Virtual Worlds as Metaphors for Web Sites Exploration: Are They Effective?

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Abstract

This work discusses the effectiveness of desktop virtual reality as a metaphor for navigating through information in structured Web sites. The work is based on a model for information classification and an architecture for generating VR interfaces from XML and DTD documents describing the Web site structure.

1. Introduction

In this work we address the use of virtual worlds for representing structured or semi-structured WWW sites, discussing the effectiveness of a desktop virtual reality implementation in terms of modeling requirements, user information understanding of the metaphor, interaction issues and technical soundness.

The definition and exploration of structured or semi-structured Web sites is deeply investigated in search of more efficient ways to extract information We have defined a model for mapping structured documents in structured Web sites to textual as well as to metaphoric Virtual Reality descriptions. A prototype system is able to present the user both visualization styles, and allows the Web designer to select customized world scenes in the framework of a consistent context. The prototype is based on XML and DTD describing the site structure and contents, and on extended XSL language for mapping the site to VRML worlds.

We experienced a classical scenario, often used as a manageable example of a structured WWW site: a University Department Web site, collecting and organizing information about teachers, courses, research areas and projects, dissertations, post-doctoral activity, and so on.

2. Information classification and representation

The information a user can access can be classified in at least four types, according to the purpose of the information for the user:

- *access points* are links to the information available in a specific context. They are presented as a menu, a table or a map;
- *indexes* are list of instances of repeated information elements. Each instance is a *selector* and is often a link to a separate information;
- *entities* collect and enclose the items bearing the real information, i.e., data. Entities are structured in components, units, etc.
- *items* are the elementary chunks of information, that are displayed according to several paradigms (windows, documents, graphs, etc.)

A *main entry point* is defined, often presenting the reader the primary document structure, organized in a hierarchical way, on which the referential links defining the hypertext navigation paradigm are anchored.

In a virtual world the user must recognize a similar classification, that we discuss with reference to a room-based metaphor.

Access points move the user to information elements or to different levels of the information structure. Obeying a *progressive disclosure* principle they can be represented by *gates*, e.g., doors, drawers, bookshelves, or by *tools*, e.g. a computer for accessing projects, or a microphone for accessing a lecture. Indexes can be represented by *catalogues*, which are objects containing other objects, (the *selectors*), such as files, rolodexes, books, or blackboards labeled with lines of texts. Entities are well represented by *environments*, which are self-contained areas of a virtual world. Terminal information items are represented by *displays* bearing readable data.

As a difference with a hypertext interface, a virtual world should be visually rich even if it does not bear much information. As an example, a home page for a teacher could be simply a menu of topics, with stylistic elements used for making it pleasant, not for augmenting its understanding. In the VR counterpart a scene for an entity of type "teacher" could be a room, but only a small part of the furniture is used to access information. The large part of it (chairs, windows, frames, lamps, tapestry, etc.) is included only to give the idea of being in a plausible office room.

Figures 1 and 2 show a text-based home page and the corresponding 3D scene automatically generated by our prototype system. The numbers identify related elements: we note that some information that in the text page is an index (5, 7), in the 3D scene is represented by access points to indexes that are rendered as separate scenes. This simplifies the understanding (and also the rendering) of the scene, but requires an additional navigation step to

reach the ultimate information.

3. Information access

Even if the virtual world metaphor is full of visual cues that help a reader to find and understand information, the only kinds of information that are accessed at last are text and images. The purpose of the virtual world is to provide a context for text and images. The content of a VR scene is therefore only partially defined in terms of the content of the document it represents. A VR scene is mainly a *template* in which information coming from the WWW document is rendered through graphic objects with suitable shapes and locations. Different documents elements, i.e., indexes, access points, entities and items, cause different ways of putting the meaningful information inside the VR scene.

Navigation ca be classified in three categories. A first kind of navigation is related to indexes: we associate it to the idea of a *map*, i.e., a virtual environment that collects the set of information in which the user navigates. A second kind of navigation is through hypertext links, that we could further divide into structural links and hierarchical links: as we said, we associate a link to a tools or to a gate, i.e., to an access point to an information item or a door to another scene. A third kind of navigation is associated to the idea of a *context*, and is used to traverse homogeneous information in a linked chain, which is not driven by the information meaning but only by easiness of interaction. This navigation is better supported by visual elements outside the scene, e.g., a navigation bar consistently used in all scenes.

4. Lessons to learn

How virtual reality could be an effective mean for improving information fruition? If we abstract from the technical limitations of current VR environments, we could trace a number of directions in which to elaborate at deeper extent.

- Virtual Reality boosts the role of iconic, thus conventional, representation of relationships among information elements. Exploration based on text-less information requires an (implicit) agreement between the designer and the reader. The uncertainty that some users feel when moving among software products with different look and feel is amplified when the interface pretends to represent a real world in an artificial way.
- Information classification must be inspired by conceptual models that are independent from the presentation. Till now the Web has not been a good example. The generalized adoption of languages like XML instead of HTML proprietary variants constitutes a good step in the direction of providing understandable information structures that can be automatically processed preserving the original semantics.
- Orientation in complex information spaces has been a major concern since the earlier hypertexts. The Web has initially put major emphasis on freedom rather than organization of navigation. Its fast growth shows that the cognitive overhead for understanding the vast information world that can be accessed is too heavy, and tools and methodologies must be developed for helping users to converge towards the needed information. 3D technology can push this process a step further since it can mimic very well a "geographic" approach to information navigation, where maps are real maps and global representations can be realistic.

5. Acknowledgments

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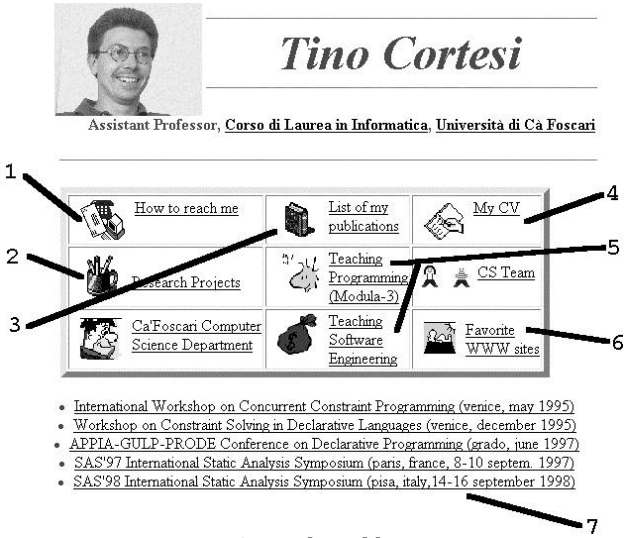

Figure 1. A text-based home page

Figure 2. A simple scene for the home page of Figure 1