INFORMATION SCIENCE PUBLISHING
701 E. Chocolate Avenue, Hershey PA 17033, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com
ITB8864

Chapter III

Collaborative Learning On-Demand on the Internet Mbone

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ABSTRACT

The ubiquity of the Internet potentially allows delivering a variety of electronic learning contents to a wide audience. This work proposes a new online learning paradigm, namely, collaborative learning on-demand (CLoD), and its supporting technology. The CLoD paradigm enables a group of workmates to on-demand request and watch the playback of an archived multimedia session for the purpose of collaborating and cooperatively constructing knowledge. CLoD is featured by cooperative playback systems, which are networked infrastructures providing collaborative media on-demand services. The chapter also details our MBone-based cooperative playback system, ViCRO^C, and presents an investigation of its usability.

INTRODUCTION

Nowadays, the technical and cost barriers to high-bandwidth and ubiquitous networking are rapidly falling. The Internet has extended its realm over new strategic network technologies such as DSL, satellite and cellular systems so as to allow people to easily exchange multimedia information and interactively collaborate without being held hostage to physical proximity.

Within this context, electronic learning (e-learning) based on the Internet and WWW has the potential to effectively and inexpensively satisfy the education needs of a large user target. To this purpose, the current trend is the proliferation of portals for Web-based education which offer new online learning programs enabling synchronous and asynchronous education patterns.

Synchronous and collaborative e-learning can be favored by a worldwide exploitation of IP multicast, e.g., MBone (Kumar, 1996). The MBone, which stands for the virtual multicast backbone on the Internet, is a technology which enables scalable many-to-many multimedia communications so as to better support large-scale virtual classrooms than the traditional point-to-point (or IP-unicast) communications. New application models and protocols centered on the MBone have been recently developed and are being standardized to support the implementation of multimedia services and tools such as videoconferencing, whiteboard, multicast chat, etc. (Crowcroft, Handley, & Wakeman, 1999). Such protocols and services are considered the basic middleware for enabling distance learning paradigms that not only mime the traditional distance learning paradigm, i.e., live transmission of standard lecture courses, but also aim at creating highly decentralized, video-mediated and collaborative virtual learning environments. In fact, the educational research area (Cohen, 1994) proved that instructional methods promoting interpersonal discourse and social construction of knowledge (i.e., collaborative learning techniques) are more effective than methods simply relying on the broadcast of information (classroom transmission metaphor). However, collaborative learning is highly dependent on communication, or discourse. Thus, mechanisms such as shared annotations and questioning which compensate computer-based, video-mediating communication breakdowns are to be introduced for supporting the richer social discourse required for collaborative learning.

The main goal of this chapter is to introduce the cooperative playback system (CPS) and describe its application models, protocols and tools. CPSs enable the collaborative learning on-demand methodology over the Internet MBone. Collaborative learning on-demand (CLoD) is an original learning method in which a small group of students cooperatively selects, plays and controls the playback of a remote, archived multimedia session of a lecture or a seminar and exchanges inter-group questions in order to discuss the session contents (Fortino & Nigro, 2000b; Fortino, Nigro, & Pupo, 2001). The learning method is completely self-tutored and self-paced, i.e., it does not have a tutor who is in charge to drive the learning process.