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When, in November 1996, we received approval of our application (submitted exactly 3 years ago in March 1996) for a Leonardo da Vinci pilot project AVOCAAD (Added Value of Computer Aided Architectural Design), we could not imagine our current situation. Of course, we had a working plan. However, during a lot of meetings the theme AVOCAAD was discussed, explored and extended, finally resulting in the current AVOCAAD web-site containing almost 100 exercises. As a result we now have an ongoing extension and grouping together of CAAD teaching materials. Everything is accessible through a normal web-browser.

In April 1997 the project started with an International Conference and a partner meeting. Since then we had a lot of discussion and interaction. Later on, we extensively discussed our curricula and courses. As a result, I can state we now really have an good AVOCAAD partner group. I want to thank all partners for their stimulating discussions and contributions. It is due to this group and the work of the people involved, that we have realized a nice AVOCAAD product. This is explained in the first paper of this book.

Now, the moment has come to start extending the AVOCAAD group with other teachers and universities interested in the outcomes of the AVOCAAD pilot project. It is the intention of the partnership to make this possible in a structured and evolving way. This 2nd AVOCAAD conference also aims to be the start of the next phase in the project, which will be dissemination. Details will be announced later on.

Finally, the project would not be what it is without the continuous effort and work of Tom Provoost. A European project is a combination of very deep insights of the partners together with a lot of practical (and administrative) work. I'm sure Tom contributes to both of them.

The feedback from our scientific committee facilitated our decisions. This also influenced the scheduling of the conference.

In Brussels, we are lucky to have support from a phantastic group of people: Nele, Claudine, Jeannine, Inge, Conny and Rita, Jimmy and Lieven and everyone who has participated in the preparation and organization of the conference. Thanks for making all this possible! Finally, we have the ongoing support of the head of our Institute. We owe Lode Janssens a debt of gratitude for supporting all our activities!

Last but not least, if we look at the contributions in this book, we have to thank all contributors and already now, look forward to all discussions and the workshop during the conference. We hope you also enjoy!

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KEYWORDS
ABSTRACT

The Leonardo da Vinci pilot project AVOCAAD (Added Value of Computer Aided Architectural Design) aims to innovate the use of computers in architecture. Hereto, new course materials and structures are developed. Focus is on new unusual ways to use software in Architecture. In this paper, we first describe the context using the general AVOCAAD statement. In order to give structure to the developed materials, a scheme was developed. This AVOCAAD scheme is given and described. In order to innovate in the architectural curriculum as well as in design offices, exercise materials will be available through the Internet. Hereto, a web-structure for the exercises was developed.
AVOCAAD

Introduction

The Leonardo da Vinci pilot project AVOCAAD (Added Value of Computer Aided Architectural Design) aims to innovate the use of computers in architecture. Hereto, new course materials and structures are developed. Focus is on new unusual ways to use software in Architecture. The project wants to benefit from the experiences in universities as well as in architectural design offices. The course materials developed will be used in the normal education of architects as well as for post-graduate education, continuous education and training-on-the-job of architects working in an office. As this last category graduated some years ago and there is now much more experience in the ‘upstream’ use of computers, especially for them, an incentive towards stimulating more creative use of computers is necessary.

The AVOCAAD statement

The original statement of the AVOCAAD project as it was also included in the proceedings of the 1st AVOCAAD conference (J. Verbeke et al. (ed.), 1997) is as follows:

“Normally, a long and tedious design process proceeds the realisation of an architectural object. During this design process, the initial ideas and concepts of the architect crystallise out in a realisable form.

The recent new technologies, the availability of computers and software which become cheaper and more user friendly, imply that (even small and medium) design offices start using CAAD (Computer Aided Architectural Design). This has an important impact on the design process, which is currently under major change. CAAD offers a lot of new possibilities and there is an increasing number of examples showing us this new technologies support and change the design process in a positive way. Nevertheless, we see an important part of the design offices is not using these new possibilities. They are using CAAD only for producing plans. Acting in this way, these offices do not gain any added value of CAAD. Although the new technologies offer a lot of new techniques and can have a positive impact on the design process, we see a lot of architects who get confronted with these new media, react in a negative way. So, it is clear new impulses are needed in order to develop the added value of CAAD to the design process and to make this positive impact clear to the architects.

In order to realise the previous goal and to react to the rapid changes in the field, it is necessary to develop new training methods, new course contents and new training material. This material has to underline the added value of CAAD to the design process. This will augment training quality and the meaning and position of CAAD in the curriculum. It will also give maximal chances to CAAD in the future. In a second phase we see a positive impact of the designing offices and the architectural Institutes on the further development of CAAD. The new training methods, new course contents and
new training materials will make the anticipation to future developments and faster innovations possible.

This can be realised in the following way. The project will benefit from the practical training program AVOCAAD-stage. The experiences will be brought together in order to develop a new vision on the creative use of CAAD. New course material will be the concrete result. This will be the start of new training and in-service training oriented towards the added value of CAAD. As a final period we see training periods in design offices during which the new developed vision and training material will be confronted with the design practice.

By incorporating this new material in the curriculum, by integrating it in a short intensive course (as part of the continuous education as young architects who finished their studies in the near past have not yet gained this knowledge) and by making it available through the Internet (for training-on-the-job), we hope to reach a maximal effect. Because of the complexity and the fast evolution, it is clear this project can only be realised by a co-operation of different partners all over Europe: design offices, software specialists and universities. We want to bring together the variety of experiences and ideas in Europe in order to incorporate the added value of CAAD as well as possible.”

Within this context a scheme was developed which positions exercises and courses depending on their intentions and content. This scheme is described in the next section. Course materials and exercises are being developed at the same time. A sample list of exercises is given in annex 1. It will be clear to the reader, this set already covers a lot of themes in CAAD teaching. The exercise used during the AVOCAAD conference workshop is also added in annex 2 as an example. Every material is placed on a web-site which is under development and which will function in an interactive way. This is further developed in the last section.

The AVOCAAD scheme

One of the initial steps dealing with the formulation of a new CAAD-curriculum was the exploration by the AVOCAAD-team of several CAAD-courses given at their and other universities. During the analyses of the results, the team was confronted with the problem how to classify all these different courses. The basic understanding of a curriculum is that it should be a set of more or less coherent courses. So the question is what criteria to use to classify the different modules in such a way that a coherent set can be defined. During the evaluation two general observations could be made. The first observation was that a part of the courses were concentrating on technical computer issues. They address CAD fundamentals, MultiMedia techniques and computer hardware. In general these courses aim to achieve practical skills and technological insight, the ‘Computer Aided’ aspects of CAAD. The remaining other part focuses on architectural design. Here, issues like basic design concepts and design theories or methods are lectured, the ‘Architectural Design’ aspects of CAAD.
The second observation was that some courses are dealing with declarative and procedural knowledge and related tools while others look at concepts and tools that support creativity and intuition.

Both observations resulted in a scheme with two orthogonal axes, bounded by a circle as shown in figure 1. Every lecturer was asked to position his course in this scheme by placing a dot and a small description of the course.

![Figure 1: The AVOCAAD Scheme.](image)

**The AVOCAAD exercise web-site**

The main goal of the AVOCAAD Pilot Project Website is to provide a tool for architects in practice and architectural students to discover the added value of Computer Aided Architectural Design. The exercises developed formulate a specific architectural problem to the ‘user’, focused on the creative use of computers. The user has to design or create the ‘object or solution’ asked, not by following a prescribed path, but influenced by his personal ideas and background and assisted by the knowledge and experiences he extracts from the AVOCAAD knowledge base. Every ‘user’ will track his path through the exercises and the related information (both internal AVOCAAD topics and hyper-linked external documentation). The AVOCAAD exercises aim to express the added value of CAAD in a general software independent way and do not have the intention to be a basic ‘drafting’ course. Yet, the reference manuals of software could be linked to the scheme on a specific layer,
providing the user with the information when he might need it at a certain point resolving the exercise.

The exercise pages contain the description (explaining the general context), the goal, the required skills, the required software (always the kind of software, rather than a specific package), the explanation of the exercise itself and what kind of result you should reach at the end. This main page has also some links that may be useful for anyone who makes the exercise: to related topics (AVOCAAD topics as well as external hyperlinks), to exercises that have the same interest or that are somehow related and to the results of other people that made the same exercise. In addition, four indicator bars give an impression on the time load, the required computer skills, the required design skills and the difficulty level of the exercise.

After finishing the exercise, the result has to be submitted to the web-site, as well as some explanation on the basic idea of your result and the path followed to come to it, where it will be included in ‘other peoples results’. Now other ‘users’ who have finished the same exercise can provide comments on your result and you can discuss other’s results. This provides a lot of reflection on the exercise you made and the path you followed through the exercise.

Figure 2: The structure of an exercise.
In this way, the AVOCAAD web-site will become a discussion forum to exchange experiences and ideas in the field of the creative use of computers in Architecture, useful both for architectural students and architects in practice.

**Modules, foreground and background information**

In order to use these exercises in teaching, the AVOCAAD partners believed it necessary to structure the exercises (see figures 3 and 4) into modules. A *module* is a grouping of exercises complemented with two different types of information: *foreground* information (or *topic*) which is actively part of the module and needs to be read by all users (architect/student) of the module and *background* information which is (passive) information that can be consulted by the user if necessary. A module is a sequence of foreground information and exercises. It is possible to attribute to each task/exercise or to each module a deadline for submitting the result. A grouping together of different modules is called a *curriculum*.
This structure enables the teacher or individual user to use all available information and exercise materials to generate new entities: modules and curricula. These can be given to groups of students/users. As exercises and foreground information can be part of several exercises, the database forms a huge archive of materials a teacher can select to compose the task for an individual or group of students. This offers all CAAD teachers the possibilities to share experience and insight in added values offered by software to architects.

Set-up

The exercises are put into a database which also contains information concerning the user, foreground information, background information, deadlines, content of modules, user types, ... Using a normal web-browser an architect or student can access the AVOCAAD-site (www.avocaad.org) and get access to the AVOCAAD server. This server (using scripts) generates the web pages the user will see on his browser (see figure 4).

This allows the AVOCAAD group to structure and maintain the database, keeping an overview of the available exercises. Moreover, adding and reorganising exercises and information becomes very easy.

Different users

As mentioned before, the AVOCAAD system will be used in the normal education of architects as well as for post-graduate education, continuous education and training-on-the-job of architects working in an office. Each user will interact with the database in a different way defined by his user-profile. For the moment the following user profiles are defined:

- Guest: general information, no interaction with course materials;
- Student: follows a predefined curriculum or module defined by his teacher;
- Professional: can select his own exercises and compose his own module;
- Teacher: selects and creates exercises, foreground and background information, modules and curricula;
- Editor: local manager, selects for local server;
- System manager: overall technical overview.
An extensive description of these user profiles can be found in R. van Zutphen et al (1999).

It is important to notice that any real user can access the database in different user profiles: a student can access as a professional, or a teacher can access the database as a student. Therefore, once a user has accessed the AVOCAAD site, he is not bound to one single user profile. People who can alter or change the content of materials (rather than uploading) have more freedom in changing user profiles than for example students.

**Functionality**

The functionality for the moment supports the following items:

Curricula (see figure 6);
modules;
exercises (see figure 7);
foreground and background information;
pages with results;
pages with related information;
pages with related links.

This functionality will be extended with web pages to enter exercises, foreground and background information.
Depending on his user profile, a user has access to some of these functionalities. This way, the database can be kept accurately containing the right information.

Figure 6: To do list for a curriculum.

Conclusions

The AVOCAAD group meets regularly. Due to intense and frequent discussions the meetings, the current web-site and exercise materials were developed. Moreover, communication between the partners is taking place by e-mail and through the announcements on web pages. Experiments with students show they work very enthusiastically on the proposed exercises. The first results show very interesting answers of the students.

The scheme and the availability of exercises on the web-site provide a powerful tool for further development of course materials. The interactive exercise web pages provide a forum for discussion and exchange of experience and ideas towards the creative use of computers in architecture.
It is the intention of the partners to develop more materials and to test them with architects in practice and with different groups of students. Moreover, action will be taken towards design offices to introduce the exercises as a way to innovate and to stimulate a different use of software for architecture.

The web-site and the web pages generated out of a database generate a powerful environment for organising and structuring exercises and course materials. It is the intention of the partners to enhance and extend the website in functionality as well as in number of exercises and themes covered. This way, it will offer all CAAD teachers materials they can use and the AVOCAAD system will be a tool for them to create and manage CAAD courses.

Acknowledgement

AVOCAAD is a Leonardo da Vinci pilot project of the European Commission under grant B:96/2/0539/PI/II.1.1.c/CONT.

The AVOCAAD web-site can be visited at: http://www.avocaad.org.
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J. Verbeke et al., AVOCAAD, the Scheme, in artisanat informatisé et enseignement de l'Architecture, Proceedings of the 16th eCAADe Conference, September 1998, EAPVM, Paris, France.


Appendix 1: Sample list of available exercises

Scale modelling  
Image editing towards exciting couples  
Space- Geometry  
The sitting (computer) man  
Variations in a space  
Authoring the architect's visual presentations  
Interactive communication links with « buttons »  
Horizontal stabilisation of multi-storey buildings  
Photo sequens  
Image editing to explore dynamism I  
Image editing to explore dynamism II  
Mirroring  
Virtual scale modeling  
Virtual scale modeling (second part)  
Adding expressions to a model  
Focused design  
Decomposing a cube  
The deconstruction of a cube  
The building box  
Musical interpretation of Architecture  
Sound in space  
Extracting Architecture out of Music  
3D Image Composition on Cubes I  
Cube Composition  
3D Image Composition on Cubes II  
Animation between cubes I  
Animation between cubes II  
The Living Model  
Color Cubes I  
Color Cubes II  
Inverse modeling  
3 in 1 – Metamorphose  
Changing Design  
AVOCAAD, the Story  
Image Layering  
Imagine and play - sketching with paper, pen, scanner and computer  
Christmas Card  
Stadion  
Tent roof  
Stairs  
The gallery – Sketching with a CAAD modelling tool  
Summer house
Base of roofs
Computer realistic rendering
Cosy corner – Light
Virtual scene – QuickTime VR
Facades & sections from 3D
Complete a drawing with 2D
Cost calculation
Story-board – Authoring the architect's visual presentations
Buttons – Interactive communication links
The image archive – Archiving a project
Slide show – sequential presentation
Moving like mad – GIF animation
Concrete column
Concrete beam
Steel column
Steel beam
Steel truss girder
Steel beam, underspanned
Wooden column
Wooden beam
Wooden truss girder
Wooden beam, underspanned
Foundation, linear and punctual
Flat Foundation on concrete plates
Foundations on poles
Steel-wire construction
Aluminium constructions
Forces in wind girders (truss girders)
Stabilization by shear walls
Stabilization by frames
Stabilization of a high-rise building
Energy consumption in buildings
Basics of facility management
Building costs
Morphogenetics: first steps
Graphic information processing
From motto to composition
Light and scenography
The sitting computer man
Designing the entrance
The use of a room
Variations in a space 1
Variations in a space 2
Extending the house (garden)
Modelling and sketching (with pencil)
Inverse design
Appendix 2: Example of an exercise description

SOUNDOSCOPY

Description
Architectural spaces can evoke sound or music as well as sounds can evoke space. The perception of spaces is definitely coloured by sound or music. Endoscopy is used to represent Architecture by pictures taken inside a model. In a similar way, ‘Soundoscopy’ could be the term for representing Architecture by sounds or music.

Goal
Creating spaces and images, by analysing music and extracting atmospheres and feelings out of it. Stimulating space design by imagination and designing/modelling this spaces from scratch in a virtual computer environment.

Required skills
Architectural design skills
3D modelling
Rendering

Required Software
CAAD software, 3D modeler, Render software.

Exercise
Create an architectural sculpture in the given environment (see VRML file above and the photographs) that is a subjective reflection on the presented piece of music or on a fragment you select from it. Make 5 (rendered) images to present your design. The 5 images together give an overview of the sculpture.

Result
- A 3D model in VRML format that represents the given environment with the designed sculpture in it
- 5 images in GIF, JPG or PNG format that give a global image of the sculpture