
Perceptual Evaluation of the Spatial Manifestations of Urban Structures – Developments

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Abstract

The objective of this contribution is to bring to the attention of the community of experts in the field of architectural simulation the interdependence of the spatial manifestations of material components of urban environments and the phenomena of visual perception and imagination which we practically employ in education, professional design and which we also try to use in our contact with the clients. The way towards finding new qualities of urban environments should be dominated by our efforts to understand and perceive the urban structure as a real space-time manifestation, which is being mediated to the user also as a sensually experienced image (scene). Its atmosphere and informative content give impulses for an individualized reaction from various aspects. The content of the experience is multi-leveled and the sensorial effects of its iconic components can be precisely verified by means of simulation processes in temporal sequences. Taking these aspects as basis, we are developing methods, which would by taking determined conditions into consideration, broaden the spectrum of research, verification, or evaluation of the real spatial manifestations and interactive actions in situ as well as their possible anticipation and performance in laboratory conditions. Perceptual simulation is, together with the significance of experiencing and evaluating the urban environment in the eye-level horizon, a starting point of spatial model simulation methods as a supportive experimental creative and verification tool. The new information technologies and the creative technical cooperation of analog and digital iconic simulation systems create unconventional possibilities for exact recording of information and impulses for the complicated transformational process engaging more actively the community in their participation.

Practice in teaching architectural design has verified the significance

of spatial modeling on working models as on classical display and simulation media. Through the configuration of the means of model simulation based on principles of the optoelectronic analogue–digital methods of endoscopy, an effective tool for interactive sequential recording of the features of structures for the needs of research or for the support of creative decision-making in the interactive design process has been obtained. This subject matter is being further developed by some of our experiences and proposals, which should contribute to the orientation and development of architectural endoscopy methods and technologies. Inter-media experimentation in urban design has a strong inventive impact on the cultivation of architectural imagination, so irreplaceable for further improvement of an active information-society environment as well as for its vital background.

Introduction

Before presenting selected demonstrations of the utilization of spatial simulation laboratory methods at our department in the main part of my contribution, I would like to take a standpoint to some basic categories of this phenomenon.

Simulation - Visualization- Imaging

The term simulation (in the architectural designing process) means in our understanding a kind of hint, an anticipated performance, imitation, visual representation or visualization of the artifacts of the creative concepts or intents. In scientific application simulation gains a new and more significant role – it becomes a tool, an auxiliary method of modeling or anticipating more complicated systems of the spatial manifestations of the material environment and of the continuity of their the space-time effects. Simulation creates specific conditions for the verification, appreciation and creation of the aesthetic and functional quality of material and spiritual substance. In architecture, spatial simulation is the most effective method of scientific research/recognition.

With the term visualization we refer to all forms of analogue or digital iconic and graphic visual communication. We can characterize it



Fig 1: Working model of a alternative study of a square

rather like visualization, representation, screening and graphical representation of conceptual intentions and ideas through various media. The new tools of electronic media communication enable enriching of visualization by the fourth dimension of sensual experience, and they also enable performance of iconic animation of a screened topic.

Spatial endoscopy

Under the term spatial endoscopy or architectural endoscopy we understand a somehow creative "examination", observation of architectural and urban working models from the inside. Endoscopy in architecture is not only presentation by means of endoscopy, but it is a method of sensory communication, the aim of which is, besides architectural sketch modeling and iterative verification of spatial manifestations on physical or virtual models in real time through optical and electronic equipments (apart from endoscopes they are also CCD micro cameras or CAD graphics), mainly simulation of visual spatial experiences of the future participant of the spatial scenery in his natural horizon. Both the analogue, as well as the digital form of model simulation should comply with these parameters of the endoscopy method of sensory communication. As we are always dealing with simulation and observation of spatial-temporal manifestations of the modeled environment and its components, I could imagine a special denomination of architectural endoscopy as

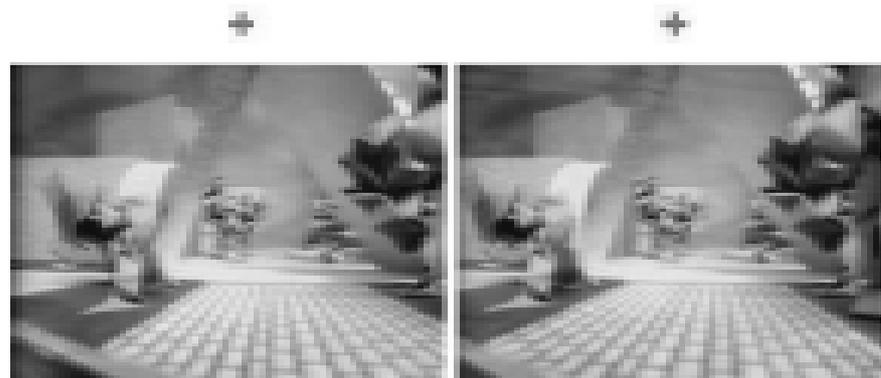


Fig 2: Digital stereo photography of a visual model simulation of an urban space study- a binocular stereogram

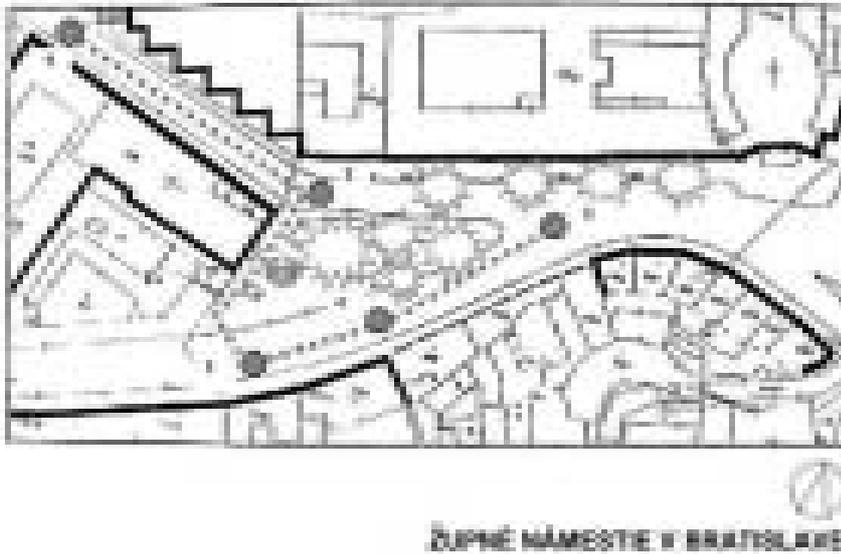


Fig 3: Situation plan for the analysis of an urban space. The route and points of characteristic views

"enviroscope". It would, of course, be a parallel with Ph. Thiel's "enviroarchitecture". The name of our association could then be European Architectural Enviroscope Association, in abbreviation EAEA without changes.

Sensory experienced image (scene)

The prevalent sign of architecture as well as of all kinds of art is, that they inform on something, they express something. It is a spiritual content, which is realized in the medium of sensuality. The unity of content and manifestation decide whether an architectural work shall be good, nice and generally acceptable without reference to a specific taste. The main purpose of our simulation is the generation of images and visions of the material arrangement of the environment for our customers, clients. Images and the spatial scenery create the atmosphere, the sensory experience of which shall motivate also the users. Therefore an "internal" understanding of the space as something that surrounds man and gives him creative impulses for his life is important. In this sense we strive to guide and educate the students and in the end also the lay community.



Fig 4: Graphical output of a visual simulation of a spatial experience along the route according to a verification scenario

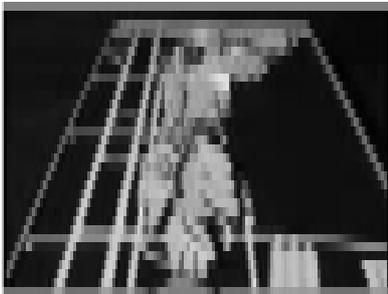
Perceptual evaluation - laboratory or digital form - methods

Manifestations of material, spiritual but also of social substance operate in the program of architectural or urban design. The model simulation is oriented towards imagination of these manifestations as of ideas of conceptual intents, visual support of the creative verification and decision-making process. Here use is made of perceptual homomorphous iconic simulations. Perceptual simulations model the partial consistency of structures or spatial situations with the planned reality in a laboratory or digital form. They stylize the artificial manifestations and in the sense of the program orientation of a task, they abstract their iconic content. Despite of this we consider the laboratory or digital form of perceptual simulation as a sufficiently valid basis for verification, evaluation and scientific notation of qualitative parameters.



I will now introduce some of our programs that are focused on the application of laboratory methods of perceptual evaluation:

- situation of urban composition and laboratory workshops, where the ideas for forming basic components of the urban structure - streets and squares are verified;
- practical sessions in urban composition, where selected fragments of an urban structure are analyzed from determined aspects;
- tuition of urban planning in studio form, where the draft is sketched on a working model and several alternatives of solutions are evaluated visually;
- scientific research of urban structure transformation - example: urban formation of the city avenue Ruzinov in Bratislava using the method of spatial modeling and perceptual evaluation of



the impact of dominant features on the identity of the internal city structure.

Big stress is always put on the continual dynamics of spatial imagination, because motion is a phenomenon, which enriches the formation but also the examination of the manifold relations of man and things in the environment with a new dimension. It is an inexhaustible source of creative imagination.

For illustration, I shall present several examples and methods of evaluation, which are developed from the examination aims and from planning of the individual localities in the programs.

Laboratory workshops of urban composition

Students perform visual verification and evaluation of the manifestations of alternative studies on urban linear and nodal structures - streets and squares within the physical environment of the spatial presentations on working models (see Figure 1). The paths and the process of verification, design and localization of characteristic visual points and orientation of sights on the route are modeled. The subjective experiences in standstill or in motion according to an elaborated scenario are verified. The theoretical knowledge of urban composition, obtained in the cycle of lectures and in seminars are used as a basis for the evaluation.

The didactic result of the workshop is the selection of an optimal alternative and the selection of imagery outputs, e.g. in the form of static digital photographs or stereo-photographs (see Figure 2), VHS-video, D-video, as a basis for a final graphic processing of the task.

Analysis of urban structure fragments

The analysis of selected urban areas within urban composition represents a parallel program of laboratory verification of urban structures. It is based on an aesthetic-compositional perceptual analysis of image transformations during the continual experience of the urban interior in real conditions. In order to allow for a more exact verification of the semantic specificities of a locality, an artificial

model is elaborated and the analysis continues using laboratory methods. Here, in a model reduction, an optimized course of the path and direction of spatial views and trans visions are optimized (see Figure 3). The results are graphically documented and they are evaluated by means of a perception diagram. The diagram is elaborated using the perception differential method, which is based on a process developed by K. Wejchert (1977). We have organized the value scale of the diagram in the following order:

- 1 – spatial monotony, no interconnection (discontinuity), weak architectural expression,
- 2 – marks of spatial interconnection (continuity) and expressive scenery richness,
- 3 – spatial differentiation, interconnection, urban and architectural significance of components, absence of local dominant features,
- 4 – spatial variety and interconnection, spatial and identification significance of its components, presence of dominant features,
- 5 – domination of characteristic components and ensembles in the spatial structure, in the image and silhouette of the city, high urban and architectural value of the scenery as a unit.

Scenes on the route in spots, where the values on the curve culminate, are usually supplied in the graphic documentation (see Figure 4). Students work out the perception diagram individually, modifying the reference manual according to the character of the programme, usually based on subjective appreciation/evaluation carried out on the spot. For purposes of a statistical objectivity of the compositional appreciation of each locality it is possible to elaborate several diagrams within the students groups. Experiences show that in group evaluation individual curves of the graph have similar tendencies and on routes led in the opposite direction a certain difference of value is negligible.

Studio of urban design

The creative process of searching and decision-making in studio design is supported by the method of spatial modeling, which means, that the draft is sketched by using modeling material on a working model. Verification is executed in an interactive form in laboratory

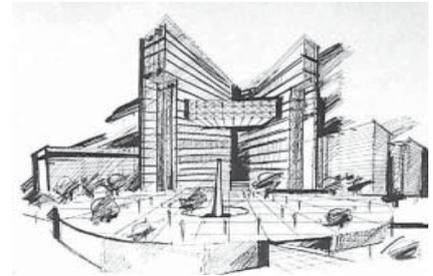


Fig 5 (above): Spatial study elaborated on the basis of a graphical output of the endoscopy method

Fig 6 (page 176): Visual model simulation using the analog- digital method. Directional sequence on a model in scale 1:1000 as digital graphical extract. Theme: Business Center Bratislava- Petralka

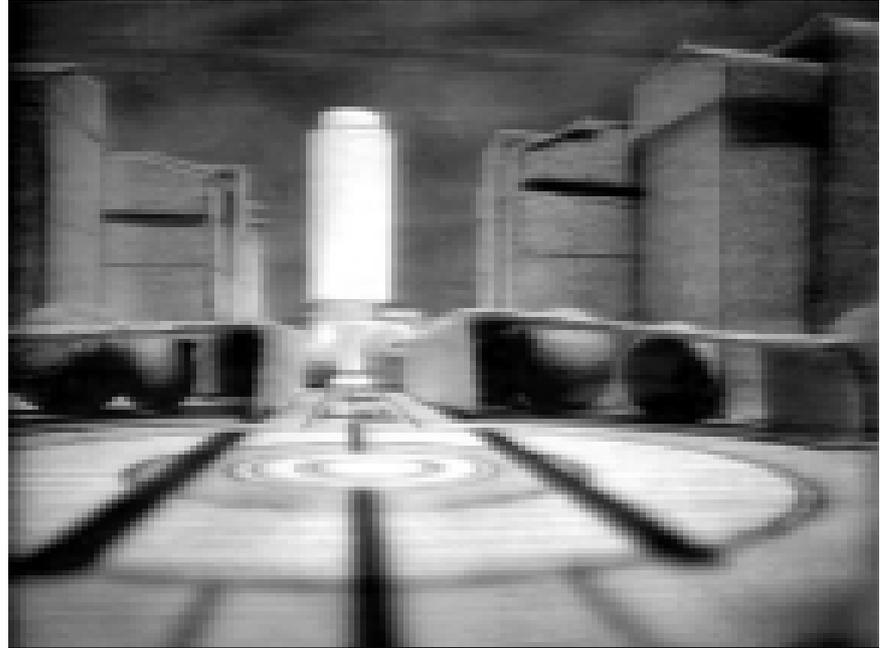
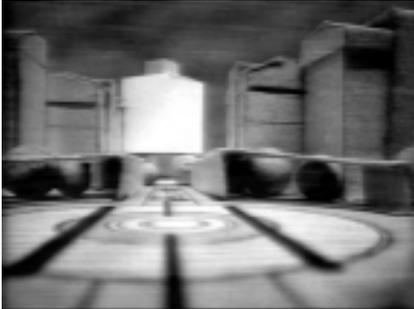


Fig 7: Visual sequential verification and evaluation of simulated disposition using a working model. Formation of space- dominating feature.

conditions in working groups. A sequential research and evaluation of the simulated disposition is performed on the working model with the possibility of immediate correction and a subsequent visual evaluation of the spatial situation (see Figure 6). The composition process using a working model has a great didactical significance, because it enables a visual and continuous verification of the spatial alternatives of the proposals. Immediate model elaboration in teamwork supports creative communication and leads to the development of the new topics/ideas (see Figure 7). Static digital photographs, stereo-photographs or panoramatic shots, VHS-video sequences, D-video are the usual output for further postproduction medial processing. Each graphic output is a suitable basis also for analogue processing of analytical and conceptual spatial studies (see Figure 5).

Research on urban formation of civic avenues

In the framework of a scientific research program focused on the

transformation of urban structures we are working on the project the aim of which is to study the impact of dominant features on the identity of the inner-city structure in the area of the civic avenue Ruzinov in Bratislava. The aim is the experimental verification of the theoretical aspects of aesthetic-compositional and creative expressions of dominant features in the sense of a morphological model of creative geometry with the help of the endoscopic laboratory method. The individual alternatives of the selected situation and formation interpretation are inserted into a volume-dimensional structure of the experimental locality presented on a M 1:1000 scale model.

The scenario of the perceptual verification process defined the following modification of and formation interpretation for the modeling:

- situations of dominant features in the environment of the existing urban structure (in the center of gravity or outside the structure's center of gravity), (see Figures 8 and 9),
- composition significance of the dominant features in the context of the volume-dimensional surroundings (the dominant feature as a solitarily feature, group or ensemble),
- forms and height proportions of the dominant features (basic geometrical and derived forms with height differentiation),
- discursive continual time-ordered sequences on the verification route according to the scenario (see Figure 10).

The performance of a quantification of the subjective-objectified evaluation using the perceptual verification method in final phase of the research will be permitted by an application of the semantic differential method on the basis of representations from the graphic output of the interactive laboratory device. From the point of view of the perceptual multilevel character of the scenes we have grouped the criteria into differentiated adjective groups according to:

- sensory demonstrations : sunny - shadowy; light - dark; medley - colorless; good-looking - ungainly; agreeable - disagreeable; interesting - common; lively - monotonous; dynamic - static;
- social demonstrations : familiar - public; comfortable -

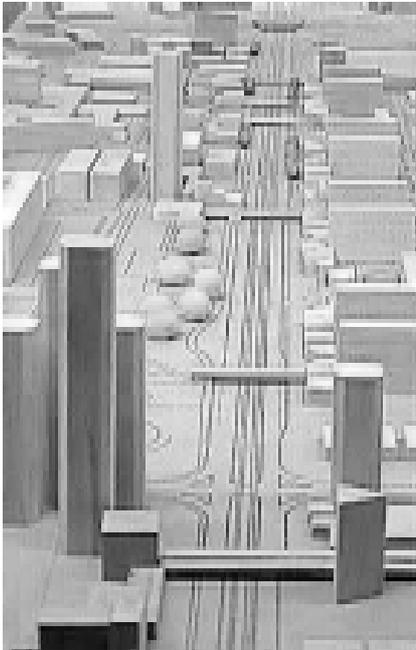


Fig 8: Situation of dominant features in the center of gravity of the existing urban structure. The civic avebue Ruzinov in Bratislava.



Fig 9: Situation of dominant feature outside the urban structure's center of gravity

Fig 10 (page 179): Image sequence as astatic graphical output of a dynamic-Discursive study of the spatial manifestations of the dominant features along the defined path. Analog digital endoscopy method. The civic avenue Ruzinov in Bratislava.

- uncomfortable; popular - unpopular; homely - stern;
dimensional demonstrations : free - constrained; wide - narrow;
open - closed; compact - opening; flexible - stable;
plastic - flat;

A perceptual synthesis of the evaluation forms the dynamic cinematographic record of the simulated spatial continuum (video-document).

Conclusions

A lot of significant personalities in the world of architecture have dealt with scientific analysis of environment. For completeness I can mention at least some of them: Ch. Norberg-Schulz, R. Venturi, R. Krier, M. Middleton, K. Lynch, Ph. Thiel. All give high importance to perceptual perception of iconic information from the surrounding environment and to their sensory digestion. They create namely the basic assumptions for demanding or evaluation of the quality of an

urban space and its social environment. In this sense we strive to develop the means - equipments and methods for the verification and evaluation of the still unknown and non-quantified values of the complex urban environment.

In model simulations it is important to realize the compatibility of the processes of biological vision and perception and of the reproduced image information from the outputs of optical and digital systems of static and dynamic scanning, presentation, transmission or archiving. We therefore find the laboratory method of perceptual evaluation with the co-operation of interested respondents a potential equivalent to the evaluation of the later accomplished reality. Imaginative abilities of electronic systems of computer graphics and analogous methods of model simulation in architecture and town-planning together with technical achievements do not only give support to the planning process, presentation and evaluation, but as an auxiliary means of support they become an important tool on the way to creativity. Exact and creative approach to raising quality is the first assumption for achieving positive changes in the permanent process of internal urban crystallization.

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