Proceedings of the Colloquy

"COMPUTATION TECHNIQUES AND COMPUTERS"

(Bucharest, 22—26 September 1967)

The development of modern economy with the help of a technique that is surprising by the complexity of its aims and efficiency of its results is a fact now admitted as current activity. The penetration of science in almost all domains of activity, as a determining factor of production, is just as conspicuous. This action of renewal — in full swing, particularly in the last score of years — makes up the world technical-scientific revolution under whose emblem the present historic age appears.

It is necessary, in the ensemble of structural changes that follow one another rapidly, to identify landmarks allowing us to look beyond the horizon without any possibility of error. One of the landmarks that can be identified is defined by the positioning of the mathematical sciences in the complexity of the technical and scientific revolution which is now under way.

The applying of mathematical methods to scientific disciplines now also extends to the economic sciences, placing new disciplines linked with mathematics, such as, for example, *economic cybernetics and economic computation*, in the circuit of applicative and basic scientific research and education.

The processing of economic information holds an important place in the framework of the 1,000 and over types of problems which are solved at present by means of electronic computers. These applications include such problems as the mechanization and automation of stock and accounting control, the solution to problems regarding technical and material supply, as well as the entire variety of economic computation.

On the whole, these applications aim at the optimum programming of production, the rational use of production capacity, the improvement of economic and technical parameters, as well as the increased efficiency of economic activity.

Multiple experiments prove that the introduction of the processing systems of economic information affords rapid and efficient documentation and allows optimum policies to be elaborated in the scientific organization and management of economic activity. On the other hand, the use of modern computation methods and the exploitation of automation installations lead to noteworthy savings, to an impressive increase in the volume of work carried out, as well as to the judicious use of manpower.

Besides the process of production, and in close connection with it, economic activity makes a process of information processing stand out. An *informational system* appears as a complex of equipment and procedures, of man and practical activities whose purpose is to model economic activity with the aid of a process of information processing and based on the use of automatizing and mechanizing means.

A modern enterprise stands out as a *cybernetic complex*. The activities which make up the object of planning or those in connection with which an estimation has been made, lead to measures which the executive factor must carry out. The achievements thus obtained are estimated. By feedback the results obtained determine the present position of the plan and new decisions adequate to the situation.

On the other hand, computation technique and the use of electronic computers are also rapidly spreading to other domains of knowledge and practice, in science, in technique and in culture.

Thus, in the present scientific activity, an important transformation occurring in the domain of the ever more complex human activities of management and organization, imperatively point to cybernetics as a concern of foremost importance.

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In Romania, the development of economy, the scientific organization of production and labour, the improvement and modernizing of planning methods, the promotion of technical and scientific progress, as well as the extension of mechanizing and automatizing, have determined particular interest for scientific investigation in the domain of information.

An illustration of this interest is the colloquy "Computation Techniques and Computers", organized by the National Council of Scientific Research by the Academy and the Society of Mathematical Sciences of the Socialist Republic of Romania, whose proceedings took place in Bucharest from 22 to 26 September 1967.

The proceedings of this colloquy were honoured by the presence of renowned specialists. Among the foreign guests, scientific communications were presented by professors: M. Altman (Poland), H. Ameling (Federal Republic of Germany), G. Boulaye (France), L. Collatz (Federal Republic of Germany), L. Fox (England), M. Ghinea (France), P. W. Gillis (Belgium), L. Kalmar (Hungary), A. Kaufmann (France), Z. Koutski (Czechoslovakia) F. Lapscher (France), O. Lehmann (German Democratic Republic), P. Naur (Denmank), F. Nozicka (Czechoslovakia), M. Péguy (France), D. Pham (France), E. Pichat (France), M. Preucil (Czechoslovakia), B. Sendov (Bulgaria), M. V. Wilkes (England), E. G. Woschni (German Democratic Republic) and L. A. Zadeh (U.S.A.).

Among the Romanian specialists, communications were presented by the following professors: D. V. Ionescu, S. Marcus, academician G. C. Moisil, E. Nicolau, C. Penescu, corresponding member of the Academy, A. Petrescu, A. Rogojan and academician N. Teodorescu.

The proceedings of the colloquy took place in plenary meetings as well as in the following five sections for scientific communications: numerical and non-numerical computation techniques; programming systems and structure of numeric computers; applications of computing technique in economy, industry and scientific research; analogous computers and uses; computing systems and organizing of computing centres.

Besides, the programme of the colloquy procedures also included four round tables dedicated to the following topics: programming languages and compilers; training of specialists in the domain of computing techniques and computers; computers in automatized processes; electronic computers in the operative management of big enterprises.

Gathered together on the occasion of these round tables the specialists were able to make a useful exchange of scientific information and opinions regarding the present trends in the range of problems dealt with.

During the colloquy proceedings organized in Bucharest, particular attention was granted to a basic problem of information, viz.: *the problem of information transmission within an informational system and in the dialogue man—electronic computer.* As it is well known, to the extent in which the operation of an electronic computer is considered on a single access channel and its operation according to a single programme, the respective problem refers to *informational languages.* In contrast with this individual aspect, the collective aspect has in view the *multiprogramming and self-monitoring systems* which allow several parallel time-sharing computation processes to be carried out.

In *automatic programming, compilation* is the translating operation carried out before the computation process is effected, namely in such a manner that the electronic computer should obtain an object programme equivalent to the initial programme and representing its "direct" translation. For a compilation programme, the fact is characteristic that in the case where a generalized instruction of the source programme is carried out several times, its compilation is only effected once, independently of eventual repetitions.

Within the proceedings of the Colloquy "Computation Techniques and Computers" programming languages and their compilation made up the object of debates at a round table and of some communications.

The communications presented dwelt on the following subjects: Structure of programming systems (L. Fox); Compilation methods of ALGOL 60 algorithmic language (M. Ghinea); Compilation programme for the GIER electronic computer (P. Naur); Compilation of the ALGOL language for medium capacity electronic computers (D. Pham); Multiple access computation systems (M. V. Wilkes).

Besides these communications the colloquy proceedings also included scientific research carried out in Romania in the field of programming automation. Thus, the following works should be mentioned: Programming languages (M. Bodnăraş); FORTRAN algorithmic language (I. C. Cavadia); Assembly languages and applications (L. M. Chirică); Changes brought to the Mark 3, 803 selfcoding translator (C. Lupşa).

As it is well known, modern research in the programming of electronic computers is noteworthy, approximately since 1955, by works in the domain of automatic programming by means of the FORTRAN, ALGOL and COBOL informational languages. The development of these studies is at present continued, taking some new problems into consideration such as: the ela-

borat'on of programming language systems; un'tary treatment of informational languages an l ele_tron c ma .h nes; programm ng of parallel ‹omputation processes; programme opt m zation on the basis of the global analysis of algorithms; programming the man—electronic computer dialogue; organizing the interaction between these two factors; programming in the natural languages used in communications among men.

Regarding the effective use and programming of electronic computer ensembles, intensive concern appears in connection with *the action of forming specialized staff.* The fact is here made evident that the preparation should precede the initial operation of the informational system, so that the knowledge acquired should be useful n c oosing t e computing systems. n applying t .e best methods and in elaborating the optimum employment procedures of the computation techniques.

The training of competent staff, its forming, as well as the provision made for development possibilites, are essential requirements in view of ensuring the scientific use of computation systems. In numerous cases the training of staff is not limited to specialists meant to only work in the domain of information processing but it also includes the personnel who formulate problems and who use the results obtained.

To illustrate the relative requirements of staff it is worth mentioning that a number of almost 500,000 specialists will be required in Europe, in 1975, for the programming and operation of the computing systems. The mathematicians, who elaborate the computation methods and the system for using the computing equipment play an important part in the exploitation of an electronic ensemble at present and they will continue to do so also in the future.

The appearance of the science of information — with repercussions in all the domains of activity, in the science of management — has resulted in modernizing and amplifying changes characterized by the introduction of analytic quantitative methods and of computation techniques as operating instruments for all degrees of decision. A new concern has herefrom resulted in the science of management, having as an object the *management information systems.*

In particular, in connection with the logical control and checking informational processes in economy, with the management and organizing of economic processes, as well as with the methods for optimizing in the science of economic management, general cybernetics has provided the theory of economic cybernetics for the study of the management information systems. In the framework of modern science specializing, *economic cybernetics appears as a new branch whose object is the application of the general principales of cybernetics to the study of economic processes.*

In Romania, scientific research of a basic character and of an applied character, in the domain of algorithms and programmes in the economic computation, are studied at the Centre of Economic Computation and Economic Cybernetics.

In keeping with this concern, the communications presented had as an object the following topics: Treatment of present combinatory problems by means of computers (A. Kaufmann); Linear programming with several parameters (F. Nozicka); Scientific management of stocks (M. Péguy); Application of computation techniques in economy and in scientific research (B. Sendov).

In addition to these communications the proceedings of the colloquy also included scientific investigations in the domanin of economic computation and economic cybernetics carried out in Romania. Thus, the following works should be mentioned: Programming of critical path method (D. Anastasiu); Practical solution for the optimization of the national power balance (C. Chirică, G. Weisz, C. Fabian); Non-linear models in the problem of oil product mixtures (V. Dumitru, V. Ionescu, G. Bărbatu); Computing methods in social sciences (M. I. Manolescu); Programming and computing methods in economic information (D. Vaida).

Finally, without having the intention to formulate conclusions on the proceedings of the colloquy "Computation Techniques and Computers", we retain the following general idea: The integration of electronic computers and their use within a vast information system, connected with a network of electronic computers, sets not only organization problems but also problems of thorough scientific investigation. It is necessary *to take into account the aspect of scientific research* in the problem of introducing computing techniques, since the dotation of an economy with modern means of computation entails large investments, changes in the scientific organization of production activity, as well as the adoption of a technical language that is difficult to interpret by non-specialists.

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