Webcasting Made Interactive: Persistent Chat for Text Dialogue During and About Learning Events

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Abstract. This paper presents a "persistent chat" extension to the ePresence Interactive Media webcasting infrastructure to support real-time commenting on and discussing of issues that arise during a learning event, followed by ongoing asynchronous dialogue about these issues while viewing the archives after the event. We report encouraging results of a field study of use of the system by students and a teaching assistant in a computer science class on communication skills, which encouraged students to review, think critically about, and improve their public speaking abilities.

Keywords: webcasting, streaming media, eLearning, digital media, digital video, persistent chat, asynchronous communications, public speaking.

1 Introduction

Because geographically distributed teachers and learners are usually not available concurrently, asynchronous tools such as listservs, threaded discussions, wikis, organizational memories, and courseware management systems are the dominant vehicles for eLearning. Yet asynchronous tools rarely establish the immediacy, interactivity, and shared purpose that result from face-to-face interactions. We have been developing a scalable Internet technology infrastructure that enables effective remote attendance at learning events, both concurrently and retrospectively, with maximum engagement, interactivity, and support for community.

Our approach uses a technology known as *webcasting* — the Internet broadcasting of streaming media to be viewed via a Web browser on a personal computer. Today's streaming media engines do significant buffering in order to provide smooth Internet media delivery to potentially very large numbers of viewers, resulting in 15-25 second delays between when events happen and when they are viewed. Consequently, while webcasting is scalable to large numbers of participants, it is typically a one-way non-interactive broadcast medium.

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Webcasts are also typically ephemeral media that result in no permanent record, or archived recordings that only can be played from the beginning, or that offer very weak methods for finding particular sections of interest. Our approach differs in being significantly interactive, and producing structured, embeddable, navigable, searchable, and taggable archives.

This paper presents an experimental "persistent chat" extension of our ePresence Interactive Media webcasting infrastructure [1], [2], [3] to support real-time text annotation and discussion of issues arising during a learning event, followed by continuing asynchronous dialogue about these issues while viewing the archives[1]. Annotations and asynchronous threaded discussions are bi-directionally linked to particular moments in the webcast. We also report results of a field study of use of this environment in a computer science class dealing with communication skills, in which the technology was used to help students improve their public speaking skills.

2 Background and Previous Work

We can enable asynchronous dialogue to follow and respond to issues raised in real-time discussion by integrating "persistence" features into synchronous, ephemeral media such as chat. *Persistence* refers to the availability of old conversational content. Most commercially available chat or instant messaging applications incorporate very limited forms of persistence. The traditional chat interface contains a history pane that displays a chronologically sorted list of recent messages, which are lost when the user logs out. Some chat tools allow users to save transcripts of chat sessions as local text files, which can then be browsed and searched. Halverson (2004) found that this feature facilitates recovery of useful information from old conversations, although it can sometimes be difficult to find the desired information amongst a large collection of transcripts with limited metadata [5].

A number of research projects have experimented with greater degrees of persistence. Erickson, et al. (1999) developed Babble, a chat application that stores all conversations that take place within the system, and makes them available to all participants [6]. The authors found that this "conversation as a single document" approach supported group awareness, and helped foster an ongoing narrative of the group as the persistent conversation continuously evolved. Ribak, et al. (2002) developed ReachOut, a peer support tool that features fully persistent conversations with limited lifespans [7]. In this case, persistence was found to generate additional ideas and dialogue which may not have otherwise emerged, since users were able to observe previous discussion before deciding to contribute their own thoughts. Robbins-Sponaas and Nolan (2005) have made similar observations about MOOs, which have many chat-like properties [8]. In particular, they noted that persistence allows a blend of synchronous and asynchronous interaction, a combination that makes for a dynamic collaborative environment.

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[1] A companion paper in this conference — Webcasting Made Interactive: Integrating Real-time Videoconferencing in Distributed Learning Spaces [4] — discusses enhancing real-time video and voice webcast interactivity. For more current information on ePresence, also see http://epresence.tv.

These findings indicate that persistence in chat can provide a promising environment for learning and for encouraging reflection and participation. However, these benefits are contingent on the ability of users to read and keep track of lengthy chat histories, as well as interact over them. Several researchers (e.g., [5-6]) report that this is difficult to do using existing tools.

While there has been some research into strictly text-based persistent chat, no integration with video has been explored. There have been numerous investigations into text-based discussion over live or archived video, but these focus on either synchronous or asynchronous discussion as disparate modalities. Pea (2006) and Stevens (forthcoming) provide good examples of annotation over archived videos [9], [10]. Bargeron, et al. (2001) and Fishman (forthcoming) provide good examples of asynchronous discussion over archived video [11], [12]. White, et al. (2000) and Baecker, Moore, and Zijdemans (2003) provide good examples of synchronous, non-persistent chat during live webcasts [13], [14]. In contrast to these systems, our aim has been to develop a persistent chat system that supports a seamless blend of synchronous and asynchronous discussion over live and archived videos.

According to a survey by Hobbs (2006), video is frequently used in schools, but primarily as a means for content delivery [15]. Teachers reported low levels of actual use of video technology such as camcorders. They gave only a few examples of more student-engaging methods of using video "to create or analyze information" (p. 45) through student video production, or "to document student performance" (p. 46).

Such instructional strategies can be beneficial to a student's active learning process and help improve academic performance. A common example involves the use of video to encourage dialogue between student and teacher regarding the student's filmed performance. In particular, Jambor and Weekes (1995) describes how allowing physical education students to direct the reviewing of their performance videos, while teachers act as facilitators, helps them take an active role in discussion and better comprehend their motor skills [16]. Traditional uses of video, especially those involving content delivery, typically lack such student feedback and engagement.

Student-created video projects have also shown to be beneficial in student learning, improving the retention of foreign language vocabulary of secondary school German students [17]. Video projects were also found to be successful in "encouraging [nursing] students to promote pattern recognition of characteristic features of common illnesses, to develop teamwork strategies, and to practice their presentation skills in a safe environment among their peers" (p. 558) [18]. Students also expressed satisfaction from producing their videos, felt that it added to the learning process, and reported great value in being able to later review what they did.

3 A Persistent Chat System for ePresence

ePresence has always had a chat subsystem that allows dialogue over a webcast. Typical uses of chat are for exchange of ideas and commentaries about the topic, social interchange, administrative discussions, and questions and comments about webcast technology and experience [19]. A persistent chat system would allow discussions about issues raised during the lecture to continue asynchronously into the

future, discussions that could also include individuals who encountered the material by viewing the archives.

Backtalk [20], [21] is a persistent chat system that preserves the traditional chat interface while adding capabilities for preserving content, engaging in threaded discussions, tagging messages via resizing and colouring, displaying overviews of message history, filtering the messages according to criteria such as author or tag, and allowing temporal and contextual (i.e., in terms of threads) displays of sequences of messages.

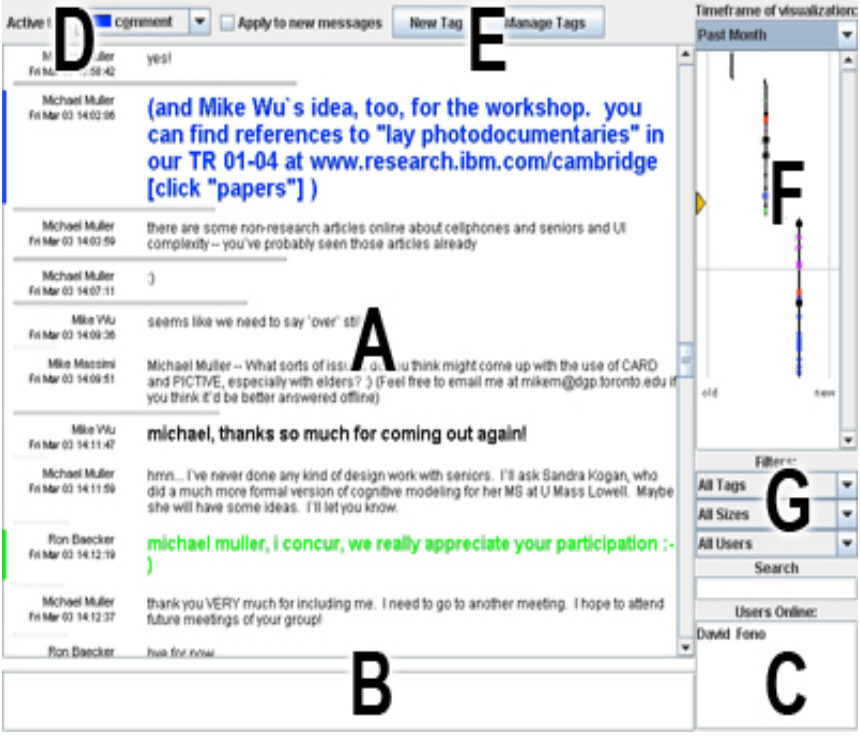

Fig. 1. The BackTalk user interface

A typical Backtalk screen is portrayed in Figure 1: A is the chat history, B the message entry window, C the list of concurrent users, D and E the tagging controls, F the message visualization, and G the filtering controls. Tagging controls allow messages to be distinguished and made more or less salient through the use of colour and size. Messages are displayed chronologically; filtering can be used to reduce those displayed to a manageable subset of the entire message history, based on colour, size, or sender. Threaded replies can be left on any message in the chat history, and reply chains are visualized using the tree structure popularized by newsgroup and e-mail clients. The visualization provides an overview of a large subset of the chat history, including temporal data, tagging data, and reply status for each message. The

visualization can also be used to quickly browse a lengthy history by clicking and dragging within the pane, which rapidly scrolls the chat history window.

Figure 2 shows a specially tailored version of Backtalk integrated with an ePresence video archive of a student presentation with a persistent chat dialogue about the presentation. We see a student giving a speech, and a dialogue about that speech between a teaching assistant (TA) and the student. Dialogues are threaded discussions in which seed messages may be annotations made by the TA during the talk or added later by the TA in reviewing the archive. Bi-directional links, represented by timeline markers under the video frame, and video icons to the right of discussion items, point back and forth between a point in the video and the threaded discussion, which enables the student to reflect on and learn from his or her "performance" and the TA's comments on it.

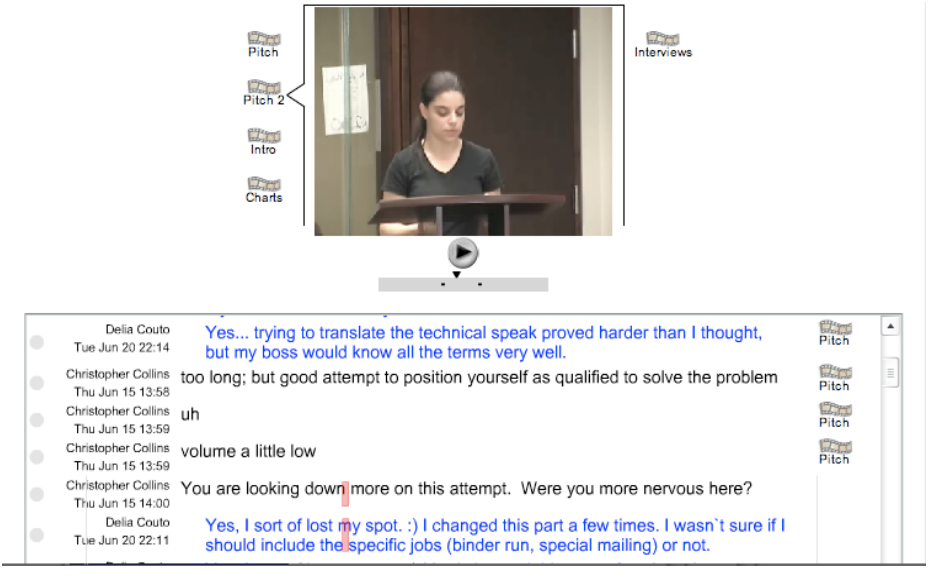

Fig. 2. BackTalk integrated with ePresence, as applied to instruction on public speaking. Christopher is the TA, making comments on a speech by student Delia. Delia reviews her performance and Christopher's comments, and responds to some of them.

4 A Field Trial of ePresence BackTalk Applied to the Public Speaking Component of a Communication Skills Course

In the summer and fall of 2006, we deployed this experimental system for use in sections of a 2nd year Computer Science class dealing with writing, speaking, and interpersonal communications. The class meets one evening per week for 3 hours. Six times during the term, each student makes a 30 second to 5 minute oral presentation. Students typically improve significantly in skill and poise over the semester, but it is hard for them to appreciate how far they have come and to reflect critically upon their

strengths and weaknesses based only on their memories of their speeches and written critiques from a teaching assistant (TA).

We therefore used ePresence BackTalk to capture four of their talks over a period of nine weeks, and allow the 15 students to review their performances. The TA annotated each presentation in real-time as it was given. The TA and each individual student could then review that individual's presentations, and discuss over the semester what the student did well, what could be improved, and how the student's performance evolved over the term. Since students were generally nervous about their speaking abilities, we did not use the full power of the technology, which would have allowed class-wide discussion of all presentations by all students. At the end of the course, students filled out a questionnaire detailing their experiences with BackTalk, and participated in a group interview on this subject.

A total of 710 messages were posted over the course of the study. Of these, 418 were notes written by the TA while presentations were being recorded, 171 messages were from the TA written outside of class, and 121 messages were from students. For each ongoing discussion between a student and the TA, the mean number of messages posted by the TA was 11.4, and the mean number posted by the student was 8.1.

Each discussion typically followed a set pattern. After a new recording was uploaded along with the TA's in-class notes, the students would log in and respond to the TA's feedback, occasionally making unrelated critiques of their own. The TA often responded in turn, but only rarely did students perpetuate a thread of discussion after that point. Discussion then generally ceased until the next presentation was recorded and uploaded, at which point the process would repeat. All discussion was carried out asynchronously, without any synchronous interaction between the TA and students.

Of those messages posted after the initial recording, 265 were linked to a specific point in a video, and 27 messages were linked to a specific video but no specific point. No messages unrelated to a specific presentation were posted. 88 messages were posted as a direct response using the reply feature, compared to 204 that were not.

The questionnaire that students filled out yielded mixed metrics of satisfaction. Students agreed that watching the recordings and reading the feedback from the TA were helpful in developing their presentation skills. Students also agreed that they could communicate effectively with the TA, and they felt comfortable using the system. They indicated that they would recommend that the system continue to be used in the course.

During the interview, the majority of students were enthusiastic about the system's potential in these regards. Many students expressed feelings such as "this method of receiving feedback was much, much better than other ways." They appreciated the ability to easily view moments in their presentations that the TA referenced in his feedback, and the ability to verify the TA's claims about their performance.

However, students used the system primarily as a mechanism for personal consumption and reflection, rather than dialogue. As such, they were not as enthusiastic about the ability to respond to the TA's feedback, and there was only a mild agreement that this aspect was helpful.

Students did have qualms with various flaws in the implementation, resulting in a high rating for perceived difficulty of using the system, as well as a low rating for

overall enjoyment. The most oft-cited problem was the students' inability to determine when the TA had responded to their comments, which forced them to continually login to the system in order to check. Many suggested a system for e-mail notification of updates to the discussion. We had noted the need for such a mechanism in our design goals for BackTalk, but failed to fully implement a solution. The other major problem encountered by students was general clutter in the interface caused by the number of features that used pop-up visual elements. While the use of pop-ups was not fundamentally problematic, students became confused when numerous dialogs, bubbles, and other components simultaneously occupied the same display space.

When asked about the possibility of applying this technology towards other purposes in other domains, students had numerous ideas, most of which reiterated the theme of providing feedback on video-recorded performances in alternative contexts (mainly sports). Additional ideas included discussion or Q&A over lecture recordings, as well as discussion by researchers over videos recorded as part of ethnographic studies. These suggestions are evocative of several existing research prototypes that enable collaboration over video and that are reviewed in a forthcoming edited volume [22].

The TA[2] found through using the system he was able to provide more detailed feedback to the students than was possible when he evaluated short public speaking assignments using the 'pen and paper' method. He found it easy to provide specific and detailed feedback — often on things that would otherwise go by so quickly that one may not have time to take sufficient notes. Using BackTalk, he was able to review the presentations after the class and add additional comments or clarify comments he had made in real-time as the webcast was recorded. Additionally, he found the archives and discussions with students to be useful aids for recognizing student improvement on the particular aspects of presentation skills that had been noted as problem areas in previous assignments.

For the final exam, students were asked to review the videos and the dialogue with the TA in order to find specific places where they demonstrated confidence and other places where they seemed less confident. They were asked what steps they would take to improve the speaking deficits they identified. The exam answers showed that with a video record of their speeches and feedback linked to specific points on the video, the students gained much more self-awareness than with any other speech evaluation method used by the instructor[3] in 15 years of teaching public speaking.

5 Summary, Discussion, and Conclusions

We have presented a persistent chat extension to an interactive webcasting system that allows dialogue among students and members of the teaching staff to occur during a live webcast of a learning event, and then be continued while viewing the webcast archives after the event. The paper also reports on a use of this technology in an undergraduate computer science course on communication skills.

Results from a questionnaire and a group interview suggest that the ability to review their presentations is viewed by the students as highly beneficial, both in terms

[2] Christopher Collins.
[3] Lillian Blume.

of specific understandings about technique as well as growing self-confidence in their skills. The TA feels that the technology enables him to give more thoughtful and more constructive feedback to the students. The instructor believes that this system and procedures for its use enable her to teach public speaking significantly more effectively than any other method she has used in 15 years of teaching.

Yet this particular study did not realize the full potential of the technology in two respects. Because only the TA had access to an ePresence system during the class presentations, there was no synchronous interaction. In other words, the TA's writing of messages functioned as personal bookmarking and notetaking, and not as a real-time dialogue with other members of the class. Also, asynchronous dialogue after the class consisted of 15 pairs of individual dialogues between the TA and 15 individual students, and not a more general discussion among all class members. The former limitation is removed in a version of BackTalk integrated with another experimental version of ePresence that is discussed in the companion paper [4].

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