THE INTEGRATION OF VIRTUAL AND FULL-SCALE MODELLING

Helena Linzer, Bob Martens, Andreas Voigt

Department of Regional Planning and Architecture
Vienna University of Technology
A-1040 Vienna, Austria

Practically every design- and planning activity aims at its ultimate realization in the built environment. Any respective decisions are generally taken on the basis of substitutes of the original. Yet, the true spatial dimensions and proportions can be conceived on a 1:1 scale "without any mental detour". Moreover, the interaction of light, colour and material is best represented in the 1:1 model. One of the main reasons why physical 1:1 models are rarely constructed is certainly the unbalanced economic relation between expenditure and resulting use. Therefore, representation by means of less expensive virtual models has taken a preeminent position. However, a balanced combination of physical and virtual models in full-scale according to area- and problem-type, degree of details and scale is likely to become increasingly important in the future. It is not the aim of Simulation Aided Architectural Design (SAAD) and Simulation Aided City Development (SACD) to do completely away with existing working procedures and planning techniques, but to act supplements promoting the integration of traditional and new simulation techniques by anticipating "realities" aimed at the best-suited design of a common living space. Furthermore, the generation of visions and utopian schemes may add to an enhancement as far as spatial development and design are regarded within the issue of falsification and verification of spatial developments.

Introduction

For definitional reasons may we point out that the *reality* refers to the actuality, thus the mere existence of objects independently of the subject. The *actuality*, however, applies to that what mankind finds himself within and to what is uncovered by man within the course of planning and design of any future built environment. Therefore, a real condition actually corresponds to the *unreality* or *ideal* condition as it were. *Prototyping* and *modelling* as working steps within planning activities are implemented in order to check the reproduction or the industrial-scaled execution of a planned construction, a part of a city or an area under planning. Both the virtual-digital and the physical-analogue working levels are carefully considered in this context, the social environment being, however, ignored to a large extent. The physical model in full-scale acts as the substitute for the original intending to arrive at the original state as closely as possible. The virtual model is fit or capable of “acting”, i.e. reality prevails at least in terms of effectiveness even in the absence of physical matter. The claim that those involved in designing architecture tend to show a preference to physical rather than to virtual models and prototypes, however, is a point in question. The integration of model-like representation and built-reality is of great importance in any case, thus focussing on the joining unification.

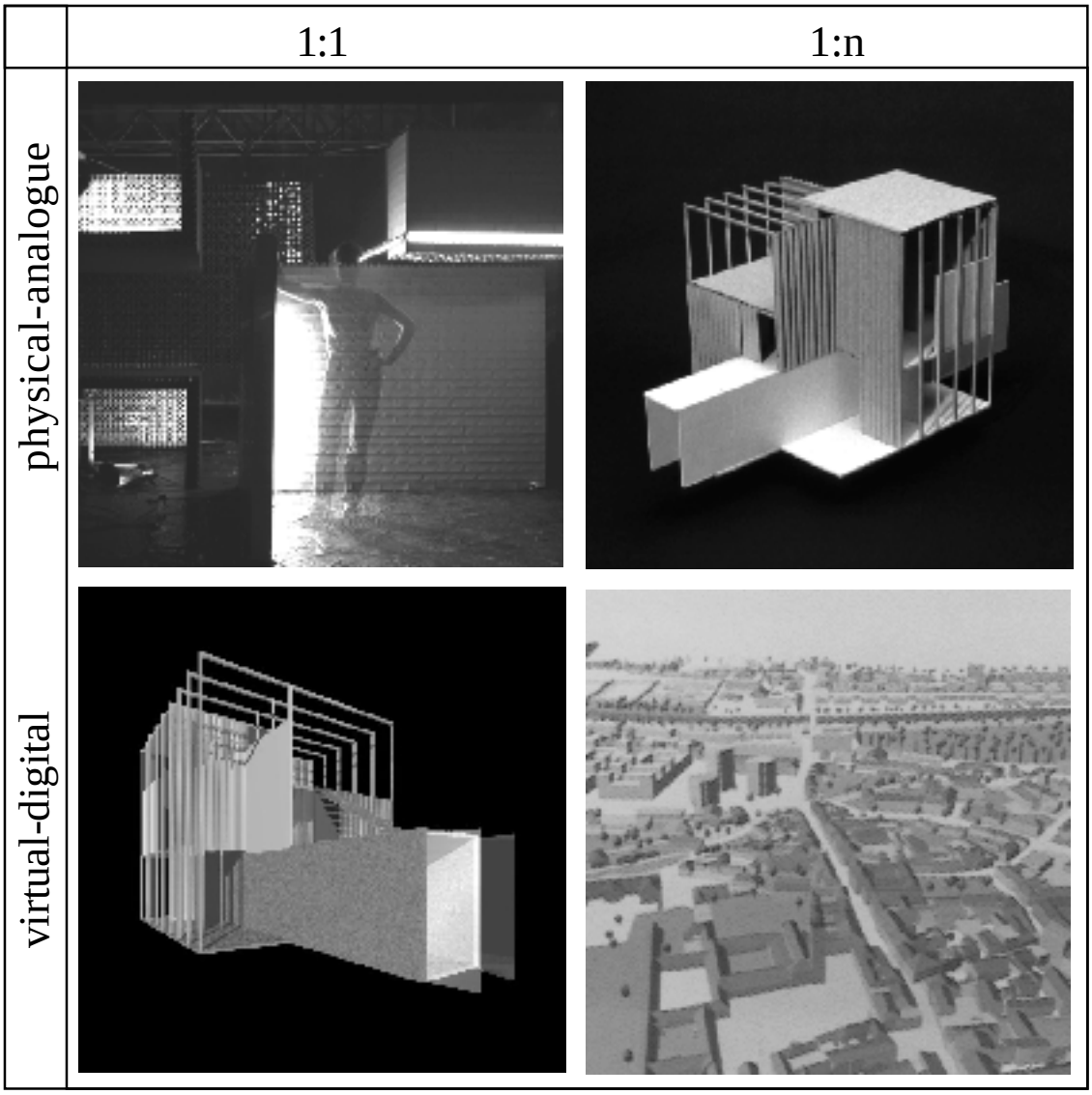

Figure 1. Virtual-digital and physical-analogue working level.

Checking and Assessing

Experience of space is a multidivisional event: when experiencing “space” not only the visual but rather the haptic or auditive aspects play an important role. Man and space are in correlation. Innumerable (part-) information is of interest when considering spatial perception: the three-dimensional architectural and urban space is complex and does not merely result from a pure accumulation of modelled polygons. Coverage of spatial dimensions, proportions and properties represents a significant working step regarding spatial thought and planning, followed up by quantitative and qualitative *spatial analysis* resulting in *spatial synthesis* and -*development.* Spatial representation frequently is only used as an illustrational means, thus upon completion of planning and design activities. Planning is assessed without knowing its spatial impact or spatial reality. With an appropriate visualization as a component of complex *spatial impact analyses* (SIA) - particularly by representation by means of prototyping and modelling - the quality in communication can significantly be improved at various levels of the planning- and decision-processes.

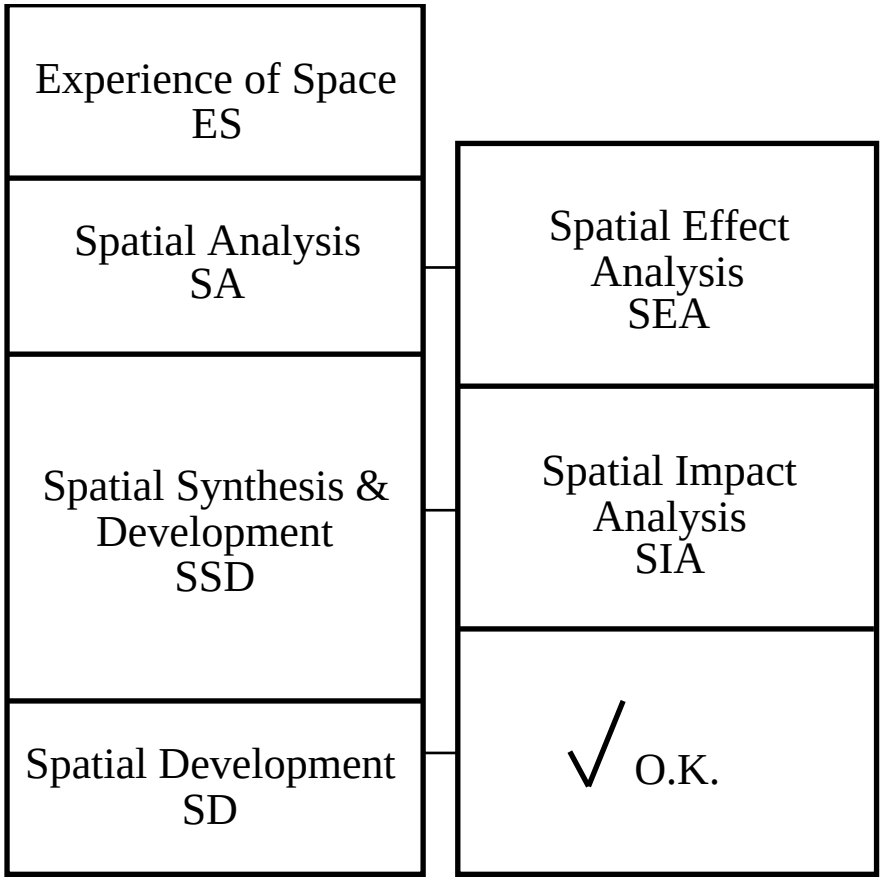

Figure 2. Planning process within the crucial field of spatial impact analysis (sia).

What is worth considering, is, to what extent the implementation of *Simulation Aided Architectural Design* and *Simulation Aided City Development* can contribute to an improvement in quality of the outcome and to a reduction of the blurred zone between idea (ideal state) and result (reality). In this context the degree of detailing and the proximity of reality of the model and the definition of specification for the desired result is to be clarified. The computer-aided respresentability of artificial light or the change of daylight is to be checked for example, an analysis of advantages and shortcomings of modelling and prototyping is to be performed likewise.

Review and Status Quo

The representation of object-oriented architecture and city development plannings was predominantly accomplished in two ways throughout centuries, namely by the *drawing* and the *scale-model.* As far as architectural drafting is concerned it naturally is remarkable that practically no material investments apart from the paper and drawing tools used were required, however, profound knowledge and the capability of working with the tools was called for. The same applies to the scale model yet requiring a much higher material- and working effort. Thus the pencil has been one of the planning tools since time immemorial not having lost any of its actuality (cf. Pencil Aided Design). Together with the inch-stick and triangular scale measure it has been the tool constantly accompanying the architect and planner.

Graphic data-processing, however, represents a relatively recent working instrument: within a short lifetime with impressing developments with extremely short life cycles. This brought about a completely new phenomenon in the field of the education of architects and urban and regional planners including research and development. The architectural production, city development and urban and region planning are characterized in a factual, social-economical and legal context by various working assignments and goals set. These fields are vastly diversified regarding the activities

demanded which show a differing degree of suitability for computer implementation. The following special fields should be mentioned in this context: CAM/CIM - Computer Aided/Integrated Manufacturing, CAD - Computer Aided Design, CAP - Computer Aided Planning, SIS/GIS - Spatial/Geographical Information Systems, CAAD - Computer Aided Architectural Design, CACD - Computer Aided City Development, etc. Simulation techniques should not only be implemented within the frame of the education of architects and urban and regional planners, in the fore only feasible didactic considerations are to be made and and concepts for teaching, research and development are to be developed. So far computer-aided techniques are particularly used to "imitate" traditional working modes. SAAD and SACD could thus stand for design- and planning strategies. What surely is not intended is to completely do away with existing working modes, but to supplement these and to enhance the integration of traditional and present-day representional techniques. Thus spatial simulation in architecture, urban and regional planning makes sense as such without regarding the implementation of simulation techniques as a genuine end in itself.

Outlook

Finally, an attempt to furnish an outlook in form of a forecast is offered. First, a number of aspects which could lead to a change in planning activities or in the education of planners, resp., are enumerated:

- Interdisciplinarity - which disciplines are actually called for?
- Teamwork - working together - "sharing";
- Pre-modelling (e.g. topographical models, city-models, adjacencies-models, building components)
- Assembling into a overall model = pre-modelled components are put together;
- Integration into reality - by means of computer animation, video-techniques, real picture- and real film simulation, photorealism;
- Client-server-principle - the "rough" work of modelling does not necessarily have to always be performed on the most efficient machinery;
- extensive availability of technology and techniques - the required technical equipment tends to be at the student´s disposal more and more.

What is the "Virtual Studio" - the studio of an urban and regional planner and architectural designer - to look like, what would it contain? The following conceptual and conceivable levels with various possibilities of integration may result:

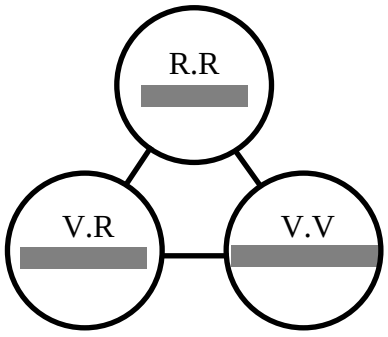

Figure 3. Triangle of the Virtual Studio.

The following simulation vicinities are to be considered individually:

R.R with and without V.R (High End-Vicinity)

- Physical model - scale-model or full-scale modelling
- Combination of full-scale modelling and VR

The specified combination of full-scale modelling and VR could unite the great interest for VR which has been established within the framework of planning education as main focus in some places with the efficient, but scarcely

used full-scale modelling technique (cf. endoscopy - quick and uncomplicated working with architectonic and city-development models, possibility of stills and walkthroughs).

VR with V.V (Low End Vicinity)

- virtual model by means of computer-simulation and -animation, resp.
- stereo-display and LCD-shutter-glasses ("VR-Light")
- computer-generated holography (scale-independent, real color representation provided the virtual/digital model exist output can result via Holoprinter).

These techniques make for viewing of virtual/digital models in an efficient, cost-saving and environment-minded manner.

Conclusion

The conception of "Virtual Worlds" resp. "Virtual Virtualities" relies on a technical, but particularly on a planning-functional aspect. As far as advanced development of our mutual vital space is concerned the advancement of development of space plays a major role in the interest of present-day planning tasks next to the maintenance and supplementation of space. This, however, calls for the conception of perspectives for the future, scenarios, variants and utopian schemes which are to be verified or also falsified with and without significant technical effort. This means not only investing considerable technical effort in the detail-authentic reproduction of realities, but rather into the best-possible arrangement of future worlds worth living in. This strategy demands an integration of topical questions and specialized fields (urban and regional planning and architecture), levels within the planning process (federal- and regional planning, local area planning, object planning/architecture), simulation- and planning techniques the multimedial integration thereof and an adequate intersection for civil participation and public relations.

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