

Designing for Navigation in Virtual Reality

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Navigational interaction is central to information exploration in electronic worlds. Three new virtual worlds were developed to evaluate spatial and textual representations of information structure. These interfaces explore strategies for interaction design in large-scale virtual environments. Participants will interactively experience one or more of these interfaces, navigating in a textual world, an object world, and a hybrid world.

Keywords: virtual reality, wayfinding, multimodality, design

1 INTRODUCTION

Navigation in virtual worlds is a relatively new phenomenon. Related real-world research comes from anthropology, psychology, and urban design (Lynch, 1960; Passini, 1984); related electronic-world research comes mainly from hypermedia (McKnight *et al.*, 1991). Since information domains are abstract, a tension arises between semantic and physical structures, when the latter serve to represent the former. Thus designers of virtual worlds should understand the tradeoffs between types of structure, particularly for the important task of user navigation.

In assessing design tradeoffs between textual and spatial representations of information structure, a key issue is the perceptions of users and designers. It is important for research to establish some reference points in the design space, where people can agree on the relative importance of specific representations. Interactive experience in virtual environments is a prerequisite for resolving these issues. Such experience can be both instructive and enjoyable. (Related research includes Darken & Sibert, 1996; Dieberger, 1995; and Rennison, 1994.)

2 CURRENT RESEARCH

Research is being conducted in this area by the Department of Informatics at Umeå University (Waterworth, 1996). This work explores tradeoffs between textual and spatial representations of information structure in virtual worlds. Specifically, how do users perceive and learn such representations in VR? What are the implications for navigation and browsing, as well as design in general? An HCI experiment was recently conducted on these issues.

The experiment was designed for desktop VR. Three worlds were developed, reflecting key points on a design continuum between textual and spatial representations. All worlds present the same data, which has general interest, rich details, and computational tractability. 1500 items are included. The designs range from a virtual city landscape to a textual hierarchy browser. Each world engages the user in a unique way, as reflected in judgements of presence, ease of use, preference, and world size, but not by success rates in finding hidden items. Almost all subjects reported strong interest and engagement, during complex tasks in information exploration.

3 THE INTERACTIVE EXPERIENCE

Participants will experience these interfaces, navigating around one or more of the textual, object, and hybrid worlds. The object world is an urbanized landscape, with strong spatial and weak textual features (Fig. 1). Like a noon landscape, this world has strong color and lighting cues. The hybrid world is similar, but with weaker spatial and stronger textual elements (Fig. 2). Like a dusk landscape, this world offers weak color and lighting cues. The textual world has weak spatial and strong textual features (Fig. 3). Like a night city, this world has abstract space, with relative but not absolute position.

The virtual worlds were constructed in VRML 2.0, on the basis of a filtered subset of WWW structure. Worlds were algorithmically generated by C++ software, with input from ASCII data in a hierarchical format. The worlds are best viewed with the CosmoPlayer 2.1 plug-in to a Web browser on Windows NT or an SGI system. A good 3D graphics card facilitates efficient and enjoyable navigation.

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Figure 1: A view of Color World



Figure 2: A view of Gray World

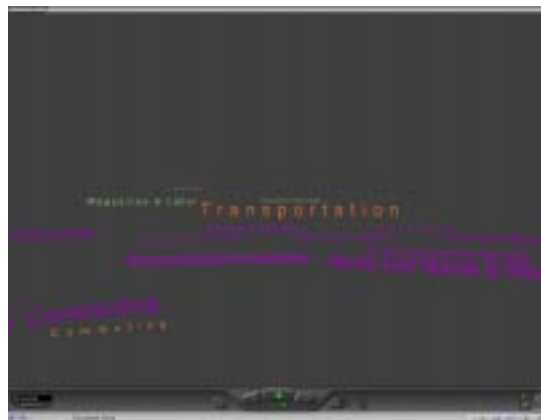


Figure 3: A view of Text World