

HCU Research Group “Digital City”: Developing and Evaluating Tools for Urban Research

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Abstract

Based on a general view on the metaphor of a “Digital City” the agenda of a research group will be described that has been established at the HafenCity University Hamburg, Germany. The interdisciplinary team will focus on the development of valued added information and innovative services for the needs of citizens, employees, businesses and tourists. As examples, the upcoming work on the so-called “Playful Public Participation” and on advanced visualization methods and tools for dynamic urban processes will be presented.

1 Introduction

Due to the enormous and increasing importance of cities it is meaningful to perform a downscaling of the term “Digital Earth” as proposed in 1998 by Al Gore, former Vice-President of the United States, towards the term “Digital City”. Although this term is already quite often used, there is no unique definition or understanding yet.

Hence, in section 2 we will present our view on “Digital City” – by using a functional approach without making a claim to be complete. Based on this view and the identification of the most important fields for research and development we will firstly give a brief description of the interdisciplinary research group “Digital City” that has currently been installed at the HafenCity University in Hamburg, Germany (section 3). This is followed by an insight into selected topics of the research agenda of the group (section 4).

2 Our View on “Digital City”

Firstly, it has to be mentioned that there is no unique definition of the term – or better, the metaphor – “Digital City” (also often referred as “Information city”, “E-City” or “Smart Community”). Probably the first, at least the most prominent experiment of virtually networking citizens was Amsterdam’s “De Digitale Stad” which started in 1994. Although this portal still exists, it has lost lot of its users (“citizens”) – and by that its meaning, in particular due to the advent of superior internet-based communication services, that are commercially or freely available in the meantime (RUSTEMA, 2001).

Our understanding of a “Digital City” does not refer to a single, specific city. Instead of that we pursue a *functional approach* where we see the following four levels of interdependent aspects (see also figure 1):

- *Level 1:* The “Digital City” supports **data and information** related to a city in digital format, e.g. by digital or internet-based maps, 3D city models, navigation systems, or alpha-numerical databases.
- *Level 2:* The “Digital City” supports a broadband and eventually mobile **communication infrastructure** for distributing and exchanging these data and information. This item is in the focus of most definitions (like in the definition of “Digital Earth”). This communication aspect also includes topics like access for a broad community, web services, or other (open) industry standards.
- *Level 3:* The “Digital City” supports valued added information and innovative **services** for the needs of citizens, employees, businesses and tourists in their actions. Those tools may serve for several functions like orientation in space, information delivery, E-Government, decision making, etc. These services shall fulfill the demands for usability, interoperability and ubiquitous availability.
- *Level 4:* The “Digital City” supports a complete **virtual environment** as substitute for reality. Here the focus is mainly on complex technical solutions like stereoscopic displays, CAVEs, etc.

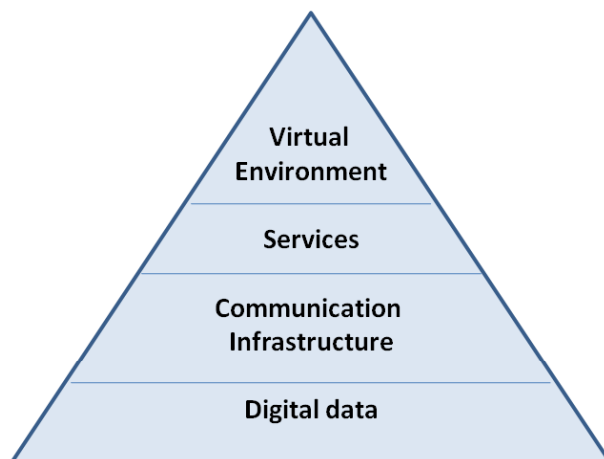


Fig. 1: Four levels of “Digital City” functions

The pyramid form as sketched out in figure 1 reflects the development status and importance of the individual levels. With regard to the base it can be stated that nowadays more and more geo data are collected at reasonable resolutions in an operational manner. Furthermore there is a clear tendency that these data are easy and to a certain degree freely accessible through suitable (geodata) infrastructures. As a consequence, more and more people, experts as well as non-experts, are using geo data as standard input for their needs related to several urban applications. On the other hand, considering the tip of the pyramid,

virtual environments have still to be seen as isolated and highly specialized technical solutions with relatively little access and only a small number of users.

The focus of our research group will be mainly on the third level (as outlined in figure 1), which is concerned with the development, the usage and the evaluation of services for typical, selected urban applications. Here we can identify huge needs due to the amount, complexity and heterogeneity of the data, and the underlying processes for exploring, analyzing and finally presenting new information and knowledge – which are by far not operational yet. In this context we follow the idea of the "Augmented City" mentioned by AURIGI (2006) who claims that the focus of digital cities shall move from a technological and project based view towards a more holistic view of urban space enhanced by technology. In this context we believe that not a full, but a partial substitute of the "real" city life should be aimed for.

3 Installation of the HCU Research Group

The HafenCity University Hamburg (HCU), funded in 2006, is a University dedicated for architecture and metropolis development, where the metropolis constitutes both the space for activities, and the object for research and studies. HCU possesses the whole bandwidth of academic methods and competences, including the natural and technical sciences, the creative-artistic sciences, the humanities and social sciences. It joins all disciplines which are necessary for these topics under one umbrella, namely Architecture, Civil Engineering, Geomatics, and Urban Planning. This unique constellation is used for inter- and transdisciplinarity in studies and research. Further information on HCU can be obtained via the URL www.hcu-hamburg.de.

In order to foster the interdisciplinary research the HCU follows the idea to install internal research groups through special funds. Although the core of these groups is built of members of HCU, there are of course strong ambitions for external co-operation, nationally and internationally.

The research group "Digital City" concentrates on the interface between geo data acquisition, modeling, analysis and presentation (summarized in the following under the term Geomatics) on one hand and on the various applications in the domain of City Planning on the other hand. Looking at this interface it can be stated that the use of Geographical Information Systems has already reached the status as useful tool for supporting and documenting planning and decision processes in urban environments. However, not all possibilities of the available methods and tools are actually exhausted or even used. In addition many specific actions within City Planning still demand for effective, efficient and user friendly solutions, for example for an improvement of actual co-operation within public participation processes. Hence, a variety of research and development questions can be identified from which a selected number shall be addressed by the group (see also section 4).

The core of the research group consists of five HCU professors from the disciplines of Geomatics and City Planning (the authors of this paper) as well as of young researchers and PhD candidates. The group is implemented for three years and follows the goals

- to perform smaller prototype projects,
- to publish respective results,
- to initialize national and international co-operation,
- to apply for research projects that shall keep the research group alive after the period of internal funding, and
- to transfer knowledge into education, mainly on Master course level.

4 Agenda of HCU Research Group

As outlined above the HCU research group concentrates on the third level of functionality related to the concept of a Digital City (see figure 1), namely the development, the usage and the evaluation of services for typical, selected urban applications. In the following, the two main research topics in this context, “Playful Public Participation” (sub-section 4.1) and advanced visualization tools for dynamic urban processes (4.2), will be presented in more detail.

However, the work of the research group will not be limited to these topics. Due to the special interest of the team members other themes like alternative routing in cities using PDAs and mobile phones, or spatial analysis of technical infrastructure systems will also be dealt with.

4.1 Focus: Playful Public Participation

The key idea of “Playful Public Participation (PPP)” is to generate pleasure and joy for the citizens involved in public participatory processes, in particular for the interaction between citizens and planning experts (KREK, 2008). A broader hypothesis of this research field is that the implementation and further development of the PPP concept will lead to overcoming the issues of rational ignorance and attracting more citizens in participatory activities.

Possible implementations of the concept range from including the activities of drawing and painting, walking and talking, or playing games. The pleasure and joy can be so strong that the participants might feel like being “in flow” during the participative process. This expression was defined and used by CSIKSZENTMIHALYI (1990) in his work. He describes the state of “being in flow” as the state of effortless concentration and enjoyment, the sense of effortless action, the moments in life in which everything seems to be just perfect and great. Religious mystics would refer to the state as the states of “bliss” and “ecstasy,” artists and musicians as “aesthetic rapture,” and athletes as “being in the zone”. We will focus on digital, serious games and open source software which can potentially attract more citizens in participatory planning.

The research agenda in this field tries to answer the following questions:

- How to design serious games in which the citizens play and enjoy, learn and participate?
- How to create a PPP environment which induces a pleasure of coming to the planning participatory web space, publishing web blogs about the neighbourhood, or chatting with planners and voting?

- How should online game-based applications be designed in order to attract the citizens and involve them in learning about planned alternatives and expressing their opinions?
- What is the role of open source software in designing public participatory games?

The second set of research question is related to ones give above. Here, specific requirements for different scales will be examined. The research will investigate whether there are specific concepts, approaches and/or implementations that are more useful at the regional, urban and neighbourhood scales.

4.2 Focus: Advanced Visualization of Dynamic Urban Processes

Probably the most special property of cities against other regions is their dynamic characteristic. This one occurs on various time scales, ranging from long or medium processes (for example, monitoring the built environment or environmental pollution) to short or very short time phenomena (for example, monitoring flows of people or traffic, or the usage of energy or infrastructure). In this context different forms of visualization are helpful tools to enable or at least to support the exploration of changes, and/or their communication. Like mentioned above, for many applications huge amounts of multi-dimensional data (i.e., maps, remotely sensed scenes or statistical data) are available. However, respective services that deliver effective and efficient value-added data for describing the dynamics of urban processes are missing for many specific questions.

We follow the hypotheses, that neither the usability of existing methods (like animations) for mapping or exploring urban dynamic processes is sufficiently investigated and well understood, nor all modern techniques (with respect to interactivity, multi-modality, etc.) are adequately used and properly tested.

Hence, the HCU research group “Digital City” will deal with advanced visualization of dynamic urban processes by

- developing a comprehensive and systematic, descriptive scheme of dynamic processes in cities and the related spatio-temporal questions related to them;
- analyzing strengths, weaknesses, opportunities and threats (SWOT) of current visual solutions for representing these dynamic processes;
- testing and modifying, or developing alternative concepts based on approaches know from other disciplines like Visual Analytics, Scientific Visualization, etc.; and
- implementing selected concepts and evaluating the resulting usability with respect to efficiency, effectiveness and user satisfaction.

5 Conclusion and Outlook

Based on our general and classified view on the metaphor of a “Digital City” we have presented the installation and the broad agenda of a respective research group that has been established at the HafenCity University Hamburg. Here, an interdisciplinary team will primarily focus on the development of valued added information and innovative services for the needs of citizens, employees, businesses and tourists in their actions. In detail, the so-called Playful Public Participation (PPP) as well as advanced visualization methods and tools for dynamic urban processes will be central themes for the next years.

One major challenge of the research group will be to overcome the well-known gap between disciplinary research on one hand, and the interdisciplinary connection and application on the other hand. Beyond this, the research group also looks for external co-operation, nationally and internationally.

References

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