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### **CAD at the AAA**

Teaching computer science at the Aarhus School of Architecture goes back as far as to the beginning of the 80s, when a few teachers and students were curious towards the new media seeing its great developing perspectives and its possible use in the design of architecture. The curiosity and excitement about technology continued, although the results were modest and the usefulness not a dominant aspect in this early period.

In the middle of the 80s the School of Architecture was given the opportunity by means of state funding to buy the first 10 IBM PC's to run Auto Cad among other programmes. Beside this a bigger CAD-system Gable 4D Series was introduced running on MicroVax Workstations. The software was dedicated to drafting buildings in 2 and 3 dimensions - an important task within the profession of architects.

### **The education is project oriented.**

At the Aarhus School of Architecture drafting is not the main element in the education. Sketching has a higher priority. Priority is given to the development of understanding of shape and capability of sketching and spatial visualisation. It was and it still is the possibilities of sketching and visualising ideas and projects which is the fundamental task, in our use of CAD.

The education is project oriented and based on the beaux arts tradition. Disciplines and the learning of skills are not taught as particular subjects, but capabilities and techniques are adopted while practising and responding to project exercises. This also defines the way data processing and CAD are integrated in the education.

### **2D Auto Cad and 3D Scribe.**

In the middle of the 80s this starting point led to an integrated use of 2D Auto Cad and 3D Scribe in the teaching of CAD. At that time, when Auto Cad was still a 2 1/2D programme and the only Cad system known among architects, it appeared to be a big step forward, that a 2D drawing could be imported into a 3D modeller, although the modeller was rather primitive. At this early beginning the idea of integrating programs was founded, due to the aim of getting the most out of the media. And yet a third programme was annexed, a paint-programme for "after treatment" of pictures produced in Scribe. Because of the screens we were limited to use only 16 colours - and what colours!

The real break through - till now - happened to be when we got Macintosh IIsx and the Zoom 3D modelling programme. It suddenly gave a lot more and much simpler possibilities visualising by means of integrating software.

Below I will more closely explain the strategy that, since the spreading of the PC's and the relatively cheap software - has been the guide to the use of data processing in the architectural education at the School of Architecture.

### **The teaching method**

On the second year the students attend an introductory course in the use of the Macintosh IIsi at the Datacentre. We teach word-processing, use of the scanner, picture treatment and desktop publishing. After the course the students are allowed to use all computer equipment available at the Datacentre. The course works out to be an incentive to elaborate written works and publications by means of computer technology and become familiar with the media.

When students on the 3rd year start dealing with CAD it will be in courses away from their department staying at the Datacentre about 4 weeks. The Datacentre is a so called service-department. This means that normally there are no students associated and that students cannot graduate from the Datacentre. We collaborate with the normal departments, who send their students to courses at the centre. The program for a course is made in collaboration with the departments, and work done during a course has its origin in ongoing projects there.

In general a CAD course is divided into 2 phases. The first phase is an intensive teaching and exercising part, where the student learns to use one or more programmes. This is followed by a period, where the student does works of his own. In this second phase the programme of the first phase is repeated, but closely related to the project in course and individually planned and carried out by each student. The real learning and understanding of how a CAD system functions takes place in this part of the course. And it is also in this phase, the less interested and most sceptical students give up. - Which they are free to do!

The first part of a course takes approximately 2 weeks if you are a beginner. The duration of the second phase depends of the engagement and ambitions of the individual student. But 2 weeks are the absolute minimum. After having attended a one month course you are not skilled, but in good conditions to continue on your own.

Having finished a Cad course at the Datacentre the students are invited to use the equipment day and night, provided that it isn't occupied by courses. In the daytime there are only few computers (5 - 10) which are not in use, but during night-time there is access to all 20 Mac's and 15 DOS-PC's.

Many students use this opportunity to elaborate their projects using the Datacentre equipment. Some buy their own computer, which enables them to do 2D and 3D modelling. The more demanding jobs such as rendering, picture treatment and edition of films are done on the Datacentre equipment.

### **Strategy number 1:**

#### **Cheap hardware and software increase the spreading and use of computers in the education of architects.**

The possibility for the students to combine and supply their own equipment with the more sophisticated facilities gathered at the Datacentre constitute one principal element in our CAD-strategy.

We use software that can run on relatively small and cheap personal computers. This benefits the students' possibility of having their own computer, like having a camera, and increases the use of the equipment belonging to the School of Architecture. And most of all it leads to

a larger integration of data processing and Cad in the education, because it is based on the inclination of the students to explore the media.

### **CAD-Methods.**

As already mentioned, the teaching of CAD takes place in the second part of the study, from the 3rd to the 5th year. New programmes are introduced while doing exercises strictly related to topics and methods in architectural work. The topics covered can range from construction, housing, industrial design to town planning.

In the architectural profession Cad is often identical to electronic 2D drafting, while Cad is mostly used for making traditionally project material with 2D drawings printed on paper. At the Datacentre this kind of work is a very small part of the work carried out. The starting point for research as well as for teaching CAD has been to increase the possibilities of visualising ideas and projects. Therefore we also investigate other means of presentations than the traditional poster.

The backbone of most courses and projects is 3D CAD, either Zoom on the Macintosh or Auto Cad on the DOS-PC. However, it is only in rare cases that one single programme can cover all the demands put to the contents and presentation of a project.

### **Strategy number 2:**

#### **Integration of many programmes offers the possibility of a comprehensive use of computer technology.**

During time we have developed a method based on the integrated use of a series of programmes where each programme is used where it suits the best.

A typical project course can be carried out in the following way:

- Mc View: A hand drawn sketch is scanned.
- MiniCad: The sketch is vectored by making an overlay in MiniCad
- Zoom: The 2D drawing is imported to Zoom and extruded into a 3D model. The model is detailed and finished.  
Colours are assigned to the model  
A film or a sequence of pictures is made to demonstrate main aspects of the model.
- Fotoshop: The pictures will have an after treatment if necessary.
- Macromind: The film or the pictures are edited and provided with text, sound and supplementary illustrations etc.

The final presentation can also be made on posters or as a slide show. In that case a DTP-programme or Aldus Persuasion is chosen for the final edition.

Such a variety of programmes can seem to be overwhelming, but the experience is, that it isn't. The important thing to learn is not a particular programme or CAD system. It is more important to understand the structure and logic in a system because of the similarities not only in the software for the Macintosh but software as a whole. And there is a clear tendency to develop standard ways of doing things, which will be integrated in all programmes.

At the Datacentre we try to be independent of particular systems, so that we will always be able to integrate new programmes, that might show up to be useful in architectural practise.

## **2 milieus.**

In the activities of the Datacentre we can focus 2 different tendencies in the use of CAD. It characterises both teaching and research. One tendency is the searching for software that will make it more interesting to being an architect and will increase creativity and the understanding of the design fundamentals. The other tendency goes for what will be useful, profitable and common among architects and their collaborators.

In the teaching it is expressed so that, you can explore the media, when teaching students, while the postgraduate courses are characterised by being more oriented towards skills.

It is also expressed in the systems required for the different tasks. The students prefer working with the Macintosh which offers great possibilities for investigating the media, while the professional architects pay more attention to the DOS-PC and Auto Cad simply because it is the most common Cad system in Denmark.

## **Courses at the Datacentre.**

The following is a brief description of some typical courses to illustrate the width in the Cad teaching at the Aarhus School of Architecture.

### **1. Spatial sketching with CAD**

The aim of the course is that the students learn one or more programmes, paying particular attention to the possibilities of spatial visualisation in the sketching phase. A rough handmade sketch is the basis for creating a spatial model of the object, building or site. While elaborating the model in the CAD modeller several ideas can be analysed, due to the easy access to make changes in the model.

The exercise is mainly a shape / form exercise, while other aspects of the project can be integrated little by little depending of time. Programmes: MiniCad and Zoom.

### **b) Visualisation with CAD.**

The aim of the course is to teach a systematic and many-sided use of a CAD system. The first part of the course consists of exercises in redrawing well-known architectural works in 2d and 3D focusing on the connection between architectural thinking and computer thinking. In the second part of the course the students elaborate one of their own projects. Usually the project has already been through an intermediate crit in the students home-department. During the CAD exercise the student have to make changes and finish the project for the final crit, that takes place in the department, but with participation of a teacher from the Datacentre. The scale of the project can be from an object, a single building to a site plan. The project is made in 2D and 3D. Programmes: Auto Cad or MiniCad and Zoom.

### **3. Building construction with CAD.**

The aim of the course is to demonstrate how an appropriate 2D and 3D model can be elaborated in a way that makes it suitable to treat huge amounts of data. Furthermore the

project material must be done in such a way, that it will be open to edition and modification and automatically update all parts of the model. Finally the material shall enable plotting and printing in different scales and detailing. The course is based on an existing project material which in the course is redrawn with Auto Cad. In a later phase of the course, the students can redo the process individually working out one of their own projects or a project done by an estimated architect. Depending on personal interest there can be paid more or less attention to the 3D modelling, which normally isn't part of a traditional project material. Generally this kind of course only attracts students who are in the very end of their study, perceiving it as a job qualification. Programme: Auto Cad.

#### **4. Cad in architecture and form analysis.**

The Cad tool is highly suitable for working with the geometry expressed in form, space and their interrelations in the proportions of a building or "space".

In stead of a traditional course in architectural theory a digital model of a building is elaborated and CAD is used as an analytic tool to obtain an understanding of the building, its superior ideas, spatial organisation and form.

Programme: MiniCad or Auto Cad

#### **5. Site plans with CAD.**

Simple building models are integrated with the digital technical maps elaborated by the local planning authorities. In 3D the building model is integrated with the terrain model. During the course different possibilities of locating buildings on the site are examined, as well as variety in height, roofshape etc. of the buildings.

Programmes: Auto Cad or MiniCad, Zoom and eventually MacroMind Director.

#### **6. Assigning colour with CAD.**

The course is a study of assigning colour and colour theory based on pictures of well-known buildings and interiors. The pictures can be pictures from a CAD model, scanned photos or video grabs. The course is a digital colour-course. Programme: Photoshop

#### **7. Interface design.**

As a part of the description and visualisation of an industrial product with a digital interface the function and operation can be simulated at the screen in an interactive "virtual reality".

Programmes: Zoom, Photoshop and MacroMind Director or SuperCard.

#### **Presentation of digital models.**

The presentation of a CAD model is a particular subject. At many courses you will be aware of the problem just before the end of the course, not having time to deal with the problem. A digital model can be presented in different ways. The simplest way is of-course plots and prints on paper. For students who have attended a CAD course and wish to extend the use of the computer courses are arranged, where we teach programmes dedicated to presentation. This implies that the student has a material ready for presentation consisting of e.g. a CAD model, scanned drawings and photos, word processed text, maps diagrams etc.

#### **1. Presentation in a publication**

The scheme is simply to edit the material into a publication. The basis is a DTP programme, but other programmes can be integrated depending on the material to be used.

Programmes: PageMaker, Photoshop etc.

## **2. Slide show**

Illustrations made for a publication can also be used as slides. Pictures from CAD models, photos, maps, text etc. can be brought together and edited in Persuasion. Finally the presentation can be done on a large screen projector.

## **3. Animations**

A 3D model elaborated in for example Zoom can be presented as a film in MacroMind Director, while you utilise that you can "take a walk" through the model working with Zoom. Besides the model can be coloured and lightened. The animation can be used to analyse the project and try variations of the same form concept.

### **c) Interactive presentation on the screen.**

The most advanced way of presentation offers the audience the possibility of creating their own presentation, because you can choose the aspects in which you have a particular interest. Depending on the author taking the subject into consideration. The presentation can also include sound and video, and you will call it multimedia.

## **Final Statements.**

Although much has happened since the first 10 PC's were purchased the strategy for the development of the computer facilities is still the same as in the 80s. It has been investigated and examined not only in teaching but also in the research that has taken place at the Datacentre during the last 8 years, It isn't for nothing that we are "68's", who have been looking for platforms since then. Our strategy can be summarised into the title of a wellknown book, from the 70s: Small is beautiful. Our opinion is, that small still is beautiful...

If we look forward it is probably a strategy that we will continue to follow with the aim to reach a higher integration of computer technology and the normal teaching of architectural topics. A time will come, when the computer is a conventional tool, that isn't isolated in a particular service-department. And it won't take long, before the computer is as familiar to the students for serving practical purposes, as calculator, typewriter, walkman and video are to our generation.

When the computer is reduced to a common thing, there will not be much demand for costly solutions, neither in the small architects studios nor at the School of Architecture. Powerful machinery will be needed for special tasks, but beside this there will exist a "2CV", that most of us have to get along with. It is the use of that one, we are trying to optimize in our work at the Datacentre.

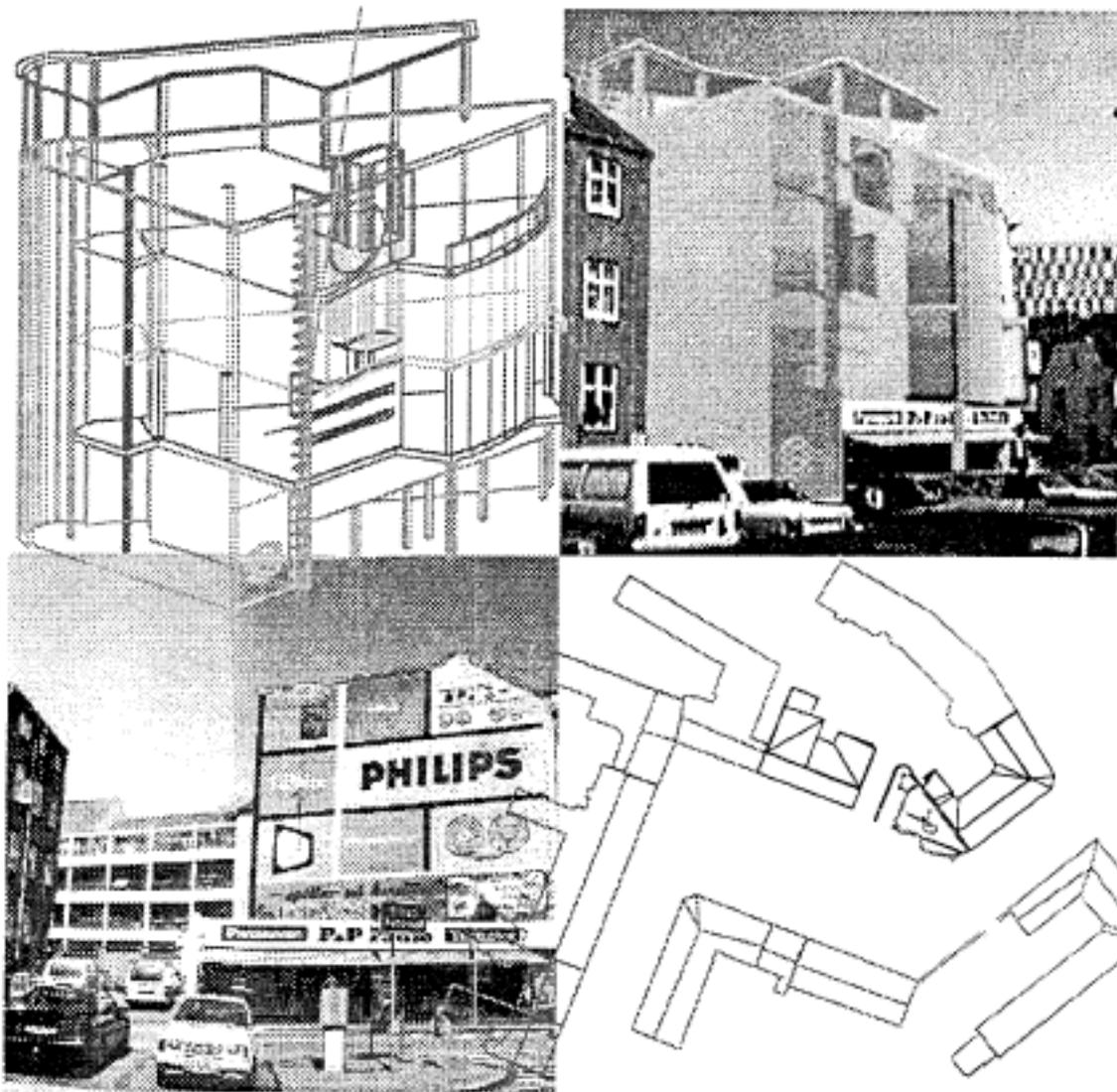
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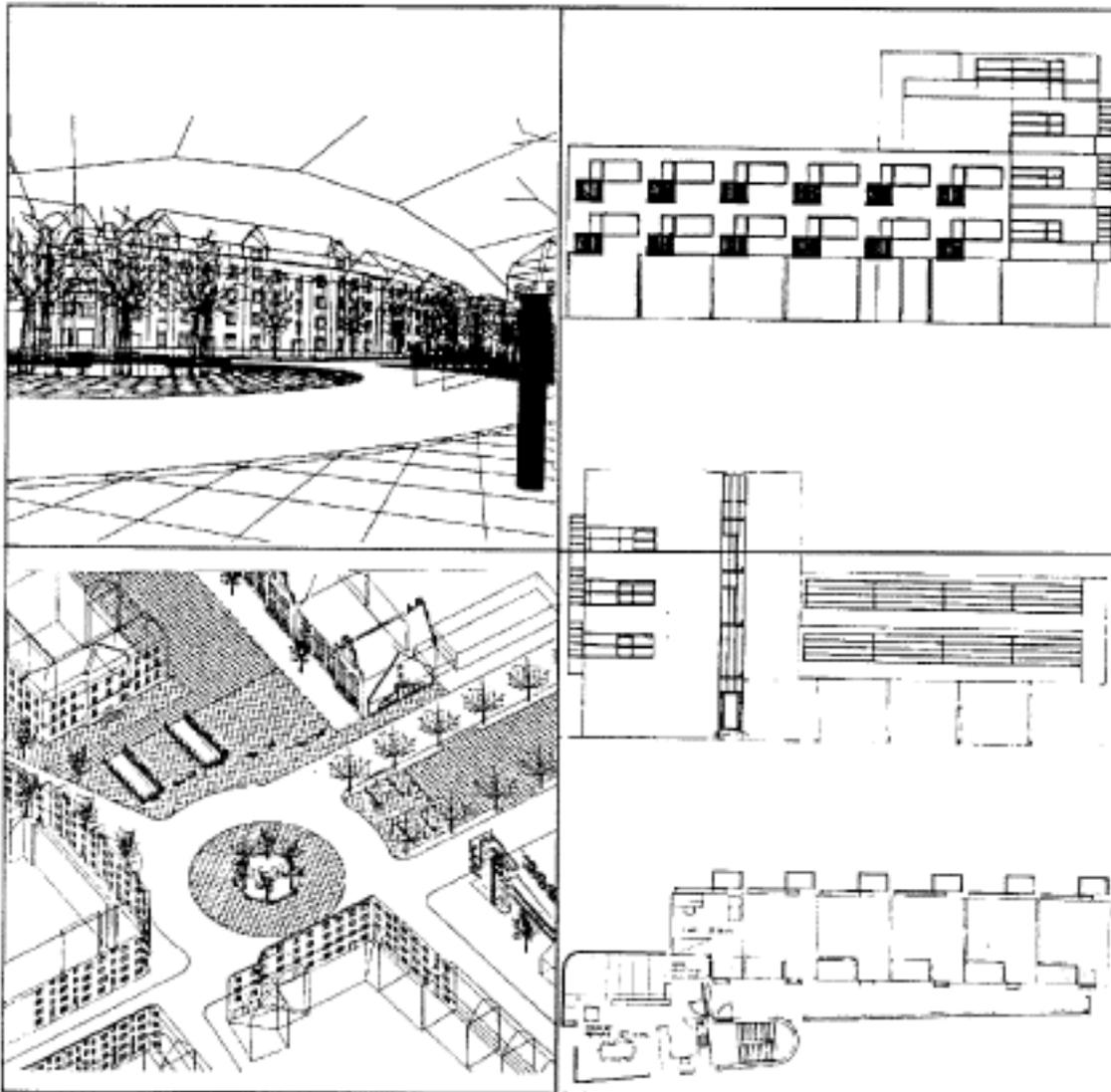
**Sketching with Zoom: Credit Card machine.**

The main task for modelling the machine is to draw the profile. This has been made in MiniCad as a 2D drawing, and afterwards imported to Zoom and extruded.

A handmade sketch of the keyboard is scanned and used for texture mapping of the 3D model. The rendered picture of the machine has finally been treated in Photoshop, to make a photo realistic illustration.



**Infill Project: Flats in the town centre of Aarhus.** The project is modelled in Zoom based on a 2D map of the site, which has been imported from MiniCad. The map is part of the digital map which covers the whole city. The final illustrations of the project are carried out in Photoshop. Rendered pictures of the 3D zoom model are imported to Photoshop and pasted into scanned photos of the place.



**Urban renewal - Proposal for a students hostel and renewal of a square in the town centre.**

The project is carried out in AutoCad. The siteplan is made as an overlay on the digital map that covers the whole town of Aarhus. To save time all illustrations are made without hidden lines. The project is presented in the traditional way on a poster.



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