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PECULIARITIES OF COMPUTING IN THE MODELLING OF CONTEMPORARY GRAPHICS

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Abstract. Computer-aided solving of graphics problems can be carried out by traditional or information technologies. Applying traditional methods, 10-30 percent of computer capabilities are used because a big part of work is done by a man who is not able to provide computer with necessary data adequately. Computer capacities can be used as much as possible only applying information technologies when a man only plays a role of an assessor, a leader, while preparation and input of data is automatically carried out by computer itself.
The foundation of information technologies is models of graphic problems, bases of intelligence computer data and knowledge, the contents and models of which should be made to satisfy the educating needs of engineering graphics. The paper presents informational graphics structure and the problems related to it as well as the ways of solving them.

Key Words: graphics programming and modeling, exchange formats, drawing database, VisualLISP Application, artificial intelligence.

1. Introduction

Information graphics problems have been analysed and solved in the works and scientific researches of bachelors [1-3], masters [4-6], persons maintains a doctor's thesis [7, 8] in the Department of Engineering Graphics of Vilnius Gediminas Technical University since 1989. Ten reports have been presented at the conferences [9 – 15], the educational experience has been generalized in teaching supplies and textbooks on graphics [16,17].

2. The main assignments of general information graphics

We have pointed out repeatedly that contemporary graphics (applied, engineering) developing on the basis of traditional preconditions is not able to ensure properly a necessary level of both rationality and educational requirements. It is conditioned by the fact that a computer is (can be used as) not only a tool but also a method of solving graphical problems. Moreover, computerizing makes it possible to solve subsidiary problems which are one way or another connected with graphics (economic, technological, etc.), what was not possible at all while

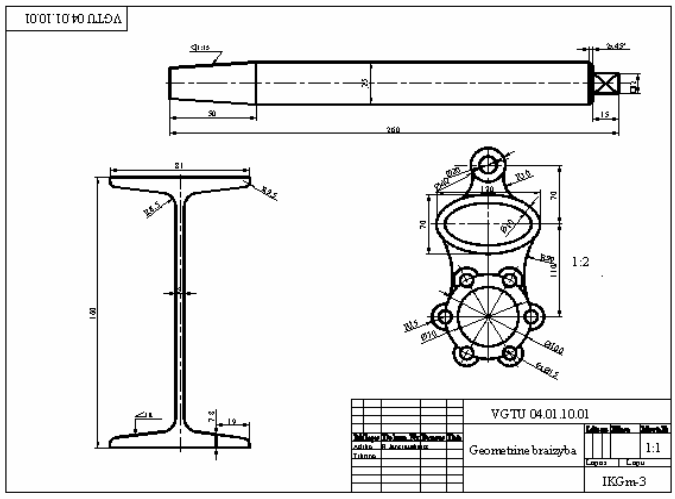

Figure 1: Geometrical drawing

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using conventional technologies and can be lost in using contemporary ones.

It is impossible to solve the problems of contemporary graphics without complex computing systems, so it would be advisable to divide the course of engineering drawing into 2 parts: general and applied (specialized) ones.

Several years' experience of the authors showed that the problems of general graphics can be solved through the following subjects:

- geometrical drawing (computing tools, contour, slope, conicity - Fig. 1)
- surface and solid modeling (techniques, tools and methodology of construction - Fig. 2)

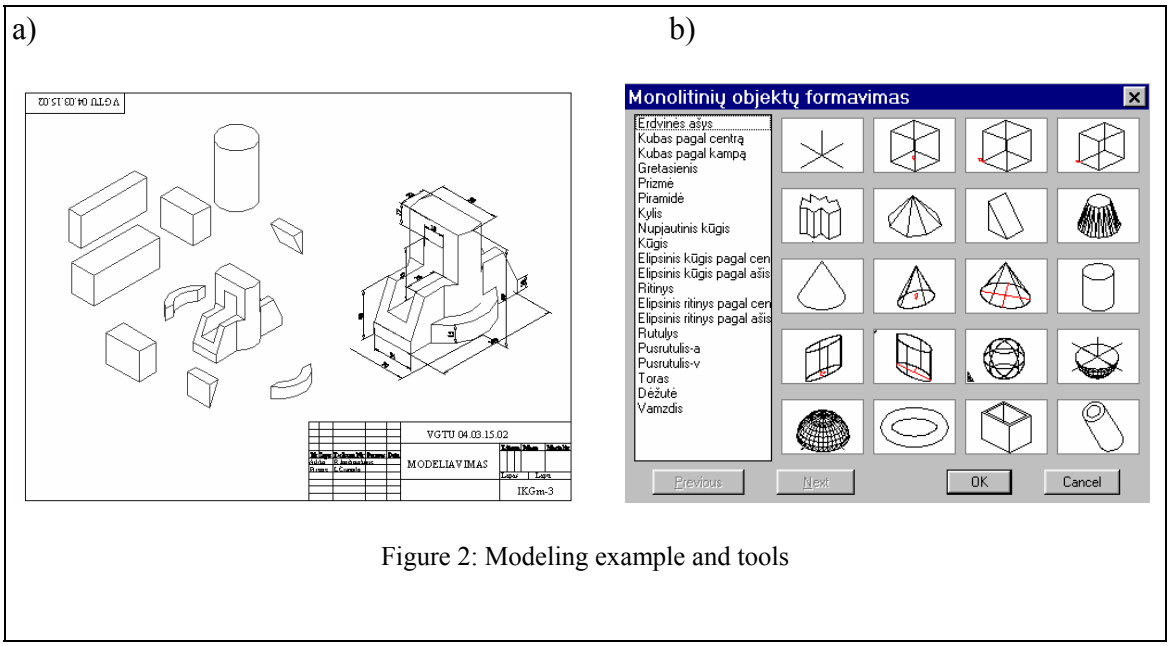

Figure 2: Modeling example and tools

- computer-aided construction of projection drawings (tools and the methodology of construction) - Fig. 3)

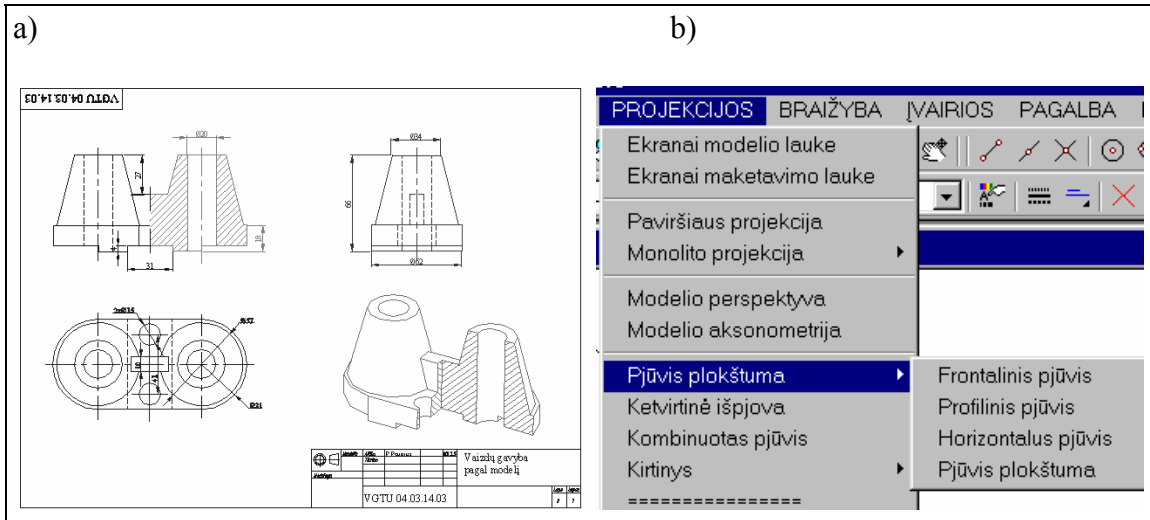

Figure 3: Projections example and tools

- fundamentals of civil engineering drawing (tools and methodology of construction - Fig. 4)

a) b)

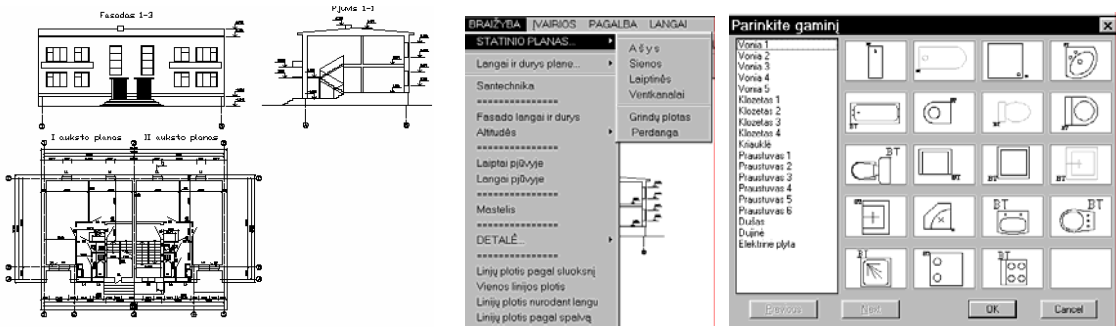

Figure 4: Civil engineering drawing and tools

Depending on the amount of allotted time, practical works can be supplemented with metric problems (developments of Fig. 5a, geometrical section parameters – Fig. 5b).

a) b)

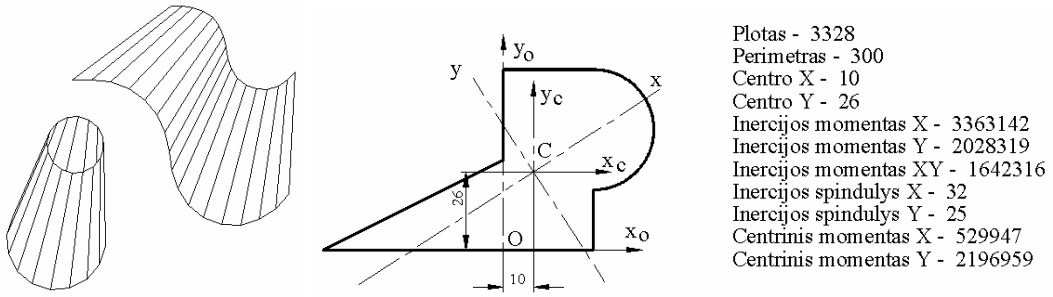

Figure 5: Metric problems

The basic requirement and pledge of successful solving is usage of adapted software the main point of which is to minimize the problems of management computing tools and to reach maximal graphical results. Here the problem of structure of tools appends, and educational specialists pay not enough attention to solve this problem. The second problem is profundity of task content.

The content of the special course depends on the course of studies of students and should be realised by adapted academic or industrial programming systems.

3. Formation of a generalized model of graphical problems and solving algorithms

Working with graphical systems the compilation of drawings becomes more or less an usual occurrence, an automated or requiring automation process.

Commercial graphical systems are being constantly renewed, thus upsetting users by their new possibilities which are unfortunately, not always justified technologically. The process of visualisation in any case depends on the development of systems (though it is not rational as arbitrary processes often develop on the basis of commercialism rather than rationality, which is not essential for the point of the matter), but the level of using computing possibilities is still left to user's province. The biggest reverse of the graphic efficiency at present is likely to be automation of drawing management.

Management is expected to be maximal visualization rationality (it partially ensures competence and improvement of commercial systems) and computer-aided analysis of drawings. Decomposition of graphical tasks into projected and verifying ones forms a control space structure which is expediently analysed, but only visualization problems are mostly considered in textbooks and reference literature .

As the qualitative and quantitative analysis of a drawing in pencil technologies couldn't even be directly connected with drawings, there are no traditions of such process, no formalized needs and requirements to carry out such analysis.

Rationality is achievable in formalizing graphical management problems aimed at making the drawing compilation (because computerised drawing shouldn't be drawn) and analysis of drawing elements (entities) easier and faster (Fig. 6a). Modeling the ways of presenting information, graphical problems can be solved by projected and verifying tasks (Fig. 6b).

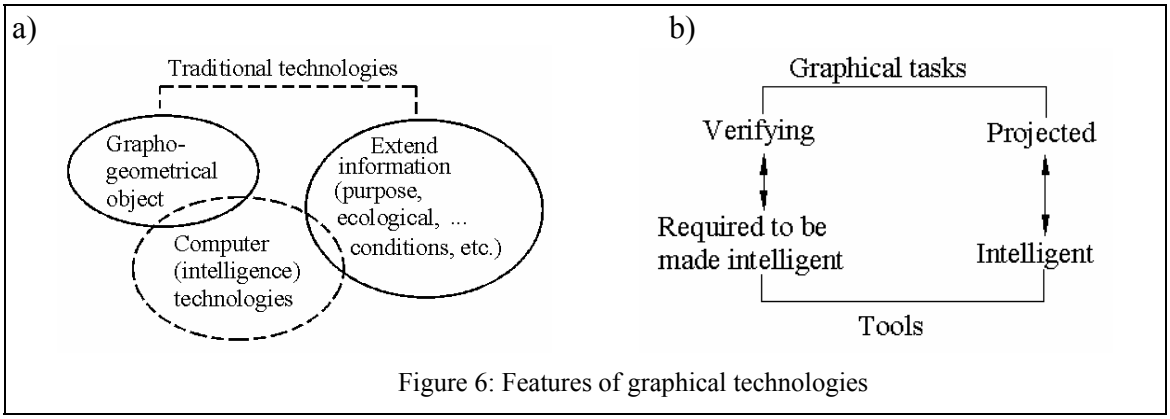

Figure 6: Features of graphical technologies

Projected tasks in graphics are expected to be visualization formation. In engineering practice in general it is formation of drawings, 3D model compilation and, if necessary, receiving drawings from 3D models.

Verifying tasks in graphics are expected to be analysis of the graphical file information. In practice they are tools with the help of which it could:

- determine the types of the whole drawing or its part entities and the quantities of each type;
- carry out the qualitative analysis of drawing entities shown by a user, i.e. present key parameters of the entities.

Special attention is paid to intelligent-heuristic methods the devices for realisation of which are presented in Fig. 7.

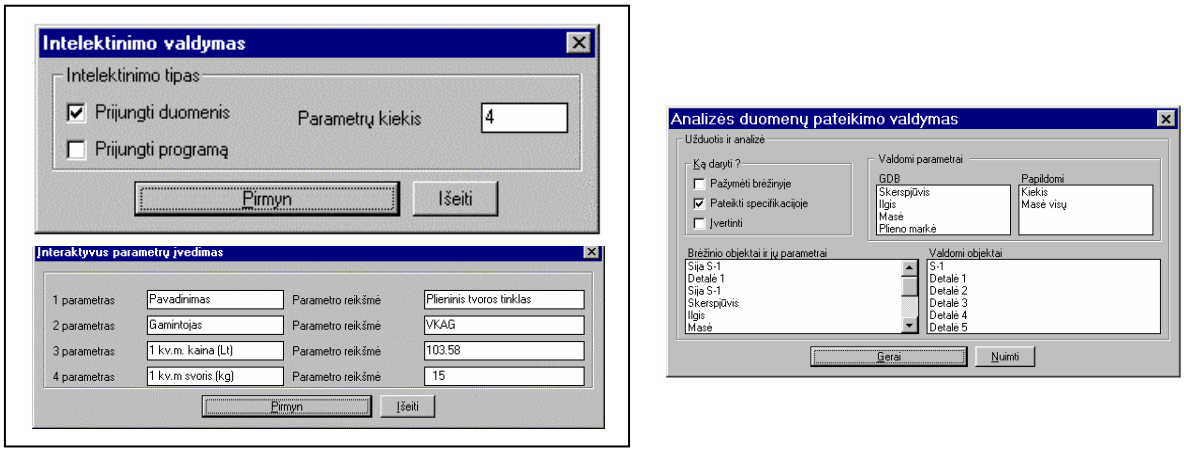

Figure 7: Tools of intelligent instructions

Using such methods allows to carry out the analysis and management of the drawing file by manipulating the parameters of its graphical data base. Besides, using intelligence protects from errors of intermediate parameters input.

4. Conclusions

- the contents of general engineering graphics problems and mechanism of their realization are presented;
- the structure of engineering graphics problems is formulated: 2D and 3D modeling, view receiving, metrical and positional problems as well as methods and devices for their solving;
- the generalized model of graphics problems which involves designing and checking assignments is presented;
- the role of artificial intelligence in graphics is show and intelligence devices of educational graphics are presented;
- applying information technologies allows and requires to change in the main the conception of graphics realization by going from element to object and process actions.

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TECHNOLOGIE INFORMATYCZNE W MODELOWANIU WSPÓŁCZESNEJ GRAFIKI

Komputerowo wspomagane rozwiązania problemów grafiki mogą być wykonywane tradycyjne lub za pomocą technologii informatycznej. Stosując metody tradycyjne wykorzystujemy 10-30 procent możliwości komputera, resztę wykonuje człowiek. Przy wykorzystaniu technologii informatycznej człowiek pełni jedynie rolę prowadzącego i kontrolującego, podczas gdy przygotowanie, wprowadzenie a następnie przetwarzanie danych jest wykonywane przez komputer. Podstawą technologii informatycznej są modele problemów z grafiki, bazy danych i wiedzy, pojęcia i modele, które pozwalają spełnić cele edukacyjne grafiki inżynierskiej. W pracy przedstawiono informatyczne struktury grafiki inżynierskiej i problemy związane z nimi oraz sposoby ich rozwiązywania.

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