

SOME PHENOMENA OF SPATIAL INTERACTION IN THE NETWORKED SPACES

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Abstract. As a result of the network-based nature of Internet and communications technologies, a new spatial form, which is defined as networked spaces by this research, is emerging. This paper provides a significant theoretical framework to unpack complex spatial relationships caused by the networked spaces. There are three phenomena of spatial interaction resulted from a thoughtful investigation of the new spatial form: people-to-people, people-to-space, and space-to-space. All of which suggest several implications for both architecture and urban design. First, the dimension of space design can be extended further from real world to the virtual world, and diverse combinations of them. Second, the interactive dimensions between architecture and media are also extended by the networked spaces. Third, digitality-mediated spatial characteristic is the key for the future of both design directions and design professions. Finally, architects and urban designers consider space design including not only the corporeal spaces, but also the media in the digital space. Such emerging design approach challenges the design thinking, design process and design knowledge of architecture, urban design, as well as media design.

1. Introduction

With the recent rapid development of information and communications technologies (ICTs), the influences of virtual world, generally called cyberspace, upon the physical world we live in have gradually increased. For example, Moss and Townsend (2000) indicates that information and

telecommunications are changing many aspects of urban life, such as home, office, automobile, and street. The distributed nature of Internet also provides opportunities for connecting urban spaces to shape a new networked city. This new city form makes urban planning scholars to redefine the well-known concept of global city (Townsend, 2001). On the other hand, the virtual places existing in the cyberspace represent their own spatial knowledge, which is rather different from the physical ones (Liu, 2001; Huang, 2001a, 2001b). With respect to theory and design, architectural and urban theories and designs must include physical spaces, as well as virtual ones (Mitchell, 1999a). Furthermore, virtual places exist in a symbiotic relationship with physical cities to form a new urban typology by the advanced telecommunication links (Mitchell, 1999b; Warf, 2001). Therefore, a new spatial form which connects both physical and virtual places is emergent, as a result of the network-based nature of Internet and communications technologies. This new spatial form is defined as networked spaces in this paper. However, such interrelated characteristics represent very complicated phenomena indeed.

The complex linkages between space, place and information technology can be further understood by adopting a relational approach (Graham, 1998; Graham and Marvin, 2001). This perspective indicates social, cultural, political and economic construction or production of technologies within, as well as between specific places. Although this methodology is useful, further studies of the complex spatialities of virtual spaces are still crucial for the spatial-oriented disciplines, such as geography, urban design and architecture (Kitchin, 1998; Dodge and Kitchin, 2001). Moreover, communications technologies, such as telephone and Internet, are spatial in nature, which allow people to interact with each other from one specific space to the others.

For instance, the major reason for construction of Internet was to build a decentralized computer network system linking remote military locations throughout the United States. Communications and interactions between distributed positions was the dominant concern of Internet. Recently, people have been increasingly used the Net for personal interaction and horizontal communication (Castells, 2000). As a consequence, the natures of Internet represent interaction between places and people. At the same time, the concept of networked spaces also indicates spatial interaction between different types of space. However, characteristics of such spatial interaction in the networked spaces are still unknown. How many phenomena of spatial interaction underlie the complex relationships between physical space and virtual space? And, what are the implications of spatial interaction for architects and urban designers? The objective of this study is to explore different types of the phenomena of spatial interaction in the networked

spaces, and to examine their significances upon physical architecture and urban design.

This research is first to propose a theoretical framework for identifying the complex relationships between different spatial dimensions within the networked spaces, and to provide a conceptual model of spatial interaction. After that, in the light of the suggested framework, an ongoing design project of a digital museum in Hsinchu, Taiwan will be analyzed. Finally, this paper concludes by considering the implications, which are derived from the emerging phenomena of spatial interaction, for future design directions of architecture and urban environments.

2. A Theoretical Framework

There are two fundamental spatial dimensions mentioned in the previous review: physical space and virtual space. Owing to increasingly innovations of ICTs, virtual spaces are emerging in addition to physical spaces. This new spatial dimension, which is generally called cyberspace, challenges the long-lasting design ideas of conventional architecture and urban design. It also provides many opportunities for architecture and urban designers to redefine design scope and to rethink spatial conceptions. These virtual spaces, such as Web space and cyber-city, have been regarded as the other layers attached onto the top of the physical ones (Kitchin, 1998; Shiode, 2000). Rather than emphasizing layers of different types of spaces, the theoretical framework of this paper focuses on different spatial combinations between physical and virtual spaces.

2.1. SPATIAL COMBINATIONS AND DIGITAL SPACE

It is to believe that both physical and virtual space can exist and develop independently. They possess their own objects, activities and spatial compositions. By implementing technologies of digital connection, such as Internet and World Wide Web (WWW), new spatial connections will arise from the mutual blending of the two spatial dimensions. For example, different physical spaces can be connected to each other by communication technology, such as the idea presented by networked city. The virtual cities also link to many virtual places by the objects within the cities. In addition, different virtual places may exchange their information through intelligent agents for satisfying user's requirements, such as specific information to be searched by user. Moreover, physical space and virtual space can coexist to form a new spatial dimension. For example, apart from constructing physical buildings around the world, Guggenheim Museum also wanted to build a digital museum on the cybersite.

Therefore, this research categorizes three possible spatial combinations: physical space plus physical space, virtual space plus virtual space, and physical space plus virtual space. The resultant association of the two parallel-developed spaces is generally defined as digital space, because digitality is the major premise for the evolution and construction of the spatial concept, that is, networked spaces. Consequently, the conception of digital space consists of three distinctive types of networked spaces: physical networked space, virtual networked space, and co-existed space. The evolution and categorization of digitalized spatial concepts are summarized in Figure 1.

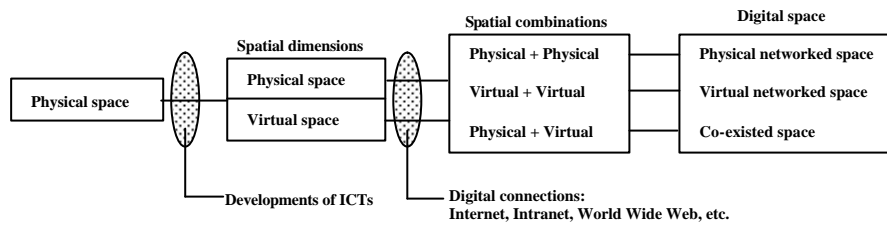


Figure 1: The evolution and categorization of digitalized spatial concepts.

2.2. DIGITALIZED SPATIAL INTERACTION

A new co-existed spatial form is emergent, as a result of the digital combination of physical and virtual space. As shown in Figure 2, the world we live in is composed of the physically and digitally connected spaces. On the other hand, virtual world, which presents its own web structure, might be seen as an extension of the physical world. Combination of both spatial dimensions and spatial interactions between them become possible by utilizing technologies of digital connection. For example, corporeal architecture, such as a library building, can build a virtual site on cyberspace in symbiotic with the real space. The virtual space is capable of linking to other sites for exchanging information that are provided by the co-existed physical ones. A new type of digital architectural form can eventually be constructed by applying such co-existed and co-built design methodology.

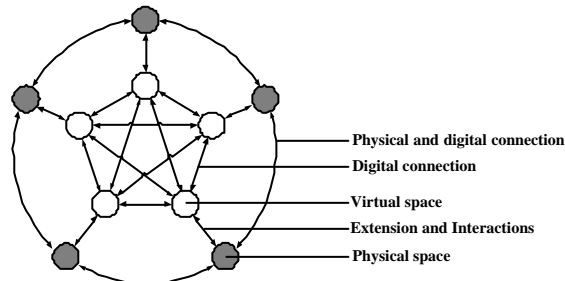


Figure 2: A conceptual model of spatial interaction.

As follows, some phenomena of spatial interaction derived from combination of the two spatial dimensions in the networked spaces will be described. First, in the physical space, people may interact with each other face-to-face or by using synchronous or asynchronous communications technologies, such as telephone and email. In the virtual space, people also use equivalent tools to that of physical space, such as avatar and chat room. Second, when people are online, they are interacting with the virtual space. Third, in the networked city, different spaces are linked together to present a space-to-space interaction. Forth, in the virtual world, different spaces may be connected together to form a large database system so that they can exchange information. Finally, when a physical space coexists with a virtual space, it is an interaction between two different spatial dimensions. Such arrangement includes all the phenomena of spatial interaction mentioned above. Therefore, this study identifies three phenomena of spatial interaction in the networked spaces: people-to-people, people-to-space, and space-to-space.

In summary, the theoretical framework proposed by this paper consists of two components: the evolution and categorization of digitalized spatial concepts, and the spatial interaction model. Two concepts of the framework will apply to the analysis of the case study: digital space and spatial interaction.

3. ITRI'S STEPS Digital Museum: A Case Study

The client of this project is Industrial Technology Research Institute (ITRI), that is the leading institution for developing technologies of High-Tech Industry in Taiwan. The purpose of this project is to build a digital museum (ITRI'S STEPS) which represents three primary objectives: to explain ITRI'S history and future visions, to promote technological aspects of education and recreation, and to integrate the developments of local research organizations such as Hsinchu Science-Based Industrial Park and National Chiao Tung University. However, in this project, we attempt to advocate three major design concepts: dual space, digital museum campus, and development of the digital city.

3.1. DUAL SPACE

In addition to design a physical digital museum in the campus space, we intend to construct a virtual museum in cyberspace (Figure 3). With respect to design, development of both museums is based on raw materials of ITRI such as texts and pictures, and follows the five exhibition themes: Taiwan Digitalized, Taiwan Lightened, Taiwan Energized, Taiwan the Life, and

Vision of Taiwan. The concept of dual space also implies digital spatial interactions between the two types of museum, and the virtual one will connect to other cybersites. In other words, ITRI'S STEPS embodies two categories of the digital networked space: virtual networked space and co-existed space. Moreover, these two kinds of digital space give explanation of two interaction phenomena: space-to-space and people-to-space.

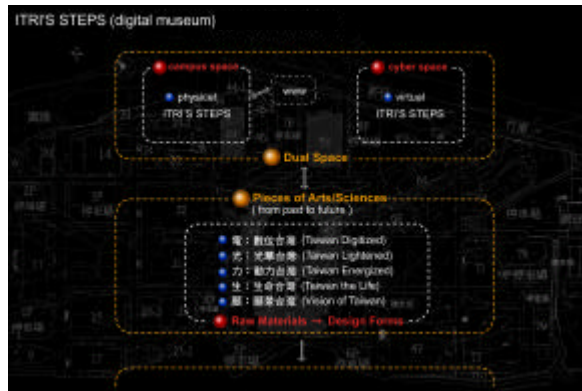


Figure 3: The design concept of dual space.

3.2. DIGITAL MUSEUM CAMPUS

ITRI'S STEPS has been regarded as the focus of the institution. By employing the latest telecommunications technologies, the museum links to other main buildings of the campus (Figure 4). Exhibition contents and information will be transmitted into the lobbies of the buildings by installing relevant interface media. The lobbies will also be converted into informational spaces. Consequently, a new digital spatial form, which is a physical plus physical spatial combination, is created, namely, physical networked space. This type of digital space represents the third phenomenon of spatial interaction: space-to-space.

3.3. DEVELOPMENT OF THE DIGITAL CITY

Since ITRI has been regarded as the center of technological innovations in Taiwan, ITRI'S STEPS is seen as the pivot in the development of Hsinchu digital city. Figure 5 depicts the framework and vision of the city. The concept of Hsinchu digital city, which consisted of Hsinchu City only, has already proposed by Peter Eisenman within the project, Hsinchu Digital Art Museum, in 2000. In order to intensify the influence of ITRI'S STEPS on a regional scale, we attempt to integrate Hsinchu County into the scope of this project. Therefore, the site of ITRI'S STEPS digitally connects to many

distributed locations within both Hsinchu City and Hsinchu County. However, this design idea exemplifies all types of spatial combination, spatial interaction models, and the three categories of digital space: physical networked space, virtual networked space, and co-existed space.



Figure 4: The design concept of digital museum campus.

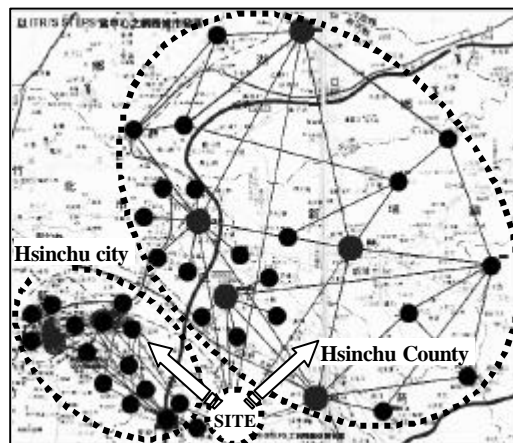


Figure 5: The design concept of development of the digital city.

4. Conclusions and Future Studies

The purpose of this paper attempts to investigate the emerging phenomena of spatial interaction in the networked spaces. This study proposes a theoretical framework that is comprised of two components: the evolution and categorization of digitalized spatial concepts, and a conceptual model of spatial interaction. The concept of digital space and spatial interaction model of the framework have been applied to the analysis of the case study: ITRI'S STEPS digital museum.

One of the major results of this research is that three phenomena of spatial interaction have been identified: people-to-people, people-to-space, and space-to-space. All of which bring into being from the complex relationships of digital networked spaces. In addition, the theoretical framework also reveals complexity of space design in this digital age. Architects and urban designers already encounter the very complicated digital connections. They may take advantages of digital technologies for conducting their designs. The proposed framework of this paper is significant to them for clarifying different categories of digital space while designing. These findings indicate several implications for architecture and urban design.

First, the dimension of space design can be extended further from real world to the virtual world, or diverse combinations of them. Most importantly, the phenomena of spatial interaction support the extension. In other words, new spaces and new activities might be resulted from spatial interactions in the networked spaces.

Second, a number of spatial combinations also extend the interactive dimension between architecture and media. For example, the properties of digital networked spaces suggested by this paper are different from the concepts of recombinant architecture (Mitchell, 1995) and recombinant design (Horan, 2000) in the relations between architecture and media. There are two relations between them: architecture in media, and media in architecture (Rijken, 1999). On the one hand, characteristics of physical space may be either mapped or transformed into virtual world, such as websites. Architecture, accordingly, becomes metaphors for media designers to carry out design of virtual environments. We may consider this phenomenon as architecture in media. On the other hand, on the contrary, the virtual world may be incorporated into physical space. This inclusion of the hardware aspects of virtual world can be regarded as media in architecture. Obviously, components of digital space not only encompass all relationships mentioned above, but also create a new domain, that is, spatial interaction, between architecture and media.

Third, spatial characteristics are being digitalized. This phenomenon is the key for future design directions and design professions. They have gradually impacted by digitality-mediated spatial characteristics in three fundamental features: design process, interactions between members of the design team, and relations between architecture and media become more important than ever.

Finally, in this digitality-mediated age, architects and urban designers consider space design not only including the corporeal spaces, but also the media in the digital space. Such emerging design approach challenges the design thinking and design knowledge of architects, urban designers, as well as media designers.

However, this paper is only a preliminary study. Relations between different phenomena of spatial interaction have not examined yet. In addition, relations between spatial interaction and media are still unknown. Future studies will first to further explore the mechanism underlying the spatial interaction. Then, the focus will aim to the intervention of spatial interaction between architecture and media. Accordingly, it would be possible to add more understandings to the study of influences of communications technologies upon architecture and urban design.

Acknowledgements

The authors would like to thank all participants who provide data and supports for this project from both Industrial Technology Research Institute and Graduate Institute of Architecture of National Chiao Tung University.

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