Multimedia Training "Designing Randstad"

ir. Alexandra Tisma
Faulty of Architecture
Department of Urban Design
Delft
The Netherlands

ABSTRACT

The project multimedia training "Designing Randstad" (MTDR) is an experimental attempt to introduce multimedia in education at the Faculty of Architecture in Delft. It intends to develope teachware which will learn the students the basics of Geographic Informational Systems (GIS) implementation in land use evaluation appropriate for physical planning purposes. Interaction between students and the system will enable students to learn about GIS, to design a model of the spatial development of Randstad area and to evaluate their own designs, to produce immediate graphic visualisation of the evaluation and to compare it with the evaluations of the fellow students.

The project will be applied in the first year curriculum, in the course "Region" of the Department of Urban planning of the Faculty of Architecture, in the first half of the year 1997.

1 INTRODUCTION

Physical planning is a complex dynamic process which involves taking decisions regarding different spatial components and socio-economic agents. That is the subject with which the students of the Architectural Faculty have to deal in the course 'Region', during the first year of their studies. During 8 weeks of the course, students are faced with the field of planning which is quite abstract as their background knowledge about it is often week. Their design task is to develop the plan for the new urban areas within highly urbanised area in the west of The Netherlands called Randstad (area fringed by the cities of Amsterdam, Rotterdam, The Hague and Utrecht).
Within this context the learning goal of MTDR is to use GIS and multimedia to provide students with a powerful learning tool, which will help them to formulate the designs and to test the results of alternative spatial strategies that they produce.

1.1 GIS and mulimedia

It is generally acknowledged that human beings learn the best through the first hand experience, by trial and error (Senge, 1990). The problems of experiencing the real world situations in spatial or environmental systems are related with the fact that, since they are usually complex systems, the consequence (feedback) from our actions are neither immediate nor unambiguous, being often far removed in time and space (Senge, 1990). On the other hand, the consequences of our interventions can sometimes be rather damaging if they are performed in a real environmental system. Therefore the use of simulation can help understanding the consequences of our actions, and in our case computer simulation is considered as best technique for the development of the MTDR teachware.
Although computer simulation exists for already more than 50 years, especially in the recent years, with the spreading of personal computers, simulation became a part of

everyday life - just to mention computer games and multimedia applications in all fields of human activity.
The use of multimedia in education is recent but dynamically expanding technique. Multimedia can be defined as a variety of analogue and digital forms of data that come together via common channels of communication (Laurin and Thompson, 1991). By most definitions multimedia generally refers to applications which handle static media such as text and graphic in raster and vector form, as well as dynamic media such as time series data, animation and video, either locally or across networks. As such, the term multimedia really refers to the technology of data integration and presentation and does not imply any specific method of information organisation.
Although the attempts to integrate multimedia and GIS have been explored by many researchers (Raper, 1994; Camara, 1994, Scholten, 1995 etc.) until now one complete multimedia-GIS system haven't been developed. Therefore to create MTDR teachware, we decided to simulate GIS functionality and operations in the multimedia environment.

1.2 **The nature of interactive learning**

Interaction and interactivity are fundamental to all dynamic systems, particularly those involving people (Barker, 1993). Interaction between the systems depends upon the "flow" which involves the movement of material, energy and information from one system to another. Interactivity can be a case between both human-human and human-computer systems.
In the case of human-human interaction, the processes involved are usually of a cognitive nature and message passing most often takes the form of speech acts, gestures and tactile dialogue. The states involved are knowledge states. As a result of a dialogue process, the communicating partners therefore learn more about each other or about the topic of discourse.
In the case of human-computer interaction, the processes involved are cognitive and computational, respectively. Message passing in this case usually involves the computer screen, mouse or keyboard which are used with a suitably designed graphical user interface. This technology allows the use of different kinds of media, such as static and moving images, sound and text.
If the computational processes involved in human-computer interaction (such as simulations, surrogations and knowledge/information presentation) are designed correctly, they can be used to initiate and stimulate cognition, reflection, thinking, creativity and learning.
Technically, if suitable telecommunications facilities are available, this type of learning can be widely represented and independent of geographic location. The active research and development currently is directed into "intelligent" tutoring systems and design of computer-based cognitive tools to support automatic tuition.

2 METHODOLOGY OF TEACHWARE DEVELOPMENT

At the moment when this paper is written we were at the beginning stage of the teachware development. At this stage an outline plan of teachware development is defined, involving the following key phases:
1 agreement on lesson content
2 lesson design
3 creation of multimedia resources
4 programming
5 system integration and testing

2.1 Lesson content

As the intention is to include the teachware module as a 'self learning' lesson element within an existing traditional course on regional planning, it was necessary to choose a subject area which is previously covered during the course and which would build upon users' existing knowledge of the subject.
The Course "Region" takes 8 weeks in the first year of curriculum of the Faculty of Architecture. It is compulsory for all the students (approximately 500). It deals with the spatial structures of buildings and the built-up environment on a high level of spatial scale - region. The main themes of the block are: dynamics of spatial changes; insight into the process of spatial planning; insight into scale, size, form and typology of the Dutch landscape; traffic and infrastructure as a base for mobility; insight into characteristics and typology of building sites. These themes are worked out in 5 cases:
- image and reality
- spatial models
- environment or economy
- site related problems
- design of the Randstad area.

The content of the block implies to a great extent working with different kinds of cartographic material (topographic, historic and thematic maps, plans, etc.) and aerial photographs.
Until now, in the fourth week of the block students were confronted with the task of selection of the new locations for urban functions within the Randstad area. For that purpose they used to formulate the requirements which the new urban areas should fulfil, such as attainability, facilities, environmental quality, services, employment etc. Afterwards they developed a model of the plan and they tested it according the stated requirements (the example of such requirements is shown on the Figure 1). The testing occurred by using the raster of 500x500m which was laid over the map of the area (25x25cm) and than it was controlled if each of the cells in the plan corresponded to the requirements. After the test was done the model of the plan was modified by re-grouping the cells or adding missing spatial components where the test had shown that they were lacking. In this phase of the course we plan to introduce the multimedia application we are described in this paper.
In our opinion, in this experimental phase of teachware development multimedia should help students to deal with two complex issues: getting the basic information and knowledge about GIS and understanding the consequences of the large scale planning strategies. Therefore instead with paper maps, students will work with digital maps and digital models which they will be able to test it in the teachware.

2.2 Lesson design

The time duration of the training will be eight hours. The lesson will involve four phases:
1. Introduction meant to provide the basic knowledge about the GIS (main characteristics, usage and potentials of the system) in the form of linear presentation of digital cartographic material, animated maps, sound and text.
2. Development of the spatial model of the Randstad area by using the knowledge about the spatial models (such as finger-city, band-city, satellite model, ring-city, carpet model etc.) students obtained in the first four weeks of the course, they will design their own models.

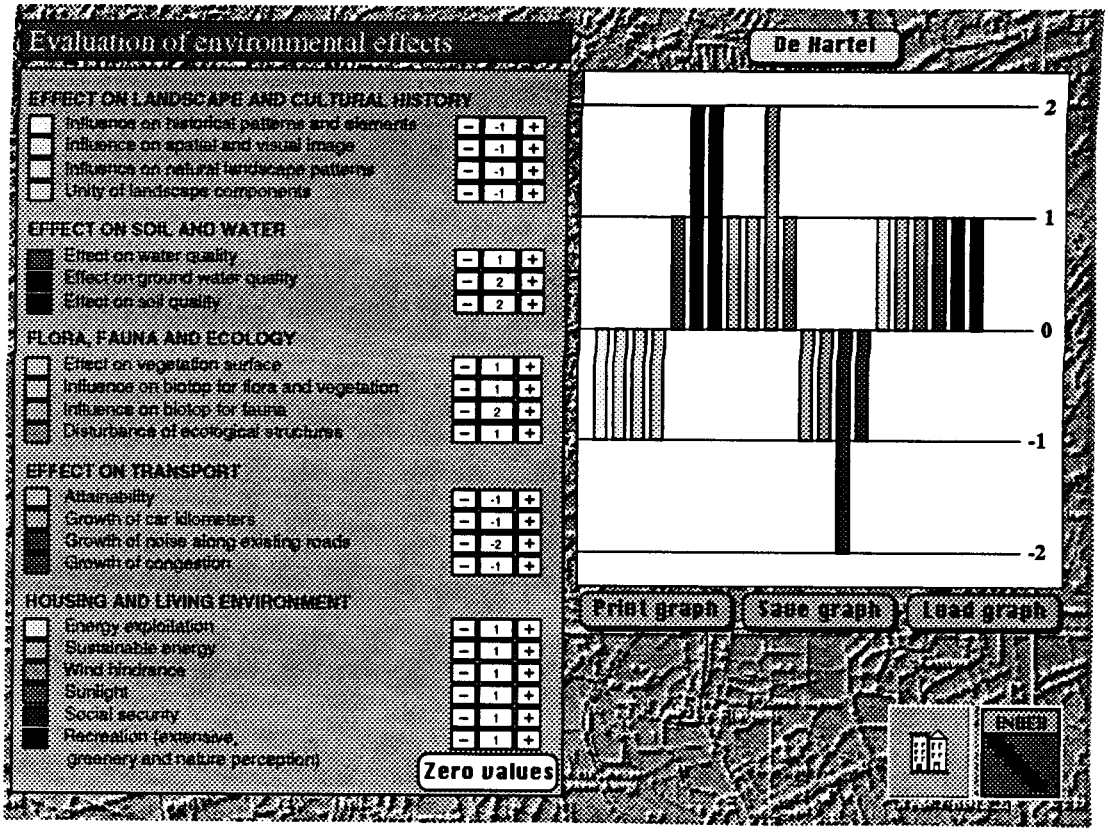

Figure 1. **One of the possible lists of the criteria for environmental impact analyses Tisma, 1995).**

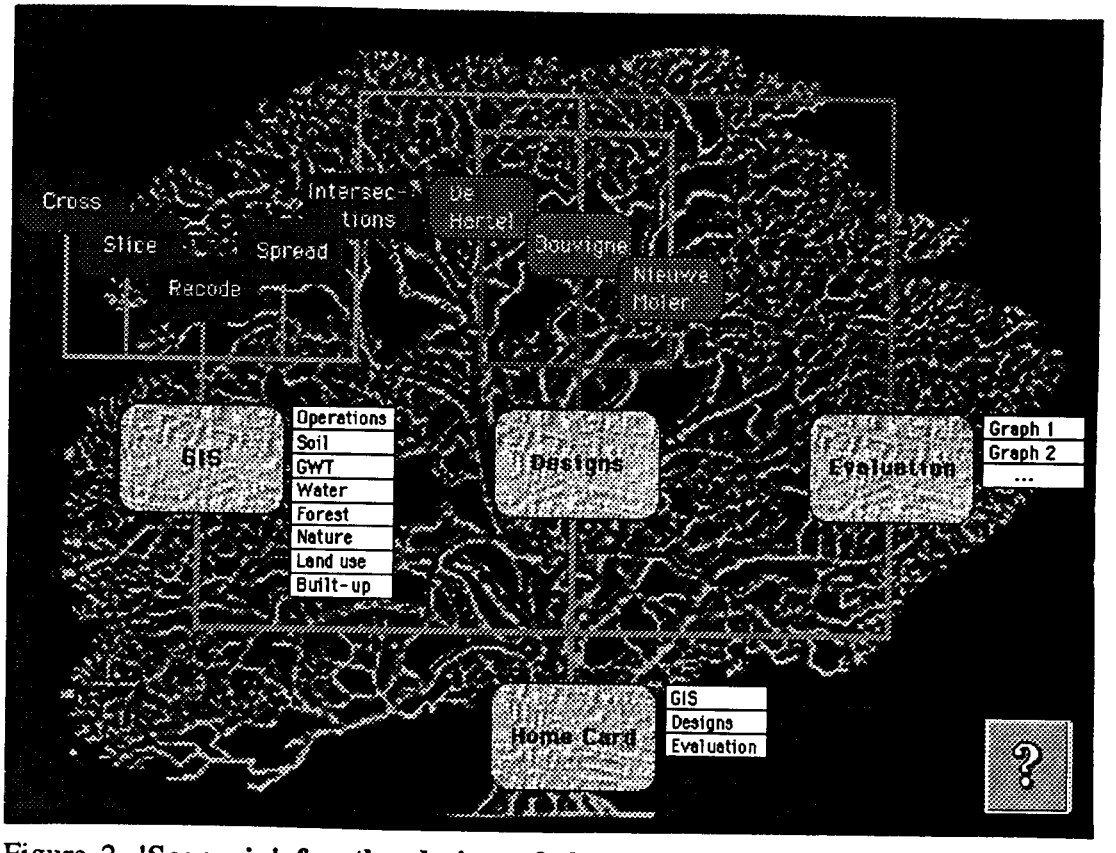

Figure 2. **'Scenario' for the design of the 'Cyberland' teachware (Tisma, 1995).**

3. Evaluation of the model. In this stage students will check if their models fulfil the requirements for the new housing areas.
4. Re-design/re-evaluation. If the evaluation shows that the model doesn't correspond to the requirements in large extent, it will be re-designed and evaluated again until the satisfactory result is found. This can be repeated as many times as necessary.
The design of the lesson will be formulated in the 'scenario' which presents the content (cards in Supercard) and the types of links (hypertext, buttons, menus etc.) between the parts of the teachware (see Figure 2).

2.3 **Creation of multimedia resources**

Multimedia resources which will be used in the teachware will consist of graphic images, moving video images, text and sound.
Graphic images will involve digital maps and photographs. Digital maps will be taken over from the data base of topographic maps available in ARC-Info system on UNIX platform. They will be converted form the original vector to the raster form and then exported as SVF files. As the final teachware will be designed on the Macintosh platform, SVF files will be converted into Interchange format, a format common to MAP II software, which is GIS package to be used on Macintosh platform.
On that way 'MAP' database will be created containing the maps of historical information of urban towards landscape development, as well as the newest spatial situation of the Randstad region composed of the four elements: urban and rural areas and networks of connections and water. When needed, all the maps from the 'MAP' database can be exported as PICT files and used in any kind of authoware application suitable for multimedia development.
Documentation of photo images of the Randstad area and of the examples of various types of housing areas obtained by scanning of the original photographs, will be stored in the 'PHOTO' database.
Moving video images of the most important points within the Randstad, such as cities, green hart, traffic arteries, industrial zones etc., will be stored in the 'VIDEO' database.
It is inevitable that there would be a certain amount of text displayed on the screen, although the intention is to minimise that amount. Some parts of the text will be given a 'hypertext' potential.
The sound will be used on two ways: as a spoken text by female voice (short messages and warnings) and as a music jingle captured from music CD or existing digital sound libraries.

2.4 **Programming**

In this phase all the multimedia resources will be brought together to form the final teachware application. The links between resources, simulation of GIS operations, surrogation of GIS functions and animation of evaluation diagram will be programmed in SuperTalk scripting language.

2.5 **System integration and testing**

The performance of the application will be tested on several types of Macintosh computers. The function of links, speed of performance and occurrence of bugs will be considered in testing. After the last tuning is done the application will be implemented in education.

3 SYSTEM EVALUATION IN THE LEARNING ENVIRONMENT

The evaluation will identify the educational effectiveness of the teachware based on the training that will be carried out in a small number of colleges with groups of about 15 students. The evaluation activities would collect and summarise information about the teachware and it's value for modern urban design learning.
The objectives of evaluation will be to measure skill acquisition in developing of spatial models by comparing the skill acquisition of the students from the experimental group to that of the control group who would receive usual class teaching with conventional materials.
If the results of evaluation show that the skill acquisition of the experimental group is considerably higher than the one of the control group, the teachware will be applied in the regular programme of the first year studies.

4 REFERENCES

Ambron, S. (1990): *New visions of reality: Multimedia and education.* Interactive multimedia. Microsoft Press.

Bijtelaar, B. (1994): GIS and multimedia: how to integrate? *Proceedings of the workshop on GIS and Multimedia*, EGIS/MARI conference, Paris.

Camara, A. (1994): Applications of multimedia GIS. *Proceedings of the workshop on GIS and Multimedia*, EGIS/MARI conference, Paris.

Barker, F. (1994): Designing interactive learning. In T. de Jong, L. Sarti (Eds.), *Design and Production of Multimedia and Simulation-based Learning Material.* Kluwer Academic Publishers, Dordrecht.

Laurin, R. and Tomson, D. (1991): *Fundamentals of spatial information systems.* Academic Press, London.

Rapper, J. (1994): Progress in spatial multimedia. *Proceedings of the workshop on GIS and Multimedia*, EGIS/MARI conference, Paris.

Senge, P.M., 1990: *The fifth discipline. The art and practice of the learning organisation.* Doubleday Currency, New York.

Tisma, A. (1995): Multimedia GIS as a design tool with a case study of the new estates in West-Brabant. *Conference proceedings of the Joint European Conference on Geographic Information,* The Hague.