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Computer Science Investigations in the Institute of Mathematics

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The Institute of Mathematics was organized in 1964 on the base of mathematical sections of the Institute of Mathematics and Physics. The principal research directions of the Institute are the following:

1. Algebraic, topological and combinatorial methods in logics;

2. Mathematical modelling in science, technics and economy;

3. Computer science.

21 doctors habilitat and about 200 doctors were trained during these years at our Institute.

We are proud that remarkable mathematicians, scientific results of whom are widely known, such as Prof. V.Andrunakievich, Prof. V.Belousov, Prof. I.Gohberg, Prof. C.Sibirsky, Dr. A.Cuznetsov, have worked or work now in the Institute. At present 107 researchers, 15 doctors habilitat and 45 doctors among them, continue investigations according to above mentioned 3 directions. The majority of doctors trained in the Institute work successfully in universities of Moldova and other countries.

The Institute publishes two periodicals: "Bulletin of the Academy of Sciences of Moldova. Mathematics" and this very magazine "Computer Science Journal of Moldova". 87 monographs, 127 issues of "Mathematical Researches", 15 issues of "Applied Mathematics and Programming" have been published also.

Works on informatics began in 1962 when first computers appeared in Moldova. A group of young investigators (Dr. M.Gontsa, Dr. A.Danilchenko, Dr. V.Fesenko) quided by Dr. M.Bushko-Juk has carried out research on Compiler Construction Theory.

The first translator was implemented for computer "Ural-2" and then with some improvements for "Ural-4". Subsequently translators from ALGOL-60 lanquage for computer BESM-2 have been created by Dr. M.Gontsa. The multi-language translating system START with entry languages ALGAMS and SOL for computers of MINSK type is a practical implementation of the investigations. (Dr. M.Gontsa, Dr. M.Marichuk, Dr. G.Bostan, Dr. G.Magariu)

In 1985-90 a technological complex, including all the necessary components for design and introduction in practice of program products (compilers, editor, etc) was worked out by Dr. C.Chebotaru, Dr. S.Cojocaru, Dr. V.Ufnarovski, Dr. E.Boian, A.Colesnikov, L.Malahova.

Later on the investigation and elaboration of translating systems of parallel action (Dr. M.Marichuk, Dr. S.Cojocaru, Dr. S.Comanescu) was conducted.

A concrete implementation of these ideas found an application in products for parallel computers PS3000 (jointly with the Institute of management problems of the USSR AS) and for an integrated programming systems for a specialized computer SAMSON (together with the Sanct-Petersburg University).

The last investigations of this group are connected with the natural languages processing. An orthographical text corrector ROMSP, which have found its application in a great number of organizations in Moldova, was elaborated by Dr. S.Cojocaru, Dr. A.Danilchenko, A.Colesnikov, L.Malahova, Dr. E.Boian.

A number of results were obtained in the domain of simulation systems design, their implementation and applications. The integrated simulation system SimTeach was elaborated by Dr. G.Magariu, L.Burtseva, T.Tofan, N.Nadvodniuc, N.Kukotina. The system provides convenient environment both for teaching of simulation method application and for solution the practical problems using simulation methods. SimTeach was used as a tool for elaboration of another three problem-oriented simulation systems: the system investigating various regimes of transport utilization; the system investigating various compiler structures; the system investigating bank and credit operations process.

These results and simulation systems were successfully presented at a number of international scientific conferences (Romania, Russia, the Ukraine, Hungary, the SUA, China, Austria).

Lately a decision support system for financing of scientific and technical projects and monitoring system of those projects realization was worked out (Dr. C.Gaindric, Dr. D.Zaporogan, A.Shpac, Dr. I.Verlan).

A group headed by Dr. Yu.Pechersky conducts research work in the sphere of an artificial intelligence. Scientists of the group have obtained a number of interesting theoretical and practical results, covering several areas of AI: the logic-combinatorial methods of pattern recognition and classification (Dr. Yu.Pecersky, Dr. F.Frolov, Dr. V.Burdaev), the new method of knowledge representation and knowledge processing (Prof. S.Solowiev, Dr. G.Solowieva), a lot of constructive improvements of the repertory grid technology (Dr. G.Andrienko, Dr. N.Andrienko), the method of representation of fuzzy knowledge based on partitioned boolean matrices (Dr. V.Levchenko, Dr. A.Savinov), the number of effective methods of knowledge acquisition, in particular expert games (Prof. S.Solowiev, Dr. G.Ginkul, Dr. V.Sirbu), an integrated technology of methods of collective expertise and methods of knowledge-based decision making (Dr. Yu.Pecersky, Dr. V.Arnaut, Dr. G.Ginkul).

Scientists of the group have published 5 books and about 350 scientific papers. They have reported at the international conferences in Russia, USA, France, Japan, Germany, Slovakia, Netherland, etc. About 30 programming systems were created on the basis of the obtained theoretical results. The systems are used in 350 scientific, industrial and financial centers of Moldova, Russia, Latvia, Byelorussia, the Ukraine, Bulgaria, Slovakia, etc.

In 1993 in the Institute of Mathematics a new research group, headed by Dr. V.P.Rybakin, was established, which started the investigations in the domain of parallel calculations. Effective algorithms of parallelizing of problems of mathematical physics for multiprocessing systems were elaborated. Dr.h. G.Mishkoy investigated, on the basis of the priority disciplines theory, the loading conditions of a transputer system node for various types of input and output informational flows. The parallel algorithm for digital model of terrain for Moldova is built

by S.Novac.

In 1996 the investigations on determination of topological configuration of a multiprocessing system, consisting of n processors, and on its effectiveness while solving the problems of mechanics of continua was started using the methods of an imitation modeling by Dr. G.Magariu, L.Burtseva, and N.Nadvodnyuk. The creative group is a member of the World Transputer Users Organization and of the Russian Transputer Association.

The essential assistance in the scientific elaborations was rendered by Prof. E.Yushchenko and Prof. V.Redko from the Institute of Cybernetics (the Ukraina, Kiev), Prof. D.Pospelov from the Computing Center of Russian AS (Russia, Moscow), Prof. A.Zakrevsky from the Institute of Technical Cybernetics (Byelorussia, Minsk) and others.

30 doctors have been trained during these years in the sphere of informatics. 11 monographs and over 600 scientific papers have been published.

Participation in joint projects with scientists in the republics of the former Soviet Union and grants received from the Committee of the science and technics of the Soviet Union, from the Government of Moldova are indicative of the qualified collectives of investigators.

During the last three years the research workers of the Institute participate in INTAS projects:

- Computer Algebra symbolic and combinatorial tools in differential algebra and differential equations with impact in fundamental physics and control theory — team leader Dr. V.Ufnarovski.

- Integrating Induction and Case Based Reasoning for Diagnostic Problems with Focus on Medical Domains (INRECA+) — team leader Dr. Yu.Pechersky;

- In the joint project with the Swedish Royal Academy "Noncommutative computational algebra" — team leader Dr.V.Ufnarovski.

  A member of researches joint with Research Institute for Informatics, Bucharest and Institute for Information Sciences, Iasi —

team leaders Dr. C.Chebotaru, Dr. S.Cojocaru, have been carried out.

Intergovernamental Informatics Programme (UNESCO) granted the project entitled " Creation of Educational research Center in Computer Science" — team leaders Dr. C.Gaindric, Dr. C.Chebotaru, Dr. Yu.Pechersky.

I hope, that this brief enumeration of some of our investigations, appendeded by more detailed papers of my colleagues, allows you to get an idea of our researches in the field of computer sciences and closely-related problems carried out in the Institute of Mathematics of the Academy of Sciences of Moldova.

50 years ago first Institutes, forming Academy of Sciences of Moldova, were established.

This issue of our magazine is devoted to this anniversary.

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