A Preliminary Study of Spatializing Cyberspace
A Cognitive Approach

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The purpose of this study is to reveal some aspects of the spatial nature of cyberspace by applying a cognitive approach, which is to decode cyberspatial cognition generated from the spatial experiences of an architectural designer. Two types of cities, the physical and the virtual, are compared in order to further realize the spatial knowledge of cyberspace. The results of this research indicate that understanding spatial characteristics of virtual environment can base upon investigating cognitive sketches. In addition, architectural designers might benefit from the findings of this study.
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Introduction

With the recent rapid growth of Internet, the influences of cyberspace upon the physical spaces we live in have gradually increased. Definitions and usages of cyberspace have widely diverged since the birth of the term. Although its meanings have not yet been fully understood, cyberspace is still in development (Benedikt, 1991). A new research scope thus emerges.

Researchers from other fields, such as geography (Batty, 1997) and communication studies (Strate, 1999), identify different overall frameworks of cyberspace. For example, Batty (1997) focuses on four aspects of cyberspace involving place and space: place and space, computer space (cspace), cyberspace, and cyberplace. In addition, Strate (1999) categorizes three levels of cyberspace: zero order cyberspace: ontology, first order cyberspace: building blocks, and second order cyberspace: synthesis. However, these studies generally concentrate more on the relationships among computer, telecommunication and user rather than spatial characteristics of cyberspace.

In architecture, cyberspace has been defined as abstract entities (Huang, 2001). Several researchers also ask, “Is cyberspace a space?” (Wong et al, 2001; Liu, 2001). With respect to theory, architectural and urban theories and designs must include physical spaces, as well as virtual ones (Mitchell, 1999). The physical city and virtual city also can combine together and coevolution to form a new urban topology (Mitchell, 1999; Warf, 2001). Furthermore, conventional architectural theory must be redefined for well interpreting spatial nature of cyberspace (Huang, 2001). As a consequence, understandings of virtual world are urgent before establishing a new architecture theory in this digital age.

In addition to varieties of definition, cyberspatial cognition in cyberspace is also very complicated. Disorientation and cognitive overhead are the two most difficult problems for users of cyberspace (Kwan, 2001). It is not easy to keep location, direction and to make choices in the ill-structured information excess environment. However, as little research has been conducted with this perspective, more empirical studies are needed.

According to Dodge and Kitchin (2001), only a few studies have investigated how users cognise cyberspace and the methods utilized to improve its spatial legibility. These studies can be classified into

two categories: wayfinding in virtual graphic worlds like AlphaWorld, and navigation in hypertextual environments such as World Wide Web. Research methods adopted by these analyses are based on conventional theories applied on the real world, such as spatial learning. All of these theories are influenced by the spatial knowledge of cognitive mapping, which has developed by Lynch (1960) since the publication of his seminal text, *The Image of the City* (Dodge and Kitchin, 2001). For example, a city metaphor, which is based on Lynch's theory, has been employed to the interface design of a virtual city (Dieberger and Frank, 1998). However, cyberspatial cognition of any specific website and cognitive images perceived by website users is still unknown.

How does an architectural designer use his domain knowledge to interpret spatial characteristics of cyberspace? The purpose of this study is to reveal some aspects of the spatial nature of cyberspace by applying a cognitive approach, which is to decode cyberspatial cognition generated from the spatial experiences of an architectural designer. In order to achieve this objective, I propose an empirical experiment to compare the spatial knowledge within both a physical city and a virtual city.

The first step of this research is to introduce the empirical experiment. The second step comprises a case study of a physical city, Hsinchu City, which is located in the northern part of Taiwan. The third step is to study a virtual city, Louis Kingdom (http://www.geocities.com/louisxxi_21/), that is an individual website in Hong Kong. In the end, the two types of city will be compared in order to find out the spatial nature of cyberspace.

Methodology

The experiment conducted in this study is consisted of three sessions: experiencing, verbal, and graphical. The physical city proceeded in advance so that the subject, who is a first-year architecture postgraduate student in our Institute, could familiar with procedure of the experiment. The first session is to invite him to see both cities. I choose an area of the physical city to visit around one hour. Each space, or web page, of the virtual city must be seen within three minutes. After that, I interview with the subject based on the normative design domains proposed by Schön (1983). Finally, the subject is requested to sketch images in thirty minutes for each city respectively.

Analysis and Results

In this section, contents of the interview will be summarized in the first part of each city. Following articles will focus on interpretations of the cognitive sketches drawn by the subject.

The physical city: Hsinchu

Function and zoning of the visited urban area are very obvious, and its form combines the old and the new building types. Form and function present a strong relationship because traditional businesses are convergent on this area. In addition, building types of this area represent an old style, and brick wall is a major material. Building facades are not as evident as signboards, due to small scale of the street and people are walking under the arcades.

During the experience process, streets, signboards, and temples are dominant spatial components. Organization of space is therefore simply a pass-through relation. However, there is not any active interaction occurred in the course of the visit. If exterior spaces and goods in the shop are interesting and curious, passive interactions might happen.

Obvious natural or artificial boundary does not exist in this area of the city. But enclosed form of the temple that develops into a food court has a distinct district as well as a boundary. Paths of the area connect to each other to form the crowded site conditions with little plants. Small lanes that link the main streets are also quite interesting. Spatial characteristics of them refer to an Italian mountain town, and another local town in a remote island. A good urban space is a frequently used space. Streets of this area can be further refined for local use. The most impressive images in this area are the vestiges of dismantled buildings, dismount materials on the wall, and hybrid building styles and materials.

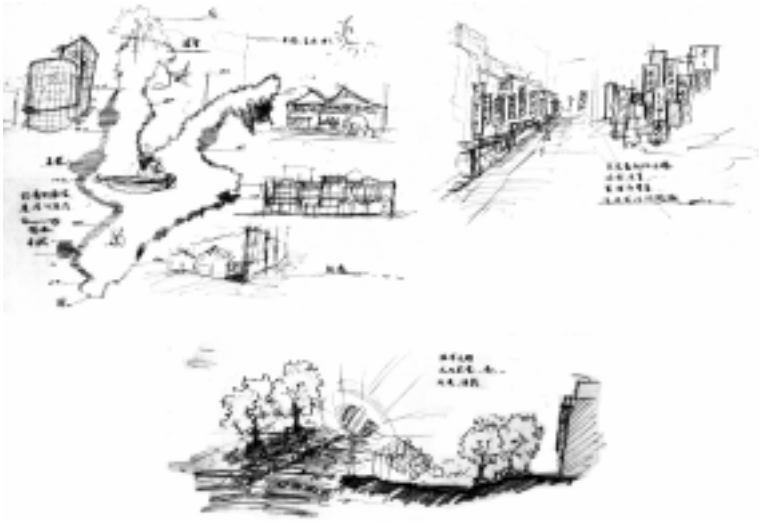

Figure 1. Cognitive sketches of Hsinchu city.

As shown in figure 1, there are three cognitive sketches of Hsinchu city drawn by the subject. Figure 1 (a) contains four major components: a memory map, building facades, food names, and environment conditions. He tried to express the experiencing process in details. Figure 1 (b) illustrates a streetscape and a collection of signboards which are the most impressive images of the city. Figure 1 (c) shows a plan of the East Gate of the city in the middle and two sketches of riverside, which connects to the East Gate. He also made notes to describe green corridors, sense of the cool water, and relaxation.

The virtual city: Louis Kingdom

Functions of the virtual city are the listed menus through which users can enter different spaces of the website. They cannot be seen at once, and they need to be explored by users. Urban concept of this personal website is abstract, and except library, most contents provide games for users. In addition, the virtual city presents multi-directional and noncontiguous of spatial configuration in which users can jump to anywhere by simply click a space.

Form is not obvious in virtual city. It is made of game-like picture images in conformity with style. As users look at the texts attached on the images, they immediately know what kind of building type on the screen. Spatial organization of the virtual city portrays a simple tree structure, which comprises only two or three layers. After clicking into spaces, conformity of the images cannot be found. Interior images are not as obvious as exterior ones. More evident relationships between form and function can be found from the classification of city centres. Similar functions are gathered to form one area. Other relationships are unclear.

Sense of space in the physical city is established by means of continuous passage of a series of spaces. On the contrary, spatial experiences of the virtual city are very weak indeed, as a result of the city comprises of fragment and noncontiguous dispersed spaces. Moreover, sense of a space is based on texts, rather than the building images themselves.

The city map is for reference only. It has a man-made boundary, which is the same as physical map. Relation between map and spatial experiences are independent, because the map does not provide any connection to other pages. The city map and local map is very difficult to associated cognitively.

With respect to scale, it is still image, and the bigger the image on the screen, the better the sense of space it is. For example, Dock is perceived as the most obvious sense of space. Dynamic representation media, such as animation and avatar, might attract users to browse the website. Poor connections between local maps make information into lots of small fragments. Without reference points and relative position, user will get disorientation in the city. This city does not provide any interactive interface. Like live real world, visual encounter with other users are expected.

Organization of space in this city is clear, and it is mapping to the physical environment. It is consisted of four major districts: city centre, south centre, east centre, and islands. The core area is situated in the southern area of the city. In terms of geography, this city resembles to Hong Kong, where the website is located. This city contains an apparent zoning concept, a core area and a clear framework. Each area operates as an independent component of the city, but all of them strongly relate to the city map. In contrast, components of space are not obvious. Because picture images are already dead, and their elements cannot be extracted. Space names are the components. The images do not make sense, or well combine with texts.

Elements of the city images can be perceived in the design of the city. Nodes and landmarks are very clear, since they have specific names. Node provides a button to enter, and landmark is presented as name, which cannot connect to other spaces. Users are not aware of path because the movement of click is too fast. Boundary exists clearly on the city map. In terms of motif, boundary of this city must ambiguous, because history has many possibilities. Sense of district is presented by texts. Site concept of this website, that is address, is associated with urban district. This city represents a terrible area of a real city, such as ghetto.

As depicted in figure 2, there are four cognitive sketches of the virtual city drawn by the subject, and contents of these sketches are more abstract than the physical city. Figure 2 (a) portrays the subject's concepts about functions, landmarks, and associated images. Local maps and the menus provided by the general version of the website explicitly describe functions of the virtual city. Each space or page of the city is perceived as a landmark, which activates the subject's memory to search a mapping associative image of the physical city.

Figure 2 (b) demonstrates that he attempts to analyze spatial experiences within the virtual city by comparing two diagrams in the bottom left. The physical city (marked A) is a continuous experience from one space to the others. On the contrary, it is an overlap phenomenon in the virtual city (marked B), because time in virtual city elapses swiftly when users hyperlink one space to another ones. Movement between spaces only can be slightly sensed by users

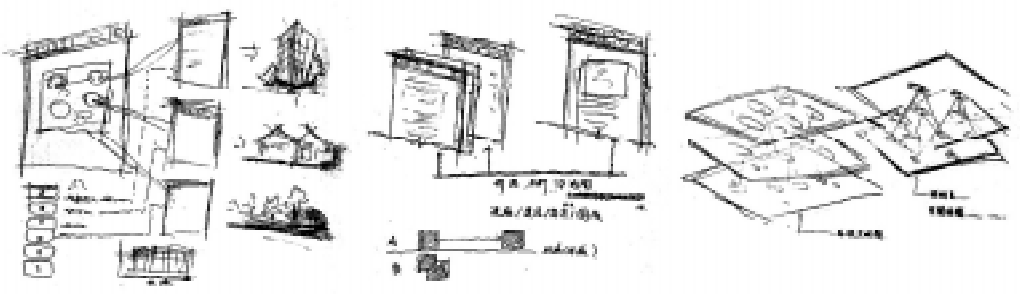

Figure 2. Cognitive sketches of the virtual city.

of the website. However, uniqueness of spatial experience in the virtual city derives from this characteristic.

Figure 2 (c) shows that the subject perceives the city map as different layers of planes, and he tries to figure out relationships among different layers. He notes that the left sketch is the city map which contains a very clear boundary. The right sketch shows more complex structure that is the subject's ideal relationships of the city map.

A comparative study

Both cities possess different types of function. The visited urban area is a part of the old town centre. Its form combines several building styles. In the physical city, form and function have strong relationship. By contrast, form is not obvious in the virtual city. Functions of the virtual city are made of information, and the menus as well as picture images on the web pages represent them.

Major spatial components of Hsinchu city are streets, buildings, and building elements such as signboards. On the contrary, the dominant elements of virtual city are space names, which are consisted of texts. Organization of space is based on the sense of space. On the one hand, it is a continuous pass-through relation that constructs spatial organization of physical city. In virtual city, on the other hand, multi-directional, noncontiguous, and jumping experiences make the sense of space more ambiguous, although the city contains strong zoning concept. The subject also uses precedents to describe spatial properties of both cities. Therefore, passive knowledge of the subject is activated by what he has seen in the city.

Besides boundary, the other city images of the physical city are well understood by the subject. Texts and picture images make node, landmark, and district of the virtual city perceivable. Furthermore, boundary of the city is clearly defined on the city map. However, nodes substitute paths since movement happens too fast in the virtual environment.

The cognitive sketches drawn by the subject represent differences between the two cities. In the physical city, he drew distinct building types, environment, and local landmarks. Also, he sketched the most impressive images what he mentioned in the interview, such as signboards, temple, and street. Although he described spatial properties of the virtual city as much as he can during the interview, his sketches only focusing on functions, spatial relation, and map, rather than the spatial components of the city.

Conclusion

The major results of this study identify several spatial characteristics of cyberspace by conducting an empirical experiment. The virtual city represents different spatial knowledge from the real world. For example, the virtual city presents multi-directional and noncontiguous of spatial organization that allows users to jump to anywhere by simply clicking a space. As a result, the way of sense of a space is changed, from a space-time relation to a perceivably overlapping experience. Moreover, spatial knowledge in the virtual environment becomes fragmented and dispersed so that they cannot be acquired at once. They must be explored and integrated by website users. Consequently, users unavoidably represent the on-line virtual spatial knowledge in the off-line real world. However, understanding and interpreting spatial experiences of virtual world still relies much upon the real world.

Implication of this study is to obtain the domain knowledge extending from the real world to virtual world. Therefore, architectural designers might benefit from the findings of this research. Their designs may involve both physical design knowledge, as well as virtual ones.

Future studies will invite more architectural designers to participate the empirical experiment, which will include more types of virtual city. Thus, spatial knowledge of cyberspace can be further understood. A theoretical framework of the new architecture theory can be established in the near future.

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