AVOCAAD
– A Framework and Website for Teaching CAAD

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AVOCAAD, CAAD, creativity, pedagogy, LLL, ODL

Abstract

This paper presents an overview of a framework for online teaching of the creative use of CAAD in the early stages of design that has been developed in the AVOCAAD project.

Introduction

The Leonardo da Vinci AVOCAAD (Added Value of Computer Aided Architectural Design) project team has focussed during its three-year period on the creative and upstream use of CAAD in design. During this process, a pedagogical and theoretical framework has been developed for teaching this innovative use of CAAD in the form of distance learning through the medium of the Internet. European partners in the research project provided learning material and exercises aimed towards this use of the computer. Intensive meetings and discussions helped develop the project.

The focus on exercises is the basis for a comprehensive structure of concepts that can generally be used for distance learning. Pedagogical issues such as distance learning, self-study, group and peer learning, material preparation, information provision, context information, browsing facilities, course construction and maintenance are addressed in the framework. Technical issues such as user profiles, dedicated user interfaces, database structure and management, web page implementation, and interaction style were developed throughout the whole project and have lead to a functional prototype on the Internet. The totality of concepts and prototype forms a community knowledge-base of CAAD teaching that can be expanded incrementally.

Testing and development of the project was done in various ways. Two conferences were held for peer review and criticism on the basics and implementation of the project. Also, a first exercise was distributed and made available among conference participants, thus giving valuable feedback on assumptions and implementation of the work. Work was also comprehensively tested with various AVOCAAD partners in educational situations, yielding further cause for refinement and adaptation of the project.

AVOCAAD framework

Detailed discussions of the development of the AVOCAAD project have been reported in [1], [2], [3], [4], and [5]. The work addressed a framework of concepts: exercise, reflection, topic, module, and course.

Concepts

The basic element in the AVOCAAD database is the **exercise**, which demonstrates one particular way of using CAAD. Each exercise is structured in the same way:

- Title, which gives a brief indication of the aim of the exercise.
- Description, which gives some context.
- Goal, which states the kind of outcome of the exercise.
- Required skills, which summarises computer skills needed to complete the exercise.
- Required software, which summarises the kids of software to complete the exercise.
- Exercise, which gives some more detailed information on the exercise.
- Result, which states the factual output that has to be delivered to the AVOCAAD website.

Each exercise is concluded with **reflection**, which asks a number of questions to see whether the aim of the exercise has been fulfilled, and to reinforce the learning experience.

A single exercise is a comprehensible unit of learning and doing. Yet to keep it effective, it should not contain too much information, and the scope of the CAAD use should also be focussed on one particular use. Therefore, it appears necessary in many cases to define groups of exercises that together develop a particular idea in the use of CAAD.

The companion to the exercise is the **topic**, which adds related information to an exercise. This information is not necessary to complete an exercise, but it provides related information that a learner can consult at will.

In a **module**, exercises and topics are grouped through which subjects like "conceptual rendering", "solid modelling", and "mirroring" are discussed. The topics serve as a narrative structure, and present the logic of doing the particular sequence of exercises.

A number of modules constitute a **course**. In this way, it is possible to define a set of skills that a learner can acquire when doing the exercises.

Three layer structure

The partners involved in the project delivered exercises, modules, and courses that were put in the AVOCAAD database. Since each partner uses specific software and has their own context of teaching, these aspects also were reflected in the nature of the exercises. Another aspect that became obvious was that more detailed information or help with the exercise is embedded within a particular software that is used by a teacher. To make these differences clear in the goals of an exercise, it became necessary to make an additional distinction. A three layer structure as a classification of exercises was defined:

- **Design layer.** Application-independent concepts of architectural design. For example: nine square plan, support and infill, deconstruction, etc.
- **Concept layer.** Application-independent concepts of CAAD techniques. For example: Boolean operations, lighting techniques in rendering, walkthroughs, etc.
- **Technical layer.** Application dependent information about an exercise. For example: specific layer manipulation in AutoCAD, specific filters in PhotoShop, vrml-generation in 3DStudio, etc.

The concepts above and the three layer structure help to accommodate the various materials when an international group of teachers has to establish some uniform way of presenting material. The three layer structure also helps with focussing on the goal of an exercise, and how it is formulated in an exercise.

AVOCAAD summary

The AVOCAAD project presents a distance learning facility that stimulates self-study as individual or as part of a group. A **learner** can be a student at a university or a practising architect. The student can enrol in a curriculum that is predefined by a teacher, but just as an architect can also compose his or her own group of exercises. By **submission** through the internet, and accessibility to others of submitted work, **group** and **peer learning** are supported, and **feedback** from other learners and teachers is available. The framework and concepts aid teachers in preparation of their material, how to structure a course and maintain it, and to balance between exercises and information provision. The systems supports teachers in student management.

The AVOCAAD server and website supports different **user profiles**, which each have a dedicated user interface and process support. A **database structure** has been developed and implemented, as well as database management. All exercises and material are available on the internet.

From the perspective of the AVOCAAD framework, a number of other approaches can be discussed. The Fake.space environment [6] has been specifically designed to explore the notion of space. Relative to AVOCAAD, the scope of Fake.space is limited to the elaboration of one topic. The Fake.space environment is richer in its various representations of content. Both projects provide a teaching environment with online learning and results material. The notion of identity of the learner is more strongly elaborated in Fake.space.

The ADMIRE system [7] supports learning architectural analysis of building through various ways of representations presented as (computer)models and texts in an interactive environment. Content is focussed on design theory and analysis. ADMIRE was not developed for exercises, but the way it is structured, such a component can be very well added.

The online and interactive CAAD instruction in Delft [8] shows how teaching material in the technical layer can be addressed.

Promise and reality

The Internet will become more and more seamlessly integrated in university teaching. This development will not be limited to the pioneering examples in the CAAD community. More and more initiatives exploit the potential of Internet. A general theoretical understanding of all this still seems lacking as noted by [9], [10].

From the bottom-up and with a practical approach, the number of online educational communities and databases with specific foci will grow. For students and teachers this raises the interesting promise that all this material will become available so that students from one university can enter and learn from a multitude of communities in which they participate. As of now, these developments still are unlinked. There is no principle objection to any of the current web-based initiatives to open up beyond the current users and expand the user base, and thus to take full profit of current and future developments. For continuation of the work, a successful bid in the European Leonardo programme was made, and two new partners were included: Liverpool John Moores University, and Bauhaus University Weimar. The AVOCAAD Multi project will address the dissemination issue discussed above.

Acknowledgements

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