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VISUALIZATION NEEDS AND TOOL KITS

A well-known Finnish novel characterizes the agrarian way of life by the following words: In the beginning there was a marsh, a hoe and John. John turned the marsh into a fertile corn field by means of the Finnish "sisu" or perseverance.

We may draw a parallel to architectural design and say that in the beginning there was the idea of the architect only after that came various tools. Nevertheless, the method of visualization – image in its many forms – is something quintessential in architectural planning and design: it plays a central role as a tool for the designer's own thinking and evaluation, in general communication of planning, and in the communication between the designer and other parties of the planning process. Different sketches give directly visual interpretations to different consequences. The needs for the communication of planning in itself have grown along with the manifold development of public communication. Accordingly, the communication of planning has to compete with the highly-developed commercial communication.

On the development trends of visualization methods

The possibilities of visualization in planning and design are enhanced by the following factors:
- The CAD hardware and software display an increased user-friendliness, flexibility and openness (such as Macintosh), and the range of visual possibilities is increased (3D, colours, textures).
- The traditional video will be accompanied by the interactive video and optic memory devices.
- Various multimedia (e.g. the combined techniques of information-technology and video) provide new possibili-

ties; the CAD and the image processing will be integralted.
- There will be a spread of microcomputer-based desktop-publishing systems that are applicable in producing publications and brochures.

However, the fact remains that the modern computer technology is still primitive for the architects' sketchy visualization which forms a highly essential part of planning. It does not much respect the architects' experimental knowledge which is hard to formulate (tacit knowledge) nor their intuition. Furthermore, the CAD visualization is so far inadequate for creating a correct impression of the building materials. The development of the work stations for image processing for artists (such as work stations of graphics design or artist design) gives hopes for new possibilities to open up also to sketchy design. For example, in the CATIA program, texture mapping is being developed for presenting various materials. As a whole, the processing of image data will increase in the planning process. The growing use of CAD necessitates a new evaluation of the requirements to official documents. For instance, in Sweden there is a development of visualization regulations under way for CAD documentation /4/.

<u>Visualization in the Finnish practice and teaching of urban planning and building design</u>

Autocad is the most popular graphic software at use in the Finnish architectural design. Examples of more sophisticated programs gaining ground are Prime Medusa, Dogs and Intergraph. In the Finnish architectural training itself, the teaching of the principles of CAD has been taken into account. CAD programs are used, for example, in the modelling and analysing of existing architectural masterpieces. Moreover, in recent years the curricula have included courses on the new visualization methods. In the last few years video courses have been part Of the curricula of the Department of Architecture at the Helsinki University of Technology, and the teaching at the Tampere University of Technology has included a course on periscopic

model photography. At the level of the Nordic Countries, attention has been paid to the research needs created by the new information technology. Accordingly, a framework program for the years 1986-1988 concerning the R&D of the information technology has been made to the Nordic Council of Ministries.

Promises and restrictions of the new technique

The following techniques and equipment as tools for visualization are discussed below in more detail:
- video techniques, including periscopic representation of scale models
- mixed techniques
- interactive work station for image processing
- optic laser techniques.

Video representation is applicable in principle throughout the planning process, like
- in the presentation and analysing of the present situation, including the functional factors
- in connection with the prototype-like or final interactive examination and periscopic representation of a scale model
- in overall presentation of the manifold planning data (present situation, models, sketches, interviews etc.).

The technical level of the present endoscope techniques is sufficient for the visualization of planning and design. Sophisticated hardware for periscopic representation with their built-in control of the camera and of the model is applicable in institutions of architectural education, as well as in studios providing visualization services. The results obtained from the Tampere University of Technology suggest that for example the periscopic representation and survey affect the thinking process in planning (relations of time and movement).

Periscopic representation requires a certain type of building technique for scale models. The scale models

which are easily workable and consist of convertible parts are well applicable in the planners' professional work. Instead, realistic and colourful models do justice to demonstrations for the public.

If the hardware permits the moving of the model or of the camera, this easily results in exaggerated presentation of the object. The viewer can no more orientate himself or herself in the model. In periscopic representation, continuing runs should be used in combination with panoramic views, still images, maps etc. /1, 3/. For example, general views and images along the route can be used to guarantee a proper visualization of the entire surroundings and of the relations between its parts. Also the drawbacks due to the relatively narrow viewing angle of the scale model endoscopes can be reduced by using overall views of the model. The relations between buildings, their relation to the terrain, visibility zones, as well as the integration of views can be visualized by the endoscope technique. Instead, the character of the space surrounding the viewer is not easily visualized even by this technique.

Among the video cameras, the three-tube professional cameras are well applicable in visualization of planning. We have also experimented with high-speed cameras in aerial photography, when a sharp image is feasible even at low altitudes. The CCD cameras, which are in the same price category as three-tube cameras. cannot, however, so far compete with the three-tube cameras as regards the quality of the image.

As a whole, periscopic video representation as a visualization service is suitable for normal architectural planning and design regarding its price category. It is also a technically mature method. Moreover, it is quite well applicable as a tool for architectural education. Video representation can also be exploited for examining lighting conditions and not only the external view. This happens by using the sun dial in the determination of the direction and altitude of light.

The mixed techniques

A scale model view or an ADP perspective can be attached, for example, to a photo or perspective drawing of the present situation. At the Technical Research Centre of Finland (VTT) we have developed a calculation program where the place of the view can be determined also on the basis of an image taken from an aeroplane. The view of the scale model can be attached to the view illustrating the existing environment by using the video mixing devices (ultimate, newsmate, chroma key) by means of colour separation /3/. Another alternative is to apply image processing systems where an image can be input, e.g. by using a video camera, and transformed into digital data. When mixing the images it is vitally important to determine the correctness of the perspectives of the image parts. When a video image is used as a base view, the movement of the persons and cars is presented, which increases the illusion of the reality. Abstract scale model images or perspective views are not applicable to be attached to realistic photographs or video images of the present situation when the visualization is addressed to lay persons who have not had much experience in planning issues. Instead, the planner may well examine his or her wire-made perspective or free-hand drawing.

Interactive work stations for image processing

Possibilities for visualization are greatly increased with a planner if he or she is able to manipulate and work on the visualization act. The artist work stations developed mainly for advertising purposes are interesting also for architectural planning and design. We ourselves at VTT have started to experiment with a microcomputer-based Super-Nova system. Its overall structure is presented in the Figure in Appendix. The software connected with the system has the following possibilities which are tempting from the architect's point of view:
- free-hand drawing

- changing of colour
- removal of the parts of the image
- addition of the parts of the image to the basic image
- animation, and
- text.

Photographs, video image and drawings can be put into the system by means of a video camera. At the moment, we are making an experiment with the system to demonstrate the repair work of a motorway outgoing from Helsinki. For example, in vegetation representation one can use images of natural plantings embedded in a video image of the present situation correctly according to the renewal plan. Thus, there will not be any differences in the reality level between the changing and the remaining parts of the environment. The hardware can also be used in further work-out (colours, textures) of computer-generated perspectives, as well as in adding details to the frameworks of scale model images. So far, CAD programs and image processing programs of the systems described above are compatible with each other only in some systems.

Optic laser technique

The utilization of visual information should run as a leading motive throughout the planning process. This development trend is supported by the use of laser-based optic data devices in the planning process in the future. Then at least extensive data bases can be accessible in optic data devices in visual form. The Laboratory of Urban Planning and Building Design at the Technical Research Centre of Finland (VTT) has experimented both with the analog optic disc technique and digital automatic writing system of WORM (write once, read many) /5/. visual information in its various forms is restored on the produced optic disc. The analog optic disc technique is primarily suitable for restoring unchangeable and extensive visual documentation. The optic disc technology guarantees, among other things, rapid accessibility to any image required. For example, the data concerning buildings of

cultural and historical values are suitable data for optic discs.

However, an integrated extension for the work stations for image processing or CAD work stations is better provided by the digital optic disc environment, because the planner can use it according to his or her own needs and ideas. In our own experiment we have fed into the system paper-based drawings, CAD graphs, digital map data, slides and video images. At present, there are two prototype systems, one of which is an independent CAD archive work station, capable of communication with 8 different CAD systems. Such systems will bring the disintegrated data stores of planning again to the use of the planner, right on his or her desk. They also make possible a continuous visual recording of different means of planning.

Visualization is more than functioning systems

Visualization plays such a crucial role in planning that sufficient attention should be paid to the theoretical studies in this field. Visualization in planning has so far been examined mainly by means of the information theory, conceptual theories and experimental environmental psychology. The main objective in the research has been to investigate how reliable different ways of presentation are in anticipating the character of the future environment. Answers have also been sought for concerning the difficulties in interpreting different ways of presentation, their credibility, attractiveness etc. On the other hand, less attention has been paid to the significance of visualization as a tool for the planner's own thinking and as a part of the planning methodology.
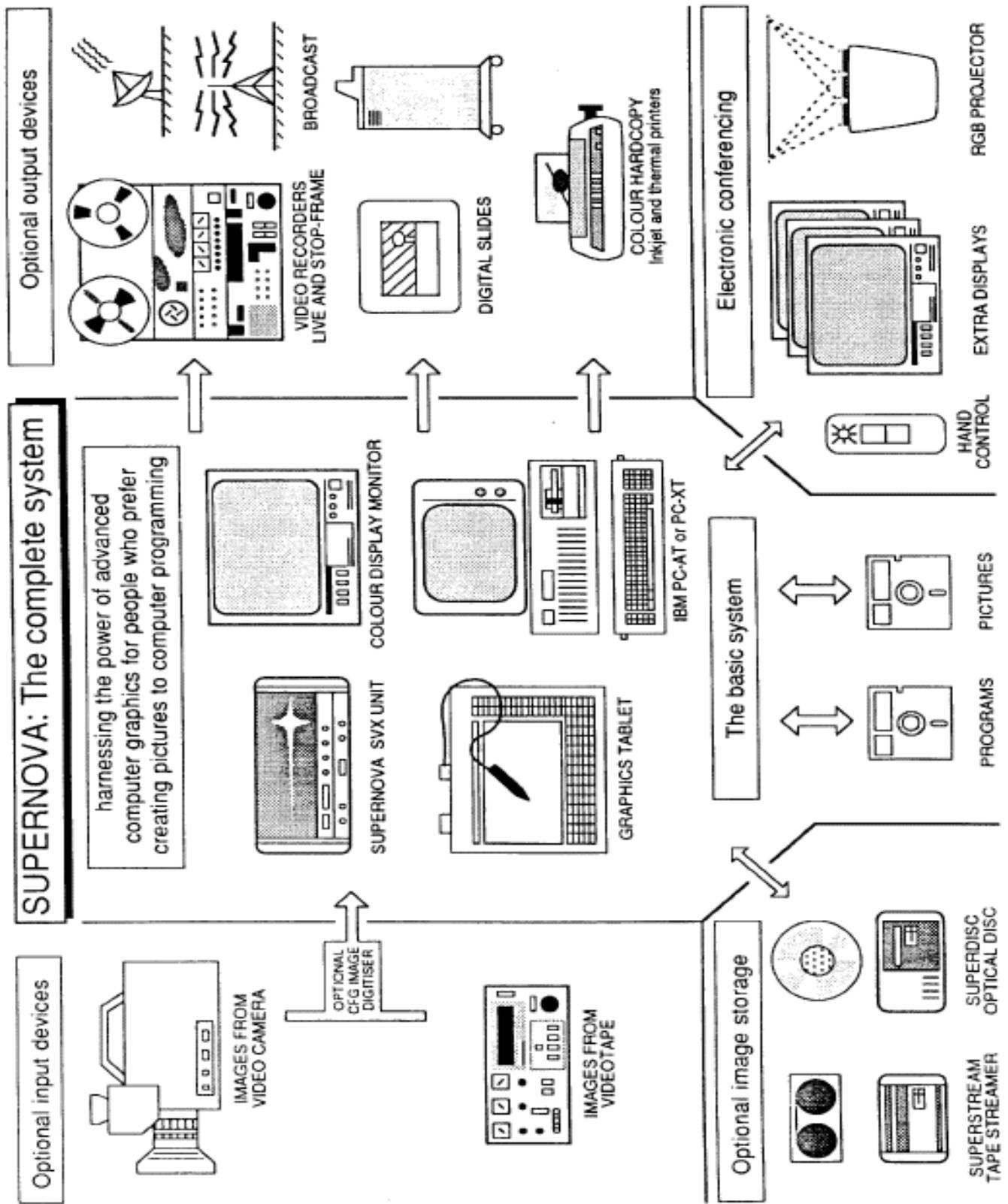
At the moment, I am myself making a synthesis of the visualization studies conducted so far, especially concerning the communication and evaluation from the lay persons' point of view. This study also contains conceptual analysis. Another research project that I am supervising is entitled "The environment of high aesthetical quality

and new planning techniques". The intention is to outline such planning methodology where particularly the aesthetical quality of the environment would be taken into consideration in the planning process in an adequate way.

The heavy stream of innovations connected to the visualization of planning shows no signs of running dry. Ideas have been presented, among other things, of through eyeglass mounted two-way video systems /2/ and of a model machine which is capable of producing, by means of uv-laser, a plastic model of the profiles of CAD images (3D Systems, Inc.). As a conclusion I wish to claim that new techniques can increase possibilities for creating fictional worlds and thereby they give a liberating element to planners' own way of thinking. An interactive mind will thus be born.

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