Forty Years of Education and Research in Computers and Informatics at "Politehnica" University of Timisoara

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1 The Initial Impulse

The history of computing systems is very old, and is related with names that became famous. Wilhelm Schickard (1623), Blaise Pascal (1642), G.W. von Leibniz (1667) were the first in a series of renowned names having connection with mechanical computing machines. Charles Babbage was then the first who developed the "analytical engine," which had a mechanical structure but with programmable capabilities.

The real revolution was brought yet by the introduction of electromechanical and electronic processing of information in a linear way. In the 30's, Howard Aiken [1] and George Robert Stibitz [2] were the first who pioneered computer fabrication. With the construction of ABC, Z3, Mark I, ENIAC, and EDVAC the modern history of computers has begun.

With this history is directly related that famous mathematician who is celebrated today in the world, John von Neumann. With the name of this brilliant scientist is related the definition of the stored program concept. His innovative idea was to store not only the information to be processed in computer memory, but also the instructions used to process the information. EDVAC (Electronic Discrete Variable Automatic Computer), which was built in 1945, contained the structure and the functioning principle found in modern computers, and known nowadays as "von Neumann architecture." The basic study where this principle was communicated had the title "First Draft of a Report on the EDVAC" [3].

The later developments and the optimization of computing structures are also related with John von Neumann's work at the Princeton Institute for Advanced Studies. Here, he started to design in 1946 the IAS computer, which was

completed in 1952, and is the prototype of all subsequent general-purpose computers [4].

In the middle of 50's many countries begun to manifest increasing interest to the development of electronic computing systems based on von Neumann architecture.

2 Beginnings of Research and Construction of MECIPT-1

According to our knowledge, the Hungarian Academy of Science's Cybernetic Research Group (MTA-KKCs), in 1957 planned to build a computer called B(udapest)-1, and a team were supposed to design its circuit-boards and construct the machine itself. As no electronic equipment of this magnitude had ever been built in Hungary and, particularly, as no computer had ever been built before, work advanced in a rather slow pace.

It followed next the construction in 1957 of the well-known medium-duty, tube-circuit machine, M-3, that had never been built anywhere before. In those days the scientific world and research laboratories were not affected by the cold war, and thus the researchers from several countries even the Russians were allowed to receive through legal channels the blue-prints of the first American ENIAC and EDVAC machines, as well as the IAS, originally built by John von Neumann. The Hungarian M-3 was in fact a distant relative of the IAS machine, and was completed in January 1959.

In the context of a political decision of CAER – that computer manufacturing to be centralized in the former Soviet Union – the Romanian government, which didn't accept such an idea, decided that three large Romanian universities of Timisoara, Cluj and Bucharest should intensify the researches for building their own computing machines.

In these universities, research groups composed of outstanding engineers and mathematicians begun to function. Thus, soon after the start of the M-3 project, in 1959 the first Romanian computer, the MECIPT-1 (Masina Electronica de Calcul a Institului Politehnic Timisoara) was built at the University of Timisoara, following the design of two scientists, Wilhelm

Lõwenfeld and Josef Kaufmann. M.Fildan, D. Farcas, V. Baltac, I.Munteanu, and H. Hartmann joined the team.

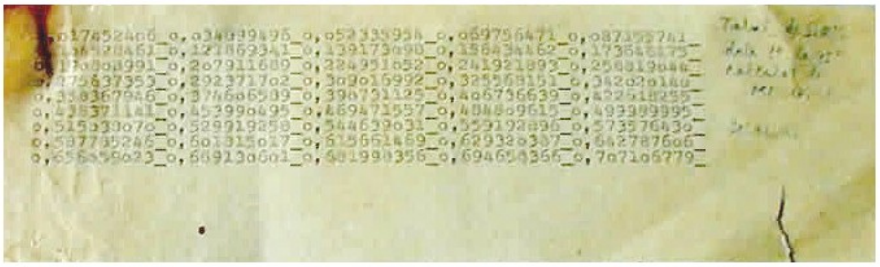
In a gesture of friendly cooperation, KKCs supplied reliable magnetic-cylinder memory units that they could already produce at the time [5]. The good relationships between Prof. Kaufmann and the head of MTA contributed to a rapid arrival of the equipment in Timisoara.

MECIPT-1

Comparing to the present days standard, MECIPT-1 had impressive dimensions. It was built with over 2000 electronic vacuum tubes, 20,000 resistors and capacitors, 30 Km of wires and 100,000 solders, having as internal and external memory the magnetic-cylinder with a capacity by today's estimate of 1 KB. The speed of computer was 50 operations per second or around 80,000 operations per hour, and the programs were writen in machine code. The instructions were formed by 15 binary digits and have a single address field of 10 binary digits. CPU had a set of 32 instructions. They were hardwired and they were chosen through a 5 digit code. Programs and information were input by a punched paper ribbon, and the result appeared on an electric typing machine rudimentary adapted with solenoids which were acting upon the keys [6][7]. It was out of question those days to think of importing devices from West.

It seems impossible to believe that such a computer proved useful according to the present day standards. Yet, on MECIPT-1 engineering computations were run related with the design of many national industrial objectives, among which we mention the hydrotechnic dam at Vidraru, the present dome of the Romexpo central pavilion in Bucharest, medical researches, etc. Intense research work

started also in many directions, one of these being the spectacular domain of language translation.



A sine calculation done by MECIPT-1 found on an old piece of paper

In 1962, in the presence of a group of researchers lead by the famous mathematician Grigore Moisil, MECIPT-1 translated the first phrase from English into Romanian. This was " *You are explaining the development of science, and we are helping describing the examples*".

3 Beginning of Education in Computers

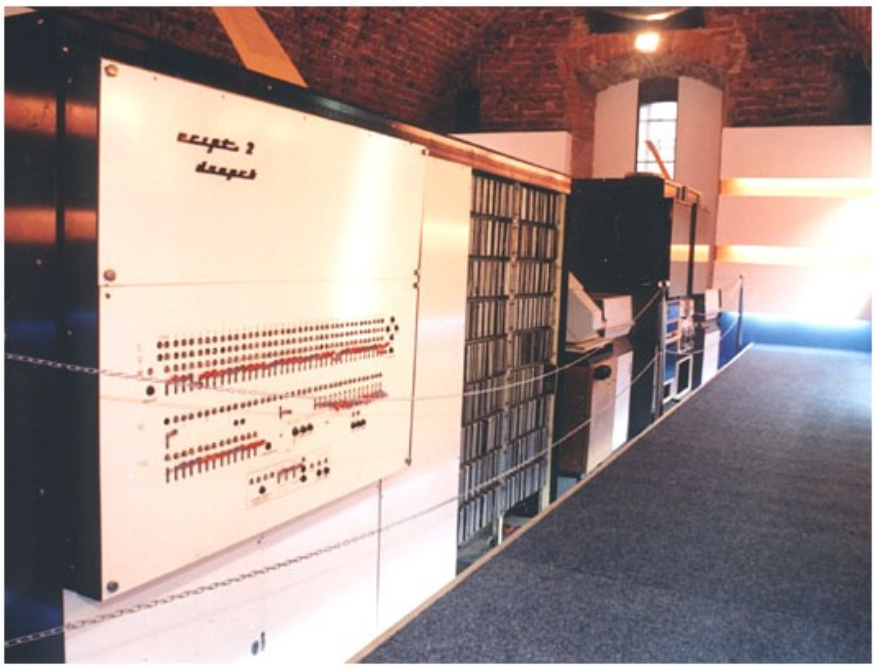
MECIPT-1 contributed to formation of the first computer engineers in Romania. In the academic year 1963 at the Polytechnic Institute of Timisoara – today University "Politehnica" – started the education program of the first section of computer specialists. The group of 30 young students was carefully selected and among them we find names which later on became renowned, Volker Popovici (Wendel), Toma Hentea, and many others.

The instruction responsibility was entrusted to Prof. Alexandru Rogojan assisted by a series of young and talented teachers, Vasile Baltac, Crisan Strugaru, Vasile Pop and many others who joined in the years that followed. This group, which graduated in 1966 (the first group of graduates in Romania specialized in "computers") was the seed of the future development of computer engineering and education in Romania. The foundation of the first specialization in computers in Romania took place in 1966 after a sustained effort of Prof. Rogojan. Many generations learned at MECIPT and honored the field of computers in Romania.

Short time after MECIPT-1, in 1963 MECIPT-2 was built. It was a computer of second generation, the first one used in CAD applications in research centers and institutes in Timisoara and Bucharest. It was conceived as a parallel binary electronic computer with hardwired fixed-point and programmed floating-point arithmetic, and built with semiconductor devices made in Romania. The instruction word length was 40 bits, and the magnetic-cylinder memory capacity contained 4096 addresses. Later the magnetic-cylinder was replaced by a ferrite core memory. The operation speed range was between 50 and 10,000 operation per second, information being input and output using a punched paper ribbon [8].

In 1965, MECIPT-3 was built. This was a computer from third generation, which included a series of advanced concepts both hardware and software.

In parallel with these achievements, the computer staff begun its life, initially as a small group in 1964. In 1965, the Department of Electronics and Computers was founded, in 1967 the Department of Computers, Electronics and Automation, and in 1972 the Department of Automation and Computers.



MECIPT-2

In 1975, it was founded the Electronic Computing Center of the Polytechnic Institute of Timisoara, as a continuation of the MECIPT group.

4 Years of Growing

MECIPT was not a random appearance. It involved a struggle for being accomplished by a group of enthusiasts who believed in MECIPT and in the great future of electronic computers. A future, we have to admit, that was not predicted so dynamic in those years of pioneering at MECIPT.

Those 40 years meant to live actively the appearance of many generations of computers, which at some moment of time we ceased to count. We still wonder of the inexhaustible resources of innovation in this domain of computer technology.

MECIPT has taught us to assume the role and responsibility of school creators, facing all the difficulties this may involve.

At present, we evolved towards the technological framework of microprocessors and VLSI circuits. New research topics came in our scope concerning unconventional architectures, automatic systems, applied informatics, fault tolerant systems, distributed and real-time systems, distributed data bases, digital signal processing, and new interfaces using image and speech processing and recognition.

5 The Last Ten Years

After the Revolution, in 1990, the Faculty of Automation and Computers is founded, as part of the University „Politehnica"of Timişoara. Consequently, the curricula have been completely reconsidered and adapted to the new trends in the domain.

Actually the Faculty of Automation and Computers consists of two departments: Automation and Industrial Informatics Department (AII) and Computers and Software Engineering Department (C). Both departments ensure students education in the following areas of specialization (courses):

- Automation and Industrial Informatics (5 years), with a total falling-off number during the academic year 2002/2003 of 788 students;
- Computers and Software Engineering (5 years), with a total falling-off number during the academic year 2002/2003 of 834 students;
- Computing Techniques (3 years), with a total falling-off number of 95;
- Applied Informatics (3 years) with a total falling-off number of 82.

Starting with the academic year 1994/1995 there have been created in the faculty two Master courses in the following areas of expertise: (i) Automatic Systems, with a total falling-off number of 15 students, (ii) Computers, with a total falling-off number of 15 students, and starting with the academic year 2000/2001 the Master course in the area of (iii) Automotive Embedded Systems, with a total falling-off number of 12 students.

The College areas of specialization have been activated in the System and Computer Science course starting with 1997.

The education during the cycle I (years I and II) of the 5 years courses are ensured by both departments, AII and C, in an alternant mode. The cycle II (the years III, IV and V) is ensured separately by the AII and C departments, according to the specific of the competencies. At the College course, the year I is actually covered completely by the Computers & Software Engineering Department, and the years II and III

separately by the two departments, according to the specific of the competencies. Also separately the departments manage the Master courses, and the Automotive Embedded Systems course is provided by the AII Department in co-operation with the C Department, the Applied Electronics Department, and with Siemens Automotive Company located in Timisoara.

The Department of Automation and Industrial Informatics continues the Chair of Automation and Industrial Informatics of the "Politehnica" University of Timisoara. The Automation staff exists since 1970. In 1990 there has appointed The Chair of Automation, and since 1996 it became the Department of Automation and Industrial Informatics. Since 1990 the AII Department is in a continuous progress. On one hand, it acted towards the assimilation of the problems concerning the Industrial Informatics field, specifically the Applied Informatics, and on the other hand, the field of Automation has been consolidated. The department activity is integrated in a quality management system which deals with didactic and scientific activities.

The Computer Science and Engineering Department at the Faculty of Automation and Computer Science and Engineering, coordinates the course "Computers and Software Engineering" which has as its main aim the education of graduates in the hardware and software domain.

The course involves about 500 students with 100 students per year. It is integrated in the "Systems and Computer Science" profile, established in 1993. It has a common trunk with the Automation and Technical Informatics Course in the first two years of study.

The graduates of the Computer and Software Engineering Course acquire a solid base of knowledge in the domain of computer and software engineering. In the final (5^{th}) year, the curriculum stipulates 5 different direction of specialisation, two with hardware orientation, two with software orientation, and one oriented towards computer systems in management.

Beginning with 1994, the Computer Science and Engineering Department also established a program leading to the master degree with emphasis on "Advanced Techniques in Parallel and Distributed Systems".

6 Instead of Conclusions

We can say that the era of programmed computers that was started almost 60 years ago by the great mathematician John von Neumann we celebrate today, changed substantially our lives, of our children and nephews.

If the computer evolution in the first years started with apparently small steps, these steps became bigger and bigger. We are very content that to this extraordinary evolution process our university had a small contribution and we had the chance by this presentation to make it known to you.

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