
Kenzi Watanabe, Norihiko SUMI, Toyonori AIMORI, Makoto OTANI, Hisaharu TANAKA, Yasuhisa OKAZAKI, Toshihiro HAYASHI and Hiroki KONDO
Saga University
1, Honjo, Saga, 840-8502 Japan
watanabe@is.saga-u.ac.jp

Abstract

We have developed a remote blackboard presenter system. The system works with the DVTS. We have developed a remote blackboard presenter system. The system enables capturing, automatic transmitting and automatic presentation of high-quality images of a blackboard for the blackboard based lessons. In this paper, we described details of the system.

1. Introduction

The instruction based learning is typical style of lessons in school. In the instruction based learning, teachers use a blackboard as a teaching material. We call this style of lessons as “Blackboard Based Lessons”.

We are researching next generation distance learning with rich-media [1]. The rich-media means High-Speed Network, High-Quality Video/Audio, High-Performance Computers and so on. The Digital Video Transfer System over the Internet, named “DVTS” [2], is a typical system on rich-media environment. The DVTS can transfer High-Quality video/audio stream captured by digital video camcorder over the Internet.

We have developed a remote blackboard presenter system. In the distance blackboard based lessons using the DVTS, a screen in the students’ side shows blackboard at the teacher side by the DVTS. When the teacher pushes “capture” button of the system, the system captures the video stream, and creates high quality screen-shot image file. The system transfers the image file to the students’ side automatically, and the system presents the image to the sub screen in the students’ side automatically.

2. Implementations

2.1. Outline of the system

Fig. 1 shows an outline of the system. The PC1 is for video capturing and file sending. This one is set at teacher’s side. The PC2 is for receiving files, and the PC3 is for presenting images to the sub-screen.

To implement the system, we had to develop following four functions: (1) High quality image capturing function, (2) An interface for the teacher, (3) Automatic image transfer function, and (4) Automatic presentation function.

2.2. High quality image capturing function

We use the DVTS for real-time high-quality video/audio stream transmission. The DVTS works on Linux. Linux has video capturing commands named “dvgrab” and “avi2pics” [3].

The dvgrab command saves DV video stream as AVI file. The avi2pics command cuts a scene in the AVI file, saves it into JPEG image files.
We create a batch file to execute the dvgrab and the avi2pics command successively. This batch file, working on PC1, provides the high quality image capturing function.

2.3. The interface for the teacher

This interface is on PC1. When teacher pushes “CAPTURE” button, the system executes the batch file which is mentioned in the previous subsection.

2.4. Automatic image transfer function

We use file sharing functions as file transmitting function between teacher’s side and students’ side.

We installed WebDAV system for file sharing. The WebDAV system provides file sharing function via HTTP protocol. We installed WavDAV server on PC2 with HTTP server “Apache”. The DAVFS (WavDAV client) is installed on PC1.

The batch file, working on PC1, saves image files to the shared folder provided by WavDAV. As a result, the image files are transferred from PC1 to PC2 immediately and automatically.

2.5. Automatic presentation function

We use the server push mechanism of Web server as automatic update function for presenting images.

The Web browser “Netscape” works on PC3. At first, the Netscape accesses the Web server. When a new image arrives, the Web server pushes HTML file, which includes the new arrival image, to the Netscape by using server push mechanism. Then, the presented image file is updated automatically.

3. Evaluation

We used this system in an experimental remote lesson between Saga University and Tokushima University. Both Universities have high speed experimental network named “JGN (Japan Gigabit Network)” [4]. The minimum bandwidth between both Universities is 50Mbps. It is enough bandwidth for the DVTS.

In this remote lesson, a teacher was in the Tokushima University, students were in the Saga University. The teacher did a blackboard based lessons. Fig. 2 shows a scene of the lesson. During the remote lesson, the teacher used the system amount 11 times. The system worked without problem.

The quality of the presented image was quite good. Students understood what was shown in the sub-screen. They traced previous contents of the blackboard by observing sub-screen.

During the lesson, it is confirmed the system works effectively.

4. Conclusion

In this paper, we described an outline, implementations and an evaluation of the system. The system can be used with the DVTS together. A teacher in a remote site can present contents on a blackboard to a sub-screen in students’ classroom. The evaluation experiment shows it worked effectively.

Acknowledgement

This research is one of the joint researches with JGN Project (#JGN-G12016). This research is partly supported by the Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture of Japan (#13480048).

References


