Cover page for Demonstration Submission

Title: GroupSketch Demonstration

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Keywords: shared workspace, real time remote conferencing,
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Resources required

Given the difficulties of gaining equipment for demonstrations, I have enclosed a full scenario, a middle scenario, and a minimalist scenario.

Full Scenario.
- three Sun workstations connected via Ethernet.
- voice link (speakers, microphones)
- video link (simple cameras with monitors)

Middle Scenario.
- two Sun workstations connected via Ethernet at the conference
- one Sun workstation at U of Toronto with a high speed modem
- one modem plus two phone lines (for voice link)
- some minor audio equipment (speakers, microphones)

Minimalist Scenario.
- two Sun workstations connected via Ethernet at the conference

Greenberg, S. and Bohnet, R. (1992)
GroupSketch Demonstration. Demonstration at the ACM CSCW 1992 Conference on Computer Supported Cooperative Work. Appended is Muller, M. and Salasco, A. (eds) CSCW'92 Demonstrations, a synopsis of the demonstrations published in Proc CSCW'92. **p11-13**

GroupSketch Demonstration

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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. The demonstration will show how *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 demonstration will focus on *GroupSketch*, a multi-user sketchpad supporting real-time remote design activities by small groups (Greenberg and 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).

Details about how the design principles were applied and implemented in *GroupSketch* can be found in Greenberg et al 1991 and 1992.

2 Description
GroupSketch is a simple group sketching tool that allows its users to draw on a virtual piece of paper (the screen). Figure 1 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 (Figure 1). 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.

3 Demonstration
The demonstration will give people hands-on use of *GroupSketch*. Three Sun workstations (two of them local and one remote) will be running *GroupSketch*. An audio

channel and perhaps a video channel will be available as well. A remote facilitator will teach two local participants at a time (audience members) how to use *GroupSketch*. The facilitator will then guide the group through one of three different *GroupSketch* applications:

- a short design session, where the group will be asked to react to an existing design drawing;
- an interactive art session, where the group works together to create a simple "artwork";
- a brainstorming session, where the group lists ideas into the workspace and then edits them collectively.

Through our prior experiences with these tasks, we expect the following to happen.

- people will learn the system effectively within 15 to 30 seconds.
- people will focus attention to objects in the display by gesturing at them with the cursor
- drawing will be both independent (one person responsible for a drawing) and cooperative (multiple people working together on a drawing)
- people will work simultaneously on any part of the display, and their cursors will become a coordinated dance of intermixed gesturing, drawing, and listing.
- we will also see that voice is tightly tied to the work in progress.

The demonstration will show that a minimalist geographically-distributed sketchpad as implemented in *GroupSketch* is effective, both in technical terms (computer performance) and human terms (usability). Although the system is not perfect, we will see that *GroupSketch* participants will pursue their tasks using strategies analogous to those observed in face to face design meetings

References.

Greenberg, S. and Bohnet, R. (1991) "GroupSketch: A multi-user sketchpad for geographically-distributed small groups." In *Proceedings of Graphics Interface '91*, Calgary, Alberta, June 5-7.

Greenberg, S., Roseman, M., Webster, D. and Bohnet, R. (1992) "Issues and experiences designing and implementing two group drawing tools." In *Proceedings of Hawaii International Conference on System Sciences*, **4**, Kuwaii, Hawaii, January, IEEE Press.

Tang, J. C. (1989) "Listing, drawing, and gesturing in design: A study of the use of shared workspaces by design teams." PhD thesis, Department of Mechanical Engineering, Stanford University, California, April.

Tang, J. C. (1991) "Findings from observational studies of collaborative work." *Int J Man Machine Studies*, **34**(2), pp. 143-160, February.

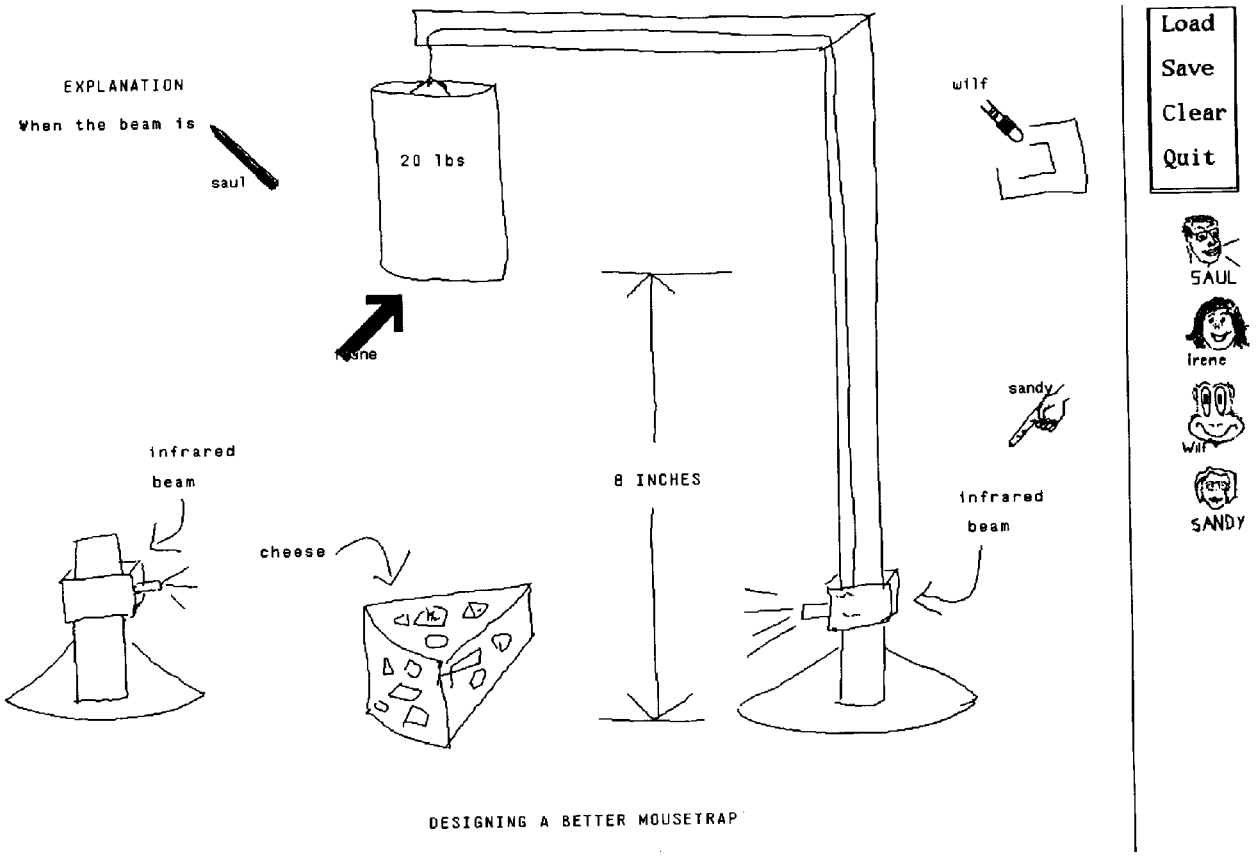

Figure 1: A sample *GroupSketch* session

CSCW'92 Demonstrations*

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Demonstrations are coming into their own as a first-rank medium for direct communication of CSCW achievements. This year's demonstrations program includes a broader range of the activities that, together, make up the emerging discipline of CSCW—not only technologies, but also methodologies for research and practice. We also see the emergence of infrastructures and toolkits to support and integrate the next generation of CSCW applications, and the maturation of CSCW technologies and practices into significant products. Finally, we see the continuing development of important projects and products, and significant new work.

MULTIPOINT, MULTIMEDIA GROUPWARE SERVICES

John Bell, IIS Technologies

Group TeleCommunications Software (GTCS) is an application for real-time multimedia, multipoint, visual conferencing using industry-standard personal computers. The system supports shared views of documents, viewgraphs, photographs, and computer-generated images, with shared gestures and annotations, through an intelligent data bridge that executes at a single workstation to interconnect the others over a variety of standard communication interfaces. The product will be available in a meeting room for practical use by interested groups. The author will be available to serve as facilitator and trainer.

THE "WORK IN PREPARATION" (PREP) EDITOR

Ravinder Chandhok, James Morris, Paul Erion, David S. Kaufer, Christine M. Neuwirth, and Dale Miller, Carnegie Mellon University

The "work in preparation," or PREP Editor, is a prototype writing environment intended to support the collaborative authoring, reviewing, commenting, and editing associated with work "in preparation." The PREP Editor allows participants to create "margins," called columns, in which they can interact, and allows each user to add, delete, hide, show, move, and resize margins with direct manipulation. The system creates a kind of "text spreadsheet" that allows for easy reorganization of a document.

SUITE: A HIGH-LEVEL AND FLEXIBLE SYSTEM FOR IMPLEMENTING MULTI-USER PROGRAMS

Prasun Dewan, Purdue University

Suite is a research system developed to support the implementation of multi-user programs. It supports a generic collaboration model, which allows the users to view all multi-user programs as active data that can be concurrently edited by multiple users, using generic models for sharing, undo/redo, and access control. These models are parameterized by a large number of collaboration parameters, which can be dynamically defined by a group of users to define the interface to the program. Suite provides a simple and powerful inheritance model for specifying default values of these parameters. The demonstration will illustrate the various components of Suite by showing how a novel and complex multi-user program is built using the system.

GROUPSKETCH

Saul Greenberg, University of Calgary

Ralph Bohnet, MPR TelTech Ltd.

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. The authors will show how 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 minimal time delay; (c) intermixing gestural, textual, and graphical expression modelessly; and (d) providing simultaneous access to a common view of the work surface area.

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* These descriptions are based on longer abstracts submitted by the authors, which have been shortened to fit these pages by the Demonstrations Committee.

OVAL: A RADICALLY TAILORABLE TOOL FOR COOPERATIVE WORK

Robert Halperin, Christopher Fry, and Thomas W. Malone, Massachusetts Institute of Technology

Oval is a "radically tailorable" tool for cooperative work. Four kinds of building blocks — objects, views, agents, and links — can provide most of the functionality of many multi-user systems. Progressive, incremental modification of systems based on these building blocks involves user actions to define new objects, new attributes, new views, and new relationships among objects, leading to an elementary "tailoring language." Following a formal presentation, attendees will be invited to use these basic resources to create multi-user applications in a kind of "Oval clinic."

WINCOLL — COLLABORATION EXPERIMENTS USING EXISTING X-WINDOWS APPLICATIONS

Ming C. Hao, IBM Palo Alto Scientific Center

WinColl is an X-Windows™ based application that creates a collaborative computing environment by allowing for controlled shared access to existing X-Windows applications, and by providing tools for communication with colleagues — with no changes to existing applications, minimal impact upon the system, and the execution of WinColl at only *one* of the workstations involved in the collaboration. Key features include: communication protocol structured by collaboration metaphor; floor control policies; and tools such as chalk, eraser, beeper, marker, and telepointer.

REAL-TIME GROUP TOOLS

Stephen C. Hayne, University of Calgary

Mark Pendergast, University of Florida

Participants at conventional real-time meetings often share physical work with each other, include notes, documents, plans, slides, drawings, and some common work space that allows each person to annotate, draw, brainstorm, record, and convey ideas during the meeting's progress. This demonstration focuses on technology that provides face-to-face or geographically distributed groups with concurrent real-time access to shared spaces. The authors will show a family of tools that support simultaneous shared views with individual perspectives, gestural communication, and linked views, supported by replicated data at each workstation and a variety of interaction models, including structured and unstructured, locking and optimistic models.

CONVERSATIONAL PROPS AND THE RENDEZVOUS™ LANGUAGE AND ARCHITECTURE

Ralph D. Hill, Tom Brinck, Wayne T. Wilner, John F. Patterson, Steve L. Rohall, and Louis M. Gomez, Bellcore

The RENDEZVOUS system, language, and architecture are designed to build multi-user applications for conversational settings — i.e., *conversational props*, or artifacts that facilitate or augment conversations. The architecture is based on a centralized *abstraction* — a collection of information that is common to all users — and individualized *views* — manipulable presentations of the information in the abstraction. The authors will demonstrate a number of applications that have been implemented in the system, including Card Table and Conversation Board.

SUPPORT FOR HUMAN COLLABORATION: APPLE OPEN COLLABORATION ENVIRONMENT

Patrick A. Holleran and Gursharan S. Sidhu, Apple Computer, Inc.

Apple's Open Collaboration Environment is designed to provide a computing architecture and environment that supports collaboration. By providing resources such as directory services, store-and-forward messaging, collaborative toolkits and programming interfaces for developers, security features, and connectivity to other collaborative or communication protocols and services, it is hoped that a new generation of innovative and powerful collaborative applications will be possible. The authors will meet with attendees at published times in order to present their architecture and environment.

CONVERSATIONBUILDER: FLEXIBLE, ACTIVE SUPPORT FOR COLLABORATIVE WORK

Simon M. Kaplan, University of Illinois at Urbana-Champaign

ConversationBuilder (CB) is an *open architecture* for collaborative work. CB is *open* in two senses: (a) it provides a rich set of mechanisms, tailorable for domain-specific support policies; and (b) it can be tailored by the introduction of new tools, adapting itself to existing user cultures and user needs. Attendees will be invited to experience existing CB applications, and to experiment with the system themselves, based on scenarios drawn from the authors' work in developing and using the system.

DISTEDIT TOOLKIT FOR GROUP EDITING

Michael J. Knister and Atul Prakash, University of Michigan

The DistEdit toolkit allows conversion of standard text editors to group editors with minimal change to their code. The authors will demonstrate several capabilities: (a) support for different editors in the same session; (b) *undo* for user's and well as group actions; (c) fault-tolerance against node crashes; (d) concurrency protocols for good response time.

THE KNOWLEDGENET WITH THE COLLABORATIVE DESKTOP INTERFACE — AN ENVIRONMENT FOR DISTRIBUTED DESIGN

Hans Marmolin, Yngve Sundblad, Konrad Tollmar, Royal Institute of Technology

Anneli Avatare and Hans Eriksson, Swedish Institute for Computer Science

The KnowledgeNet with the Collaborative Desktop interface is a CSCW environment for distributed design work, which is under continuous development within the Swedish MultiG research program on multimedia application in high-speed networks. Supported by a slowly-changing common database that contains *shared information about who knows what*, team members are treated as *primary objects*, meeting in a tool-oriented *room metaphor* or an *electronic hallway*, using integrated communications media (text, graphics, sound, video). Example applications include team maps, connection exchange, answering machines, bulletin boards, and common whiteboards.

COLLABORATIVE COMPUTING IN A GROUP ENVIRONMENT: THE SMART 2000 CONFERENCING SYSTEM

David A. Martin, SMART Technologies, Inc.

The SMART 2000 Conferencing System integrates a touch-sensitive display board for group presentations with modem-networked personal computers running conventional applications for local or geographically distributed meetings. The product will be available in a meeting room for practical use by interested groups. The author will be available to serve as facilitator and trainer.

TELEPICTIVE, A PROTOTYPE TOOL FOR COLLABORATIVE GUI DESIGN

David S. Miller, Michael J. Muller, John G. Smith, Ellen A. White, and Daniel M. Wildman, Bellcore

TelePICTIVE is an experimental prototype that provides an interface for designers of diverse expertise to cooperate in the design of a graphical user interface (GUI). It uses the abstraction-link-view paradigm of the RENDEZVOUS system to provide shared access to a design space of computer analogs to paper-and-pencil objects. TelePICTIVE supports inter-user awareness through telepointers and linked views. The authors will provide a demonstration and an environment for attendees to explore first-hand groupwarefor GUI design.

THE PICTIVE APPROACH TO COLLABORATIVE DESIGN

Michael J. Muller, Ellen A. White, and Daniel M. Wildman, Bellcore

PICTIVE is a *method for collaborative participatory design* of computer systems, supported by a detailed set of models: an "equal opportunity" *object model* of low-tech design objects; a *process model* emphasizing mutual education, validation, and responsibility; and a *participation model* that attempts to enfranchise all of the stakeholders in a software system (users, developers, writers, marketers, etc.). The authors will facilitate attendees' participation in PICTIVE group design sessions, using either design problems provided by the authors or problems brought by attendees.

ASPECTS™ REAL-TIME CONFERENCING SOFTWARE

Derick E. Naef, David K. Stokely, and Andrew M. Lewis, Group Technologies, Inc.

Aspects is a commercial Macintosh™ application that lets two to sixteen users on a network or modem link work together on a document at the same time and see each other's changes as they happen. Document contents include text, drawing, and bit-mapped painting. The product will be available in a meeting room for practical use by interested groups. The authors will be available to serve as facilitators and trainers.

SASSE: A COLLABORATIVE WRITING TOOL

Dimitrios Nastos and Ron Baecker, University of Toronto

Documents are created through a number of activities, including brainstorming, outlining, writing, editing, and reviewing. SASSE, the Synchronous Asynchronous Structured Shared Editor, supports the different requirements of each of these activities, as well as smooth transitions among these activities (in any order). Synchronous work is aided by color-coding of participants and their selections, views that enhance collaboration awareness, and the use of sound. Asynchronous work is aided by automatically-generated change descriptions and by writer-inserted annotations.

VANNA: A SYSTEM FOR ANALYZING AND ANNOTATING VIDEO RECORDS

Russell Owen, Beverly Harrison, and Ron Baecker, University of Toronto

VANNA is a video annotation system that supports a method for analyzing and "coding" video data of collaborative activities. The system uses a computer with touch screen and on-screen video to make notes about a video tape while it plays, thus reducing analysis time by narrowing the focus of the coder's concentration. Visualization tools for providing overviews of the annotated video tape and identifying possible areas of interest will also be demonstrated.

TELEPHONE-BASED CSCW APPLICATIONS WITH HYPERVOICE

Paul Resnick, Massachusetts Institute of Technology

Telephones are the most ubiquitous, best-networked, and simplest computer terminals available today. They are thus an attractive platform for cooperative work applications such as event calendars, issue discussions, task tracking, and question-and-answer gathering applications — especially those in which

local area network connection of all users cannot be assumed. HyperVoice is an application-generator for telephone-based applications, including a new telephone interface called Skip and Scan that opens up the possibility of complex telephone-based applications. The author will demonstrate the Skip and Scan interaction style and a number of telephone applications that have supported a variety of user activities in the field.

CSILE: A COLLABORATIVE HYPERMEDIA SYSTE M FOR EDUCATION

Peter Rowley, Ontario Institute for Studies in Education

The goal of the Computer-Supported Intentional Learning Environment (CSILE) Project at OISE is to build (a) an instructional theory driven by cognitive science research into collaborative learning processes and expert knowledge organization, and (b) a collaborative educational hypermedia system. The system has been used in classrooms for the past six years, supporting learning for students in grades one to thirteen as well as adults. CSILE supports deep understanding through (a) a cognitively reflective model of learning; (b) encouragement of students to contribute to the social construction of each others' knowledge; (c) knowledge-building environments that facilitate incremental integration of a student's existing knowledge with new information via connective frameworks; and (d) support for teachers to monitor the evolution of students' knowledge in the database. The authors will provide a guided tour of the system, illustrating the social conventions that they have created for effective use, and highlighting points of success and remaining problems.