Sketch Based Video Annotation and Organization System in Distributed Teaching Environment

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ABSTRACT

As the use of instructional video is becoming a key component of e-learning, there is an increasing need for a distributed system which supports collaborative video annotation and organization. In this paper, the authors construct a distributed environment on the top of NaradaBrokering to support collaborative operations on video material when users are located in different places. The concept of video annotation is enriched, making it a powerful media to improve the instructional video organizing and viewing. With panorama based and interpolation based methods, all related users can annotate or organize videos simultaneously. With these annotations, a video organization structure is consequently built through linking them with other video clips or annotations. Finally, an informal user study was conducted and result shows that this system improves the efficiency of video organizing and viewing and enhances user’s participating into the design process with good user experience.

Keywords: Collaborative Operation, Distributed Teaching Environment, Sketch Based Interface, Video Annotation, Video Organization

INTRODUCTION

Video materials have already been widely used in teaching environment and playing an active role in delivering lecture information to learners. However, most of the existing video delivery systems generally aim to improve the process of teacher’s one-way information delivery to the learners but fail to support interactive participation of both teacher and students. Thanks
to the continuous increase of network bandwidth, this situation may be changed by applying a distributed architecture which provides an environment in which the teachers and students can comment and manipulate video materials simultaneously.

To construct a good performance video system, exploring what the teachers and students want for such system is a great help. For teachers, authoring video materials is always a time-consuming work, especially for those who have not professional computer skills, mastering the professional authoring tools such as Adobe Premiere is still a challenging task. The professional software generally provides a series of video authoring functions such as fade in/out video effect or video transitions, however, these functions may not meet the special education needs in class. In general, an ideal video system in teachers’ expectation should be: (1) Easy to make comments on video materials (2) Easy to change video play sequence. For students, they are more interested in how to express their opinions or their attitude on the video. Generally, they want a video system in which they can freely add annotations and share them with their classmates and teachers. And after class when they want to trace back what they annotated in class, the system should easily locate that position.

Our system aims to provide (1) A distributed architecture which support collaborative operations in different geological locations; (2) An interactive environment provided to teachers with the ability of organizing video clips effectively and conveniently; (3) A method enabling teachers to impose extra information into the video content freely; (4) An interactive communication mode between teachers and students during teaching process which support group’s collaborative work on the video materials. In this paper, we present a distributed architecture and a sketch based interface for facilitating the interactively instructional video organizing and viewing with integrating sketching annotations into video clips. Sketching annotation are collaboratively added into video clips based on different video-related context, such as panorama or situation of video objects, which addresses the needs of teachers and students who teach or learn better through natural and flexible interactive methods. Our system is mainly used in the following application scenarios:

- Collaborative video annotation. Teachers and students collaboratively add annotation in the video and by exchanging their annotation they can have an experience similar to the classic classroom discussions.
- Organizing archived video. Teachers apply our system to prepare for their lecture materials.
- Dynamic modification of the viewing sequence of organized video clips. As the lecture delivery is an interactive process which may vary a lot according to different feedback from students.

RELATED WORK

There has been a lot of research work related with video organizing and viewing. Zhang (2002) proposed a hierarchy structure and a process scheme for organizing video data to facilitate the indexing. Zhu (2004) introduced InsightVideo, a video analysis and retrieval system, which joined video content hierarchy, hierarchical browsing and retrieval for efficient video access (Zhu, 2004). In order to improve the efficiency and interaction of the traditional video viewing process, a number of projects related to interactive video have been provided. Since early development of hypertext systems, videos have been taken as part of hypertext research in projects such as Aspen Movie Map described by Lippman (1980). And Sawhney (1997) introduced a generic framework to structure and dynamically present a new form of video- and text-based media called hypervideo. Shipman (2008) proposed a hypervideo system called Hyper-Hitchcock, which dealt with so-called detail-on-demand video, namely only one link at any given time. All the projects above focus
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