The CIAD-System - Multimedia Teachware as a Driving Force for CAAD

Sevil Sariyildiz
Mathias Schwenck
TU Delft
The Netherlands

Software systems for educational purposes have been developed and used in many application areas. In this paper we will describe a development in the field of architecture and building science. CIAD is a teachware system directed to be used in the education of students of architecture as well as a tool that gives a survey to architects and engineers in the practice. In the first place it provides information about the use of computer science technologies in the building design process. Furthermore, information about the architectural design process itself is included.
CIAD is a modular system which can be extended and updated easily. After giving an overview about the system, a module dealing with the detailing of a building design will be explained in-depth. By means of different examples the user gets information about the process. In animation sequences made from different renderings of example designs the process is explained. After that the user is requested to re-execute the different steps.
By means of this teachware we create an environment where the user learns more efficiently by working with examples that are made by various CAAD-programs. Additionally to the primary purpose to give an overview concerning the use of information and communication technology (ICT) for architectural design, the user will be motivated to use ICT as a medium for future work.

Key Words: *Computer Aided Architectural Design, Teachware, Multimedia Techniques*

The CIAD-System - Multimedia Teachware as a Driving Force for CAAD

INTRODUCTION

The application of computer programs for teaching purposes has been a field of interest since the 1960-ies. At the beginning there was an estimation that computers, called “teaching machines”, should be able to take over more than 50 % of every kind of education in a very short time. The development so far includes many projects resulting in inappropriate computer aided learning systems. It has shown that this expectation was significantly wrong. Furthermore, the overrating of the possibilities in computer aided learning or teaching has caused many reservations with respect to the use of computers for educational purposes [Wolf92].

In the last years the situation has changed because of new technologies like multimedia. Their common use has been enabled by the significant increase of hardware performances and other developments in the field of computer science. Another reason is that people in general are used to audio visual presentations, e.g. television, computer games, etc. and tend to pay more attention to this kind of presentations than conventional ones.

About the role of computers in learning processes [Parn92] stated that computers are powerful tools for education people. The main reason is the fact that the people are fascinated by the interactivity of the computer. In this way computers are very good means to provide motivation for learning.

Comparing the statement by Parnas with the problems mentioned above the contradiction seems to be obvious. [Maye92] has also taken into account this problem and presented the conclusion that the approach of computer aided learning did not fail because it does not work. Computers were even very effective for learning *given the right context and the right support*.

Therefore, we conclude that general problems that have to be taken into consideration in the development process are:

- Is the context in which we want to use teachware suited for computer aided learning?
- Which kind of support is needed to provide an effective way of learning?

• How can we avoid known disadvantages of traditional teachware?

These questions are discussed in the context of the CIAD-project in [SaSJ95]. There has been given a positive answer to the first question. Furthermore, the realisation concept for the development of the project is described. That includes the concepts that have been applied to solve the other two problems mentioned.

THE CIAD-SYSTEM

CIAD (**C**omputers **I**n **A**rchitectural **D**esign) is a teachware system developed for two general purposes:

(1) to provide information about computer science technology applied in the architectural design process

(2) to provide information about the architectural design process using these computer applications.

CIAD is a teachware system directed to be used in the education of students of architecture as well as a tool that gives a survey to architects and engineers in the practice. It has been developed in the context of a European COMETT project financed by the European Community for 3 years. The main aim of the project was to give support to the people who are working in the building industry about the newest developments in the field of computer science, but also to make this information available for students of architecture.

One of the starting points for the teachware was the general life cycle of a building consisting of several phases as shown in figure 1:

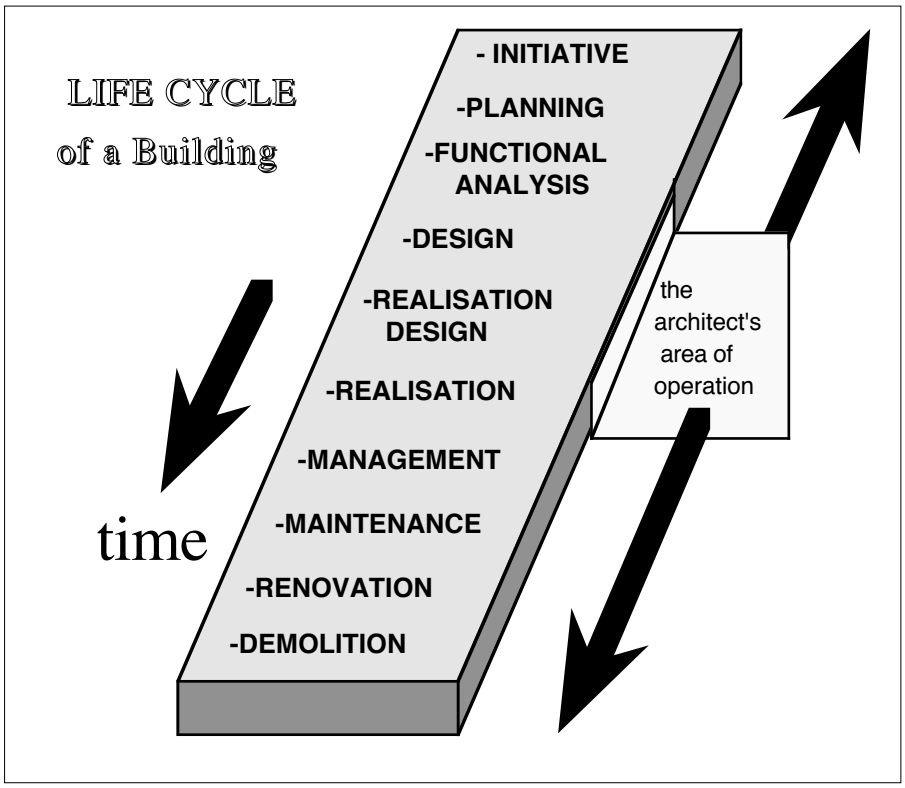

Figure 1: The life-cycle of a building

The developed teachware program deals with the Conceptual Design and the Materialisation as two parts of the life cycle of a building. In addition, a general overview is given about the application of information and communication technology (ICT) in the building sector.

So, there are three main subjects which are taken into account, namely:

1. an overview about ICT for the building sector in general
2. design aids for the conceptual phase of design
3. existing and also to be developed tools for the materialisation phase of design.

While doing this, we built up the software in such a way that the trainee has the possibility to get information about these subjects, to look at the examples and also to practice this knowledge by means of the software. Existing hardware and software for building technicians and architects as well as new research in the field are considered.

The teachware is programmed in a Macintosh environment with the "Authorware Professional" program by Macromedia, Inc. This program can be considered a high level programming language for multimedia applications. It is very suited to make visual interactive displays for learning purposes.

CIAD is a modular system consisting of various modules. In general, the modules could be divided into two categories:

(1) Primary Modules

All modules directed to impart knowledge about computer aided architectural design.

(2) Secondary Modules

This category contains all modules related to general topics such as the use of computers in the building sector or to fundamentals.

The classification does not imply an order of importance. It is only based on the fact, that the primary modules are directly related to the subject. In contrast, secondary modules are dealing with the context in order to impart basic knowledge.

The primary modules can be classified depending on the kind of learning mode. We support three modes:

- *"Theory"*

This modules are directed to impart theoretical knowledge about the subject discussed. The main goal is to extent the knowledge of the user about the concerning field.

- *"Practice"*

In this modules the knowledge already imparted will be illustrated by means of examples. Practical aspects are discussed.

- *"Exercises"*

The user get the possibility to make exercises or is requested to make some tests.

These problems are discussed in-depth in [SaSJ96]. In the next chapter we will focus on a specific module dealing with a detailing exercise.

AN EXERCISE MODULE FOR THE DETAILING PHASE

In the teachware we try to give examples that show the possibilities and impossibilities of information technology for the building sector. Furthermore, the teachware is practice-oriented. "Real-world"-problems in building design are simulated including the way in which the computer may help to solve them.

For the teachware a design of a small building was developed. This design was made in several variations of materials, building elements and building techniques. Each step is simulated within the teachware

environment. The user is able to (re-)build the design within the computer. In this way, the design is used as an example to let people practice with the teachware and, at the same time, they learn something about the detailing procedures. So, the user learns while working.

In this section we will described a primary module dealing with an exercise related to the detailing of a small building. This module is mainly directed to be used in the education of students. By means of different examples the user gets information about the detailing process. After that he is requested to re-execute the different steps in the correct order.

To realise a scoring system which records and checks the work of the student the user is requested to answer some questions regarding his identification. Features that are stored for every user are data for user identification (name and study number), information about the parts of the module finished including the achieved results and the overall result. A side effect of the recording facility is the possibility to individualise the communication with the user by individual comments including his name.

The figure 2 - 17 on the next four pages give an impression of a part of this module. It covers the construction of a simple wooden building as shown in figure 2. The house consists of different sub-elements which have to be composed in the right sequence.

In general the exercise can be divided into two parts:

(1) Demonstration of the Process

In a animation sequence made from different renderings of the example design the composition process is explained (figures 3 - 9).

(2) Re-execution of the Process

The user is requested to compose the different elements in the correct order as demonstrated in the first step. After selection an element the system checks the correctness of the selection and gives explanations. If the selection is correct as shown in figure 10, the user gets some information about the element he composed in the right way and is requested to go further. Otherwise the error is explained and he gets a second chance to select the correct element (figure 11). If he fails again, the element is placed automatically with an extended explanation. The figures 12 - 17 give some further snapshots from the process. At every time the user is able to get general information about the materials the house consists of by clicking on a specific button.

More detailed information can be found in [SaSJ95].

Figure 2 - 3

figure 4 - 9

figure 10-11

figure 12-17

SUMMARY AND CONCLUSIONS

1. There is a need to develop such teachware for self-learning, because teaching in the concerning field is a time-consuming and expensive happening if it is done with traditional methods.
2. A general concept has to be developed which handles the various specific themes.
3. While developing teachware, there is a need for a teamwork with various specialists like architects, building technicians, computer scientist and even students to test it.
4. Developing teachware is time-consuming, but if you have it, teaching time is very short or even nothing.

In order to answer the question what the added value of such teachware is, we have to take into account the following three features:

- Because of the dynamic by using movies, videos and especially the spatial 3D visualisations within the teachware, there is a faster learning and understanding of the things compared with the traditional way of teaching.
- Teaching time is much shorter.
- The human being is visual oriented, so using teachware is a natural way of learning. The enthusiasm to learn things increases significantly.

References

[Maye92] Mayes J.T., "The 'M-Word': Multimedia Interfaces and Their Role in Interactive Learning Systems"
In: Edwards A.D.N., Holland S. (eds.), "Multimedia Interface Design in Education"
Springer-Verlag, Berlin, 1992

[Parn92] Parnas D.L., "Software - Allheilmittel und Rauschgift"
In: Dette K., Pahl P.J. (eds.), "Multimedia, Vernetzung und Software für die Lehre"
Springer-Verlag, Berlin, 1992

[SaSJ95] Sariyildiz S., Schwenck M., Jander E., "CIAD - A Multimedia Teachware - System for the Field of Architectural Design"
Report, TU Delft, Faculty of Architecture, 1995

[SaSJ96] Sariyildiz S., Schwenck M., Jander E., "Multimedia Teachware in the Field of Architectural Design"
Proceedings of the 3rd Conference on "Design and Decision Support Systems in Architecture and Urban Planning", Spa, Belgium, August 1996

[Wolf92] Wolff M.R., “Computerunterstütztes Lernen in der wirtschaftswissenschaftlichen Hochschulausbildung - Status und Anforderungen”
In: Dette K., Pahl P.J. (eds.), “Multimedia, Vernetzung und Software für die Lehre”
Springer-Verlag, Berlin, 1992