

FROM URBAN LANDSCAPE TO INFORMATION LANDSCAPE

Digital Tainan as an Example

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Abstract. Urban landscape is an important visual form to reflect the characteristics of a city. This paper attempts to transform the urban landscape into information landscape to reveal the city characters, build a web-based system to navigate the 3D city model, and better understand the urban life by scene-based scenarios and role-play. The Digital Tainan project is presented for demonstration and discussion.

1. Introduction

Urban landscape is an important visual form to reflect the characteristics of a city, while different cities have their unique characters. We are concerned about the context of the physical city, the meaning and the structure of digital cities, and the interaction between the digital city and its users. We start with literature surveys of different city concepts in both physical and virtual cities, for instances, Sign City (Ockman, 1999), Collage City (Rowe and Koetter, 1978), Information City (Castells, 1991), Fractal City (Batty and Longley, 1994), City of Bits (Mitchell, 1995), Data town (MVRDV, 1998), and Virtual City (Dodge et al., 1998). These studies reflect the formation or representation of a city conceptually.

In a physical city, people can perceive the characteristics from its city landscape, and residents or tourists may have different city experience. While the urban is mainly shaped by its geographic properties, planning regulations, landmarks and infrastructures, the daily life and activities contribute mostly to the urban memory. Essentially, a city is a place for exchanging information. This study attempts to transform urban landscape into information landscape, and build a web-based system to navigate the 3D city model for better understanding the urban activities.

2. The Characteristics of a Digital City

What is a digital city? Mitchell (1985) depicts the city of bits as a result of digitalization, while a city generates and contains information for various reasons. In our opinion, a digital city is defined as a place for exchanging information and the physical form is only an expression of the city, while the spatial attributes remain critical for identification. A digital city should consist of various urban information created by the residents, and is interactive with its users. The contents and the characteristics of the digital city contribute to the formation of the city. Therefore, we use the information landscape to reveal the city information. "Information landscape" is defined to be a repository of information on the cyberspace and characterized by spatial attributes.

2.1 THE CONTENT OF A DIGITAL CITY

We have analyzed several digital cities, such as Virtual Helsinki, Virtual Seattle, Virtual Kyoto, Virtual Paris, etc. The common presentation of these digital cities is implemented on the web or CD-ROM to present the city information. Being a living environment, the main elements of the physical city are "activity", "space", "time", and "user".

Transformation of the physical city into the digital one can abstract the essence of the city information and enhance our understanding (Chiu, 1997). In the digital city, these elements are transformed into "information", "cyberspace", "sequence", and "role-play", Figure 1. Based on the relationship between information, cyberspace, and sequence, we are able to build a framework to represent the contents of information landscape.

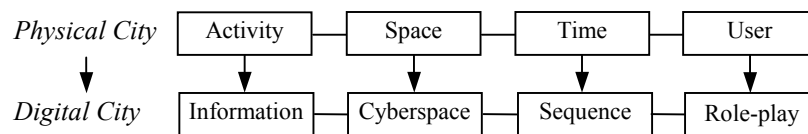


Figure 1. The elements transformed from the physical to the digital city

2.2 THE REPRESENTATION - CITY INFORMATION AND MEMORIES

Human are considered as urban information receptors on one hand, and reflect the scale and proportion, context, and experience of urban landscape (such as streets or buildings) from memory into various representations on the other hand. This study then analyzes what the digital city should look like or what its representations are when users surfing a digital city on the web. In physical space, urban landscape has geographic attributes, and full

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with natural and artificial objects. These objects can be represented by icons or artificial scenes with textural mappings (Chiu, et al., 2000). Thus, information landscape is a framework or platform with spatial attributes, while cyber-geography is somewhat different from the physical geography.

2.3 FUNCTIONS AND POTENTIAL USERS

A digital city on the web needs to be navigated, provide information to be searched, record memory, and interact with the users. Then the city model is created as an urban information system on the web and integrated with multimedia for storing, browsing and exchanging various information. Its application is toward a city information server for guiding people to experience the previous important events and current activities.

We suggest that the potential users of digital cities are not different from the real cities. While users can receive unique city experience in a physical city, users will get different experience when navigating a digital city. Users can take different roles in the digital cities at various period of time. The concept of 'role-play' is applied to the different users, such as citizen/foreigner, tourist/resident, male/female, young/old, and etc. For example, a young urban female professional worker has different perception and needs of the city information from an old male tourist.

3. Designing a Digital City

3.1 THE STRUCTURE OF THE DIGITAL CITY

The relationship between the physical and the digital city is classified as three types, i.e., replacement, complement or independence (Chiu, et al, 2000). We attempt to design the digital city with same content as the physical city, but represent the city by a new structure with existing information. The way is to take the existing physical city information apart, and reconfigure a new structure of the digital city. Figure 2 shows the 3D model of the physical city that consists of the original form.

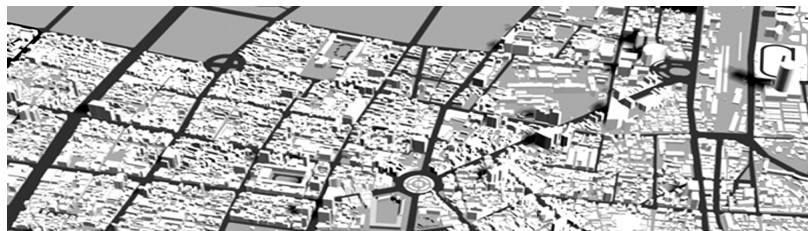


Figure 2. The 3D city model of the physical city

Figure 3 demonstrates the scope of geography and the details of information. We can classify the geographic information of the physical city and organize the digital city in three levels: city, zone, and building. Meanwhile, the details of information include site (or address), volume, context, and information (activities or events).

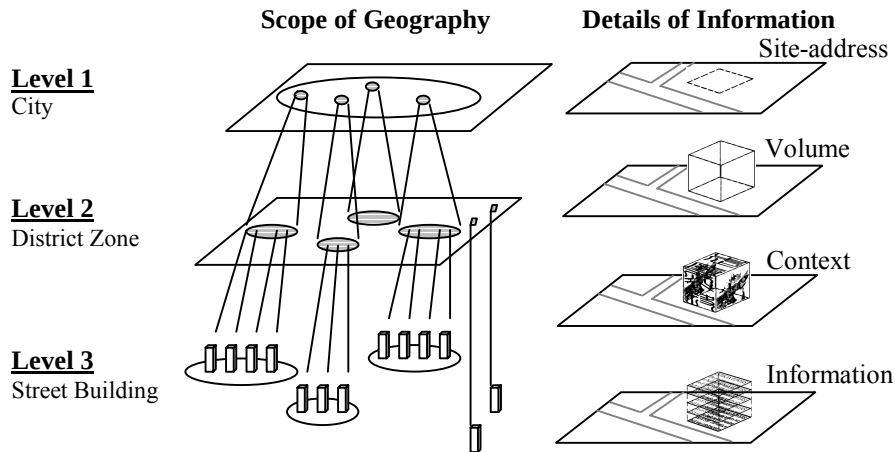


Figure 3. The structure of the digital city

3.2 DIGITALIZATION OF CITY INFORMATION

The system is mapping the locational attributes into a new structure with infilling of various information. We are concerned about what the messages are from the city information rather than the geometrical description of the physical form. Thus a small historic building may include more information than a skyscraper. Therefore, the city information can be digitalized and represented in different forms alternatively. For instance, Figure 4 illustrates the 3D city model on the left and the information landscape on the right.

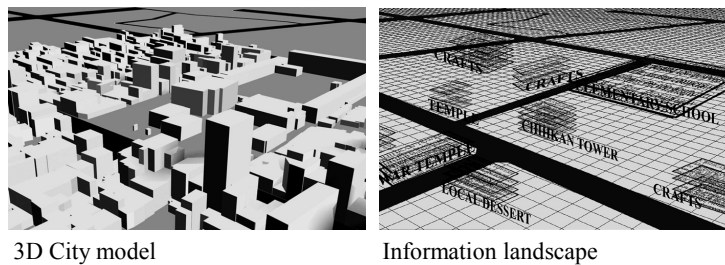


Figure 4. The digitalization of city information

3.3 INTERFACE IN DIGITAL CITIES

We apply digital images, texts, 3D models, panorama views, animation, VRML, sounds to illustrate the different activities or experience. The web-based system is therefore integrated with these inputs. Meanwhile, the cognitive map of each user is unique to the others, and it reflects the personal experience and memory. Therefore, we attempt to enhance the interaction by recalling the visual and acoustical experience in accordance with the locations. The collaged urban images and sounds are provided for the users to construct their cognitive maps, such as visual maps and sound maps.

3.4 SCENARIOS AND ROLE-PLAY

The roles of users in the system are also concerned. The user may act as a tourist, a resident, or a researcher. Every user has his/her own way to read city information, therefore the users can choose their roles in the system for associating related information.

The scenario concept is also adopted to relate the cognitive maps to the different users. A scenario is defined as a play with scenes, roles, events, and time sequence, Figure 5. Therefore, users can define their roles in the play, such as citizen/foreigner, tourist/resident, male/female, young/old, and etc.

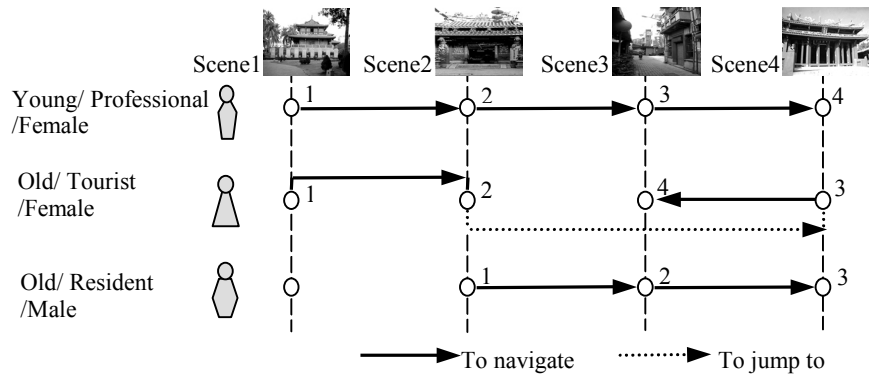


Figure 5. Role-play in a scenario

4. Demonstration of the Digital Tainan

Tainan is the oldest city in Taiwan with plenty of historic buildings and cultural heritages. The Digital Tainan is implemented as an example to illustrate the concept and for further discussion. This section presents the framework and demonstrations of the Digital Tainan project.

4.1 THE CONTENT AND REPRESENTATION OF DIGITAL TAINAN

The city of Tainan is decomposed into several component layers: city, zone, and building, and users can access the Digital Tainan by “search”, “navigate”, “explore”, and “describe” functions. The user can discover his/her own interests in the Digital Tainan by choosing the different systematic layers of the city. The context of the Tainan city is integrated and represented by images, texts, models, maps, panorama images, animation, and sound. Figure 6 demonstrates the snapshots of the Digital Tainan.

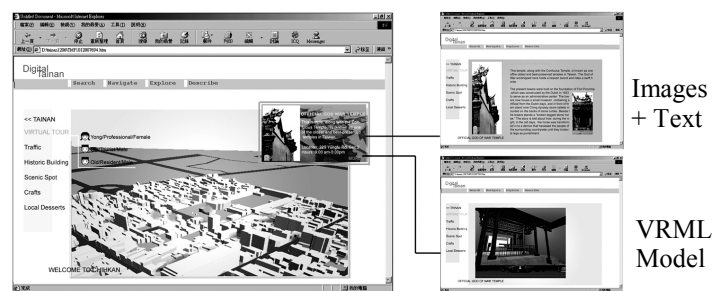


Figure 6. The presentation of Digital Tainan

4.2 NAVIGATION - STREET EXPERIENCE

From the behavioral point of view, we further study whether the city model can provide different city experiences to different users. Figure 7 illustrates the variation of a sequence of images of a typical street in the central Tainan. The scenes are represented in a sequence of buildings, plus signboards, walking people, and sounds to reflect different levels of city information, which the users can perceive the city images visually and acoustically.

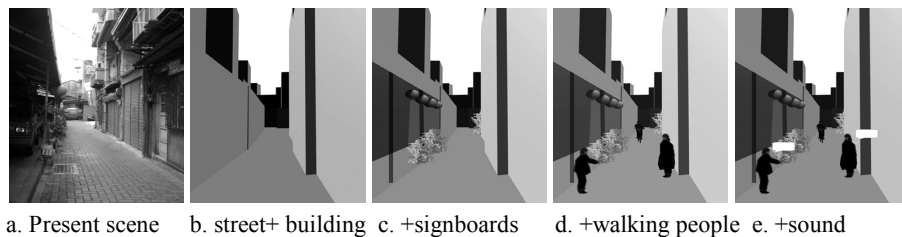


Figure 7. Navigating with the different elements

4.3 EXPLORATION - BUILDING EXPERIENCE

Users can explore specific buildings or landmarks in-depth by panorama images or 3D animation of the particular building. For example, we use 3D

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models to simulate the experience of visiting a historical site by change of the scope and angles of views. Figure 8 illustrates the sequence of exploring a particular historic building from the outside environment to the inside spatial relation.

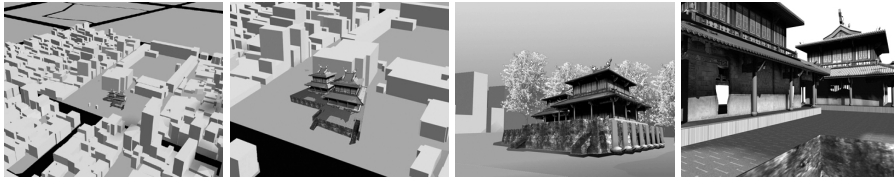


Figure 8. Exploration of a historical building from different views

5. Discussion

5.1 THE MEANING OF DIGITALIZATION

A digital city is a container with memories in the past and activity information at present to reflect the personal experience. Although we built the web-based city information system for promoting interaction, the emphasis of the digital city is to reflect the memories of the different users. The meaning of digitalization is to deliver the information of a physical city by a new platform, including all kinds of city messages, such as the image, sound, behavior and memories, not merely the form.

5.2 SOCIAL INTERACTION

The urban life is a social activity. City is a place for exchanging information, and social interaction is the way to proceed. In the Digital Tainan, we attempted to achieve the interaction by scenarios. But the way of scenario is confined to the passive interaction, and the users can merely choose the arranged roles and scenarios to navigate the information of the digital city. The further step is to design the interactive interface for allowing the users define their roles and interact with each others.

5.3 USER RESPONSE

After surfing the Digital Tainan on the web, we found that users in different backgrounds have variant interests. For example, a tourist is generally interested in navigating the visual representation and the acoustical experience of the tourist spots, and the design interface created by multimedia provide a mean for interaction. However, a professional may

explore the spatial experience and the details by search the background information first and access related links. Therefore, an information bank (including image, sounds, and digital models) is necessary for organizing various digital city information.

5.4 FUTURE WORK

The transformation of urban landscape into information landscape requires methodological as well as technological efforts. Currently, most digital cities exist are mainly created as a repository or an information bank. The Digital Tainan project provides some directions for future development in the design of the digital cities, including information, user behaviors, and technologies. The scenarios used in the system reflect some social behaviors, while limited roles are defined. Therefore, the social interaction requires more in-depth studied and integration of technology to reach the intention.

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