John S. Gero, Scott Chase and Mike Rosenman (eds), *CAADRIA2001*,
Key Centre of Design Computing and Cognition, University of Sydney, 2001, pp. 201-204.

VIRTUAL AND FULL-SCALE MODELING

A collection of resources

BOB MARTENS AND ANDREAS VOIGT
Vienna University of Technology
Austria

Abstract. In this paper the relationship between Virtual and Full-scale Modeling will be traced back. A number of publications supports the dissemination of existing knowledge resp. experiences. Although a series of biannual EFA-Conferences (European Full-scale Modeling Association) produced a remarkable number of useful papers, the "scientific output" beyond this platform remained to be so far in the dust of gray literature. On the other hand the rapid growing interest for computer applications and tools rediscovered the working area of 1:1 simulation more or less the other way around. Although the term VR in the nineties was strongly occupied by computer-interfaces resp. -representations, soon the insight gained in importance that reality is by far more complex than some 10.000 polygons. Furthermore, some kind of unproductive competition resp. defense of good old modeling traditions versus promising computer technology seemed to act as the main activity. However, the fusion of Virtual and Full-Scale Modeling could indefinitely serve as a promising field of research.

1. Introduction

The working field "Virtual Reality" has been practically exclusively absorbed by the computer business. In search of another reality people in data suits, -helmets and -gloves enthusiastically roamed around cyber-space, naturally also involving a great deal of curiosity and play instinct. Even with such initial fascination doubts as to trueness to life and abstraction were inevitable. Apart from violations against basic principles of stereoscopic representation such as errors regarding height, one felt as walking through a cardboard model. Deserted urban scenarios standing for e.g. lines of streets made up of mapped floor covering and façade surfaces clearly demonstrate that one has to put up with only an unsatisfactory degree of detailing and thus one has to work hard to get used to interactive dealing with this "emptiness", also regarding the "CAVES" put up at so many sites worldwide. Life-size projection are furnished in a cube-like experimentation structure by letting the images -

except for the floor surface - coincide at adjacent surfaces, resulting in blurredness, the vision bends at the edge surfaces are done away with complex perception mechanisms. And even no-Nobel-award winners will realize that the reality to be perceived in a real form is of an extremely complex nature, such as described by Richard Coyne (1992): "In a similar manner, VR (Virtual Reality) is promoted on the basis of how the experience of wearing 'eye phones' to visualize stereoscopic views of computer models is unlike reality. Through VR it is possible to fly through buildings, break through walls, and reach out and move building components-facilities that 'reality' does not provide."

2. Dissemination of Full-scale Modeling Research

The developments regarding VR described herein are to be regarded as a "revival" rediscovering more or less the conceptual VR-approaches of the fifties and sixties. In those days, however, suited technical equipment and particularly also the required computer performance was not available. The exclusive absorption by the computer industry seems hopelessly outdated nowadays. Thus the topic "VR in Design" is not only to be regarded in a computer-assisted manner. The positioning of the specialized field "full-scale modeling" does not require additional justification, an explicit enumeration, however, of its strongholds and shortcomings might prove wise in this context.

The biannual EFA-conference provides a meaningful device having produced approx. 70 contributions in its previous seven conferences [1]. Even though a number of labs exist throughout Europe they can only be regarded as "family-style" small-scale enterprises with little "publishing pressure". This is not to mean that activities only take place sporadically, but rather that the following-up of work performed by means of further (scientific) publications is not granted. The many interested who only hardly can get hold of comprehensive information on "full-scale modeling" might feel like traveling from lab to lab in the days of Goethe in seek of information. Those visits to the sites will prove interesting, an accessible collection of resources surely will add to easier access to information. The proceedings mentioned above meanwhile featuring a ISBN-number have already been completely integrated in "CUMINCAD" [2].

3. Recent Research Activities

Linzer et.al (1994) issued meaningful contributions to the present topic at the eCAADe Conference on "The Virtual Studio". Accordingly, differentiating between the virtual-digital and the physical-analogous working levels is to be

considered the main issue, also taking into account the special status the 1:1 scale represents. Fortunately, these matters were also of interest to others involved. Research into the terms "physical", "model" and "full-scale" brought about following findings [2]. Dealing with the physical scale model on the one hand and the computer-assisted model on the other hand (including any such conversions) is exhaustively documented (Cheng, 1995 - Burry, 1998 - Liu, 1999). It seems quite obvious that particularly Frank Gehry set the stage for this approach, by stressing the importance of digitalizing analogous (working-) models. Such conversions, furthermore, are not regarded as one-way streets by Streich (1996) who also refers to findings within medical technology. Inserting an architectural model into the computer tomograph, however, is not indicated due to a possible disease, but rather grants a different view in the process of generating architecture. Wu et. al. (2000) also stick to the level of the scale model emphasizing the strongholds of light design in a very interesting testcase. What must be pointed out, however, is that developments in the field of rapid prototyping suffer from (reasonably priced) availability as well as from the restrictions in size. Anders (1997) focuses on drawing-up a theoretical working scope for the possible integration of physical and non-physical space coining the term "Cybrids". Chan et. al (1999) refers specifically to the 1:1 scale thus deducing a specific understanding for the interior space layout during development in the "CAVE". The special 1:1 scale is also included by Newton et. al. (2000) thus granting variety of methods favoring a constructive side to side of differing intervention types.

4. Outlook

At present issues regarding the proportion of physical space in comparison to virtual space as well as any mixture thereof are being closely studied at the ETH Zurich. Thus a visualization center (so-called "VisDome") has been installed at the main building being utilized in an interdisciplinary way also over vast distances. This mainly aims at the ex-change of knowledge in research and development in the fields of digital modeling, visualization and interactive simulation. The thus re-sul-ting common working platform with (novel) haptic interfaces integrates 150-degree-large-scale projection, high-end graphics computers, virtual-reality hardware and all the equipment for video-processing [3]. Hopefully, other university institutions will also create interfaces dealing with somewhat "alchemistic simulations."

Notes

[1] Previous EFA-conferences: Copenhagen (1987), Bologna (1989), Lund (1991), Lausanne (1992), Wageningen (1994), Vienna (1996), Florence (1999) and Lund (2000). See also http://www.tuwiuen.ac.at/efa/

[2] CUMINCAD (http://itc.fgg.uni-lj.si/cumincad/) is an acronym for "Cumulative Index on CAD" and provides a valuable resource, allowing access, via a searchable index, with special attention to publications on computer-aided design in architecture, implemented in a web-based environment.

[5] See also http://caad.arch.ethz.ch/projects/ Furthermore the project "ETH worlds" has commenced focussing on the integration of the physical and virtual world: http://www.ethworld.ethz.ch

References

Anders, P.: 1997, Cybrids: Integrating cognitive and physical space in architecture, *in Design and Representation*, *ACADIA '97 Conference Proceedings*, pp. 17-34

Burry, M.: 1998, Handcraft and machine metaphysics, *Computers in Design Studio Teaching*, *EAAE/eCAADe International Workshop Proceedings*, pp. 41-50.

Chan, C., Hill, L. and Cruz-Neira, C.: 1999, Is it possible to design in full scale? A CAD tool in a synthetic environment, *CAADRIA '99*, pp. 43-52.

Cheng, N. Y-W.: 1995, Linking the virtual to reality: CAD & physical modeling, *CAAD Futures,* pp. 303-311

Coyne, R.: 1992, Metaphors, computers and architectural education, *CAAD Instruction: The New Teaching of an Architect?*, *eCAADe Conference Proceedings*, p. 307.

Lin, C-Y.: 1999, The representing capacity of physical models and digital models, *CAADRIA'99*, pp. 53-62.

Linzer, H., Martens, B. and Voigt, A.: 1994, The integration of virtual and full-scale modelling, *The Virtual Studio: Proceedings of the 12th European Conference on Education in Computer Aided Architectural Design*, pp. 147-151.

Newton, C. and Burry, M.: 2000, Using sticks, stones and computer visualisation, *CAADRIA 2000*, pp. 511-519.

Streich, B.: 1996, 3D-scanning and 3D-printing for media experimental design work in architecture, *Design Computation: Collaboration, Reasoning, Pedagogy: ACADIA Conference Proceedings*, pp. 183-190.

Wu, W., Ng E. and Tsou, J.-Y.: 2000, A comparative investigation into a process-based approach to lighting studies using physical and computer generated models in design studio, *CAADRIA 2000*, pp. 107-121.