The paper presents an account of the early occurrences of the Workshop on Real-Time Programming by one of its original organizers and advocates. Some comments on current state and future of real-time programming are also given.

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1. INTRODUCTION

A few months ago Prof. Zalewski, the program chairman of this 30th IFAC/IFIP Workshop on Real-Time Programming (WRTP), asked me to give an invited paper on a subject of my own choice. The reason for this honourable proposal was that I had been somehow involved in the foundation of this series of scientific meetings in the early 1970ties. Unfortunately I was not able to accept, because since some time my physical problems (which are a consequence of Polio I contracted back in 1960) prevent me from any serious travelling.

In addition I have "suffered" from considerable "mental restlessness" through all my life, which has caused me to change my professional field of activity several times. My last favorite areas of work were management of software projects, human computer interaction, virtual and augmented reality and creativity training for engineers. However, all this took place within the area of process automation - which of course is one of the main application areas of real-time systems. Nevertheless, I somehow lost contact to the more detailed problems of this fascinating area of software development. So we agreed that at least I should write down some thoughts about the foundation of these workshops as well as differences between the topics of "back then", today and, perhaps, tomorrow. I hope that you will find the following a useful contribution.

2. THE PAST

First of all I want to congratulate all those people who have worked hard to make these workshops survive since 1971 to their persistence and their diligence. During this time we have seen the rise and fall of quite a number of other scientific events that had much more ambition and support of the scientific establishment behind them. In the contrary, when we started these workshops back then, real time systems were not regarded as "proper science" by the then young computer science. This at least was true in Germany.

One reason was that real time systems could not be handled by means of the (then almighty) "automata theory". It appears to be interesting that a few years ago computer science found out that too little research had ever been done in our area and that from now on they had to take over and "do it right". They even coined a new term for our area of work: "embedded systems".

Even practitioners in the computer area did not understand what our problems were. So once the boss of the computer centre of the university of Erlangen asked me why we would need a separate computer for our experiments at all. He held that his "CDC" was so powerful that we just needed a connecting cable to his central computer and he could provide all the computer power we needed as a negligible by-product.

But on the other hand we had allies as well who urgently needed our results. I just can mention the airplane industry, large industrial compounds like power stations, chemical plants, rolling mills and, after all, the big research laboratories in the field of nuclear physics. So it happened that in 1971 three British researchers from the AERE at Harwell - Ian Pyle, Ivar Hooton and R.I. MacDonald - initiated and organized the first WRTP (Pyle et al. 1972). Because of the support of Euratom it immediately had a good European basis. Its 66 participants came from the UK, France, Switzerland and Germany. I was one of them and immediately liked the idea.

Thus the next WRTP took place in 1972 at Erlangen, though we just operated a rather small accelerator lab. Together with Ian Pyle I edited the proceedings (Pyle and Elzer, 1975). Unfortunately I could not find the list of participants any more, but the list of authors shows that we even could include papers from the USA. One of the local organizers was Peter...
Holleczek, who has later successfully been running the PEARL-workshops in Germany together with Wolfgang Ha-lang.

Another result of this Erlangen workshop was the contact to Janos Gertler, back then chairman of the IFAC Committee on Computers. He thought it to be a good idea to give the workshops an "established" organizational basis and to run them as IFAC workshops. And this they still are.

Now let us have a look at changes of the technical contents of the WRTP: In those early days nearly everything we developed was new. Computers and operating systems changed approximately every two years. Programs used to be written in the assembly language of these computers and therefore had to be re-written each time this computer changed. Program elements which were necessary for real-time purposes either had to be written in assembly language as well or were provided in the form of specialized operating system calls.

This meant that programs had to be completely redesigned or at least rewritten when a new computer was used. Everybody can imagine how cost-intensive and error-prone this method was. Therefore it appears to be self-evident that a lot of R&D and - as a consequence - most of the papers at workshops and conferences dealt with standardization of operating systems and higher level languages for programming real-time systems.

3. THE PRESENT AND THE FUTURE

Today it appears that the architecture of processors proper has not changed much since decades. Besides, there are a kind of "de facto standards" for commercially available operating systems that may be far from optimal (everybody is complaining about them), but nevertheless are used.

There even is a "standard" programming language, "C", that has been developed in the 1960ies for programming operating systems and other system software. It is much less convenient and more error-prone than the real-time languages we once developed, but for several reasons most developers use it. Thus the subjects of conferences and workshops have changed a great deal.

The discussion about system and software engineering methods has superseded that of programming languages proper since the 1970ies. Various approaches to the specification of software systems (sometimes even including the underlying hardware as well) have been presented at the workshops. Portability of programs (or at least program components) remains to be an important topic. A lot of research results concerning timing and scheduling of processes have been presented at the workshops since decades. Fault tolerance has also been intensely discussed - as well it should, taking into account that real-time programs often are part of safety (or life) critical applications.

But this certainly is not a final state yet. Real-time systems are becoming more and more part of everybody's daily life. E.g., an average car of today contains more real-time software than a power station of yesterday. And it is not used by experts who (mostly) know what they are doing and what they can expect from other experts' design. Average people who drive a car sometimes have quite strange ideas of what is going on under the hood. And, unfortunately, it appears as if today's designers often forget this. So it might e.g. be important to include topics like usability of real-time systems into future workshops. The various aspects of reliability, safety, security, dependability, fallback and recovery procedures, etc. would also be worth the effort.

So we have come to a possible future of the workshops. I am convinced that we will not run out of work the next decades. OK, let's begin with it. Therefore I wish all participants and organizers success and a busy - and therefore happy - future.

REFERENCES