Computer aided structural design in Hungary

Computer Aided Structural Design in Hungary

Conception des structures assistée par ordinateur en Hongrie

Gegenwärtige Lage der rechnerunterstützten Projektierung in Ungarn

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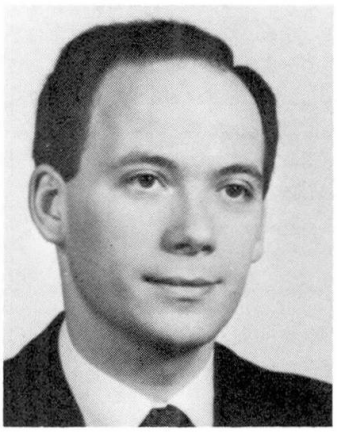

Peter Lengyel, born 1953, obtained his structural engineering degree at the Technical University Budapest and his applied mathematics degree and doctorate at Loránd Eötvös University of Sciences, Budapest. Managing now a departement for CAD programming he has been involved in research in numerical methods in FEM analysis.

SUMMARY

The paper introduces the basic features of Computer Aided Structural Design (CASD) from the computer manufacturer's point of view, and characterizes the state-of-the-art in Hungary. The basic tendencies of CASD are summed up on the basis of statistical comparisons of computer applications in Hungary, and reflect the state of international trends towards fully automated structural design.

RESUME

Cet article présente les caractéristiques principales de la conception des structures assistée par ordinateur (CSAO) du point de vue de constructeurs d'ordinateurs et décrit la situation actuelle dans ce domaine en Hongrie. Les tendances fondamentales de l'introduction de la CSAO sont exprimées sur la base de comparaisons statistiques des dépenses effectuées pour l'informatique en Hongrie. Parallèlement, une évaluation des effort entrepris sur le plan international en vue d'une automatisation totale de la conception des structures est réalisée.

ZUSAMMENFASSUNG

Diese Arbeit präsentiert die wichtigsten Eigenschaften der rechnerunterstützten Projektierung vom Standpunkt des Rechner-Herstellers und beschreibt die gegenwärtige Lage dieses Fachgebiets in Ungarn. Die grundlegenden Tendenzen des CAD werden mit Hilfe von statistischen Untersuchungen über den EDV-Aufwand in Ungarn zusammengefasst, die wohl auch die internationalen Bestrebungen in Richtung von voll automatisierter Projektierung charakterisieren.

1. INTRODUCTION

The VIDEOTON computer factory is the largest manufacturer in Hungary, and is specialized in producing minicomputers. Since this category is generally accepted as the most suitable computer for CASD - as far as capacity and costs are concerned - VIDEOTON has been laying great emphasis on its technical-scientific software development. A structural engineering program package has been developed, which is widely used by the Hungarian and foreign users. The program library is under steady development and extension. Each of the programs has been worked out on basis of real user's wish, and thus these are frequently used by design offices. This is the way, VIDEOTON has wide ranging connections with structural engineering research and design institutions in Hungary. The aim of the present paper is to summarize the experiences obtained through this cooperation.

2. THE DESIGN OFFICES AND THEIR CONNECTION TO CASD

First of all some words about the design offices involved in structural engineering. There are structural design offices in Hungary being specialized in different fields, such as industrial structural design, design of buildings' structures, structural design of bridges, or that of water engineering, etc. The largest offices are to be found in Budapest, however the other major cities have outstanding design offices too. In Hungary the small buildings for housing families /family houses/ are mostly built on basis of typified designs offering a large choice, and being rather cheap. Therefore the general structural design problem belongs to one major individual task given to the design office in question /e.g.: design of a hospital, design of a hotel, etc./. There are of course typified designs here too, but these are - from the structural automation's point of view - out of interest. Thus the design office has always a certain given problem to solve, and is keen on having a computer for its solution. All these explain, why some of the structural design offices have a computer centre with a large staff for the solution of their momentary tasks. There are others, who prefer to buy and rent programs or have them made by university departments or software houses. The choice depends on how often occurs the given problem in the practice of the design office.

These are shortly the demands to be solved on one hand, and let us now see the other side, i.e. the offer of computer manufacturers. The offer is today extremely wide, and went through the process of a long development. This development can be best characterized by some data published by the Hungarian Central Statistical Office, /1./.

Firstly the following diagram shows the increase of the number of employees in the field of computer application and development in Hungary. (Fig.1)

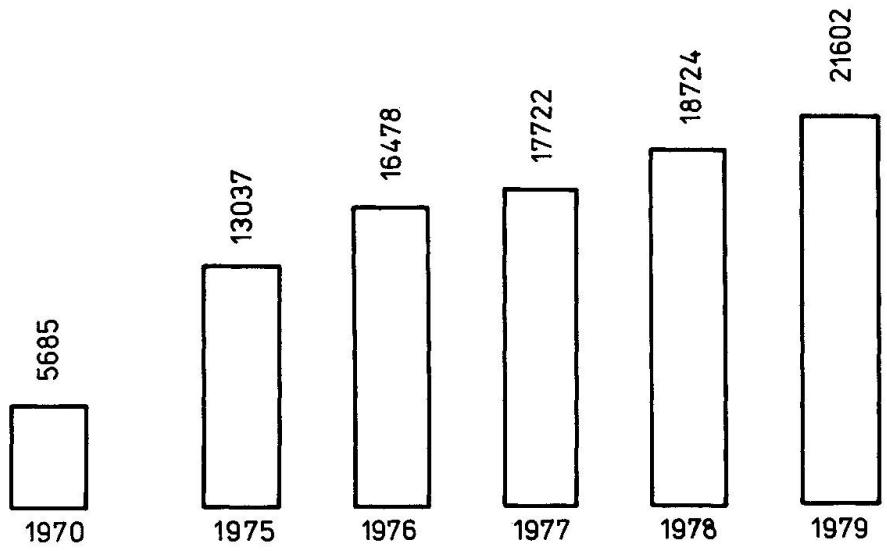

Fig.1 Number of employees in the field of computer application in Hungary

The next figure shows the distribution of computer application in Hungary. The percentage ratio of technical scientific and technical structural calculations have decreasing tendencies, however the change of absolute values is about six times for technical scientific and more, than two times for technical structural calculations. (Fig.2)

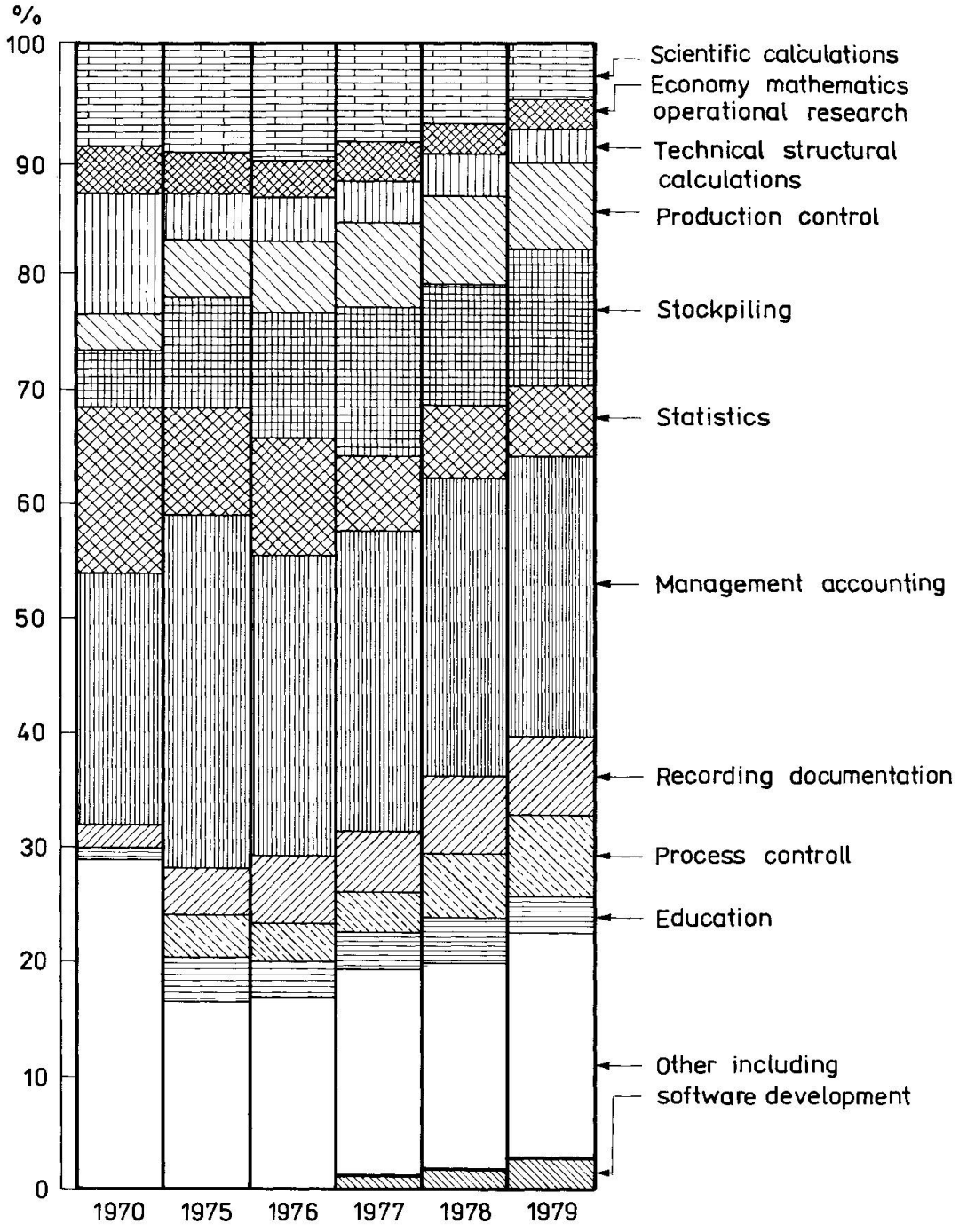

Fig.2 Distribution of computer hours in different fields of application

Let us now consider the change of the total number of used computer hours between 1970 - 1979: (Fig.3)

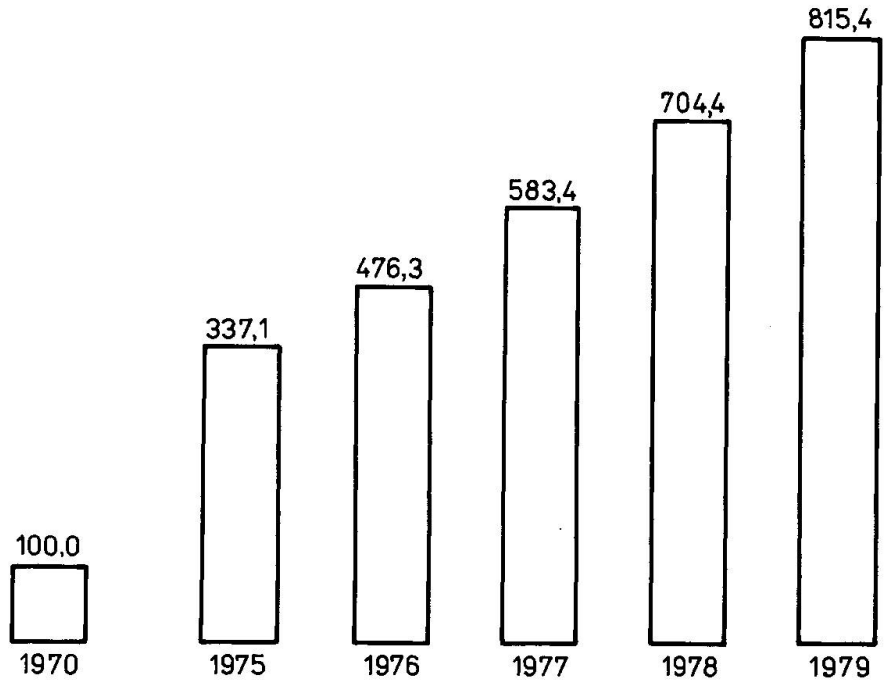

Fig.3 Total number of used computer hours

If we have a look at the utilization of computer hours the following diagram can be obtained. (Fig.4)

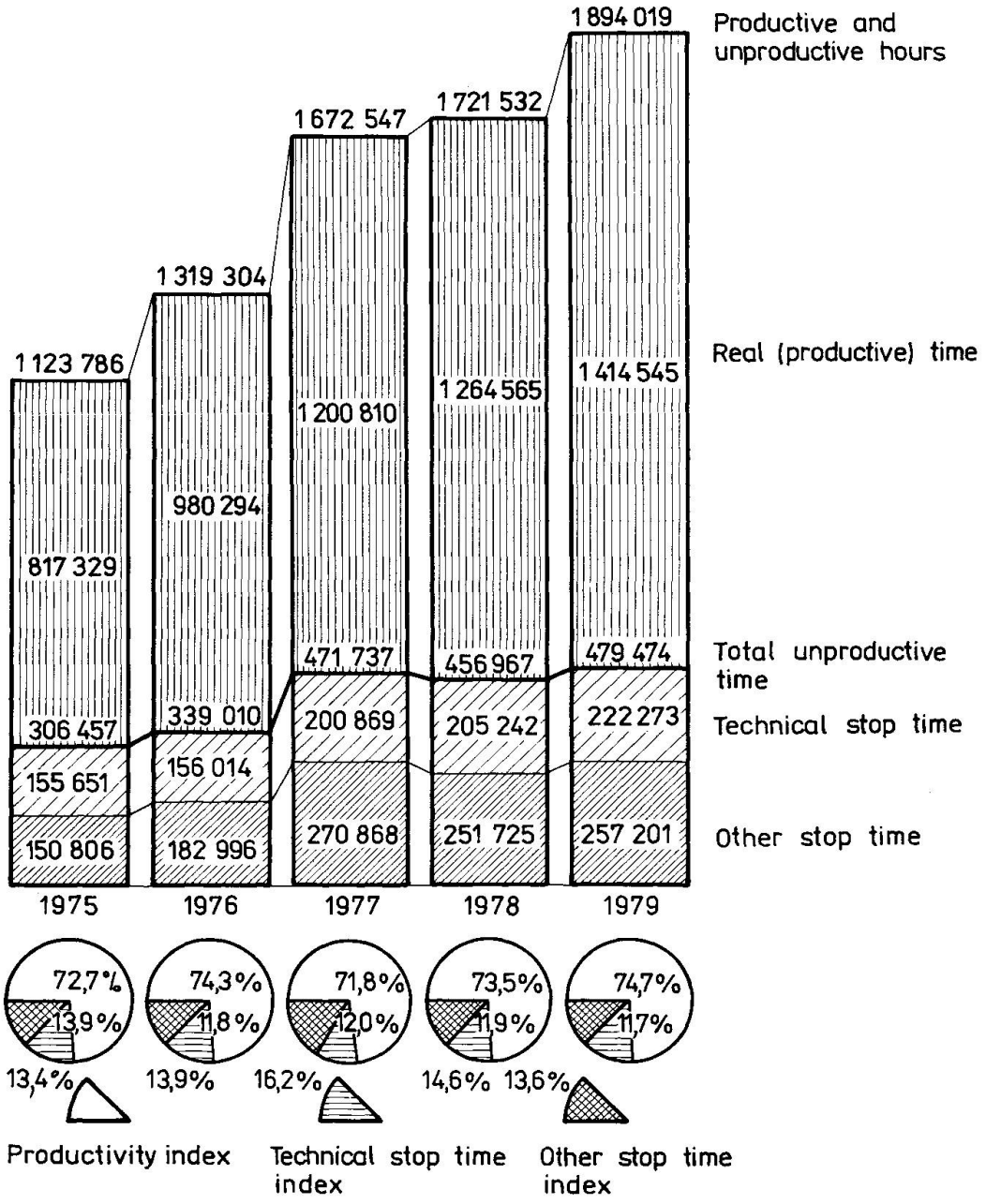

Fig.4 Utilization of computer hours

3. TENDENCIES IN CASD

The rapid change in computer application can be seen if the research and design activity in building industry is considered, which includes CASD too. Here in 1979 alone there were 94617 computer hours utilized in Hungary. Thus the increasing use of computers underlines the importance of the question, which is the proper approach to the economic utilization of these? And this question belongs to the often heard statement: the greatest obstacle against the overall use of CASD has been the lack of proper hardware in the 60's, the lack of proper software in the 70's and the lack of knowledge for proper application in the 80's.

Let us first summarize the practice of application of the Hunga-

rian design offices. In the mid 60's there were only a few companies having their own mini or mainframe computer. Others joined the trend of CASD only some years later, and started from the other end of the line, i.e. introducing pocket and later desktop calculators. The third alternative has been the case, when problems requiring larger central core capacity were solved by computer centres, however the routine tasks of smaller demands were run on desk tops located at the practising engineer.

The picture is even today very colourful. However,efforts have been done for the general introduction of multi-user systems, where the engineer has a terminal being suitable for standalone useage, and for real terminal function to a mega-mini or mainframe computer too. The definite lines having been dividing the above trends some years ago, are to disappear as the development of smaller - as far as sizes are concerned, however bigger as far as capacity is concerned -, and cheaper CPU-s and background store units is internationally accelerating. It is worth mentioning, that the background store techniques have had for a long period /roughly between 1967 - 1979/ a relatively steady level compared to the development of CPU-s. This situation has changed mostly due to the introduction of Winchester disks, and this will have stimulating effects on the new trends of CASD.

It can be stated, that the today's office of structural engineering has still more alternatives to choose from, and the size of the office determines which hardware choice is the optimal one. However, tomorrow even the big offices will have many display units, functioning as local desktops or forming networks. These technical possibilities are available at present, however they have not yet been generally introduced into structural engineering practice.

Another important aspect of CASD is the graphical input and output. The situation is here also similar to the previous one, i.e. although the technical opportunities are given, today we cannot speak about a general useage of graphical displays, that is about a total graphical interaction in the field of CASD. However, as far as graphical output is concerned the application of plotters is a generally existing commonplace of CASD.

This is true for CASD in Hungary, too. Here there is a great shortage of auxiliary man-power in the structural design work, and so of draftsmen. Therefore every CASD user has some sort of plotter, being almost steadily used.

The lack of graphical displays in the design offices can be best explained by the level of technical development and by the cost. This is proven by the fact that IBM presented its first graphical display /IBM 2250/ in 1965, but waited 12 years until the next type of graphical displays has been manufactured, because of high costs and lack of proper software. Now, as the manufacturers try to cover the field of CAD with hardware and software products as well /let us only think of the UNIS-CAD System of Sperry Univac having been first presented at the Hanover Fair in April 1982/ we can count with a much easier and cheaper availability of graphical displays. These devices are very important, because without them we will always be able to speak only about computer aided design, but not of a design automated by computer. It can be stated, that if a total automation in CASD - even including the unavoidable human interaction, however computer aided and not manual interaction - is achieved, there will be a much greater

and general enthusiasm towards CASD, than today. This total automation is very difficult to get at, mainly because of the points of view of software and application. /One might think for exampleof the problems having been experienced during the useage of large program systems./

4. CONCLUSIONS

The present paper has mentioned some international effort, trends and their link with CASD in Hungary. As there is a large amount of man-power concentrated in computer application in Hungary -as shown in the previous figures -, and as all of the design offices have some sort of experiences with CASD, the general trend, i.e. the strengthening of CASD can be felt in Hungary, too. This means that the number of multi-user systems is increasing, and the popularity of micros is also ever greater. On the other hand there is a very strong software development capacity, which provides structural programs for general aims, but for the solution of individual tasks too. All these form the basis of the general useage of graphical devices, which mean the first step toward the development of

CASD ——— CASD

i.e. Computer Automated Structural Design out of Computer Aided Structural Design. The speed of this development is very hard to predict in advance, however the speed of another development might already been demonstrated in the field of computer application. The number of used punch-cards, and printer paper sheets in Hungary has shown the following change during the period of 1960-1979. Figure 5 gives the impression, that concerning the duration of tendencies in the field of computer application one can never go for sure.

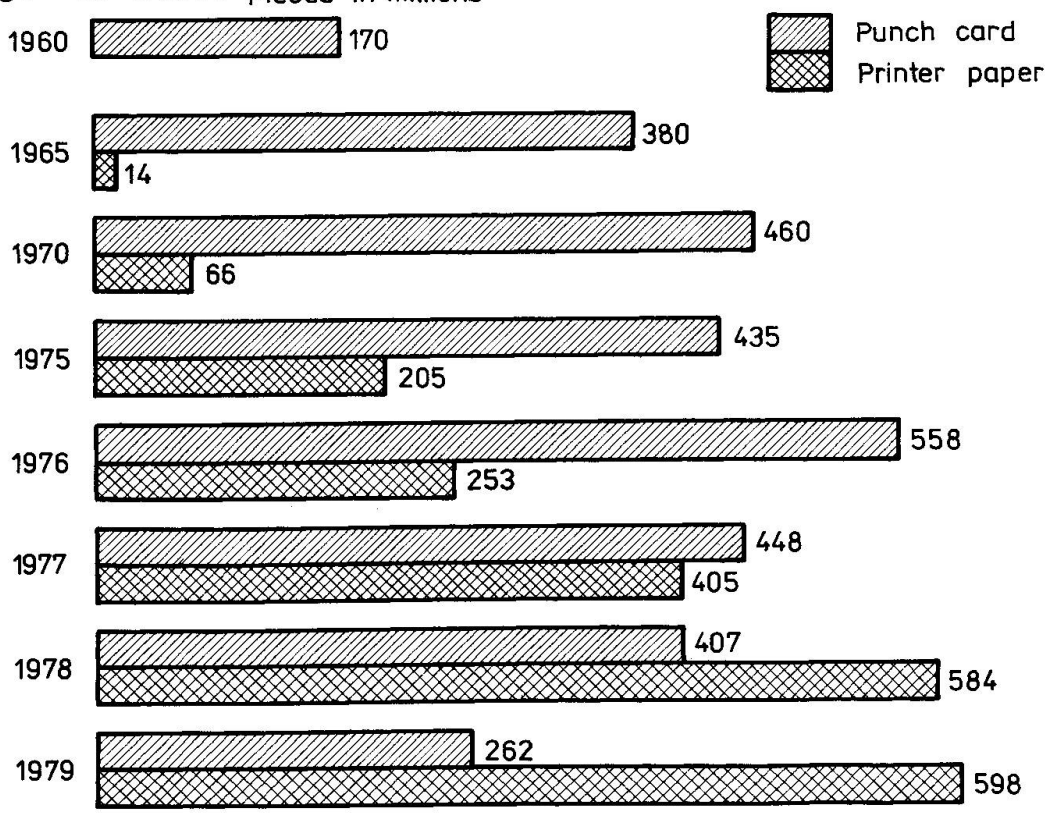

Fig.5 Number of used punch-cards and printer papers

REFERENCE

1. Statistical Yearbook of Computer Application 1980. Statistical Publishing Company, Budapest, 1981. /In Hungarian/

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