Informal Videoconferencing and Awareness

Scott Carter and Scott Lederer
Group for User Interface Research
University of California, Berkeley
Berkeley, CA 94720
{sacarter, lederer}@cs.berkeley.edu

ABSTRACT
We produced a prototype informal videoconferencing and awareness appliance and deployed it under two distinct scenarios to investigate the usability and behavioral effects of the convergence of videoconferencing, context-awareness, and ambient displays. Findings indicate designers of such systems should pay close attention to privacy concerns, audio technologies, videoconferencing software configurability and resolution, and the social dynamics of workspaces.

Keywords
Videoconferencing, Awareness, CSCW

INTRODUCTION
People today use a variety of techniques to communicate with peers and maintain limited awareness of peer activity. Communication techniques include face-to-face conversation, telephony, instant messaging, and e-mail. Awareness techniques include peripheral vision, hearing, and instant messaging buddy lists. People's lifestyles and behaviors are informed by these communication and awareness techniques and may be further affected by emerging technologies such as videoconferencing, context-aware systems, and ambient displays. To investigate the ability of these emerging technologies to facilitate communication and awareness, we built a pair of prototypes designed to simulate wall-mounted informal videoconferencing and awareness appliances, deployed them under two different scenarios, and analyzed their users' behavior and usage patterns.

STUDY DESIGN
In Phase One of the study, we deployed one appliance in a graduate student computer lab in the UC Berkeley School of Information Management and Systems (SIMS), and one in a graduate research lab in the UC Berkeley Computer Science Division (CS). Students often cross-register between SIMS and CS classes, so formal and informal relationships tend to emerge between students in these programs. However, since SIMS students spend most of their time in South Hall, which is halfway across campus from Soda Hall, the CS building, the opportunities for rich informal communication between SIMS and CS students are fleeting. In deploying the prototypes in these locations, we aimed to foster and analyze awareness and communication between students of similar interests but in distributed locations.

In Phase Two, we placed one appliance on one of the author's desks in his research lab, and the other in the other author's home. The system supported remote collaboration during the composition of this paper.

SYSTEM DESIGN
The system supports two remotely located people, each with access to one of the prototype appliances. Each prototype was designed to simulate a single unit mounted on a wall or desk at a comfortable height for the user and composed of a touch-sensitive flat panel display and embedded processor and network connection.

The appliance interface (Figure 1) is divided into three sections: in the lower-left corner is an in/out button, which the user presses whenever he enters or leaves the general proximity of the device; the region to the right of the in/out button provides feedback of the system's understanding of the local user's own in/out state, showing a green rectangle if the system registers the user as *in* and a gray rectangle if *out*; the large upper region provides awareness of the system's understanding of the remote user's in/out state, showing a blue rectangle if the system registers the remote user as *in* and a gray rectangle if *out*. When the upper region is blue, the local user can press any blue area to initiate a videoconference with the remote person. When a videoconference is in session, the video window is situated inside the blue region, along with a button for ending the videoconference session.

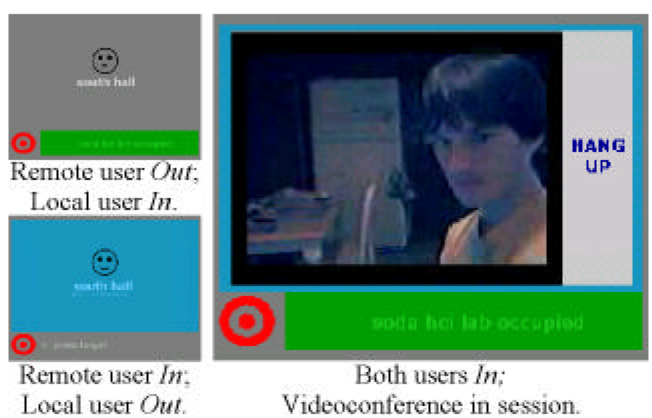

Figure 1

As built, each prototype consists of a Windows 98 computer running Microsoft NetMeeting and Internet Explorer 6 in full-screen kiosk mode, a webcam, a microphone, and a touch-sensitive LCD display. All user interaction occurs through the touch-sensitive display. The web browser displays the system's GUI, which is a web page served by a remote web server and built dynamically by a PHP script according to the system state. The system state is stored in a MySQL database and is updated whenever a user changes his in/out state and whenever a videoconference session is initiated or terminated. The browsers reload the web page every five seconds to keep the interface consistent with the system state.

OBSERVATIONS

Our research revealed issues future designers of informal awareness and videoconferencing wall displays should consider. Previous studies have shown that social issues evolve over time in video conferencing systems [1], that such shared awareness systems may augment a sense of community among distributed groups [2], and that privacy is a crucial issue [3]. Our findings reiterate that such displays raise privacy concerns and show that they require appropriate audio technologies, demand high resolution and robust Internet videoconferencing tools and considerably affect the social dynamics of workspaces.

Privacy

Privacy is an issue in workspaces not entirely devoted to videoconferencing. Our display attempts to address these issues by allowing awareness without necessarily connecting to a space, the reverse of the system recently developed at Microsoft [3], and therefore may be particularly helpful where privacy is a paramount concern. Still, when we attempted to install the system in the *computer lab* during Phase One of the study, we encountered some resistance from students who were concerned that the display would continuously transmit audio and video. Also during Phase One, we found the shutter of the camera in the research lab closed on two occasions. However, both of these incidents occurred early in the study and lab members quickly became accustomed to the display.

Audio

In Phase One, users had some trouble communicating aurally through the desktop microphone. In Phase Two the difficulties were overwhelming and we had to move to lapel microphones, which, because of their proximity to the mouth, significantly improved voice intensity and clarity. Though high-end microphones could also be used to address this issue, it may not be feasible to integrate them into wall displays in the near future.

NetMeeting

NetMeeting proved difficult to configure and provided too low resolution. We had difficulties adjusting the size of the NetMeeting ActiveX control window – in fact, we discovered that due to a bug it is possible to do so only under Windows 98. Also, resolution is so poor as to prevent informal document presentation (e.g., two interactive designers want to show each other paper prototypes without the hassle of scanning them, or a mother wants to show her son a painting she recently made).

Social Implications

The display also affected the social dynamics of spaces. During Phase Two, for example, we discovered that others working in the lab space found it disturbing to have one person talking to a "disembodied voice." This, coupled with the previously mentioned problems we encountered with microphones, leads us to believe that videoconferencing wall displays should have two sets of audio devices: a traditional omni-directional microphone and accompanying speakers for brief, non-critical interactions and a nearby cache of wireless, lapel microphones with attached dime-sized earphones for more lengthy and involved conversations. The system should detect when the wireless devices are in use and subsequently turn off the other audio devices. In addition, the lapel could provide useful contextual information (e.g., location or heart condition).

Furthermore, while we designed our display to encourage visual peripheral awareness, we found aural peripheral awareness to be important as well. During Phase Two when the display changed from one state to another in the *home* space, the remote researcher was able to hear other members of the home begin to comment on the system. Also, in Phase One often someone from one space would establish a connection only to find a lack of presence on the other end. When this happened, the initiator would often call out a greeting to let the other side know that the video display was active. In this way, though not originally a design goal of the system, users could be away from the display and still notice changes in system state.

CONCLUSION

We investigated the usability and behavioral effects of a prototype informal videoconferencing and awareness system. Findings show designers of such systems should pay close attention to privacy concerns, audio technologies, videoconferencing software configurability and resolution, and the social dynamics of workspaces. In future work we hope to deploy the system in a student dormitory and scale it to support more than two users.

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