Chapter I
Automatic Digital Content Generation System for Real–Time Distance Lectures

Hiroshi Takeda
Hosei University, Japan

Hisashi Yaginuma
Hosei University, Japan

Hajime Kiyohara
Hosei University, Japan

Akira Tokuyasu
Hosei University, Japan

Masami Iwatsuki
Hosei University, Japan

Norio Takeuchi
Hosei University, Japan

Hisato Kobayashi
Hosei University, Japan

Kazuo Yana
Hosei University, Japan

ABSTRACT

This article describes a new automatic digital content generation system we have developed. Recently some universities, including Hosei University, have been offering students opportunities to take distance interactive classes over the Internet from overseas. When such distance lectures are delivered in English to Japanese students, there is a pressing need to provide materials for review after class, such as video content on a CD-ROM or on a Web site. To meet this need, we have developed a new automatic content generation system, which enables the complete archiving of lectures including video/audio content, synchronized presentation materials, and handwritten traces on virtual whiteboards. The content is generated in real time and is immediately available at the end of the class. In addition, this system incorporates a unique video search algorithm which adopts a phonetic-based search technology. This enables quick review of the video content by typed-in keywords. The system can automatically create a vast amount of digital content and provide students with an efficient learning tool.
INTRODUCTION

Hosei University has been providing numerous classes and lectures in the form of distance lectures through Hosei University Research Institute, California (HURIC). Since such distance lectures from abroad are delivered in English, we have strongly required an e-learning system for postproducing a lecture, including video/audio and other presentation materials, quickly into digital content, and making it available for review after class to Japanese students lacking sufficient language ability. It would be possible, were it merely a question of delivering distance lectures in real time, to suitably combine commercially available systems to display handwritten data in addition to video/audio and slide materials. However, in order to turn information presented in the lecture, including hand-written data, into video-synchronized digital content automatically, a data storage server is required in addition to a PC for the lecturer (Kaneko, Sugino, Suzuki, & Ishijima, 2000; Li, 2000; Panasonic, 2005). There was hitherto no system that was very portable and could be used with only a PC and a video camera. Further, since videotapes of the many lectures held every week create an enormous amount of stored content, students would be forced to waste time and energy if they had to play back a video in order to search for sections of a lecture they wanted to review. In order to conduct such a video search with precision, a search function using the lecture audio as keywords is required in addition to the conventional video search function using slide title indexes. To achieve such an audio-based keyword search function, the audio portion needs to be converted to text after a lecture and time information for each word or phrase added/edited manually. This would take too much time and be so costly that it would be difficult to achieve.

This article proposes an new automatic digital content generation system for lectures, developed and improved based on practical experience accumulated through distance classes at Hosei University (Hayashi, 2003), which allows handwritten data to be incorporated and audio-based keyword searching to be performed. Since the system can digitally reproduce and distribute videotaped information of a lecture, including handwritten data, immediately after class without any editing, students can play back sections that they did not fully understand as much as they like and continue their studies in detail after the lecture for a thorough understanding. Also, although still at a prototype stage, a function allowing applicable sections to be searched using audio data as keywords is automatically added so that any section requiring review may be located and played back immediately.

REAL-TIME DISTANCE LECTURE SYSTEM

Since April 2002, Hosei University has been offering a pre-MBA course toward an MBA to be acquired by further studying abroad for a minimum of one year. Figure 1 shows photos of the pre-MBA class. In this course, a service is provided in which students can attend some MBA-accredited courses in advance at Kudan Hall in Ichigaya Campus through distance classes from the Hosei University Research Institute California. Furthermore, an international distance class on welfare engineering given by lecturers in the US, Korea, and Hosei University in Japan is being offered as an interdisciplinary as well as a crossover subject to Ichigaya, Tama, and Koganei Campuses from April 2003. Figure 2 shows a set of scenes of the classroom.

These e-learning classes employ the system illustrated in Figure 3 for the linkage between the HURIC and Ichigaya Campus, and they use the multicampus LAN and teleconferencing system shown in Figure 4 for linkages among the campuses. In the classroom, the teleconferencing system presents the lecturer’s motion and voice to students, as shown in Figure 5, and the
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