The Distribution Method of the High Resolution Video for a Blackboard Based Lecture

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ABSTRACT

This paper discusses a method for supporting blackboard based lectures. In this method, students watch the video of the blackboard based lecture on a tablet computer. Some parts of the blackboards are recorded by two or more cameras, and a player is designed to enable the students to view and listen to any portion of the lecture. The videos in our method must be high resolution and high quality so that students are able to identify the characters written on the blackboard. However, when many students receive the video by wireless LAN, the bandwidth available for each student decreases. We attempt to maintain the image quality of the video by decreasing the frame rate. After viewing the videos, the tested students have completed questionnaires to evaluate these videos.

Keywords: E-Learning, High Resolution Video, Lecture Support, Network, Video Streaming

INTRODUCTION

This paper describes a method for supporting blackboard based lectures recorded using high resolution video and viewed on a tablet computer. Various videos with teaching materials and some lecture support systems have recently been introduced by educational companies been rapidly developed based on information technology (Hidenori et al., 2008). New lecture methods such as flipped learning and active learning have also been proposed. However, many teachers still deliver lectures using a blackboard because a teacher requires blackboards during a lecture to be able to flexibly respond to an unexpected question or situation. However, it is a significant burden for a teacher to interrupt the lecture to describe
the same lecture context. Moreover, in large classrooms, some students are seated at the back of the classroom and are unable to identify the characters on a blackboard easily.

Thus far, our research group has provided teaching materials focused on mathematics for synchronous distance learning (Yamaguchi et al., 2007). While these teaching materials are still the teacher’s burden because they require computers to use wireless networks. Tablet computers today are rapidly spreading in the daily life, and we can assume to use them for supporting lectures in rooms.

Figure 1 presents the scheme of the proposed lecture system. Students watch previously recorded videos on tablet computers. If the contents of the lecture do not change, the video of the lecture from the last fiscal year can be used. Then, students can take notes while hearing the video sound using headphones attached to the tablet computer.

When a student asks a question about the lecture context, the teacher replies to the question and provides an explanation supplementary to the lecture. In this way, the teacher does not need to describe the same content repeatedly. We aim at the following improvements using this method.

- The teacher’s burden is reduced.
- All students can read the characters written on the blackboard clearly.
- A teacher can spend time during the lecture helping a student who cannot understand the material.

We expect teachers and students to be able to effectively use the lecture time. In this method, the video of lectures using blackboards must have a high image quality for the character identification. However, when many students watch a video via the wireless LAN, each student has less available bandwidth. Although many video players for mobile terminals excellent already exist (Pang et al., 2012), we consider that these players use much bandwidth. Therefore, this paper uses video with a lower frame rate and low bandwidth that can be distributed.

**VIDEO OF A LECTURE USING A BLACKBOARD**

This section describes the lecture video that students watch on the tablet computer. In a lecture using a blackboard, the teacher’s description and the text on the blackboard are the information in

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*Figure 1. The scheme for a lecture using tablet computers*
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