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AN INTEGRATED DESIGN ENVIRONMENT

Summary. The paper presents the idea of intelligent
integration of CAD - systems in one Design Environment. The
three approaches to integration of design environment are
discussed.

1. Introduction

During the last two decades computer systems supporting
designers in different stages of the design process have
appeared [1-4]. These systems can help with geometric
modeling, finite element analysis, simulation etc. The
industry began to use their commercial versions in the design
offices. Computer codes are available which can support the
designer in nearly every field which is connected with the
design process. Quite often one design office uses more than
50 different systems. This situation creates a number of new
problems which are described in the next chapter. Some ideas
of solving these problems are presented too.

2. CAD systems in the design process

In every design process some specific way of design process is connected with designing. In this respect every commercial computer system, available on the market, has its own specific way of the design process. It can deal with a modeling procedure, an organization of processing and the way how results are shown. Every discipline has its specificity which reflects on used solutions. Computer representation of model and design process is very important. In commercial systems these problems are rather well solved. This can be a special system of coding files which works with some managing system. Every file has its own identifiers, describing different possible connections. Very often a special system of interfaces is available which allows direct communication with another system or an outside control.

The common feature of software with integral separate systems is that it is well developed but it is closed (this means flexible only on limited way). Systems made in different software firms can have different data bases, processing and dialogue organizations.

The most important feature of the design process is its complexity. The whole design process consists of a number of mutually interconnected subprocesses. The results of one subprocess can be input data of another one. According to that the use of many different computer systems on different stages of the design process needs their integration. Consequently the main goal of the integration is to improve the efficiency of the information circulation and not to allow for not necessary redundancy.

The integration can be done in one of the following ways:

a) via a system of interface's which connect different computer systems,

b) via an integrated data base, common for few systems,

c) via a two-level data base with a meta-knowledge level.

The first approach is quite often used in practice. And it

is very efficient in the case of little problems. Using it we should remember that this can be the beginning of a never finishing system of inter-system links. And every improvement causes with big changes in the software. This type of structure has little flexibility and is very dangerous if it achieves l rge dimensions which are difficult to understand.

The use of integrated data base is very popular. The connection of information about geometric and physical features of the model in one data base is natural. On the market commercial data bases of this type are available. But with them one data base often dominates other.

The logical structure of integrated data bases is very difficult for fast and proper designing. Very often there are no flexible results, or "over flexible " results. We should remember that the integrated system is permanently developed and improved. Every change in the idea of storing information can cost a lot of work. Except for that this solution is very popular in practice.

The third idea seems to be especially interesting . In [8] a very interesting idea of a data-base with meta-knowledge is presented.

The possibility of searching in a data base for similar solutions seems to be a very important aspect. For this purpose an expert system can be used. Circulation of information is a very important problem in a design office. The main goal of every procedure is to achieve optimal solutions of design problems. Chefs of design offices can have problems how to arrange work for the whole office during the realization of some specific order. It is proved that in different disciplines different algorithms are used. The algorithms are based on well tested schemes.

3. The idea of integrated design environment

The chapter shows a concept of integrated design environment. The most important part of the integrated design environment is the data base. The data base should integrate all computer codes used in the design process. The structure of a data base should be open and allow to add new components. As mentioned in chapter 2 several solutions for the data base design are possible. The best solution seems to be a data base with meta knowledge level.

This kind of data base can be treated as an intelligent data base. Let's now consider a compulsory set of functions which should be offered by the data base.

The data base should allow to create connections between models which can be used by different computer systems. It should not allow to store redundant data and it should offer possibilities to reflect process aspects of design. It should be possible to archive older versions of some projects. It is very important to have the possibility of an intelligent searching in such archive or archive of standards. The archive should be equipped with functions which allow to store all development of some constructions but without redundant information.

The design process has its own dynamic structure. Some things should be done earlier, some later, some can be initiated after having done some others. A network can model it well. The design process of a new product is connected with many activities done by different people. The basic problem is how to optimally exploit the effort of single designers and how to coordinate their work globally. The data base should allow cooperation between different design sub-processes and store current state of them.

Intelligent solutions are needed because such a structure of a data base is not only a system for storing some information in some formal way. The data base should be equipped with different expert systems supporting nearly all activities.

The data base building is very expensive. It seems to be very important to create software in a more universal way. The natural way is to build software while looking on some real design situation of some real design office. But parallely the process of universalization of created software can be conducted. This can be done via making upper level software which can create this specific software for some single design office.

4. Conclusions

The authors develop different specific versions of a data base with some elements of intelligence. These data bases are not extremely big but they deal with some real industrial cases [10,13,14].

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EINE INTEGRIERTE ENTWURFS-UMGEBUNG

Zusammenfassung

Der Artikel behandelt die intelligente Integration von CAD Systemen in einer Entwurfs-Umgebung. Dabei werden drei Ansätze zur Integration der CAD Systeme erörtert.

ZINTEGROWANE ŚRODOWISKO PROJEKTOWE

Streszczenie

Praca przedstawia inteligentną integrację systemów CAD w jedno środowisko projektowe. W pracy zaproponowano trzy podejścia do problemu integracji środowiska projektowego.