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**Towards the development of a 3D digital  
city model as a real extension of public  
urban spaces**

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## **Towards the development of a 3D digital city model as a real extension of public urban spaces**

### **Electronic neighbourhood: background and objective**

From 2001 to 2004 we had an opportunity to test the use of ICT in connection with an urban regeneration project in the Nørrebro Park district in Copenhagen, which was completed in late 2007.

The Nørrebro Park district is a very mixed district, both physically and socially. The regeneration project was based on extensive involvement of local residents and representatives of trade and business. A holistic approach was adopted, including a coordinated and integrated social and physical focus. The project was based on an analysis of opportunities and problems in the area and was intended to lead to contracts in which various public and private players would commit themselves to targets to be achieved and funds to be applied.

In terms of time, the ICT project<sup>1</sup> was limited to three years at the beginning of the district regeneration period. Consequently ICT was mainly used to establish contact between residents and to identify problems and formulate goals. The district regeneration project was geographically limited, and it was therefore necessary to establish some kind of collective affiliation and sense of belonging to the district.

The main concept on which the ICT project was based was to set up an 'electronic neighbourhood' on the Internet<sup>2</sup>. The electronic neighbourhood was not intended as an alternative website but rather as an extension of the physical neighbourhood developed in parallel with the regeneration project. The electronic neighbourhood was intended as a tool that could be used in various urban regeneration projects as well as a means to gather knowledge and points of view in relation to the various activities involved. The electronic neighbourhood was thus to be a link between, on one hand, the physical neighbourhood that was being transformed and, on the other, the Internet. Just like the actual regeneration project, the development of the electronic neighbourhood was to be based on involvement of residents, and three tools were used: websites, a geographical information system (GIS) and a 3D city model.

### **Electronic neighbourhood as a space of flows**

Websites are of course the basis for the electronic neighbourhood, the facades of the electronic neighbourhood in cyberspace. The electronic neighbourhood is not a single website, but a network of several interlinked websites: the district regeneration website, the local newspaper website, and the websites of local housing associations and local business and trade associa-

tions<sup>3</sup>. It also comprises websites of a more ad hoc nature: websites created by individuals or groups of residents to discuss themes they find relevant.

The electronic neighbourhood is thus a 'space of flows': a network of places based on telecommunications and computer systems connected around one common, simultaneous social practice.<sup>4</sup> The purpose of many of the projects carried out in connection with the regeneration project was to ensure physical improvement of the district. Consequently it was necessary to set up a geographical information system for the district and make a digital 3D model of it in order to be able to present discussions and proposals in the electronic neighbourhood.

### Geographical information system for the quarter

The geographical information system (GIS) for the quarter was made on the basis of digital maps provided by the City of Copenhagen. By means of address coordinates it was possible to link central registers to maps. The GIS was thus used to map the places in the area where housing improvement and other initiatives were needed. Furthermore, the GIS was a digital centre for the storage, comparison and presentation of many types of soft and hard data in the form of theme maps on the Internet. The GIS was used to store all the pictures taken by eighty children in the area during a photo safari and display them on the Internet. The pictures were first displayed at an exhibition in the gymnasium of the local school. This actual exhibition was closed a long time ago, but can still be seen on the Internet. The tacit knowledge exposed and made easily accessible at that time has been copiously used in connection with other activities. This is also true of the Walkshop organised with wheelchair users, which resulted in analyses and proposals for improvement of accessibility in the area.



**Figure 1**

Meeting in one of the project groups in the regeneration project.



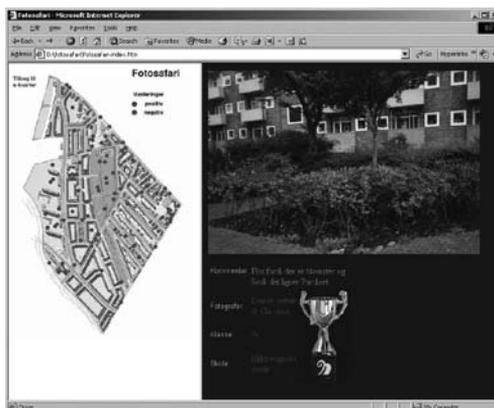
**Figure 2**

Some of the nodes in the space of flow of the electronic neighbourhood



**Figure 3**

Children's photo safari: Exhibition in the school gymnasium (a: venstre) and on the Internet (b: højre).



**Figure 4**

'Walkshop' with Svend (a:venstre), and how it looked on the Internet via the GIS (b:højre)



### 3D model of the neighbourhood

A 3D model of the neighbourhood was made on the basis of the geographical information system. In the electronic neighbourhood project, a distinction was made between a base model of the neighbourhood (similar to a base map) and more detailed models that could be extended as and when needed on the basis of the base model in collaboration with the residents and the various project groups. The degree of detail of the base model is equivalent to a scale of 1:500.

The model was first used to create an identity, a sense of ownership of the area within which the regeneration activities were to take place. Second, the model was used in relation to specific activities such as upgrading of streets, courtyard conversions, etc. The development of the model and the modelling of proposals took place in collaboration with residents. In this process, the dialogue between residents on one hand and architects and urban planners on the other hand was very important, as the outcome of the project and its viability depended on this dialogue.

### **The virtual marketplace**

The purpose of establishing a virtual marketplace was to have a public meeting place on the Internet where visitors could also find information about the work of various project groups. In such a virtual multi-user world (a 3D immersive multi-user world), visitors can chat in a special chat forum where they may, for example, go into projects together and have various points of view presented to them.

The virtual marketplace is based on the Cultural Fair event that takes place in late August each year. At this event, residents in the area meet over a weekend in Nørrebro Park to spend a good time together and learn more about the many activities that take place in the district.

The virtual marketplace is based on photos taken at the real Cultural Fair and is thus a 'true and faithful' reproduction of the park and the square as the residents know them. When a visitor enters the virtual marketplace, he or she will recognise the stalls, tents and stage, and will see well-known planting and buildings in the background. Each visitor is represented by an avatar, whose name and appearance can be changed at any time. At each stall, there is a board with a brief description of the group's work and possibly links to its websites. At two of the stalls - the Informatheque and the Park Group stalls - people can enter yet another virtual world or, as it was generally called, be teleported to the virtual worlds of the Informatheque and the Park Group.

The Park Group's virtual world is of course a virtual park, which is the setting of a large-scale exhibition of panels and pictures of the park in the past and present. Some of the panels are illustrated by 3D models that people can walk around in and look at. A series of historical pictures showing what the park used to look like and the life going on in it is shown on large glass panels in the virtual park.

The virtual marketplace is not an ordinary 3D model that can be accessed on the Internet. It is a 'multi-user world', which means that all the people visiting the virtual marketplace at the same time can see each other. A chat forum has been added to enable visitors to text message to ask or answer questions about the park, the regeneration project, etc or simply comment on various matters. People can thus agree when to meet in the virtual park and walk around at the virtual marketplace together with a resident or a professional guide.

On the real-life market days, the electronic neighbourhood was accommodated inside a container. By means of a microwave link, the container was connected to the Internet and thus to the virtual marketplace. Consequently it was possible, in the midst of Nørrebro Park, to take a walk in the digital representation of the park and visit the virtual exhibitions. Being in both the physical and the virtual park at the same time was quite an extraordinary experience.

There is a significant difference between looking at a picture or watching a film of a model of a project and actually walking about on one's own inside the model at a leisurely pace. There is also a significant difference between walking alone and walking alongside others and meeting others - be it anonymously or not - inside the model, communicating with each other. At some point in time it is likely that the multi-user world will become a real social space that residents will actually use as a meeting place. Thus the virtual space may become a new public urban space.

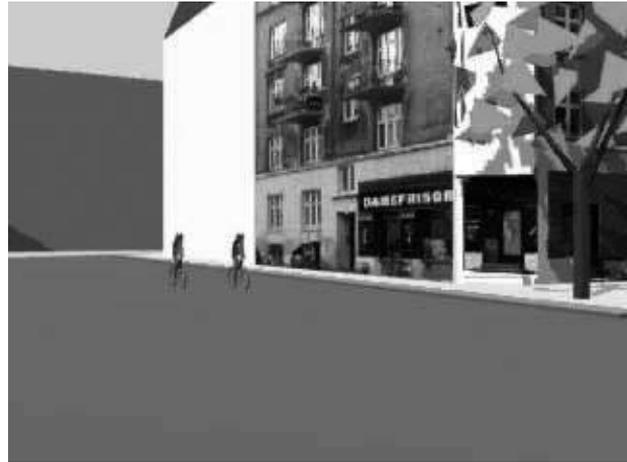
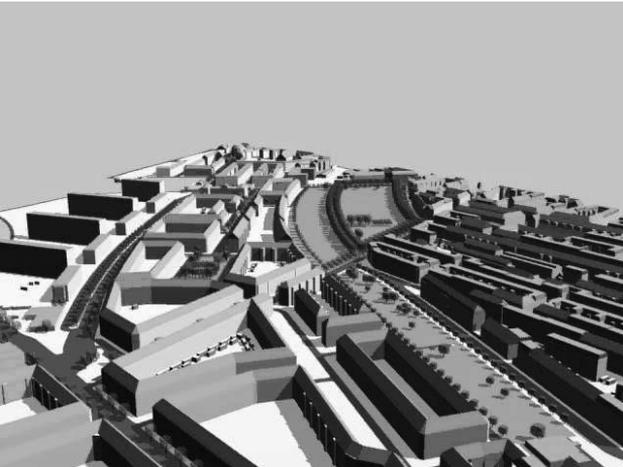


Figure 5

The digital base model of the district (a:venstre) and a more refined model for the upgrading of the Asminderødgade street (b:højre).



Figure 6

The marketplace at the Cultural Fair (a:venstre) and the virtual marketplace (b:højre).

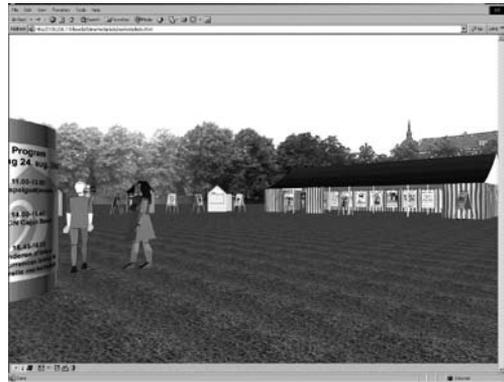


Figure 7

At the Cultural Fair at the centre of Nørrebro Park, visitors could 'go into' the virtual marketplace. Visitors (a:venstre) and their avatars at the virtual exhibition (b:højre).

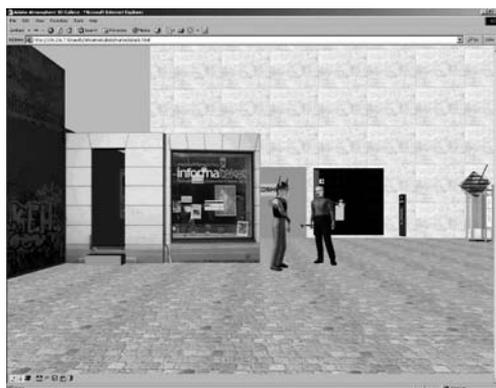
Building the virtual marketplace is design work consisting of creating the model and determining its functionality. In other words, it is a specific architectural and urban planning job.

### Bits: a new building material

The shape of the marketplace is based on the real-life marketplace in Nørrebro Park in this case, but it could just as well have been a city hall lobby with access to all the administrative departments or a front office shared by several enterprises. However, virtual worlds need not necessarily look like the buildings or urban spaces they concern.

Multi-user worlds may be created in cyberspace alone with a very clear function, eg a virtual neighbourhood centre in which individual project groups and NGOs could have specific rooms. This would give them a public face, as well as an opportunity to present their work to the public. In addition, there could be more private work and meeting areas with files for the storage of material.

This is definitely a new area for architects. In planning processes it should be considered when it would be most appropriate and expedient to cater to various needs in the physical world and when it would be best to do so by means of virtual worlds. The electronic neighbourhood project was a pilot project associated with a specific urban regeneration project, but it was not an integral part of the regeneration process, for which reason the electronic neighbourhood could only be developed to a limited extent. Consequently, the benefits for the regeneration project were limited as well.



**Figure 8**

The virtual world of the Informatheque: Access via a reproduction of the physical facade of the Informatheque. Behind the authors' avatars: a lecture hall in which a slide show is running.

Architects and planners have to think both physically and digitally even in the programming phases. More than ten years ago, William J Mitchell wrote: “Architects will increasingly confront practical choices between providing for bodily presence and relying on telepresence. They will be forced to explore the proper respective roles of physically constructed hardware and symbolically encode software, and of actual space and virtual places”<sup>5</sup> (page 172). This is not utopia today, but an everyday issue. It challenges the general understanding of information technology and architecture, which is a conventional understanding where information technology is only seen as a tool that can be used in the design of our physical surroundings. In fact, information technology should rather be seen as a new building material that can be combined with other building materials in architectural projects<sup>6</sup>. Since there is only very limited awareness of this new building material, schools of architecture should explore its properties and its potential in the field of architecture.

## Notes

- 1 The research project was funded by the Ministry of Housing and Urban Affairs. The research was conducted by a team composed of architects Bjarne Rüdiger and Bruno Tournay from the School of Architecture of the Royal Academy of Fine Arts in Copenhagen and architect Steen Holmgren and sociologist Kresten Storgaard of Danish Building and Urban Research. Project website: [www.e-kvarter.dk](http://www.e-kvarter.dk).
- 2 At the conclusion of the e-quarter project, a report entitled “The Electronic Quarter” was published by the Danish Ministry of Social Affairs in September 2005. The report (in Danish)) can be downloaded from the ministry’s website.
- 3 District regeneration website: [www.parkkvarter.dk](http://www.parkkvarter.dk). Local newspaper website: [www.paagaden.dk](http://www.paagaden.dk)
- 4 Castells, Manuel (1998): The information age: economy, society and culture. Vol I, II, III. Blackwell Publishers Ltd Oxford
- 5 Mitchell William j. (1995): City of Bits; space, place and the infobahn.
- 6 Leach Neil ed. (2002): Designing For A Digital World, Willey-Academy UK