

Real Time Groupware on the Information Highway

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Abstract

When we envisage the "information highway" and what it can be used for, we usually begin with its physical metaphor. We see it as an electronic thoroughfare that lets us travel through distributed digital libraries - such as the World Wide Web - and, when we request it, that lets us ship the information within these libraries from place to place. We also see it as a carrier for delivering our electronic messages, such as email and bulletin board postings.

The highway metaphor unfortunately blinds us to other ways that we can use this system. While travel on physical highways is slow, travel on the high-speed networks that underpin the electronic highway is nearly instantaneous. Because of this speed, the "highway" becomes an ideal medium for supporting real time communication and collaboration between people located anywhere in the world. The point of this paper is to introduce two important ways the information highway can support such collaborations: through groupware supporting both real time distributed meetings and casual interaction.

Introduction

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Real Time Distributed Meetings

Real time face to face meetings are the cornerstone for people working together. It is vital for brainstorming, for rapid evolution of ideas and arguments, for making decisions, for information exchange. It is not just a verbal process. We actively work on shared documents of all types, scrawl on whiteboards, refer to drawings, pass our notes around, and sketch on the backs of envelopes.

Groupware for real time distributed meetings bring people and their work together at the same time, even when some or all participants and their work products are in different physical locations. Groupware is responsible for providing *telepresence* - a way of giving participants enough cues to help them orchestrate their interactions - and *teledata*, a way of having participants bring into the meeting the materials and on-going work they wish to share with one another.

Telepresence can be supplied many ways, the most obvious being video conferencing. This gives participants a sense of presence by allowing them to see and hear one another. Unlike specialized video conferencing rooms, the combination of multimedia computers, digital audio and video, and a high-speed network makes multi-point desktop conferencing easy to set up and cheap to use.

Teledata brings to the distributed meeting the work materials, such as notes, documents, plans and drawings, as well as some common work surface that allows each person to annotate, draw, brainstorm, record, and convey ideas during the meeting's progress. Teledata usually has two forms. A *shared window* takes an unaltered single-user computer application and displays it on the screen of all participants. Each participant sees the same image on their display and has opportunity to interact with it by taking turns. The idea is similar to several people sharing a single computer; each sees the same thing and can pass the keyboard around, but the application has no idea that it is being used that way. *Collaboration-aware* groupware, on the other hand, is specifically designed with the group in mind. For example, consider a multi-user whiteboard application we built called GroupSketch, which is illustrated by a screen

snapshot in Figure 1. Four participants, each working on their own computer at their own site, are in this particular GroupSketch session. The caricatures on the right hand side show who is present. Each person sees the same thing on the display, which is called "what you see is what I see" or WYSIWIS. Participants can simultaneously draw on the screen anytime they wish, and all such actions are instantly visible on everyone else's screen. Multiple cursors are displayed, one per participant and labeled with their name, which is extremely valuable for gesturing around the whiteboard and for indicating who is doing what (another form of telepresence). Both researchers and industry are now producing a variety of other exciting collaboration-aware applications, including brainstorming tools, multi-user text and graphics editors, presentation systems, and so on.

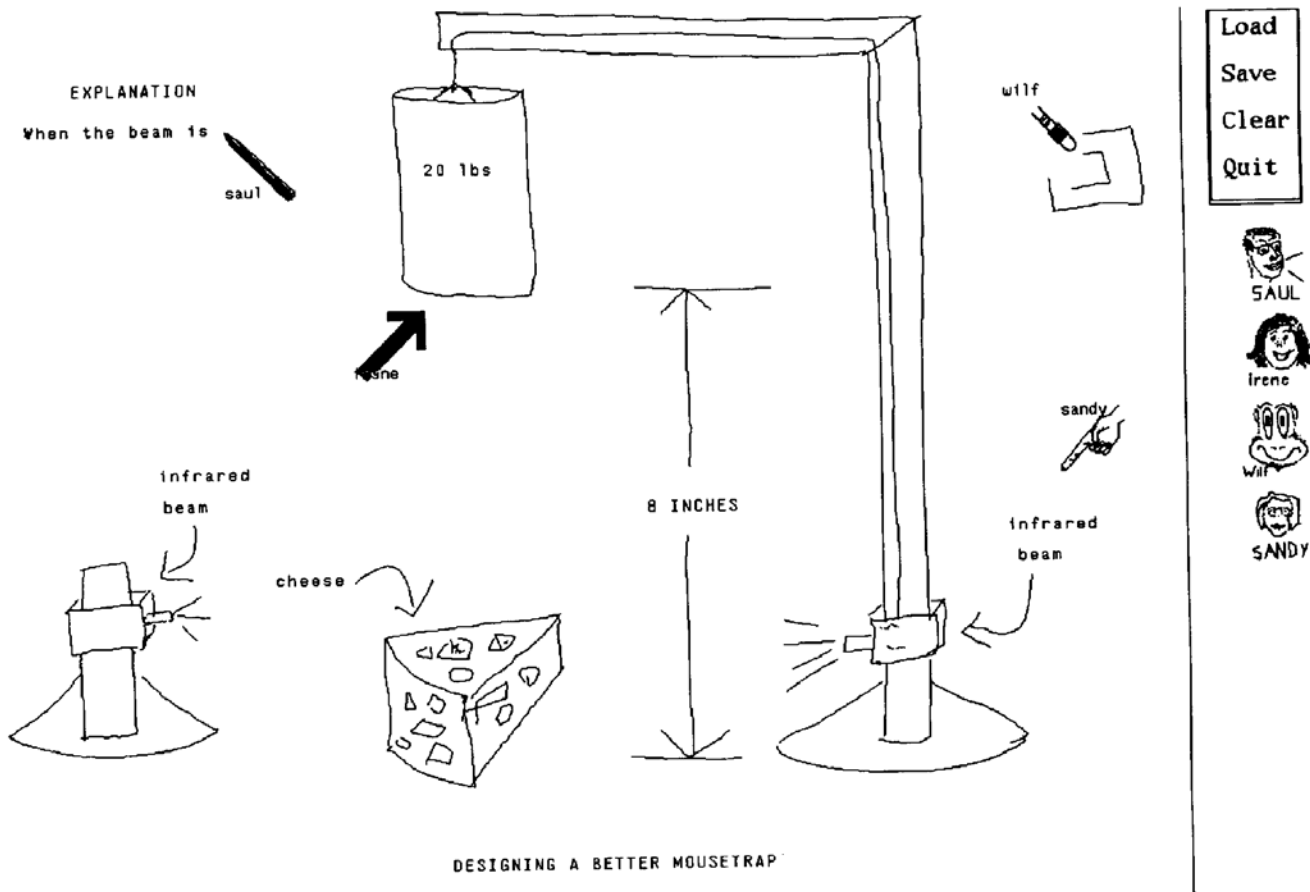


Figure 1: A sample GROUPSKETCH session

In real life, we do not separate "presence" from "data", as we convey a strong sense of presence while we are working with our documents. Several researchers are trying to fuse the seam between telepresence and teledata. For example, Hiroshi Ishii of NTT has built an innovative system called ClearBoard. Imagine two people working on different sides of a plate of glass, with either writing on their side of the glass surface. Each sees the face of the other, has a strong sense of where the other is looking, sees their hands as they are drawing, and sees the marks both make on the glass. ClearBoard implements this scheme by overlaying a groupware sketchpad similar to GroupSketch with a teleconference video image. By reversing the video image, the writing even comes up the right way 'round!

Casual Interaction

It is all too easy to think of real time conferencing as a replacement for the formal, scheduled meeting. Yet it is not necessarily pre-planned, purposeful meetings that are best supported through the information highway, but casual unplanned or one-person initiated meetings as well. Work is fundamentally a social process, with many interactions required for people to initiate and coordinate their collaborations. Only a small part of this process relies on the formal meeting; we often need frequent causal contacts to maintain collaboration on both the task and the interpersonal level. In our office settings, this is often over coffee or lunch, in hallways, or by one person going to another's office for a brief conversation.

When people are geographically distributed, the bottleneck to rich spontaneous interactions is distance. Quite simply, there is little chance of bumping into one another, and its too much work to track someone down for a quick chat, or to fight the battle of telephone

tag. Computer technology has potential to bring distance-separated people into contact. Through the information highway, we can find out who is around, and whether they are available for conversation. We can also use it to establish real time communications at low personal cost. Just as electronic mail encourages informal messages, so can an easy to establish real-time link encourage informal meetings.

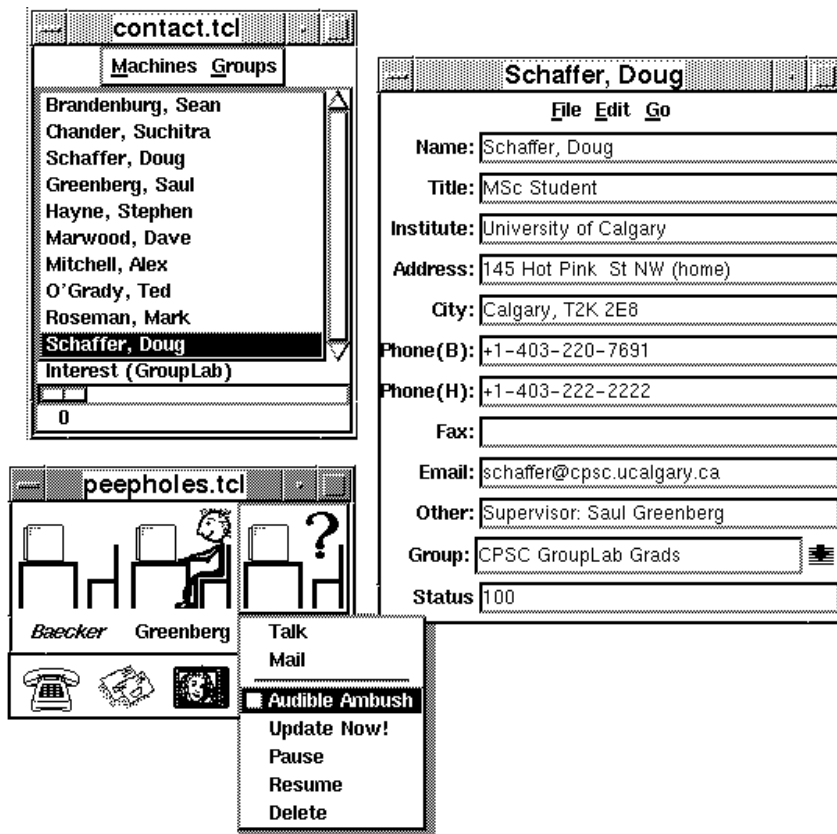


Figure 2: A sample PEEPHOLES display

Towards this end, we built PeepHoles, a simple yet effective mechanism that allows people to see who is around on the Internet and that lets them quickly establish real time contact with one another (Figure 2). For example, I can create a rolodex-like address book of people I am interested in, with one entry for my colleague "Doug Schaffer" shown on the right. If my rolodex is large, I can create personalized subsets of communities. For example, the display on the upper left shows a sub-group consisting of people at Calgary who are interested in our GroupLab project. By selecting a name I can create a "peephole" on one or more people, which raises an icon that indicates whether or not the person is on their machine and how active they are (bottom left). If I see that the person is around (shown by the icon of someone sitting behind a computer), I can establish real time communication with them by selecting the appropriate groupware icon. I also have the choice of invoking conventional communication tools, such as the telephone or electronic mail, through a simple button press. I can also "ambush" a person. If a person is away from their machine (the question mark over the chair) or not logged on (the empty chair), I can ask my computer to inform me as soon as they return to it - a typing sound would be played by the computer, which attracts my attention. I would look at the peepholes, and notice that the person is back). At that point, I can engage them in real time communications. Peepholes is also hooked into my electronic mail system. As I read my mail, a peephole to that person is created, and I have the choice of responding to their messages by a variety of communication and groupware channels.

A multimedia system supporting casual interaction is Montage, a research product from Sun Microsystems. On the surface, it is simply a digital video plus groupware sketchpad system. However, it has been carefully crafted to facilitate casual interaction. A person can create a community of fellow collaborators by adding their names to a menu. Selecting a name from the menu then allows a brief video "glance" into that person's office, similar to the way we glance into an open office as we walk by. The recipient of the glance would hear a sound of someone approaching, and then see an image of the glancer on their screen. If the person is there and doesn't seem busy, audio can be turned on, and a conversation started. The sketchpad can be brought in on demand. If the person is not there or appears busy, an electronic Postit note can be left. Social factors such as privacy are incorporated into the system, and people can do the computer equivalent of shutting their door. While Montage and other similar systems (including Toronto's Telepresence project and BellCore's Cruiser) are now being tested over modest-sized groups, it is only a matter of time until we see a version available that will suit the social cultures of the large diverse communities that will populate the information highway.

Summary

The information highway is not just a medium for searching and delivering parcels of information. Rather, it is best seen as an extremely rich communications infrastructure that can deliver a broad variety of multimedia-based real time interaction. Real time distributed meetings and casual interaction just touch the surface of what the information highway can support. Just as our culture has evolved a way of using the telephone far beyond its original intent (which was to let one village communicate with another), we should expect our use of the information highway to evolve far beyond the simple idea of information transmission.

If you find yourself intrigued by the idea of real time groupware, you can go to several excellent sources for further reading. The Scientific American special issue gives an excellent introduction to the use of advanced technology on wide area nets such as the Internet. The books by Greif, Greenberg, and Baecker are collected readings; all give background, and the articles discuss the research and development of groupware technologies, as well as the sociology behind these systems. Johansen's book describes how business teams can use groupware to their advantage. The Proceedings of the ACM Conference on Computer Supported Cooperative Work (CSCW) is the venue for research publications in the area. The ACM SIGGRAPH Video Review issues are the videotape proceedings of the technical video track of these CSCW conferences; they contain clips of a variety of advanced groupware systems.

ACM SIGGRAPH Video Review. Special Editions of the CSCW 1992 (issue 87) and 1994 (issue 106) Technical Video Program. Edited by Saul Greenberg. ACM Press. Videotape

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