CAD
As Interaction Instrument Between Planning Partners

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CAD has been developing rapidly to a widely used and widely spread instrument equally in architectural studios as well as in most offices of the engineering planning partners. This paper tries to submit an impression of difficulties and advantages by introducing CAD as interaction tool. An outlook on future aspects will be given.

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1. Introduction

CAAD has brought a new dimension into working methods. Into working methods not only within the architectural studios itselves but also within the multiple interchange between different planning partners.

Planning partners are surrounding the somehow central position of the architects and submit the more technical aspects to the planning process. Statics and building services - meaning heating and cooling, water and waste water, energy and air conditioning - surveying and site supervising, to mention only the most important.

The engineering partners of the architects mostly were handling CAD long before architects entered the computer-stage. Interacting by CAD-interfaces made things easier on the one hand, on the other hand architects are driven into new difficulties by the enforcement of certain disciplines.

2. Historical review

Only short historical remarks should be given here:

In the sixties CAD started to get introduced - first in the engineering area, later and very rarely in the architectural studios. A lot of research was going on in the universities, mainly in the US and in the UK.

In the seventies CAD succeeded to get a certain acceptance in the planning process. Engineers seized the tool and tried to persuade themselves that they are working more efficiently - and more and more they actually did. The user surface did not range as important item within the very exclusive system-developers. Nobody could even think about data transfer - as there were nearly no planning partners with CAD-assistance. CAD in those days was not so much CAD but rather CID: Computer Impeded Design.

The eighties brought the big success to a number of software-houses dealing with CAD-systems. A hot discussion between developers

came up, which operating system could best handle the huge requests of CAD-programs und CAD-users: UNIX, DOS or did the APPLE-world fit best. The efficiency of the programs was widely improved, the user-friendly-surface moved towards a much more central importance. Interfaces between CAD-systems were discussed, DXF and IGES were created.

Presently we have a widespread acceptance of CAD-systems, not only in the engineering area but also in the studios of architecture. The development of hard- and software made possible, that the normal users generally are not really interested which operating system is on duty. We watch the development of a number of different CAD-systems and we deplore the lack of intelligence within the interfaces, which is due to the early point of introduction. The developers are mainly relieved that most of the graphic information can be moved from one system to the other, without too much loss of information.

3. Interchange between planning partners

Since CAD was introduced, a multiple interest built up to take advantage of the data produced in the course of the planning process. There is a variety of planners with widely varying activities:

3.1 Interchanging planning partners

Here are given the most important ones:

Architects

Civil Engineers

Building Service Engineers

Surveyors

Site Supervisors

Administration (Public Authorities ~)

Administration (Customer ~)

3.2 Interfaces

Since there is a huge variety of different CAD-systems, we are going to need interfaces to export and import CAD-data. There are efforts

made to improve the intelligence of those interfaces, but most of the intelligence is left to the users, which is not a very lucky solution, speaking of the average.

The mainly introduced interfaces are the following:

DXF

This interface was created by AutoDESK providing a very simple interchanging script. There were millions of implications of AutoCAD worldwide and the business-heads were rather certain that other system would ever come close. So the other systems were forced to take over the AutoDESK-dictated standard to get a chance. Nevertheless we do have DXF in our days and interchange is possible, the low level of the standard is a fact we have to live with.

IGES

This interface was created for more powerful systems, but it is lacking common usage. Very few CAD-systems offer IGES. And an interface is only of some value if we can assume that all planning partners are able to interchange, whatever system they are using.

3.3 Quality defects caused by interfaces

CAAD nowadays is drawing advantage of a certain intelligence within the systems. The user mostly is not involved into decisions whether there should be made a change of layers while working on different aspects af data. So the system is forcing a number of decisions, producing results nearly without logic mistakes - as long as the systems are left alone.

Data transfer to other systems implies the use of interfaces. Speaking of DXF as the mainly used tool, data transfer is working mostly without mistakes between numerous systems - but on a very low level.

Most of the intelligent features do not arrive at the other system by data-transfer, as:

Measurements

These data are transformed to lines and characters without being linked to the geometric data. Users introducing DXF-information inte their systems and wanting to use measures intelligently associated to geographical data, are forced to create the measures once again.

Linetypes

Different thicknesses and line types can be altered with some luck, if there is a certain connection held up between the exchanging partners and if they are fairly well familiar with their software. Anyway, without any further input the transferred result is arriving with the default line-type.

Character sets

It seems that this will never work out really satisfying, so we should be aware of a certain amount of „post-processing“ or we should remove the text-layers as a whole.

Hatching

Here it is of some importance to remove the layer carrying the hatching information, because the system importing the DXF data is not able to recognize hatching as it is. We get an incredible amount of line information, which is blowing up the data volume to a large extent.

3.4 Quality defects caused by users

As there were beginners' difficulties within nearly all user areas introducing CAD, there are now similar difficulties entering the interchanging stage. We should agree that all or most of the interchanging partners have closed up to some professionalism using their system.

If there still are left basic handling troubles with geometric accuracy, or there are handling troubles while using for instance the layer administration, the information arriving at the partners might end up in a condition which - in the worst case - makes further use literally impossible. We have to strictly distinguish between trouble caused by the lack of intelligence within the interface or the trouble caused by „low-sofistic“ user-handling. The latter may be fatal.

4. Interchanging media

The interface is producing data inevitably much larger than the original source. This is of some importance when it comes to data transfer.

Floppy disks

This data-exchanging media is the oldest, commonly used and widely spread. But since there are only 1.44 Megabytes of storage available, trouble is coming up. A good floor plan of a larger building with avarage information comes to about 1 Megabyte of CAD-data. Transformed to DXF this is enlargening to somewhat about 3 to 4 Megabytes and thus exceeding the capacity of a floppy disk. You can choose between playing disc jockey or handling compression routines. The latter is much better.

Anyway, floppy disks turn out to be rather solid and cheap, but they are not the solution the world is waiting for. And when it comes to long distances floppies tend to be awfully slow.

Modem-Transmission

A much better method of data-transfer takes advantage of a transmission-media, that is available all over the world: the telephone network. There is no delay by using the post office and there is no limitation of data-volume. The only drawback may be seen in the costs of transmission.

The equipment needed is very confined: We need a modem- a nice transmission rate of 14400 or 28800 baud turns out to be useful - and we have to connect it with the telephone switchbox on the one end and the PC on the other. Modems differ largely in their features and price, a specialist should give advice. If available an ISDN-connection turns down the transmission times considerably. Thus 1 Megabyte of data-transfer are a matter of less than one minute.

If there is ISDN available we can do without the modem, an ISDN-board tucked into the PC is handling all problems. But: Problems come up, if your partner is not holding an ISDN end in his office, but only a modem. Therefore the modem is the allround solution, at least for the time being.

This is, seen from the present situation in Germany, state of the art. There is a considerable number of engineering offices capable of data transmission by modem, studios of architecture at presence are clinging to floppy disks.

Internet

As there are only few modems in studios of architecture, there are only few networkers in engineering offices.

Seen from the equipment there again is a modem or an ISDN-board. But the transmission is done differently, we need a network-provider. One does not place a phone call to the planning partner and send - or receive - the CAD-data. There is a phone call to a net provider, done by the net communication software you have to install in your PC. There your data hit a gateway leading to the powerful and fast network of the provider. Your partner finally picks up his data by another gateway passing again over a telephone and a modem. This use of the net provider and the gateways produces costs on either side of the transmission.

This seems to get importance in future bcause of the power and speed of the networks. But costs presently are preventing more frequent use.

5. From Interchange to Interaction - some Features

All present means of transmission are very badly operating, if it is really interaction, what is wanted. It is a sometimes not very satisfying way of interchange and reminds us awfully of the punched cards, we fed the large computers in former days - and hours later we received the response in the form of a pile of paper. Real interaction with the computer began to come up with the workstation, where you sent your message and could receive the response in due time on your screen - hopefully.

To perform a similar process with the planning partners it is inevitable to interact with them directly by means of your PC-screen. Today software-houses are developing systems, where you can talk with your partner over micros and tiny TV-sets fixed to the computer screens. The screen may offer several windows, both participants have access to. And one or more of the windows may contain CAD-drawings, the partners both can work on and afterwards send - or receive - over the telephone-net.

Mostly this is an optional module of the CAD-software with the CAD-software being the business part of the deal. On computer fairs we can watch an engineer talking to his supervisor on a far away site and providing him with drawings after having the site supervisor change several details of the construction. To pep things up there is another window containing a digital site-photo of the detail regarded. After all the capacity of the telephone net will confine your fervour to transmit a whole video sequence.

So, there is a point to start with. In the first step we should be happy if we could have a phone-call by using micros to avoid nervous hacking on keyboards. Most of us would agree to cancel the TV-set, because it seems to be enough, if you receive the grunting voice of

your site-supervisor, you need not have as well his sweating face in front of you. And if finally both participants agree on transferring some CAD-data in whatever direction, this will mean a lot of progress.

And this is not a science fiction vision but can be realized without greater difficulties. The goal seems to be the independent from a certain CAD-system and to provide interactive access to CAD-data. By hopefully soon cheaper digital cameras we may come up with picture transmission as well. Zooming in these pictures without loosing too much of the resolution would be great.

6. Conclusion

Starting with the simple data transfer between different CAD-systems and discussing means of transfer I tried to leave the area of mere interchange and proceed to real interaction.

Today we are operating the data transfer on a rather low and unsofistic level. I did not claim to discuss ways to improve the intelligence of interfaces. This is discussed for many years and will not be very promising as long as intelligent transfer is again confined to a small group of CAD-systems, if ever.

Interaction based on CAD-data will save time and money. The future use of networks with high capacities will further improve the connection and interaction activities between planning partners.