Demonstration tools for Collaborative E-Learning

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ABSTRACT

We describe a demonstration tool for teaching assistants, a synchronous/different place groupware application developed to encourage students to interact with instructors and TA's through computer networks. In a real-time remote-controlled "show me" session, a TA can guide a student, step by step, by using an application sharing program and can annotate directly on a student's interface. Besides the live connection, students can review a FAQ database containing recorded "show me" videos. Other tools, like instant message delivery and "chat" room, are available to facilitate the demonstration.

Keywords

CSCW, educational groupware, demonstration, FAQ, annotation

INTRODUCTION

"Effective adult learning occurs when the learning is Problem-based, Experiential, Meaningful to the learner, and Self-directed" [3]. With the increasingly accessibility of high-speed Internet/Intranet connections through campus and homes, groupware systems are potentially helpful in the educational setting. Students are familiar with popular groupware tools, such as Yahoo! Messenger [7]. However, these tools are not specifically designed for education. The need to support learning by demonstration and easier access to direct, re-usable, course-specific help in collaborative learning motivate us to develop a set of tools. The TA demonstration tool in CIMEL (**C**onstructive, **C**ollaborative, **I**nquiry-based **M**ultimedia **E-L**earning) [4] project is a synchronous/different place groupware system developed to encourage students to interact with instructors and TAs via live links and remote-controlled "show me" sessions and by reviewing multimedia FAQ's of recorded sessions.

RELATED WORK

Email and attending office hours are the traditional ways for students to get help. More recently, students and TA's can discuss problems though text chat. Instant message provides timely feedback compared with email. However, text chat does not allow direct demonstration. NetMeeting™ [5] does provide some application sharing functionalities, but there are no annotation tools to use. Participants have to discuss "by reference" in form of text chat or audio.

There are groupware systems specifically designed to support online TA/Student collaboration. The Icicle [1] system automates some of the code inspection tasks in a group programming project. However, Icicle requires the physical presence of both students and TA. This co-presence means the student has to leave his/her working site to visit the instructor or TA. And it usually takes TA considerable effort to setup the programming environment on his/her own computer.

TA-tool ([6]) is a combination of a chat tool and a shared editor for sharing program code to allow a student and TA to discuss a program line by line. This tool only allows TA to comment on the shared program code, instead of directly changing the code. We use the same philosophy in our system: the TA provides guidance and the student learns by his or her own practice. However, without running the program, it can be very hard to find the tricky bugs.

vClass [2] is a real-time education, demonstration and collaboration environment. However, application sharing in vClass also does not allow for direct annotation on shared applications. In order to annotate, users need to copy a screen shot to a shared white board, which makes demonstration less smooth and annotation less interactive.

CIMEL COLLABORATIVE NETWORK

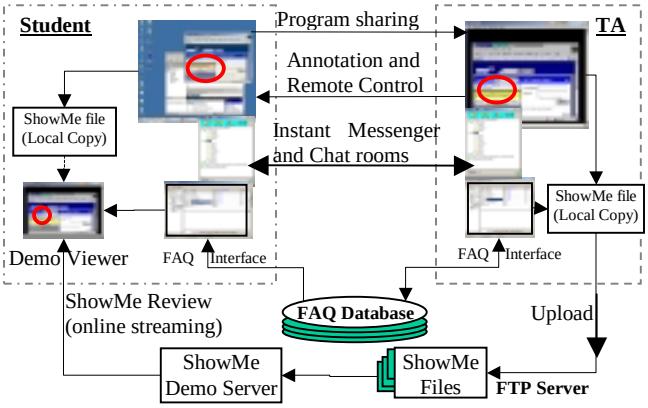

Figure 1 Architecture of ShowMe record and play

We are building a collaborative networking system that will allow users to contact each other through various communication channels (chat, online demo, audio, video, archived FAQ etc), where a combination of client/server and peer to peer computing models is used. A server is merely used to maintain the global state information (e.g. availability of participants). The communication between

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participants is handled by direct, peer-to-peer connections over IP. The "ShowMe" collaborative tool is synchronous/different place groupware tool built on this architecture, as shown in Figure 1.

The first step in using the collaboration tool is identifying the parties with which one wishes to communicate. The system provides a list of users that may be contacted, organized by course name and their role(s). A user could e an instructor in course A, teaching assistant in course B, librarian for a department, student in a course, or a combination of these roles. The system tailors the program's behavior according to the user's role.

A student can select an online TA and click the "ShowMe" button to initiate a live demonstration session. If the TA accepts the connection, he or she will see a graphical copy of an application on the student's computer screen. They will both be able to annotate the application with graphics and text to help make clear what they are talking about. In contrast to other "shared graphical application" systems, only the student will be able to interact with the application's button and controls. Students do not need to worry abut someone else "taking control" of their computer. They are forced to do the steps advised by the TA, rather than passively watch them being done for them, which we believe will help them better learn the material.

Application sharing provides a WYSIWIS view by sending the image of student's desktop through the network. In order to save the bandwidth, the image difference from the last image sent is compressed using Huffman coding. An advantage to our compression method is that if there is absolutely no activity, the amount transmitted and the storage requirements are very small.

In our implementation, we consider both awareness and privacy issue. Two different pointers are shown on each site, with a transparent sphere around as an option, to indicate the "focus of attention". To ensure the privacy, a student can share his or her desktop in one of these different ways. 1) Share the whole desktop, 2) share the top-most window and other space is masked with a black background, 3) Share a specific application, no matter which is currently active. Other application areas are masked.

DIRECT ANNOATION TO ENHANCE DEMONSTRATION

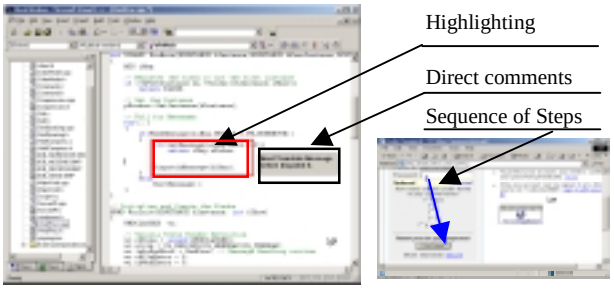

Figure 2: Annotating an Integrated Programming Environment and email login process using the "ShowMe" Demonstration Tools

We have designed several annotation tools in application sharing in order to enhance the demonstration. Examples are shown in Figure 2. In an interaction session, participants can use a text annotation tool to directly write comments on top of the application interface, a rectangle to enclose a given region, and an ellipse to circle objects. In addition, these shapes can use a "highlighting" filled, semi-transparent area. Arrows can also be drawn to draw attention to a small object or to show the order of consecutive steps.

FAQ REVIEW SESSION

Our framework supports the recording of communication sessions that can be added to a Frequently Asked Questiondatabase. Our system uses a flexible database scheme to manage the information. It uses an information tree and an information list that are built and maintained dynamically by the authorized user. The system also allows the user to sort and search archived FAQ.

The system records "ShowMe" demonstration sessions as a video file (of our own format) locally on each machine. After the live demonstration, a user (presumably the TA or instructor) could save the demonstration to the FAQ. A ShowMe record consists of a text description of this demonstration and hyper links to view this video, which has been FTP'ed to the FAQ server. When a student needs to review the ShowMe session, he or she finds the link in the FAQ, and clicks the hyper link to launch a Demo Viewer. The viewer provides online video streaming from the server, making it unnecessary to download the file at once.

In order to record the communication history of participants for inclusion in the FAQ and for future analysis, our system implements a tracking mechanism. The user name, IP address, time stamp (message type-in time, send time and receive time), and chat messages are stored in a database. In addition to facilitating the creation of FAQ elements, collected data will help with future analysis of the use and effectiveness of real-time collaboration tools.

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