e-Learning through distributed virtual environments

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e-learning is one of the emerging needs of the information age. Access to education is going to become crucial for the success of our information society, and therefore a lot of potential is seen in distance learning and distributed virtual environments. The communicative character of the distributed virtual environments would allow students and staff to meet in social shared spaces and engage in on-line real-time seminars and tutorials. Such technologies may mitigate some of the problems of isolation that distance learning brings. This paper presents our work in multi-user distributed virtual environments which are designed and implemented for educational uses in the bounds of the VES project. Furthermore, it presents our proposal for the extensions and reconstruction of the current system in order to create a more efficient system, which can be characterized as a learning virtual environment.   © 2001 Academic Press

1. Introduction

On the one hand, e-learning technologies aim to accomplish the needs of an educational community, where participants (teacher, students and administrators) can exploit learning and communication capabilities. On the other hand, Virtual Environments (VEs) provide a way to combine the best features of real-world information navigation—memory of places and visual cues—with the best features of online navigation—fast searches and sorting and quick cross-referencing. Networked VEs can contribute to e-learning, offering additional functionality and capabilities to the users. There are many types of networked VEs that can be used in e-learning which are presented in the following paragraphs (Fig. 1).

1.1 Types of networked VEs

1.1.1 *Multi-user distributed virtual environments (mDVEs)*. mDVEs allow a group of geographically separated users to interact in real time [1,2]. While a simple virtual environment is a computer-generated simulation with which the user can interact in such a way that he receives real time feedback [3], aiming to provide its users with a sense of realism, an mDVE is something more. In an mDVE, multiple users can interact with each other in real time, and furthermore the VE is distributed, running on several computers which
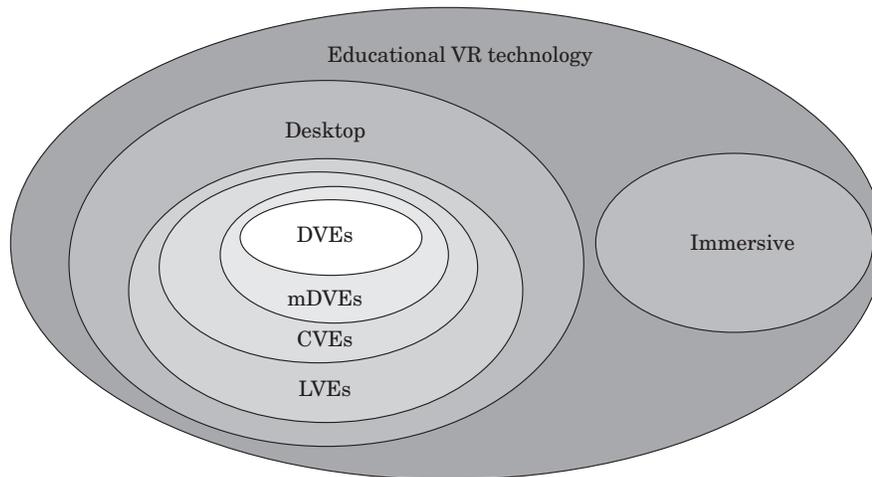
Figure 1. Educational VR technology.

are connected by a network using a series of client server applications [2,4]. mDVEs have many characteristics that can be exploited in the educational process and especially in distance learning. Specifically, mDVEs offer a way of communication and they give a shared sense of space, presence and time [5]. In addition, an mDVE application can meet the requirements for a complete Computer Mediated Communication (CMC) system [6], such as an easy to use interface, cross platform, conversation logs, indication of the presence of the attendees and multi-modal interaction.

1.1.2 *Collaborative VE-systems (CVEs)*. An extension of an mDVE would be a CVE, which is an mDVE aimed at a collaborative task. CVEs aim to provide an integrated, explicit and persistent context for co-operation that combines both the participants and their information into a common display space. These objectives create the potential to support a broad range of co-operative applications such as training [7].

1.1.3 *Learning virtual environments (LVEs)*. A simple definition of a Learning Virtual Environment (LVE) is a CVE aimed not only at a collaborative task but also at additional educational tasks such as synchronous and asynchronous learning. An LVE is a set of virtual worlds or a virtual world, which offers educational functionality to its users [8]. The avatars (the graphical representation) of these users populate the LVE and they are provided with additional behaviour such as gestures, interaction, movements and sound.

1.1.4 *Immersive virtual environments*. Immersive educational environments are supported by high-end equipment such as datagloves, Head Mounted Displays (HMD), ImmersaDesk and CAVE to visually immerse a user in the virtual world.