Chapter 8.15
Future Directions of Multimedia in E-Learning

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ABSTRACT

In the last chapter, we discuss how advanced multimedia technologies are used in distance learning systems, including multimedia authoring and presentation, Web-based learning, virtual environments, interactive video, and systems on mobile devices. On the other hand, we believe pedagogic theory should be incorporated into the design of distance learning systems to add learning efficiency. Thus, we point out some suggestions to the designers of future distance learning systems.

INTRODUCTION

Distance learning, based on styles of communication, can be categorized into synchronized and asynchronized modes. The advantages of distance learning include flexibility of time and space, timely delivery of precisely presented materials, large amount of participants and business opportunity, and automatic/individualized lecturing to some degrees. Both synchronized and asynchronized distance learning systems rely on multimedia and communication technologies. Due to its commercial value, distance learning is becoming a killer application of multimedia and communication research. We discuss current distance learning systems based on the types of multimedia technologies used and point out a few new research directions in the last section.

MULTIMEDIA PRESENTATIONS AND INTERACTIONS

Authoring and playback of multimedia presentations are among the earliest applications of multimedia technologies. Before real-time communication and video-on-demand technologies, multimedia presentations were delivered to kids and distance learning students on CD ROMs. The advantage of multimedia presentation over traditional video tapes is due to interactivity. Multimedia presentations allow one to select "hot spots" in individualized topology. Techniques to realize this type of CD ROM presentations allow a rich set of media coding and playback mechanisms, such as images, sounds, and animations (including video and motion graphics). Successful examples include MS PowerPoint, Authorware Professional, Flash, and others.

With the development of communication technologies, multimedia computing focuses on efficient coding mechanism to reduce the amount of bits in transmission. Synchronization among media became important. Inner stream synchronization is implemented in a single multimedia record, such as the interleaving coding mechanism used in a video file, which includes sound track and motion picture track. Another example of inner stream synchronization and coding is to merge graphics animation with video stream (Hsu, Liao, Liu, & Shih, 2004). On the other hand, inter stream synchronization is more complicated since both the client (i.e., user) side and the server (i.e., management system) side need to work together. Inter stream synchronization allows packages (e.g., sound and image) to be delivered on different paths on a network topology. On the client side, packages are re-assembled and ensured to be synchronized. Another example of a recent practical usage of inter stream synchronization is in several commercial systems allowing video recording to be synchronized with MS PowerPoint presentation or Flash. Some systems (Shih, Wang, Liao, & Chuang, 2004) use an underlying technology known as the advanced streaming format (ASF) of Microsoft. ASF allows users or programs to embed event markers. In a playback system on the client side, users can interrupt a vide presentation, or jump to another presentation section. The video presentation can also use markers to trigger another presentation object such as to bring up a PowerPoint slide (converted to an image) or another multimedia reference. In order to deliver a synchronized presentation, an ASF server needs to be installed on the server machine.

ASF provides a preliminary technology for video-on-demand (or lecture-on-demand). In order to support multiple clients, it is necessary to consider bandwidth allocation and storage placement of video records. Video-on-demand systems (Hua, Tantaoui, & Tavanapong, 2004; Mundur, Simon, & Sood, 2004 allow a video stream to be duplicated and broadcast in different topology on multiple channels, to support multiple real-time requests in different time slots. In addition, adaptive coding and transmission mechanism can be applied to video-on-demand systems to enhance overall system performance.

Video-on-demand allows user interactions to select video programs, perform VCR-like functions, and choose language options. Interactive TV (Liao, Chang, Hsu, & Shih, 2005) further extends interactivities to another dimension. For instance, the users can select the outcome of a drama, refer to specification of a commercial product, or answer questions pre-defined by an instructor. The authoring and playback system developed in Liao, Chang, Hsu, and Shih (2005) takes a further step to integrate video browser (for interactive TV) and Web browser. Thus, distance learning can be implemented on set-top box.

WEB-BASED DISTANCE LEARNING AND SCORM

Most multimedia presentations can be delivered online over Internet. And, Web browser is a com-

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