Challenges concerning further development of "digital cities"

Andreas Voigt, Helena Linzer

Vienna University of Technology, Austria

voigt@ifoer.tuwien.ac.at, linzer@ifoer.tuwien.ac.at, http://www.ifoer.tuwien.ac.at

The present paper discusses topical challenges for a further development of digital cities: recent lines of argumentation in favor of further development of digital cities primarily result from the model theory, the recent planning theory and interdisciplinary applications (e.g. facility management). The findings of the planning theory are to act as a checklist for quality-examinations of activities already performed in the field of "Digital Cities". It has to be focused on the improvement of utilization possibilities of digital cities. The contribution is based on the variety of personal experience with the modeling of digital cities including the experience published throughout the scientific community.

Digital Cities, Virtual Reality, Planning and Decision Support

Digital Cities – Concepts & Types

The concept "Digital City" has established itself as a rather fuzzy term for digital modeling of "select" characteristics of urban space (i.e. the simplified representation of urban reality in a digital model). Which features are included in the modeling of digital cities, the scope of their details and their time correlations depend on the specific users concerned as well as on the particular objectives of these models and thus may vary considerably. So far the overall "optimum" basic dataset is hardly to be determined.

Presently, two types of "Digital Cities" can be distinguished: "*Information Turntables*" permitting a virtual presence of urban activities and utilization possibilities directed towards a vast public and "*Work Models*" for the future of cities first of all mainly required by specialized planning.

At present practical experience predominantly is focused on GIS-based city models (mostly furnished by surveying departments or planning authorities of cities, cf. Laurini 2001) or on CAD-based city models (resulting from specific activities, such as urban-constructional competitions), professional pilot projects (e.g. expert systems supporting the solving-process of clearly defined planning problems) or are an attempt to issue an example for putting into practice new concepts regarding data and content management (e.g. *"data-pipelines"*, aiming at accounting for the continuous and dynamic changes in urban space, *"urban-space related content-management"*, aiming at navigation through complex space-related data sets, cf. Voigt et al. 2002a).

Table 1. "Key-activities" of Space-related Quality Management

[A] Space-related monitoring, determination of specific quality requirements

[B] Definition of space-related decision principles, specification of scope of potential action

[C] Space-related conception aids, development of spatial ideas

[D] Space-relation (spatial) conception and development of variants

[E] Spatial impact analysis, checking of spatial compatibility

[F] Information on planning contents and mediation in planning issues

[G] Normative implementation of contents of planning

Planning Theory

The question as to whether the present concepts

of digital city models are in compliance with the requirements of the planning world and those of the everyday world (politicians, citizens) is to be considered carefully. The findings of planning theory are to act as a checklist for quality-examinations of activities already performed in the field of "Digital Cities".

Planning is considered as "material" and as a "procedural" task. Therefore the quality of planning-"products" (i.e. "design") and the quality of "production processes" (i.e. "planning procedures") have to be secured carefully. This calls for a clear definition of terms (as well as related objects) and quality requirements, critical examination and validation of activities, processes and findings, the securing of quality achieved and continuous quality improvement, taking responsibility for the entire "product" (i.e. "space") and – above all - a consistent consideration of client´s requests. This is regarded as a key to improve the quality of "Digital Cities".

The following table 1 with "key activities" of an urban space-related content-management (cf. Voigt and Linzer 2001) may be regarded as a general technical checklist for the performance-quality of "Digital Cities". If the contents (mainly [C], [D] and [E]) are implemented in the conception of "Digital Cities" it seems possible that their utilization possibilities could be improved substantially.

Throughout the whole planning procedure "Digital Cities" may contribute to new knowledge, decision-quality and improved communication.

Users & Utilizations

The supporters of digital cities have identified numerous (potential) *users* (or clients) for their digital city models:

"Experts" of most differing fields such as urban planners, architects, landscape planners, traffic planners, sociologists, environment psychologists, tourism experts and city-managers as well as political decision-makers: politicians, the top-level of administration closely connected to politics and - last but not least - the citizen as the political sovereign.

The list of possible *utilizations* within and throughout the planning process is vast: e.g. thematic basis for urban planning - real estate property, land utilization, stock management, planning of site location, assistance of urban-constructional competitions (from tendering to decision-finding), visualizing of projects in the urban-constructional context, assistance of urban re-development and village renewal-procedures, performance of spatial impact analyses, various kinds of municipal information systems such as planning information systems, information systems regarding technical infrastructure and traffic structure, tourist city information systems, information systems for disaster management.

Table 2. Potential Utilizations: Experimenting with Urban Space

1.	Checking spatial impact and value of individual experience of urban configuration
2.	Grouping, shaping and structuring of building volumes
3.	Arrangement and distribution of building volumes in a defined framework
4.	Variations of the individual objects or of object groups in the constructional-spatial context
5.	Changes concerning existing stock
6.	Urban-spatial questions of detail
7.	Temporary space installations

"Experimenting with urban space" is regarded as a key planning task which needs intensive support by digital simulation techniques. The following table 2 (cf. Voigt et al. 2002b) lists various "experiments with urban space" calling for support by "Digital Cities".

Figure 1. Simulation-aided Village-Renewal Procedure (Example Großwarasdorf, Austria)

Conclusion

Digital city models are to create a "desire" to want to be used, working with them should directly show the resulting advantages for the user and lead to a deeper understanding for the qualities of digital cities. Amongst many other aspects the following topics are considered to be challenges to improve the quality of digital city models:

The broad range of clients requests and potential utilizations have to be studied carefully, considered and implemented in "Digital Cities"; this will lead to different qualities of digital models; in addition the question of an overall "optimum" basic dataset has to be tackled and solved in a pleasing way.

Simulations produced by "Digital Cities" have to be validated concerning the variety of details specifically required by the user; therefore findings of environmental and perception psychology have to be integrated (cf. Markelin and Fahle 1979).

References

Laurini, R.: 2001, *Information Systems for Urban Planning*. London & New York

Markelin, A. and Fahle, B.: 1979, *Umweltsimulation*. Stuttgart

Voigt, A. and Linzer, H.: 2001, *Approaches towards an (Urban) Space-related Quality Management*. – In: Guzman Dumonot, Guillermo (ed.), [Proceedings sigradi-Conference, V Congreso Iberoamericano de Grafico Digital, BioBio (Chile), 21 – 23 November 2001], BioBio, pp. 331-333

Voigt, A., Schmidinger, E., Walchhofer, H. P., Linzer, H.: 2002a, *Space-related Content Management*. [Proceedings of the 20th Conference on Education in Computer Aided Architectural Design in Europe, eCAADe] Warsaw, pp. 400-403

Voigt, A., Schmidinger, E., Walchhofer, H. P., Linzer, H.: 2002b, *Conception of Urban Space – Simulators Supporting Planning Work*. [Proceedings sigradi-Conference, VI Congreso Iberoamericano de Grafico Digital, Caracas (Venezuela)], Caracas, pp. 87-90