Chapter 2.5
Customizing Multimedia and Collaborative Virtual Environments

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INTRODUCTION

Virtual reality (VR) represents a modern human-computer interface consisting of a three-dimensional (3D) environment generated by computer where the user can interact in different ways. VR can be applied in several applications domains such as medicine, education, entertainment, etc. In particular, interest is drawn to the application of VR in education since a student is able to interact and to be involved with a 3D environment, which simulates situations that are difficult or even impossible to be carried out in the traditional education process.

The application of multimedia within virtual environments (VEs) represents a promising and interesting trend in the development of educational environments since interaction can be enhanced, thus, captivating interest and increasing the motivation of the student by the addition of audio and video. Besides multimedia, we should also consider the benefits of the computer supported cooperative work (CSCW) inside VEs: Cooperation motivates and increases productivity. When applied to educational environments, it can stimulate the student since he is able to communicate with geographically disperse participants of a collaborative session.

This chapter introduces some important issues when considering the integration of three different research domains: virtual reality, multimedia, and CSCW, and presents a generic architecture for the development of multimedia and collaborative virtual environments (MCVEs) for educational purposes, called CreaTiVE (creative toolkit in multimedia and collaborative virtual environments). CreaTiVE aims at exploring the potential of VR, multimedia, and CSCW in the development of educational software.

BACKGROUND FOR MULTIMEDIA AND COLLABORATIVE VIRTUAL ENVIRONMENTS

Different issues must be considered for the development of MCVEs for education, especially when considering a multidisciplinary approach that shall take into account the particularities of three different domains in computer sciences: virtual reality, CSCW, and multimedia.

Virtual Reality

The application of VR to the design and implementation of educational VEs aims at allowing the students to interact and to be involved with this environment and its objects. This experience can be advantageous to the student in a learning process according to his degree of involvement (or immersion) with the VE which depends upon his sense of presence (awareness). The sense of presence is the feeling experienced by the user as the result of how his cognitive model is built in response to the user's immersion within the VE. The sense of presence is object of discussion and definition by different researches. According to Coelho, Silvério, Da Silva, and Santos (2005), presence does not depend only on technology but also on the participant. Some user's psychological aspects influence this feeling: (1) The man-machine *commitment* in which the man let himself be misled by the machine in order to finish a task; (2) The users' focus (*attention*) on the VE stimulus; (3) The participant's *ability and will to focus* on the task; (4) The participant's *selective attention,* which describes the tendency of selecting significant information with a particular interest to the individual; and (5) The *focus on the virtual world,* etc.

VR systems are inherently immersive, where according to his or her sense of presence, a user has the feeling to be inside the VE (generated based on head mounted displays (HMD), immersive rooms, etc.). However, the main drawback for the development of immersive VR application is related to the cost of VR devices. This limitation can be overcome by the development of non-immersive systems and by the industry advances. Non-immersive systems are described by the three-dimensional visualization of a VE using a conventional monitor (desktop VR). Although, immersive VR application has evolved and either considered typical, the desktop VR still presents some positive points as: to use all the advantages of the evolution of computers technologies industry, to prevent the technical limitations and problems of the HMDs and the intuitive use. Furthermore, multimedia presentations can also be applied in VR applications in order to increase the sense of presence, to capture the user's attention and to promote involvement within non-immersive VEs.

With the increasing development of the Internet, the VR concepts can also be applied to the implementation of distance learning courses. However, there are still some constraints related to development of distributed VR applications such as the optimization of response time, consistency and scalability upon limited and dynamic resources, leading to perceptive delays, which represent challenging, research drawbacks. One of the main purposes for using VR interfaces in distance learning is the high degree of interaction provided by these applications. In other words, it allows students and teachers, geographically