Designing conceptual mapping in cyberspace

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Abstract

The design of virtual place constitutes a special and new class of design. Virtual places are both forms of information as well as information of form. Though we already have actual experience with virtual functions in the form of virtual museums, virtual shops, virtual schools etc., there, as yet, exists no theoretical basis informing the design of virtual place. New experience is beginning to emerge that deals with key issues in the use of, and interaction in, virtual places. Among these issues is designing the sense of presence in what is a virtual world. This new knowledge and understanding is beginning to help to define this new field of design. The objective of the research has been to determine and define the generic requirements of a virtual place from a design point of view. The paper describes an experimental program whose objective was to identify generic design concepts of “virtual place”. A goal of this work has been to make a conceptual mapping of Cyberspace. We present the basis for the conceptual mapping employing the ICF formalism in making the survey, analysis and the categorization of relevant sites.
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Introduction

Online activities of diverse functions such as shopping, banking, and travel planning are occurring more and more often in virtual environments. Currently, these are commonly “information environments” rather than spatial experiences. However, as beside the physical environment, networked environments become an important part of our actual daily experience, the design of virtual space may enhance our presence and functionality in the new world of information.

The design of virtual space constitutes a special and new class of design in which the verisimilitude of the constituents of place is becoming a central issue. However, there is a more fundamental problem beneath the obvious requirement of “reality”. The design of E-place has dual importance. It is the design of both the sense of place in terms of the “information of form”, as well as the unique experience of the virtual in terms of ability to simultaneously experience the “forms of information”. It is the reconciliation between making the virtual appear real and preserving the uniqueness of the medium as “conceptual space” that is the essence of the design problem.

Though we already have considerable working experience with the design of virtual space in the form of recent virtual museums, shops, schools etc., we lack a theoretical basis for design. Furthermore, we still lack a coherent statement of the design problem. Without any doubt, among the challenging problems is the achievement of a sense of place in this medium which might duplicate, replace, or improve the traditional human perception of place. However, whether such an effort should be based upon the effort to achieve an analogy with physical space is as yet unclear. Should the virtual be like the real?

Early attempts to deal with the design of virtual space by providing a sense of place and physical presence are beginning to emerge. Our knowledge is becoming formulated around the concept of “typological verisimilitude”. That is, for each type of distinctive experience of a human function, e.g. a bank, there is a particular form of spatial presence that is required. The place, bank, is a distinctive spatial experience as it is a distinctive conceptual environment.

We are attempting to address the complexity of this interpretation of “presence in place” as it relates to the performance requirements of virtual functions. Rather than treating the problem as the visual duplication of actual physical environments we are attempting to conceptualize the new design problem of place and presence in information space.

In our on-going research we are particularly interested in capturing generic knowledge related to the following issues:

a. How is the relationship between people and place transformed in electronic environments;
b. How should place be conceptualized in order to accommodate these transformations;
c. How can the conceptualization of place-based experience be achieved;
d. How can spatial metaphors and spatial interactions be achieved;
e. What experience beyond perceptual space-based experience should be accommodated?

The initial stage of the research was based upon the collection of theoretical materials as well as a systematic survey of web-sites offering a range of interpretations of place. Following these early stages, we have undertaken an experimental program whose objective was to identify and define generic design concepts of virtual place. The experiment was carried on in an educational situation in which a team of student-researchers collaboratively constructed a generic knowledge base for the
programmatic and performance requirements of the design problem. We report below on the results of this experimental research. The experiment is a unique form of social interaction made possible by the communication and collaboration potential of Cyberspace.

In the following sections we first briefly introduce a theoretical basis for the definition of cyberspace and of its impact on space-time relations in virtual spaces. In the next section we present approaches related to the spatiality of cyberspace and how we conceptualize space and place. Following this we describe the experimental program, its theoretical assumptions, the provisions for the collaborative construction of the knowledge base, and the methods of knowledge collection. In the last section we present our findings.

**What is Cyberspace?**
The meaning of the term “Cyberspace” is derived from the Greek word *Kyber* – “to navigate”. There are two basic interpretations to this term. The first refers to Cyberspace as a navigable digital space of information created by networked computers and known today as the Internet. The second interpretation is taken from the writings of William Gibson who is commonly credited with inventing the term. This first appeared in his novel, *Neuromancer*, (Gibson, 1984) in which he refers to Cyberspace as a *conceptual space* within the technology rather than the technology itself. The distinction is non-trivial, since for Gibson Cyberspace is a particular form of mental space within the technology itself.

**Place in Cyberspace**
In his novel Gibson presents Cyberspace as placeless and spaceless. Spaceless in his view is described as a visual metaphor that provides an abstracted view of the real world, but is lacking tangible substance. In a later work (Gibson, 1986) Gibson describes that in Cyberspace there exists neither space nor place and therefore, there is no spatiality. In fact, he proposes Cyberspace as a linked digital information system that employs spatial metaphors in order to assist in the navigation and interaction with data constructs. According to Dodge and Kitchin, (Dodge and Kitchin, 2001) Cyberspace is actually transforming real world spatiality into a “placelessness” world. As such it is changing the conventional relationship between people and places.

The provision of a sense of place in the virtual world requires the following components: physical settings, a functional context, and a social setting. We consider these components in the following sections.

**The physical setting in virtual worlds**
According to Benedikt (1991) Cyberspace contributes to the blurring of reality and virtually. Similar to other media such as television and film, the sense of a place may be possible with the representation of an analogy of the real. In the field of Virtual Reality immersion techniques have been developed to allow us to experience the virtual as real place in “mimetic spaces”. According to Benedikt, Cyberspace is an indefinite artificial world where humans navigate in information space (Benedikt, 1991). First examples of virtual architecture in Cyberspace fall into this category. Most of these examples of virtual architecture are mainly digital simulations of physical architecture. They illustrate the visualization of physical architecture and focus more on visual effect and digital navigation. Many are still lacking real interactive potential.

**Architecture and interaction in Cyberspace**
However, virtual architecture is more than an information-based view of architectural typologies or navigation in the empty virtual space of inanimate architectural images, or a web address to function, communicate and exchange information. Virtual architecture should provide *consistent*
cognition for the organization and navigating in Cyberspace by providing a sense of place, a sense of function, as well as a sense of awareness of others in the same place (Gu and Maher, 2002; Kalay and Marx, 2001).

Today, interaction with architectural metaphors allows users to be involved and experience the environment and the sense of place in an online fashion. User interaction becomes a significant attribute, which contributes to the experience of interaction with a virtual space in the architectural sense.

**Spatial form and virtual space in Cyberspace**

Cyberspace does not have an explicit spatial form. It is accepted that Cyberspace has a spatial and architectural form that is dynamic, dematerialized and devoid of the laws of physics. It is “space in which the mind can explore spaces that are in everyway socially constructed, produced and abstract” (Benedikt, 1991).

Holtzman (Holtzman, 1994) explains that “there is no there there”. It is a space without space, “a nonplace” (Gibson, 1987) and yet it possesses a potential for spatiality which can contribute to the possibility of virtual places. A virtual place need not and will not be subject to the principles of ordinary space and time. According to Benedickt, Cyberspace is a “common mental geography” in which mystical or imaginable spaces become visible. Abstract spaces of the imagination are free from geometry and conventional typology. They can be re-invented; the formal qualities of time and space are different. “Temporality is erased and transcended within Cyberspace”.

In Cyberspace there are no physical constraints that dictate the dynamics or the spatio-temporal qualities of portrayed virtual space. In general, all principles of real space may be violated in Cyberspace and the characteristics and constraints are only determined by the specification that defines the particular digital space (Memarzia, 1997). Novak addresses the transient, ephemeral, dynamic and changing qualities of *mediated spatial experience* when he refers to “liquid architecture”: “Liquid architecture is an architecture that breathes, pulses, leaps as one form and lands as another. Liquid architecture is an architecture whose form is contingent on the interest of the beholder” (Novak, 1991).

**The social setting in Cyberspace**

Researchers who have explored the relationship between people and places have indicated that it is the relationship of the two that creates the sense of a place. “People are their places and place is its people” (Relph, 1976). In this view, Cyberspace, rather than as a physical location, can be considered a place based on interest and involvement. Such places can be accessed from anywhere. They can be defined according to modes of interaction and thus they potentially enable new forms of social relationships based on shared interests.

This social view of Cyberspace refers to it as a place where rules of interaction are created (Dodge and Kitchin, 2001). According to this definition, as soon as people interact in Cyberspace it gains spatiality. A recognized virtual place such as the *Lambda Mall* (Williams, 1996) gains the recognition of acting as place where people can interact by using a spatial metaphor of a mall in order to structure an online activity. Thus the interactivity setting appears to be more, or at least as, important as visual analogy in creating the sense of a place in an electronic environment.

**The functional context in Cyberspace**

In Cyberspace we can perform many functions that were once assigned to specific architectural typologies. We can learn, read, communicate, exchange documents, make bank transactions, or buy clothes or furniture. Virtual places in Cyberspace are actually in the historical process of replacing
traditional building types: libraries, museums, bookstores, shopping malls, schools, etc. (Mitchell, 2000). Physical spaces in virtual architectural typologies are, in fact, analogues of physical elements. As a functional place, virtual architecture is understood as a networked place supporting an extended range of online interactions. Without the use of the architectural metaphor, virtual typologies remain a set of linked web pages. Architectural metaphors provide a potential basis for linking and interacting with other virtual environments, users and online activities. Today there are many metaphors of place that are used for information-based activities in Cyberspace: Chat Room, Meeting Place, Conference Room, Cyber-Cafe, Shopping Mall, Virtual Bank etc. However most of them are still lacking a perceptual sense of place, the sense of physical presence, and the kind of interactivity that traditionally constructs our sense of place.

Towards a sense of place in Cyberspace

Cyberspace and the Internet have changed and restructured relations between people and place. New media and spatial metaphors are being employed in changing our conceptual understanding of what Cyberspace actually is and may become. The conceptual space that is Cyberspace is extending both our functional and social life through interaction and communication. Currently there are two basic metaphors for place:

1. The “document” metaphor, or information-based models of place – this model is analogous to Web Pages and navigation and interaction are supporting documents;
2. The “physical place” where metaphors analogous to our real experience with the world are employed.

As was said above, in order to go beyond these two dominant models and provide a sense of place in the virtual world, it requires physical setting, a functional context, a social setting, and interactivity. With these general requirements in mind, the objective of our research has been to determine and define the generic requirements of place from a design point of view.

The experimental work also includes the attempt to create a new dimension of place that we believe is characteristic of an environment of information. This new concept of place seeks to combines aspects of various models. It includes navigation and browsing concepts from information-based models, social interactions from the social model, and orientation and belonging from the physical model. In combining the physical presence attributes with the conceptual and informational attributes it is truly unique.

Our main research objective has been to determine how interaction with virtual architecture contributes to experiences of place in Cyberspace. This has been undertaken through a survey of, and experimentation with, existing sites that exploit a virtual architecture metaphor. In order to enrich this experimental work we have also attempted to map the relevant activities that are dealing with the conceptualization of Cyberspace as well as to learn from existing precedents in the media. The theoretical aspect of the survey has provided the definition of a range of significant issues to be solved in this emerging field. The survey and experimentation with precedents has provided a specific set of concepts and solutions to these issues which are characteristic of the current state of the art. Given the relative newness of this as a field of design, and given the dramatic uniqueness of the design field, both of these methods, the theoretical as well as the experimental, have proved to supplement one another.

Mapping Cyberspace is, in itself, an extremely complex task. If the goal of this work is to explore the conceptual impact of Cyberspace on the architectural design of virtual places then, somehow, we require a medium for the conceptual mapping of Cyberspace itself. We present the basis for conceptual mapping that was commonly employed by the student-researchers to execute the survey,
analysis and categorization of relevant sites. It is the structure of the conceptual method that provided a common basis for the analysis, evaluation, and documentation of the relevant material gathered on the sites. The common method also provided a “social framework” for collaboration on group integration of the separate modules of knowledge that were collected by the individual researchers.

A structure for conceptual mapping in Cyberspace

Examples of the designs that were considered of significance as exemplifying the generic characteristics of virtual place were assembled to form a conceptual structure. This method includes the construction of a semantic net of design concepts as a basis for selecting, storing and retrieving precedent knowledge. It is based upon our prior work in which it has been exploited as a basis for knowledge formalization of design precedents. The method is relevant to the study of design precedents, in this case, of designs for web sites. In addition, the method has provided a framework in the form of a basis of convention for the social construction of knowledge in a collaborative process.

Employing a common method, and a formalism for the documentation of knowledge derived from case studies of web sites, the group of researchers developed a semantic net of concepts related to the constituents of place in virtual architecture. The method employs Case-based Reasoning as a model for capturing and formalizing knowledge of the design problem. Case-based design is a relevant method which has frequently been employed in capturing design knowledge. Recent works in case-based design have also demonstrated how case libraries of collected and analyzed precedents of prior designs can be employed as a resource for learning and study of design knowledge which can be useful and applicable in current design. (Oxman, 1994; Akin et al., 1997; Oxman and Heilighen, 2001)

One of the distinctive problems in representing designs, including web site designs, is the richness and complexity of their descriptive content. Each design contains many related chunks of information that are difficult to decompose. A theoretical model for the representation of design cases is the Issue-Concept-Form (ICF) formalism (Oxman, 1996). This representation refers to three coordinated abstracted levels of design knowledge which have been defined as the ICF model.

The design issue is domain-specific semantic information related to goals and issues of the problem class. Issues may be formulated by the programmatic statement, intrinsic problems of the domain, or by the designer himself. The design concept is a domain-specific formulation of a solution principle, rather than the explicit physical description. The design form is the specific design artifact that materializes the solution principle.

This tri-partite schema has implications for memory organization, indexing, and search in the knowledge base collecting the examples from the sites. It provides a method for documenting and storing the knowledge derived from the analysis of precedent sites, and of structuring that knowledge into a semantic net. In distinction to current navigational systems, memory is organized by the knowledge chunks, rather than by holistic cases. Conceptual links in the semantic network can connect different precedents. From any node, related ICF links can be retrieved which in turn, call up their precedents. So each site can be characterized by various concepts, or characteristics, of place. Figure 1 illustrates a conceptual mapping of virtual place precedents employing the ICF structure

WebPAD is a tool which will be employed in our research (Oxman and Shabo, 1999). It exploits the ICF formalism for extracting and representing knowledge from design precedents. It provides an environment in which new knowledge can be in-put by independent agents using the system. 

provides certain utilities that support the independent and collective construction and modification of the case-base. To our knowledge this is a unique property of the WebPAD system. This property addresses one of the inherent possibilities of knowledge construction in cyberspace. Figure 2 presents a screen illustration of the Web-Pad system.

Figure 1: A conceptual mapping for virtual place precedents employing the ICF structure

Figure 2: Analyzed virtual precedent in the Web-Pad system
**Conceptual mapping of places in Cyberspace**

In the following section we present the method and findings which are the result of working with the ICF formalism on selected site precedents which were found interesting and meaningful on the web today.

The selection of precedents was based on site types that have a natural reference to architectural place-based models rather than to document-based models. Those selected for study were further processed to emphasize sites with maximal emphasis upon applications of spatial representation and the presence of the constituents of place. The initial selection determined the following types to be most promising for additional detailed analysis: virtual museums and exhibitions, virtual learning environments, virtual shopping centers, virtual meeting-rooms, etc.

The following precedents are representative of the material studied in the survey and analysis:

**Virtual Museums:**

- Virtual Museum of Arts El Pais
  http://www3.diarioelpais.com/muva2/#

- Art Museum.net - Van Gogh’s Van Gogh
  www.artmuseum.net/vangogh/gateway.asp

- Math Museum – interacting with objects by video clips
  www.math.brown.edu

**Virtual Learning Environments**

- Alfy
  www.alfy.com

**The ICF in mapping Cyberspace**

In encoding design knowledge, selected web-sites provided a basis for the acquisition of conceptual knowledge. This was accomplished through content analysis of design issues, concepts, forms in each of the sites. The virtual design domain has raised several generic issues. Among them are the following: how the collapse of temporal boundaries can be experienced in a new way in virtual space, how the collapse of spatial boundaries makes physical boundaries more interesting, and how the collapse of social boundaries can contribute to new experiences in virtual places?

Design concepts are solutions that are employed as generic strategies to solve issues. In the example illustrated in figure 1, selected concepts are extracted from the sites in order to describe the unique virtual experiences in Cyberspace.

Metaphors function as a “form solution” in many of the virtual places. By using a conceptual metaphor a new meaning is perceived which changes the root concepts. For example a spatial metaphor can introduce visualizations, pictures and images of the real world to the user in order to create a sense of place. However, by interacting with these metaphors a new experience can be achieved. For example, in the museum of Van Gogh we are introduced to an exhibition hall and pictures on the walls. However, while we navigate we experience new kinds of relations between time and space. First, we navigate through a domestic space of the exhibition hall directly into a mental space of a picture that was painted by Van Gogh. Secondly, we visit both in the same time –
the space today and the space in the past. (See figure 3). A conceptual mapping of places on cyberspace was mapped employing the ICF structure. This is illustrated in Figure 3.

![Figure 3: A conceptual mapping of places in Cyberspace](image-url)
Conclusions

As Cyberspace becomes a new frontier for design, we are entering a new design discipline. In this paper we have introduced some of the complexity of this new field, and presented the need to understand and redefine its theoretical basis. In order to map the complexity and the role of place making in this new electronic dimension we have undertaken research to identify issues and concepts. In addition we have begun to map the relevant existing design precedents and their potential contribution to emerging identification of the objectives and possibilities of place making.

Beyond the conventional monotonic definition of visual verisimilitude as a design objective for simulating the visual content of place, we have begun to suggest a new range of performance requirements for place in Cyberspace. Furthermore, place in electronic environments must have attributes that are different to those of physical place. The clue appears to us to be in integration of modes of space time and information. This, rather than focusing on the visual recreation of spatial environments, can enable the existences of places that provide data access and knowledge within the visual scene. We have seen just this in the Van Gogh museum.

We can conclude that such multi-modal environments are the real design future of place in Cyberspace. Interactivity and social presence are significant performance requirements which must be realized. The future of place in Cyberspace is a new reality rather than a recreated reality. As such it is truly a new design frontier.
References


Relph, E (1976) Place and Placelessness, Pion, London
