

LIBRARY IN VIRTUAL REALITY

An Innovative Way for Accessing, Disseminating, and Sharing Information

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Abstract. This paper focuses on Virtual Reality (VR) as a very powerful technology that can be applied to the libraries, aiming at contributing to the activities of accessing, disseminating, and sharing information. The paper presents the VR concept and describes some libraries in virtual reality under utilization in different countries. In the final considerations, it is pointed out the use of virtual reality to develop libraries as collaborative virtual environments.

1 INTRODUCTION

By searching through the Internet, we have found a great amount of electronic and digital libraries; however, we identified that a very reduced number of these libraries available on the web are based on virtual reality technology. Furthermore, it was observed that the libraries based on information technology count with very few interesting visual characteristics, in terms of human-computer interfaces and pedagogical appeals for educational research. The existing characteristics are usually limited to hypertext and image resources, many times with an overload of multimedia presentations that make the navigation through the application slow. In addition, most of the libraries do not provide an adequate interactivity level that the virtual reality technology can offer to the fulfillment of typical user needs.

The existing libraries available in the web could be improved in several aspects, by the introduction of virtual reality, as well as the three-dimensional, walkthrough environment of a library in virtual reality could motivate the user to the investigation

and search for information. Virtual Reality (VR) technology can make possible the simulation of the real world (or part of it) and the user should be able to, through interactive activities, perform experiments, manipulate, observe and draw conclusions from their own simulation. Therefore, some activities that would be almost impossible to be accomplished daily, could be developed through a library supported by VR.

The objective of this article consists of the presentation of virtual reality as a very useful resource to be applied to the libraries available in the web, aiming at contributing to the tasks of accessing, disseminating, and sharing information.

First, the article gives an overview of the VR in terms of three essential characteristics, that is, immersion, interaction, and involvement. After that, it presents some libraries in virtual reality under utilization in different countries. Finally, the article gives the final considerations, pointing out the use of virtual reality technology to develop libraries as collaborative virtual environments.

2 VIRTUAL REALITY

The history of libraries shows that they have always depended on technology. Since the manuscripts for the use of printed texts, up to the information access through databases, the use of the CD-ROM, and the appearance of the digital library, in the end of the 1990's, and furthermore, to the incorporation of telecommunication networks, the technology was always present in libraries (Cunha, 2000).

Nowadays, according to Cunha (2000), we are approaching a new stage of evolution toward the Libraries in Virtual Reality (LVR), which can be considered as part of the libraries of the future.

Virtual Reality has been applied to a wide number of knowledge areas, as an innovative way to effectively interact with real environments. It entails the use of advanced technologies, including computers and several non conventional peripherals, to produce a simulated (i.e., virtual) environment that users perceive as comparable to real world objects and events. With the aid of specially designed devices and sensors, users interact with displayed images, moving and manipulating virtual objects, and performing other actions in a way that generates a feeling of actual presence in the simulated environment. The unique features and flexibility of VR give an extraordinary potential for use in work-related applications. It permits users to experience and interact with a life-like model or environment, in safety and at convenient times, while providing a degree of control over the simulation that is usually not possible in the real-life situation. The work-related applications that appear to be most promising are those that employ virtual reality for visualization and representation, distance communication and education, hands-on training, and orientation and navigation.

According to Kirner (2000) and Vince (2004), VR allows a strong communication between users and the computer application, concerning the aspects of immersion, interaction, and involvement. Those aspects can be described as following.

(a) Immersion. It is associated to the feeling of the user to be "inside" of the virtual environment and "deeply engaged in a virtual world as if it were the real one" (Vince, 2004). In this context, we can characterize the immersive and the non immersive virtual environments. In immersive environments, the images are shown to the user in such a way that makes the user to believe that he/she is submerged in this environment. This is achieved by means of visual, 3-D modeling, sound and activation of human senses, combined or provided by specific VR

devices (such as head-mounted displays, trackers, glasses, etc.) and projection rooms or CAVES. In the other hand, non immersive environments are characterized by the use of computer monitors, keyboard, and mouse. The degree of realism of the scenes and the quality of information available to the human senses is essential for the accomplishment of interaction, in VR applications. It is directly related to the quality of sound, image, perfection of the objects, and response-time provided by the computer system (Vince, 2004).

(b) Interaction. It refers to the capacity of the computational system to detect the user's inputs, and instantly modify the virtual world and the actions over this world. Kirner (2001) describes the term interaction, affirming that "[...] the interaction process in a virtual environment, immersive or not, is considered nowadays to be a continuous system where each action from the user should be answered with an action from the virtual environment system". The interaction modes involve the identification of gestures, three-dimensional interfaces and multiple users' participation. Virtual reality joined to the distributed collaborative visualization can improve significantly the interaction conditions among users, accelerating the adjustment and selection of visualizations and allowing the user's immersion in the considered environment.

(c) Involvement. It is related to the degree of the users' motivation to take part of certain activities. The involvement can be passive, such as to read a book and watch television, or active, such as to participate in a game together with other partners. VR is potentially useful for implementing these two types of involvement, besides to allow a more intuitive interaction (Vince, 2004). We can say that the virtual reality environment needs to captivate the user's attention in the development of a task, holding his/her interest. Virtual reality is characterized by the illusion of participation in a synthetic environment allowing different types of data analysis represented in the environment, allowing the user to manipulate and analyze his/her own object under study or somebody else's, through the collaborative participation in these environment. The use of collaborative environments in virtual reality systems will be included in the next section, focusing on library environments supported by virtual reality.

3 LIBRARIES IN VIRTUAL REALITY

Some experiences are already indicating the approximation of the libraries to virtual reality. Among those available at the Internet, we choose five representative LVR - the Médiathèque De L'Ircam – France (2001), the VILMA Library - Spain (Martin, 2000; Munhoz, 2000), the ULBRA Library – Brazil (Azevedo, 2001), the Digital Library of Theses and Dissertations - United States (Neves, 2000; Phanauriou, 2000), and the ARLib – Austria (ARLib, 2003 Umlauf, 2002), presented as following.

(a) The Médiathèque De L'Ircam. This library applies the non immersive VR technology so that the user can take a virtual tour in the library environment.

(b) The VILMA Library. This “Virtual Library with Multi-layer Architecture” is a digital library focused on computing documents. These documents are collected from the Internet through several mobile agents, and once on the library environment, they are classified and catalogued using information retrieval techniques. After their inclusion into the library, these documents are available for access in several ways, such as: documents browsing, catalog browsing, and customizing of the views to the user.

(c) The ULBRA Library. This is a prototype of graphical consultation to an existing library, using virtual reality. In this way, the users can access the virtual world representing the library, walk through its corridors and consult its works (book and documents in general) in a virtual environment. This virtual library allows, for instance, the user to visualize the cover and browse through the initial pages of a book. The shelves are identified by subjects, as it occurs in conventional libraries. When a book is selected, its 3-D representation opens up, so that the user can have access to its contents.

(d) The CAVE-ETD Library. This is an immersive environment that was developed to provide access to the Electronic Thesis and Dissertation (ETD) Library, which includes the full content of the MS and PhD thesis collection from colleges of the Virginia Polytechnic Institute at the University of Virginia. The users wear special glasses to visualize and explore the library. Besides, the interactions of the user with the virtual library are performed with the wand, a 3-D pointing device, which makes possible the free navigation around the different rooms and the browsing of the collection.

(e) The ARLib Library. ARLib Library is an immersive environment, representing the Institute for Computer Graphics Library at the Technical University of Vienna, which was developed using Augmented Reality (AR) technology. AR can be considered a special type of virtual reality, that makes possible the user to see the actual world around him and, in addition, to see some computer-generated markers or inscriptions included in the actual world. These markers or inscriptions enable the link to a search engine and a database containing all the information related to the object under consideration. The ARLib application aims to aid the user in typical tasks that are done in a library, such as searching for a book and returning a book. To search for a book, the user utilizes the book search engine to find the publication he intends to find on the shelves. This is performed by entering one or more search criteria using the text input widgets and then selecting an item of the resulting set. The publications can be accessed through their title, author, keywords, year, etc. User input in general is performed by means of a wrist-worn augmented tracked touch-pad. To return a book, the ARLib attempts to detect markers that are attached to books. If a marked book is spotted, all available information about the publication is presented on the wrist panel, and the book's designated position on the shelf is highlighted to aid the user in returning the book to its correct position.

Figure 1 shows a user in the ARLib.



Figure 1: Using the ARLib (ARLib, 2001).

4 CONCLUDING REMARKS

For the development of those library environments in VR, there are several computing resources that are already used nowadays by the Computer Science professionals. First of all, it is necessary to plan, implement, maintain and evaluate the developed software according to criteria elaborated by the area of software engineering (Kirner, 2000). Besides, the resource of collaborative environment that the VR technology can enable is related to the concepts and applications of the areas of distributed systems and database. Those two areas, although they are not focused by our present work, are necessary for the creation of a CVE (Collaborative Virtual Environment).

The development of VR applications, such as the LVR, requires the use of modeling software tools and languages, which can be freeware, such as VRML, or commercialized, like 3D Studio, Poser, and World-UP, among others. There is a vast amount of software for modeling of scenarios and objects, with characteristics referring to the treatment of actions, animations, effects, simulation and manipulation of objects. For the development of a LVR, it is necessary to use the appropriate programming language, as, for instance, JAVA, which can be useful in the creation of structures that implement the interface between the VRML and the resources of the environment, as chat, or even in the development of those resources.

Besides using the VR technology, there are other aspects of great importance that characterize a LVR, as, for instance, the user's interactivity with the environment and with the users amongst themselves through the communication nets. In order to assure such interaction, it is important to exist the possibility of collaboration, since a collaborative environment can be a fundamental piece of a LVR.

We believe that libraries based on the use of technology have specific functions for certain groups of users. As well as a virtual library has a non physical structure, a LVR should provide a virtual space for the exchange and spread of information. The VR technology possesses many possibilities for the creation of a virtual environment, which can work as a point of virtual meeting for the exchange of information. While in the virtual libraries a space does not exist, in the LVR the space is represented by the virtual world, and the participants should be present in a collaborative environment, where they can be represented by avatars. The exchange of information depends on the virtual presence of the users of

information inside of the environment, since the exchanges are activated by their participation and interaction. In the virtual libraries there is no specific place for the collaboration in real-time among their users, while in a LVR the space is appropriate and necessary for the participants to interact amongst themselves and with the objects of the scenery, simulations, and other contents that a LVR can contain (Matos, 2003).

Therefore, we can conclude that such library type goes beyond employing the virtual reality technology. The resources offered by this technology can be explored integrally, because it allows the immersion, enabling more specific studies on new ways for assessing, disseminating, and sharing information.

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