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## Adaptation of Work Places and Homes for the Disabled Using Computer-aided Design

Johansson, Gerd; Eriksson, Joakim

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PO Box 117  
221 00 Lund  
+46 46-222 00 00



- moderate expenditure in purchasing and maintaining.
- useful in aiding the design of the future environment, in supporting the communication and understanding and in encouraging active participation of all persons involved.
- effectivity considering both quality and the effort/time spent.

The prototype of the planning tool was based on commercially available hardware and software products. After selecting appropriate software, the work then emphasised the development of methods of using the programs in this field of application and complementing these with special programs to support the planner.

The present prototype is based on Macintosh computers (Apple Inc.) and mainly the commercial programs Swivel 3D Professionals, MacroModel, Modelshop II, MacroMind Three-D and MacroMind Director (Macromedia Inc.). The planning tool and its usage are described in great detail in Johansson et al, 1992 and Eriksson et al, 1994. Figure 2 shows schematically the use of the different programs.

## RESULTS AND CONCLUSIONS

The case studies have shown that a computer-aided tool is useful when planning environments for the physically disabled and it has been positively evaluated by the persons involved. The three-dimensional visualisation improves understanding and supports an iterative planning process with active participants. It is also very useful in checking the accessibility of the environment and the person's ability to reach different objects directly in the computer model.

The persons involved in the case studies were of the opinion that the quality of the final solution will be improved when using computer aided design. The criteria of effectiveness was, however, in most cases not fulfilled, as the modelling of complex objects is very time-consuming. To be time-effective the number of objects in the library must be increased to reduce the time spent on modelling a suggested solution. This may limit the use of the planning tool to common and well-structured environments where comprehensive libraries could be achieved. Our future work will therefore concentrate on

- homes for disabled persons.
- service homes for disabled and housing for elderly people.
- special work environments such as the computer working place and the working place close to the person, e.g. the work table.

## FUTURE RESEARCH

At present we are planning two new research projects based on experience gained hitherto. In the first project the work is directed towards adaptation of homes. The occupational therapists at a rehabilitation centre will independently test the CAP-tool. Besides improving user-friendliness and effectiveness of the tool, we expect to find out more about where the CAP-tool is most useful/efficient, the optimal design of the planning process, and the effect on the rehabilitation of the disabled person.

In the second project, we are planning to continue our work on adaptations in working places by using a CAP-tool. We will concentrate on persons who use their hands/arm when working but have considerable difficulties due to his/her disability. Furthermore the aim will be to match the analysis of the person's ability by i.e. movement analysis with the precise analysis of the work. The overall goal with this project is to design a working place for a disabled person that will reduce and hopefully eliminate the musculo-skeletal disorders caused by the work in question.

## ACKNOWLEDGEMENT

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## REFERENCES

- Eriksson J., Johansson G.I. and Akselsson K.R. 1994, A planning tool prototype for environment adaptations, in manuscript.
- Johansson G.I., Eriksson J., Sandgren M. and Akselsson K.R. 1992, Computer aided planning for working and living environments for disabled people, Computer Applications in Ergonomics, Occupational Safety and Health (Amsterdam: Elsevier Science Publishers B.V), 137-144.



Figure 1. A suggestion of a bathroom adaptation (from case study no. 6).

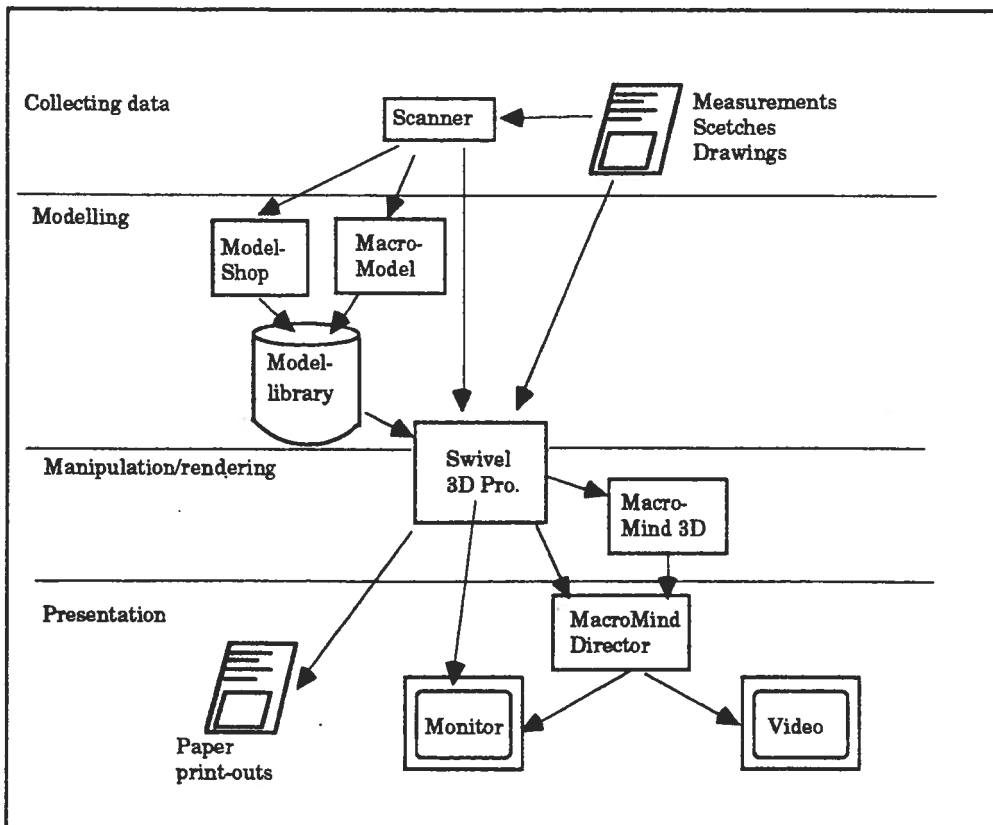


Figure 2. A schematic description of the use of the different programs.

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