The Co-existence between Physical Space and Cyberspace

A Case Study

WAN Peng-Hui, LIU Yung-Tung, and LEE Yuan-Zone

Graduate Institute of Architecture, National Chiao Tung University, Hsinchu, Taiwan
http://www.arch.nctu.edu.tw, http://www.maffee.com

This paper reports on the relationship between physical space and cyberspace, with a case study. Three approaches are discussed of this co-existent relationship, the image, the user ID with avatars and the map with real-time information from the real world. Besides, we pose a 3D new-type form of cyberspace without concrete spatial boundaries and elements. In this kind of cyberspace, the user interface becomes relevant crucial. This research propose two methods to be the principles of the user interface, the stick with the spatial place and the 2D visual elements transplanted from 2D typical website. Furthermore, multi-user interaction and single user interaction are separately discussed in different hierarchical layers with diverse issues. This research deals with a case in progress and all phenomenon is preliminarily discussed.

***Keywords**: Cyberspace, Physical space, Co-existence, User interface*

Introduction

Cyberspace, a new concept, has been discussed widely in recent years, and due to the excessive information of the cognition of cyberspace, the relevant spatial theories about physical space should be mainly referred (Kwan, 2001). Cyberspace is frequently likened to physical space (Mitchell, 1999). The relationship and interaction between these two worlds, physical space and cyberspace, has been proposed in positive and negative terms. Young (1998) suggests that cyberspace is associated with negative experiences such as addiction behavior. Some scholars, however, have considered that the Internet has gradually enhanced real life. Light (1999) posits that the life of the real world can influence the virtual world while Crang (2000) argues that increased estrangement will come about from indulgence in virtual space.

As Web is viewed as multi-activity medium with activities focusing on interactive communication among users (Chen et al. 1999), the virtual hypermedia environment of cyberspace incorporates interactivity with both users and computers and possesses unique characteristics distinguishing from the physical world (Hoffman and Novak, 1996). Chen et al. (1998) assert that the construct of users' optimal experience in Web navigation is a useful and practical tool to understand users' perceived experience.

In some aspect, cyberspace can be defined as the space in virtual environments, Internet, or Web. Some researches focus on the activities and experiences relative with users inside cyberspace. Kim (2001) investigates how task type and cognitive style influence users' search behavior

on Web, and find that online search experience interacts with task type to influence navigation style. Furthermost, in order to apprehend the impact of form on movement within virtual environments, Bridges and Charitos (2001) deal with a part of a research project (Charitos, 1998) and define the spatial elements of a virtual environment as follows: place, path, intersection, domain, portal, buffer, landmarks, boundaries, thresholds and signs. User experience in cyberspace is significantly enhanced by the use of dynamic textures and the proportions of a path will induce the movement. This kind of conclusion also reflect on that the activities of Web must be challenging, competitive and provide feedback to its users in order to encourage the occurrence of optimal experience (Csikszentmihiayi, 1996, Chen et al., 1999).

A kind of orientation relevant to physical and virtual architecture occurred in recent years. A famous Germany museum called ZKM, the Guggenheim Museum and the Digital Museum of Hsinchu, Taiwan subsume simultaneously physical and virtual museums. It is obvious that the relationship between forms and spaces of a physical museum to those of a virtual museum is significant. Users visit the museum in physical world, and browse the museum in virtual world. ITRI's Steps, a digital museum of the Industrial Technology Research Institute in Hsinchu, Taiwan, is the case study of this research. This case study is still a project in progressing with both physical museum (Figure 1) and virtual museum (Figure 2). It is followed the orientation mentioned in the above paragraph. The major designing principle of this project is the image of technology and it is been restricted that the form and the space of the architecture of physical world and cyberspace must not be semblables. One special and spectacular point is that these existing no substantial or concrete architectural elements, such as walls or boundaries, in the cyberspace of the virtual museum of this project.

Figure 1. Virtual museum of ITRI's Steps.

Given that some researchers propose the interplay of physical world and virtual world (Mitchell, 1999, Chen et al., 1998, 1999, Hoffman and Novak, 1996), the questions will be argued in the following sections. What is the relationship between this kind of co-existent physical space and cyberspace? Does that have any particular phenomenon? Besides, since the virtual site of this project is a new-type one, how to build it and what should be contained inside it? This research deals preliminarily with these different issues and to understand the phenomenon and representation among them.

Figure 1. Physical museum of ITRI's Steps.

Co-existence of physical space and cyberspace

This research is a preliminary study dealing with a progressing project as the case study. Both physical space and cyberspace are demanded to follow the designing principle of high-tech image. This is the outward and apparent aspect of the relation of these two spaces. It can be taken as the fundamental phenomenon of co-existence of physical space and cyberspace. Beside that, two more possible instruments will be posed and discussed in the following paragraphs.

Co-existence through user ID

User visit physical space in the real world and browse cyberspace in virtual world. The spatial structure and the exhibition are totally different in two spaces, but the same function is that no matter users "visit" or "browse" in "real" or "virtual" world, they will have identifications (ID) inside the museum. The user ID is one way to connect physical space and cyberspace.

When one user visits the physical museum, he/she will see his/her virtual agent (avatar) on the display in the exhibition place. The environment shown on the display is the virtual museum, not just the mirror reflection of physical space. Except that, the virtual agent is able to interact with other virtual agents not only of that of coinstantaneous physical users but also of the browsing users in cyberspace in the same period of time. After the user visit physical space, he/she will get an ID number and password so that he/she will go into the virtual museum without another procedure of registration. This can make the user to browse the virtual museum in an easier way.

Co-existence through map and web-camera

Another way to make the co-existence of physical space and cyberspace is the map. The map (Figure 3) in cyberspace here is not the traditional index map of the typical homepage, and furthermore, it supports the particular function of the real-time information of the opposite buildings in the physical campus. The shape of the map is just like the diagram of the physical campus and it includes the main buildings inside the campus.

In the real world of the campus, web-cameras are installed in the main lobby of those main buildings. When the user browse the virtual museum, he/she can easily get the real-time information of images and sound coming from the campus in physical world. It also means that if there is critical information need to be transmitted to cyberspace in time, this kind of mechanism can supply the assistance. It's another aspect of co-existence.

Figure 3. Map and the web-camera image in cyberspace.

Characteristics of cyberspace

The virtual museum, cyberspace, of this project is a new-type form without concrete and conventional spatial elements. It consists of three hierarchical layers, one main lobby (Figure 4) and five sub-exhibition spaces (Figure 5) with various show places (Figure 6). The most crucial characteristics of cyberspace are the interaction and the user interface.

Multi-user and single user interaction

The interaction of cyberspace can be separated into two different types, the interaction between one user and another and the interaction between the user and the environment and pieces of arts. As Table 1 show, the interaction between users is operating in multi-user relationship in the first layer, the main lobby and the second layer, sub-

Hierarchy	Layers	Users	Type Interaction With
First	Main Lobby	Multi-user	Users
Second	Sub-exhibition spaces	Multi-user	Users
Nethermost	Various show places	Single user	Places and pieces

Table 1. Interaction types of cyberspace.

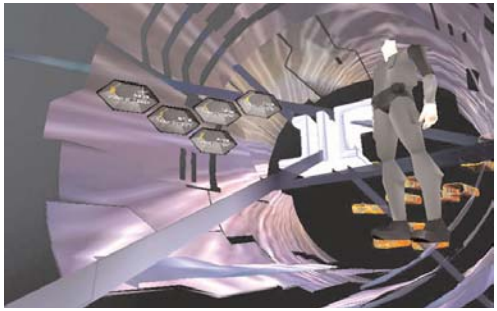


Figure 4. Main lobby and the avatar.

Figure 5. One sub-exhibition place.

Figure 6. One exhibition pieces of arts.

exhibition spaces. Each user will have its avatar when he/she gets into cyberspace, and in the first and second layers of the virtual site, each avatar is able to interact with other avatars, such as saying hello, chatting or discussing about some issues.

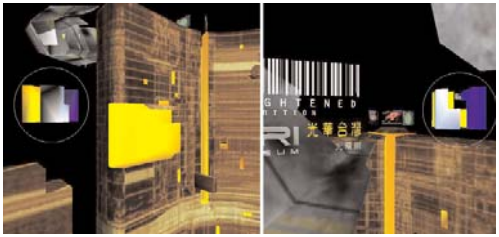
In the other hand, the interaction of single users occurs in the various show places, the nethermost hierarchical layer of cyberspace. With this kind of type of interaction, the user can interact with the show place and the exhibition pieces of arts, in the aspect of touching, experiencing or other activity with gravity or weightlessness. The remarkable point is that these two types of interaction cannot exist in the same time in present time, for the computer server has no ability to deal with these kind of programming processing.

User interface in cyberspace

In the kind of cyberspace without concrete boundaries and spatial landmarks, the user interface become relevant crucial. The user will easily get lost or has no idea about where he/she locates in the virtual site without the direction or the guide. For its innovative 3-dimentional form, it is not facile to set up the guide with typical concept. This research would like to preliminarily pose two kinds of principles of user interface in this cyberspace, stick with the show environment and transplantation from the conventional 2-dimentional (2D) website.

1. Stick with the show environment

One method to put the guide or the direction in the virtual site is to combine the user interface with the site. The user is able to recognize the particular elements in cyberspace after experiencing for enough time in order to know how it represents and where he/she locates. One sample is the L-shape hown in Figure 7.



2. Transplantation from 2D website

Another method to supply the direction as the user interface is the transplantation from the traditional 2D websites. It's a simplex but firsthand concept of the user interface. Since the 3D cyberspace is displayed in the Internet, it is suggested that the user browses the virtual site has the experience of browsing 2D websites. This suggestion presents that the user will get the connection with his/her former experience with the familiar and typical visual elements of 2D website. Figure 8 shows one template that the typical web elements as buttons of home, news, next and before is represented in 2D aspect which floats in 3D cyberspace.

Conclusion

In the study we sum up three kinds of co-existence aspects of physical space and cyberspace in this project, the high-tech image, the user ID and the map with real-time information. With these conceptual and realistic approaches, users can not only visit the physical museum and browse the virtual museum separately, but can link physical space and cyberspace together in order to get more complex, interesting and even wondrous experience.

Beside, the crucial characteristics of cyberspace are discussed. Multi-user and single user interaction types operate in different hierarchical layer of cyberspace and with variant interacting affairs. Furthermore, we pose two concept approaches that we solve the "get lost" problem of users in 3D cyberspace, one is stick with the environment and the other is the transplantation from 2D websites. This discussion provides some insights that should be useful to designers and should be further studied.

Apparently, this work tackles a relatively new area. The researches about the interaction of physical space to cyberspace are also need to be mostly investigated. However, the reciprocal relationship and connection between physical space and cyberspace have many aspects and dimensions to be explored further.

Figure 7. Direction in cyberspace.

Figure 8. 2D direction elements in 3D cyberspace.

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