

# Supporting Awareness and Cooperation in Digital Information Environments

Tom Gross

FIT — Institute for Applied Information Technology

GMD — German National Research Center for Information Technology

tom.gross@gmd.de

## Introduction

The use of the computer has drastically changed during the last decades—from a machine mainly used for calculation to an information and communication device. This change went hand in hand with great progress in information processing and communication support capabilities of computers—both conceptually in areas like user-centred design, hypermedia, or computer-supported cooperative work and technologically in areas like graphical user interfaces, Internet technology, World-Wide Web, information visualisation, or groupware. Several of the early visions of pioneers of these areas such as Vannevar Bush [1945], Douglas Engelbart [1963], or Joseph Licklider [1960; 1968] have already been put into practice.

Nevertheless, it is still rather difficult to immediately get the information wanted in an adequate quality and quantity. One possible way to tackle this problem is to support direct interaction among humans. Humans are still the best information providers for other humans and are able to adapt to contingencies (e.g., speed of the capturing of information of recipient, quality of information, quantity of information, etc.) in a more flexible way than machines.

In my research work I aim at developing concepts and systems supporting spontaneous dialogic exchange of information among humans in order to allow rapid retrieval of information in an adequate quality and quantity. A typical scenario, in which spontaneous dialogic exchange of information is essential, is a situation, in which a person suffers from an anomalous state of knowledge (ASK)—that is, the person knows that she has a lack of information and has only a rough idea of the information needed.

In my Ph.D., for instance, I developed a concept and a prototype for the support of awareness, communication, and cooperation of users of the World-Wide Web. This prototype—the Computer-Supported Cooperative World-Wide Web (CSCW3) prototype—is based on a room metaphor and allows its users incidental or pre-planned

meetings, asynchronous and synchronous information exchange, information sharing, and group navigation through the World-Wide Web.

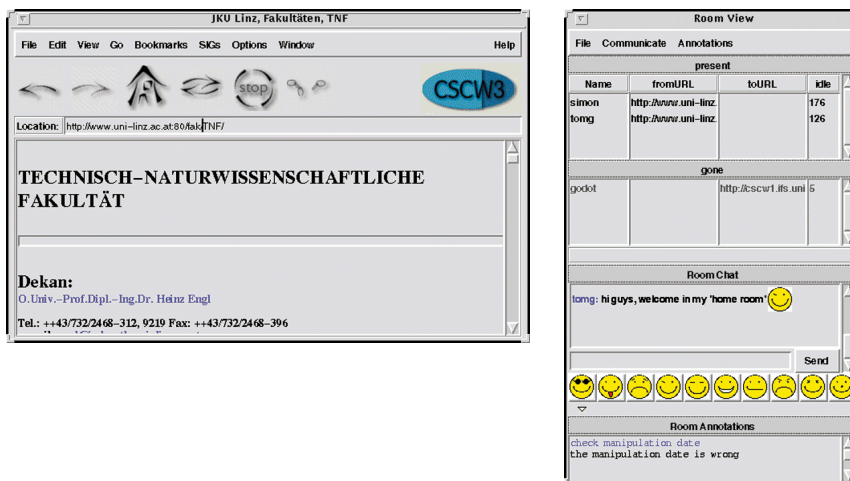
## The CSCW3 Prototype

The CSCW3 prototype constitutes a Web browser with vast collaborative functionality. The fundamental metaphor is the room metaphor. A room consists of a Web page and all users, who are logged in on the same CSCW3 server and who visit the respective Web page at the same time. The CSCW3 prototype provides support for single-user activities as well as for asynchronous, for synchronous, and for semi-synchronous collaboration.

Single-user features include the transfer and display of documents (e.g., Web pages), a history mechanism, a private bookmark list, a private cache, and so forth.

Asynchronous features include the exchange of private bookmark lists (in HTML format), group bookmark lists (i.e., Usenet news-like bulletin board systems with text and URLs), shared caches, asynchronous group awareness information (e.g., persistent users' history lists provide information about navigation paths), and annotations of Web pages.

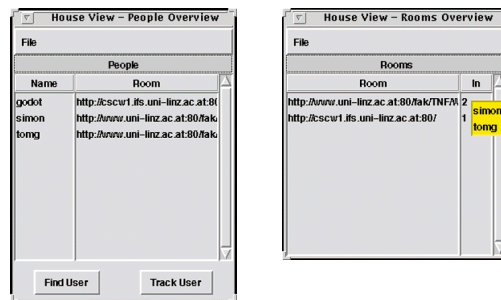
Synchronous features include synchronous group awareness information (e.g., the room view with group awareness information about CSCW3 users in the same room), room chats (IRC-like text chat tools in each room), tracking (coupling CSCW3 browsers), and group chats (IRC-like text chat tools for groups of users of coupled CSCW3 browsers). Figure 1 shows an example of a CSCW3 browser window with the CSCW3 room view. From the CSCW3 room view it can be seen that user simon and tomg are currently visiting the same page and that user godot already left five seconds ago.



**Figure 1.** CSCW3 browser window with the CSCW3 room view.

Semi-synchronous features support easy transitions between single-user activities, asynchronous collaboration, and synchronous collaboration and include people overviews (overviews of all CSCW3 users and the rooms they are in) and rooms overviews (overviews of all populated rooms and their visitors), find user buttons (special buttons to search for other CSCW3 users), and business cards (with Email and talk addresses, etc.). Figure 2 shows examples of the people overview and the rooms

overview. The rooms overview only shows the total number of users visiting the respective page; a click on the number opens a glance view with a list of the users on the respective page.



**Figure 2.** CSCW3 people overview and rooms overview.

The CSCW3 architecture represents a client-server construction consisting of CSCW3 clients managing the visualisation of the CSCW3 main browsing window and the different rooms, navigation, and so forth; a shared cache daemon serialising and processing users' requests and administrating the shared cache; a CSCW3 server daemon administrating central user data, group bookmarks, and annotations, broadcasting messages within rooms, and so forth; and various HTTP daemons of standard Web servers. The CSCW3 prototype is implemented in Tcl, Tk, and Tcl-DP [Ousterhout 1994].

Informal *studies of user behaviour and interviews* of test users concerning their satisfaction with the CSCW3 prototype revealed that users rarely closed the room view and that they found the information it provides interesting. Even users, who navigated rather fast (i.e., stayed less than ten seconds per Web page) glanced at the room view to see who else was visiting the same Web page. The room overview window was mainly used when users were aware that only a small group of users (six maximum) were using CSCW3. Interviews revealed that in larger groups the room overview list was too long and users were not willing to read them. The people overview window was often opened, especially for searching other users.

## Related Work

Several prototypes and systems have been developed to support awareness, communication, or cooperation of users of the World-Wide Web. Examples of systems primarily supporting asynchronous cooperation are shared global information spaces such as BSCW [Bentley *et al.* 1995] or Mushrooms [Kindberg 1996]; annotation systems such as HyperNews [LaLiberte 1995] and the ComMentor [Roescheisen *et al.* 1995]; and social filtering systems such as GroupLens [Konstan *et al.* 1997]. Examples of systems supporting synchronous cooperation are MOO-Gopher [Masinter & Ostrom 1993]; GroupWeb [Greenberg & Roseman 1996]; Sociable Web [Donath & Robertson 1995]; and Awareness protocol for the WWW [Palfreyman & Rodden 1996]. MetaWeb [Trevor *et al.* 1997] and CoBrow [Sidler *et al.* 1997] are interesting toolkits for awareness on the Web.

## Conclusions

In the Basic Research Symposium I would like to discuss approaches for the convergence of information and communication technology. The CSCW3 prototype, which supports awareness, communication and cooperation of users of the WWW, can be seen as a little step towards this direction.

## Biographical Information

Tom Gross recently joined GMD, where he is currently working in a project on an awareness information environment called NESSIE. In the years 1993-9 he was working at the Institute of Applied Computer Science at the Johannes Kepler University of Linz, Austria, where he received his Ph.D. in 1997. His research interests include CSCW, HCI and global Internet-based information systems.

## References

- Bentley, R., Horstmann, T., Sikkell, K. and Trevor, J. Supporting Collaborative Information Sharing with the World Wide Web: The BSCW Shared Workspace System. In *Proceedings of the Fourth International WWW Conference - WWW'95* (Dec. 11-14, Boston, MA). O'Reilly, Sebastopol, CA, 1995. pp. 63-74.
- Bush, V. As we may think. *The Atlantic Monthly* 176, 1 (July 1945). pp. 101-108.
- Donath, J.S. and Robertson, N. *The Sociable Web*. Presented at Workshop on WWW and Collaboration at the Fourth International WWW Conference - WWW'95 (Sept. 11-12, Boston, MA). MacArthur, K., ed. World Wide Web Consortium, 1995.
- Engelbart, D. *A Conceptual Framework for the Augmentation of Man's Intellect*. In Howerton, P., ed. *Vistas in Information Handling*. Spartan Books, Washington, DC, 1963. pp. 1-29.
- Greenberg, S. and Roseman, M. Short Paper: GroupWeb: A WWW Browser as Real-Time Groupware. In *Conference Companion of the Conference on Human Factors in Computing Systems - CHI'96* (Apr. 13-18, Vancouver, Canada). ACM, N.Y., 1996. pp. 271-272.
- Kindberg, T. *Mushroom: A Framework for Collaboration and Interaction Across the Internet*. Presented at ERCIM Workshop on CSCW and the Web (Feb. 7-9, Sankt Augustin, Germany). Busbach, U., Kerr, D. and Sikkell, K., eds. Arbeitspapiere der GMD 984, 1996.
- Konstan, J.A., Miller, B.N., Maltz, D., Herlocker, J.L., Gordon, L.R. and Riedl, J. GroupLens: Applying Collaborative Filtering to Usenet News. *Communications of the ACM* 40, 3 (Mar. 1997). pp. 77-87.
- LaLiberte, D. *Collaboration with HyperNews*. NCSA, National Centre for Supercomputing Applications, University of Illinois, <http://www13.w3.org/Collaboration/Workshop/Proceedings/P6.html>, 1995. (Accessed 03/05/99).
- Licklider, J.C.R. Man-Computer Symbiosis. *IRE (now IEEE) Transactions on Human Factors in Electronics HFE-1* (Mar. 1960). pp. 4-11.
- Licklider, J.C.R. The Computer as a Communication Device. *Science and Technology* (Apr. 1968).
- Masinter, L. and Ostrom, E. *Collaborative Information Retrieval: Gopher from MOO*. Xerox PARC, 3333 Coyote Hill Rd., Palo Alto, CA, 1993.
- Ousterhout, J.K. *Tcl and the Tk Toolkit*. Addison-Wesley, Reading, MA, 1994.
- Palfreyman, K. and Rodden, K. A Protocol for User Awareness on the World-Wide Web. In *Proceedings of the ACM 1996 Conference on Computer-Supported Cooperative Work - CSCW'96* (Nov. 16-20, Boston, MA). ACM, N.Y., 1996. pp. 130-139.

- Roescheisen, M., Mogensen, C. and Winograd, T. Short Paper: Interaction Design for Shared World-Wide Web Annotations. In *Conference Companion of the Conference on Human Factors in Computing Systems - CHI'95* (May 7-11, Denver, CO). ACM, N.Y., 1995. pp. 328-329.
- Sidler, G., Scott, A. and Wolf, H. Collaborative Browsing in the World-Wide Web. In *8th Joint European Networking Conference* (May 12-15, Edinburgh, UK). 1997.
- Trevor, J., Koch, T. and Woetzel, G. MetaWeb: Bringing Synchronous Groupware to the World-Wide Web. In *Proceedings of the Fifth European Conference on Computer-Supported Cooperative Work - ECSCW'97* (Sept. 7-11, Lancaster, UK). Kluwer Academic Publishers, Dordrecht, NL, 1997. pp. 65-80.