DESIGNING PRESENCE IN VIRTUAL ENVIRONMENTS

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Abstract

Recent explorations of the concepts of form and content in virtual worlds open a new understanding of the development of novel design paradigms that can induce the sense of presence in virtual worlds. This paper presents current research in the design of presence in virtual worlds. It investigates the impact of two paradigms that integrate the components of form and content: the first is termed: "scenario-based design" and the second is termed: "performance-based design".

1. Introduction

Virtual environments are currently being designed and implemented to accommodate diverse functions such as shopping, banking, and travel planning. Currently, these information environments are generally not sufficient to simulate the experience of real life. There is a need to establish new conceptual approaches to the design of virtual environments in order to enhance the richness and complexity of our experience in virtual worlds. Among the challenging problems today is the achievement of a sense of presence in the virtual environment which might duplicate, replace, or improve the human sense of "being there".

This paper reports on research which attempts to define, model and evaluate new design paradigms for the creation of a better sense of presence in virtual environments.

Current research in the experience and evaluation of virtual environment is providing many significant new concepts of *presence* [4], [10] that can be applied in the design of virtual worlds [6]

Being there – the experience of presence in mediated environments is associated with multidimensional perception and various cognitive processes. These subjects and research related to them are of great significance to the field of virtual design, since they provide a theoretical basis for understanding and developing design paradigms for presence-rich virtual environments. New design paradigms should include and integrate traditional design experience and cognitive understanding of space, function and structure with new emerging concepts related to mediated environments.

2. Background

Current approaches in the design of virtual environments for everyday functions such as e-business and e-culture are frequently based on the common and prevalent *document metaphor*. Other concepts were imported from the field of Virtual Reality in order to deal with concepts of space. Simulation of spatial reality has a key role in order to duplicate the experience of real space. The design of architectural building types, as well as the design of urban spaces has usually been employed to support visual experience. In contrast to reality, the content of an architectural

space and the typological qualities of virtual spaces are defined as symbolic rather than functional. For example, in virtual worlds there is no need for structural elements, since structure has lost all but it's visual and symbolic meaning. Arcades and other urban typologies are used in the design of virtual architecture in order to replicate the experience of recognized spaces. Structure symbolizes the analogical realm of space and time in digital space and acts as an interface for movement. This is particularly relevant with respect to the definition of movement space that acts as a medium for transcending the scrolling facility of document-based environments. Such investigations of temporal space experienced through movement and scene transitions can be regarded as among the conceptual foundations of the user's experience of presence in virtual space.

However, even this kind of Virtual Reality approach, well known from gaming environments, often reduces the cognitive space in which people can be active and creative in a way similar to everyday life. In order to go beyond this concept, current research is moving from the concept of simulating presence in a virtual space to the concept of presence in the virtual place [1], [5-6]

3. The conceptualization of presence

According to Wijnand [10] there are various categories that affect the sense of presence. Among these characteristics, Slater [3], [7], [8] has made a distinction between external characteristics associated with the media and internal characteristics associated with the user. Media effects considered to be objective and well-defined while the user behavior is considered to be subjective.

Form and content are basic concepts in understanding presence [8]. Both are known to have a significant impact on the sense of presence. Various types of presence can be achieved in virtual environments according to the application of different types of the media-form and the media-content in the design of mediated environments. These will be explained below.

Media-form is defined by the physical properties of the display that enable the activation of the virtual environment. The physical environment is responsive to the creation of multisensory stimuli that activates perception, cognition and emotion. For example,

the following three categories that are associated with media form are: sensory information, the level of control over the sensory mechanism and the ability to modify the environment

Media-content refers to objects, actors and other aspects of the environment that are represented by the medium and which allow a flow of events known as the "narrative" or the "story". Factors of media content are responsible for keeping the user interested and involved.

Slater provides good examples of the achievement of interesting and engaging context in different settings by mixing principles of content and form. According to Slater "being there" or "being present" means activating the perceptual, cognitive and mental systems in a way similar to real situations where the human behaves as if he is there experiencing similar thoughts and actions.

The sense of presence can be achieved even when the level of immersion is not high. What is important is the creation of rich and complex environments that induce the human feeling of "being there". For example, in the design of a music hall, content can be conveyed by sensory and visual effects of place such as sound, and the spatial experience can be achieved by visual and immersive effects. Both of these, the form and content can create interesting and engaging environments for having a sense of presence. Furthermore, such a place can offer the social sense of place by providing opportunities to meet, recognize a face, to be surprised by meeting, or other forms of social content.

This approach to the dual concepts of form and content open new directions to experiment with and develop new design paradigms that can induce an enhanced sense of presence in virtual worlds. In the following section we illustrate the exploitation of the concepts of form and content as a basis for the development of design paradigms for virtual worlds.

4. Design paradigms that induce presence

Designing a place in virtual worlds should be rich enough to activate all the components of the human perception, cognition and emotion. Architectural design has a particular significance in this emerging design field, since it is a field that has been traditionally engaged with the creation of rich human experiences through the design of the physical environment. Furthermore, architectural design has historically developed a rich conceptual vocabulary for dealing with the description and evaluation of environmental form.

In our own research we found the dual concepts of content and form extremely useful. We are currently exploring two types of paradigms that integrate these two components. We are now experimenting with the two design paradigms in developmental and empirical situations: the first is termed task-based design, the second is a scenario-based design and the third is termed a performance-based design. Task based design is implemented as a virtual reality technology and is presented somewhere else [7] the other two that are presented in this paper are illustrations of the ideas.

4.1. Scenario-based design

Our approach to scenario-based design attempts to utilize the concepts of "content" and "form" in a situation of co-presence. "Co-presence" is created by the integration and the interaction of the two types of presence, physical presence (form) and the social presence (content). Scenario-based design creates choice and opportunities for social interaction simultaneously in various virtual places. Figure 1 illustrates an example of a meeting between a visitor and a painter in a virtual museum. The unique quality of this environment is that the painter can meet the visitor in the museum upon her/his request, or alternatively invite the visitor to his/her studio. This paradigm supports a real or imaginary scenario that can be associated with places such as museums, schools etc. The meeting creates the quality of co-presence. In addition, the sense of presence is enhanced by the unique experience provided by the virtual, an experience possible, but usually beyond, that of real environmental experience in such environments.

Figure 1: An illustration of a "Scenario-based design" (by R. Kolomiski)

4.2. Performance based design

In virtual environments there is no need to respond to climate, gravity or weight. Therefore the concept of simulation-based design is free to simulate any defined relationships. In our experiments, simulation-based design simulates behaviors according to physical and temporal variables and parameters and integrates them in the design. This can be also relevant to the issue of social presence. For example, figure 2 illustrates an "Internet Café" that can grow or become smaller in direct response to the number of its current participants at any time and the existing potential for social interaction that is represented symbolically. Thus in performance-based design of virtual place the environment is responsive. Such performance functions of virtual place are the activation and change of dimensions and shape according to the number of users who "occupy" the space.

Volume and shape can become visual cues to simulate habitability even in an imaginary environment. In our work we have demonstrated how such information and data constructs can be translated to, and implemented by, dynamic physical simulations. For example, in many chat-room applications we can read information such as the participants list, the number of active participants, the participants that have joined and left the

forum, etc. Usually this information is handled and presented by techniques of listing (information-based design). In contrast, we have demonstrated a flexible 3-d space that is responsive to the number and the presence of its virtual participants and will represent them symbolically and visually.
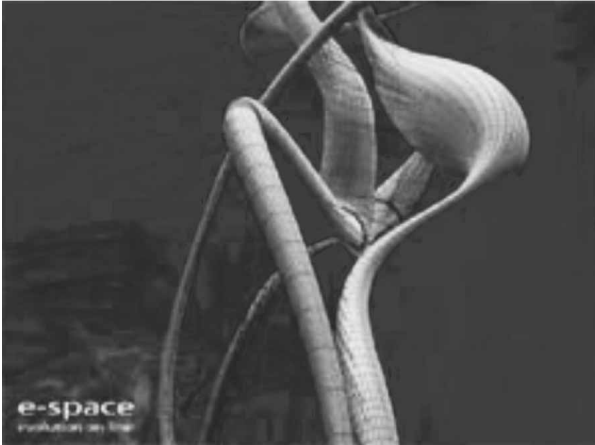

Figure 2. An illustration of a" Simulation based design" (by S. Zait, I. Idan and L. Rosenfeld)

5. Conclusions

In exploring the suitability of new design paradigms for the construction of virtual places we have found that the concepts of form and content stimulates insightful innovation with respect to the potential of the design of virtual environments. In design they offer a good point of departure for more experimentally-driven design approaches for virtual places as well as for imaginative exploitation of the virtual in order to create a sense of the hyper-real.

In order to advance such developmental hypotheses of new paradigms of design the evaluation and measurement of the sense of presence in designed mediated environments has become essential. Currently there is no well-defined and universally accepted methodology for the evaluation of design and for the characterization of good design. In order to address the complexity of the interpretation of "presence in place" as it relates to design of such places, evaluation issues that are associated with the

design and creation of virtual worlds have become an important research priority.

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