Chapter 97
Implementing Advanced Characteristics of X3D Collaborative Virtual Environments for Supporting e-Learning: The Case of EVE Platform

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ABSTRACT

Three dimensional Collaborative Virtual Environments are a powerful form of collaborative telecommunication applications, enabling the users to share a common three-dimensional space and interact with each other as well as with the environment surrounding them, in order to collaboratively solve problems or aid learning processes. Such an environment is "EVE Training Area tool" which is supported by "EVE platform". This tool is a three-dimensional space where participants, represented by three-dimensional humanoid avatars, can use a variety of e-collaboration tools. This paper presents advanced functionality that has been integrated on "EVE Training Area tool" in order to support: (a) multiple collaborative learning techniques (b) Spatial audio conferencing, which is targeted to support principle 3 (augmenting user's representation and awareness). Furthermore the paper presents technological and implementation issues concerning the evolution of "EVE platform" in order to support this functionality.

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INTRODUCTION

The maturation of the Internet and the need for electronic communication formed the basis for the research and development of collaborative applications. Collaborative Virtual Environments (CVE) is a promising form of this type of applications. CVEs might vary in their representational richness from three dimensional 3D graphical spaces, 2.5D and 2D environments to text-based environments (Snowdon et al., 2001). CVEs can enable the users to share a common 3D space and interact with each other as well as with the environment surrounding them, in order to collaboratively solve problems or aid learning processes.

Collaborative Virtual Environments are technologically based on Networked Virtual Environment (NVE) platforms. NVEs allow the communication and interaction of geographically separated users, inside 3D virtual worlds. This paper presents advanced NVE's functionality that has been integrated on EVE platform (Bouras et al., 2001; Bouras & Tsiatsos, 2004; Bouras et al., 2005; Bouras et al., 2006) in order to support. More specifically, the main goal of this paper is to present the evolution of EVE platform in order to support e-learning and e-collaboration scenarios in a more effective manner.

Since the early uses of collaborative virtual environments in learning, researchers have tried to establish a schema that incorporates some well known aspects, issues, elements and principles which should be taken into account during the design process of educational virtual worlds. The rationale behind the designers' decisions can have a significant effect on the appropriateness of the platform for education. Regarding the design adequacy of EVE for online learning purposes, we validated (as presented in the next section) the platform's features, philosophy and policies against the design principles presented in Bouras et al. (2008). These principles are the following:

Principle 1: Design to support multiple collaborative learning scenarios: A useful tool for collaboration would support the execution of many e-learning scenarios. E-learning scenarios can combine one or more instructional methods like role-playing, case studies, team projects, brainstorming, jigsaw and many more, as long as the environment supports their functional requirements;

Principle 2: Design to maximize the flexibility within a virtual space: Space parameters like size, architecture, facilities and the physical environment affect the way learners socialize (Koubek & Müller, 2002). In order foster educational value, virtual environments must fulfil the teacher's expectations for spatial and temporal flexibility. Therefore, due to the need for multiple functions within a collaborative online synchronous session, it should be possible to quickly reorganize the virtual place for a particular activity or scenario;

Principle 3: Augmenting user's representation and awareness: Combining gestures, mimics, user representation, voice and text chat communication, users can share their views and show others what they are talking about;

Principle 4: Design to reduce the amount of extraneous load of the users: The main objective of an e-learning environment is to support the learning process. Therefore, the users should be able to understand the operation of the learning environment and easily participate in the learning process;

Principle 5: Design a media-learning centric virtual space: The virtual space should be enhanced by multiple communication and media layers. Each media type (e.g. text, graphics, sound etc.) has its advantages. The virtual space should integrate many communication channels (e.g. gestures, voice and text chat etc.) in order to enhance awareness and communication among the users;