

GroupSketch

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Abstract

GroupSketch allows a small geographically-distributed group to list, draw, and gesture simultaneously in a communal work surface, supporting interactions similar to those occurring in the face-to-face drawing process. *GroupSketch* facilitates collaboration by: a) allowing gestural expression through large unique cursors visible on all displays; b) conveying the process of expressing ideas by transmitting small granular changes of user activity with minimum time delay; c) intermixing gestural, textual, and graphical expression modelessly; and d) providing simultaneous access to a common view of the work surface area.

1 Motivation and foundations

Almost every group process begins with a set of initial design meetings, where participants express, discuss, and develop ideas. It is a creative forum where people are encouraged to present their thoughts to the group, to build upon the ideas presented by fellow members, and to problem-solve. Participants typically use some large communal *work surface*—a group drawing area—to facilitate their interactions. Typical media now used include white boards, flip charts, and large sheets of paper for drawing and note-taking. Given that an individual's work is increasingly centered around a computer workstation, the networked computer can become a valuable medium for distance-separated people to share their on-line work with each other through an electronic work surface.

This document and accompanying video will focus on a *GroupSketch*, a multi-user sketchpad supporting real-time remote design activities by small groups (Greenberg & Bohnet 1991). *GroupSketch* is based upon John Tang's design principles, generated from his study of several small-team design sessions (Tang 1989; Tang 1991). Four of the guidelines are summarized below.

- 1 Enable all participants to share a common view of the work surface while providing simultaneous access and a sense of close proximity to it.
- 2 Provide ways of conveying and supporting gestural communication. Gestures should be clearly visible, and should maintain their relation with objects within the work surface and with voice communication.
- 3 Convey the process of creating artifacts to express ideas.
- 4 Allow seamless intermixing of work surface actions (listing, drawing, gesturing) and functions (storing information, expressing ideas, mediating interaction).

Detail about the design principles, how they were applied, and how *GroupSketch* is implemented can be found in Greenberg & Bohnet (1991), and Greenberg, Roseman, Webster & Bohnet (1991).

2 Description

GroupSketch is a simple group sketching tool that allows its users to draw on a virtual piece of paper (the screen). The Figure displays a typical *GroupSketch* screen with four participants engaged in a design session. The borders enclose a shared work surface where people can draw, enter text, or gesture. Every person also has a large, labelled cursor. All participants see the same work surface on their display, and every movement of the cursor and change in the drawing is immediately visible on all displays. Each participant is represented by a unique labelled caricature located to the right of the work surface. While audio is not directly supported, we expect a full duplex audio channel to be available by other means (eg speaker phones).

A critical point is that *GroupSketch* supports simultaneous interactions, where any person can do any action at any time. Four action modes are supported: pointing, drawing, listing, and erasing (see Figure). With no mouse buttons or keyboard keys pressed, the cursor portrays the image of a pointing hand (Irene's cursor). To draw free-style, the user depresses the left mouse button of a three-button mouse, changing the cursor from a hand to a pen (Sam's cursor). The pen-shaped cursor also appears automatically when typing. Pressing the middle mouse button changes the cursor into a large arrow to draw participants' attention (Bruce's cursor). Users can erase graphics or text in the work surface by holding down the right mouse button, which changes the shape of the cursor into an eraser (Wilf's cursor).

The menu on the right of the Figure allows a person to privately save an image, retrieve a previously stored image to the group display, clear the public work surface, or leave the collaboration (leaving other participants in the meeting). Menu selections and cursor movements outside the work surface are private and are not broadcast to other workstations. Loading an image or clearing the work surface will have the same affect on all participant's screens.

The video shows three excerpts from *GroupSketch* sessions. In the first, one person is teaching three others how to use *GroupSketch*. As every person is active in the workspace,

the students can watch and mimic the teacher's action, which allows the teacher to see when the learners have caught on. The second clip illustrates a typical *GroupSketch* design session. We see people focus attention to objects in the display by pointing at them or by circling objects with the cursor. Drawing is both independent (one person responsible for a drawing) and cooperative (multiple people working together on a drawing). People work simultaneously on any part of the display, and their cursors become a coordinated dance of intermixed gesturing, drawing, and listing. Voice is tightly tied to the work in progress. The final clip shows *GroupSketch* at play, where the session participants decide to draw a portrait of the first author of this paper. While the resulting picture is not necessarily art in its highest form, it does illustrate how people can draw together in a situation where, unlike conventional medium, they physically do not get in each others' way.

As the video illustrates, *GroupSketch* is effective. Although it suffers some flaws, our usability studies have shown that *GroupSketch* participants pursue their tasks using strategies analogous to those observed in face to face design meetings (Greenberg & Bohnet 1991). The lessons learnt are now

being applied to *GroupDraw*, an object-based drawing package that will provide a group with far richer tools than paper and pencil (Greenberg, Roseman, Webster & Bohnet 1991).

References.

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