An MPEG2 over IP Transfer System integrating Live Distance Lecture and On-Demand Distance Learning

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Abstract

In the institutions of higher education, hundreds of intellectual activities, i.e. lectures, are performed everyday. It is very important for such institutions to have a system which can archive these activities as their property efficiently and systematically. However, it will not always be the good materials for on-demand distance learning if we record the usual lectures. On the other hand, the live distance lecture has been performed recently. Although some revisions are required, the archives of live distance lecture is well suited for the materials of on-demand distance learning by nature. In this paper, we describe the MPEG2 over IP transfer system which is the key technology to integrate the live distance lecture and on-demand distance learning. And then we describe the live distance lecture archive system operated in Hiroshima University.

1. Introduction

For the institutions of higher educations like universities, the knowledge created and transferred in its intellectual activities, i.e. discussions, lectures and seminars, is the valuable property. Then, it is indispensable for such institutions to have the system which can archive their property efficiently and systematically. However, it will not always be the good materials for on-demand distance learning if we record the usual lectures. Because, the materials for on-demand distance learning should have some attractions as a program and needs a special care for the audience.

On the other hand, the live distance lecture has been performed recently for the distant students. During the lecture, the lecturers always pay attention to the distant students. For example, they are always aware of being taken by a camera and write the characters larger than usual lecture. Therefore, although some editing may be required later, the record of live distance lecture is well suited for the materials of on-demand distance learning by nature.

2. Live distance lecture system

Hiroshima University has two satellite (Kasumi and Higashi-Senda) campuses in addition to the main (Higashi-Hiroshima) campus. Two satellite campuses are about 35km and 40Km apart from main campus, respectively. As the lecturers and the students must come and go among the campuses, they have been requested to make use of the live distance lecture system among campuses.

From 2001, the live distance lecture system which can connect between 4 classrooms in main campus and 3 classrooms in satellite campus has come into operation (the left part in Figure 1). For high quality video and clear voice, the system uses MPEG2 hardware codec and ATM (Asynchronous Transfer Mode) network for audio/video data transmission.

3. MPEG2 over IP transfer system

We have developed the MPEG2 over IP transfer system called “mpeg2ts” which transmits MPEG2 audio/video stream over the Internet. The mpeg2ts is a network application running on Linux and supports IP multicasting, IPsec (IP security) and FEC (Forward Error Correction). There are two modes, codec and converter, in the mpeg2ts. In the
codec mode, the mpeg2ts acts as a hardware codec by using PCI MPEG2 encoder/decoder card. In the converter mode, the mpeg2ts acts as a media converter, e.g. from ATM network to IP network.

We have used the mpeg2ts many times not only for the live distance lecture but for the events such as the experiment of broadcasting the solar eclipse observed at the region of South Africa on June 21st, 2001 [1, 3, 4]. As the mpeg2ts was developed under the GNU GPL (General Public License), the source code and related documents are freely available from the mpeg2ts’s home page [2].

4. Integrated live distance lecture archive system

We have developed the live distance lecture archive system which integrates the live distance lecture and the on-demand distance learning. Figure 1 shows the configuration of the system. The mpeg2ts acts as the ATM-IP converter in this system. The ATM paths between the classrooms are branched at the intermediated ATM switch by using the point-to-multipoint connection. The mpeg2ts receives MPEG2 stream from the branched ATM path and forwards it to the archive server. This system was completed in March 2002 and currently in the 6 months test phase.

As this system transmits and archives the live distance lecture simultaneously and automatically, it saves the lecturers a lot of time and labor. Then the lecturers can concentrate on the lecture and finally they get the materials for online distance learning system. The authoring and streaming tools are also included in the system, then the lecturers can edit their materials to create new materials and broadcast the materials to the distant students through the network.

5. Conclusion

In this paper, we described the MPEG2 over IP transfer system called mpeg2ts and the development of the live distance lecture archive system. This system is applicable not only for distance learning but for any activities such as the telemedicine, the preservation of the historic work of art, and so on. Therefore, this system makes it possible to archive the intellectual property of the institutions of higher educations systematically and spread its activities widely to the networked society.

References