

GroupWeb: A WWW Browser as Real Time Groupware

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ABSTRACT

GroupWeb is a browser that allows group members to visually share and navigate World Wide Web pages in real time. Its groupware features include document and view slaving for synchronizing information sharing, telepointers for enacting gestures, and relaxed “what you see is what I see” views to handle display differences. A groupware text editor lets groups create and attach annotations to pages. An immediate application of GroupWeb is as a presentation tool for real time distance education and conferencing.

Keywords

Word wide web, groupware, shared visual workspaces.

INTRODUCTION

The World Wide Web is becoming a universal repository for distributed information, with Web browsers becoming the standard way that people search for and display items of interests. Although the information is a shared resource authored by the community, Web browsers are still single user tools that partition one person from another.

What if Web browsers were redesigned as groupware that allowed people to share views of pages? Such a browser would be a valuable presentation tool for real time distributed meetings for several reasons. First, relying on a user’s established Internet connection removes the complex telephone setups required by many conferencing tools. Second, the prevalence of the HTML document standard on the Web means that a large amount of existing information can be brought into the meeting. Third, most computer-literate people are now familiar with the interfaces of Web browsers, so little training would be required.

A few browsers today provide rudimentary groupware abilities e.g., NCSA Mosaic and [1]. Typical features include page synchronization and chat windows. Drawing on research into groupware workspaces and shared drawing tools [2], we suggest a set of changes that can turn Web browsers into excellent presentation tools. These are described by way of our implementation of GroupWeb, a browser that allows distributed groups to navigate and

share Web pages in real time.

THE GROUPWEB DESIGN

GroupWeb is built on top of GroupKit, a groupware toolkit [3]. Like normal Web browsers, GroupWeb fetches and displays HTML pages. However, several people can enter a GroupWeb session via a session manager (Figure 1f). Each participant runs their own GroupWeb replica, and the browser becomes a shared visual workspace (Figure 1a). Each replica has independent access to the Web, but they communicate directly to each other to stay synchronized.

GroupWeb is founded on five design requirements: document slaving for synchronizing pages, relaxed “what you see is what I see” views to handle display differences, view slaving for synchronous scrolling within pages, telepointers for enacting gestures, and group annotations that can be attached to pages. Each are described below.

Document slaving for synchronizing pages

The most basic act of a presenter is selecting material (a slide or page) and bringing it to the group’s attention. In GroupWeb, the material is an HTML page that the presenter selects by navigating a link. GroupWeb guarantees that all the browsers in the session receive a copy of the page, which we call document slaving. It does this by instructing all its replicas to fetch the new page, specified by the HTTP address.

Relaxed “what you see is what I see” views

In face to face meetings, all people see exactly the same thing. In distributed meetings, a similar effect can be achieved by strict “what-you-see-is-what-I-see” (or strict-WYSIWIS), where the visuals are kept identical across all displays. However, display sizes and personal desires differ, and it may be onerous to impose this constraint onto distributed meeting participants. GroupWeb “relaxes” strict-WYSIWIS by permitting windows to be different sizes, and by reformatting the text to fit the display nicely. While this means that people may not see exactly the same thing, it does provide more flexibility for the way each person wishes to view their page.

View slaving for synchronous scrolling

Most HTML pages require scrolling as they rarely fit completely within a window. In a shared document, scrolling can be independent or synchronized. GroupWeb allows both. Independent scrolling, a form of relaxed-

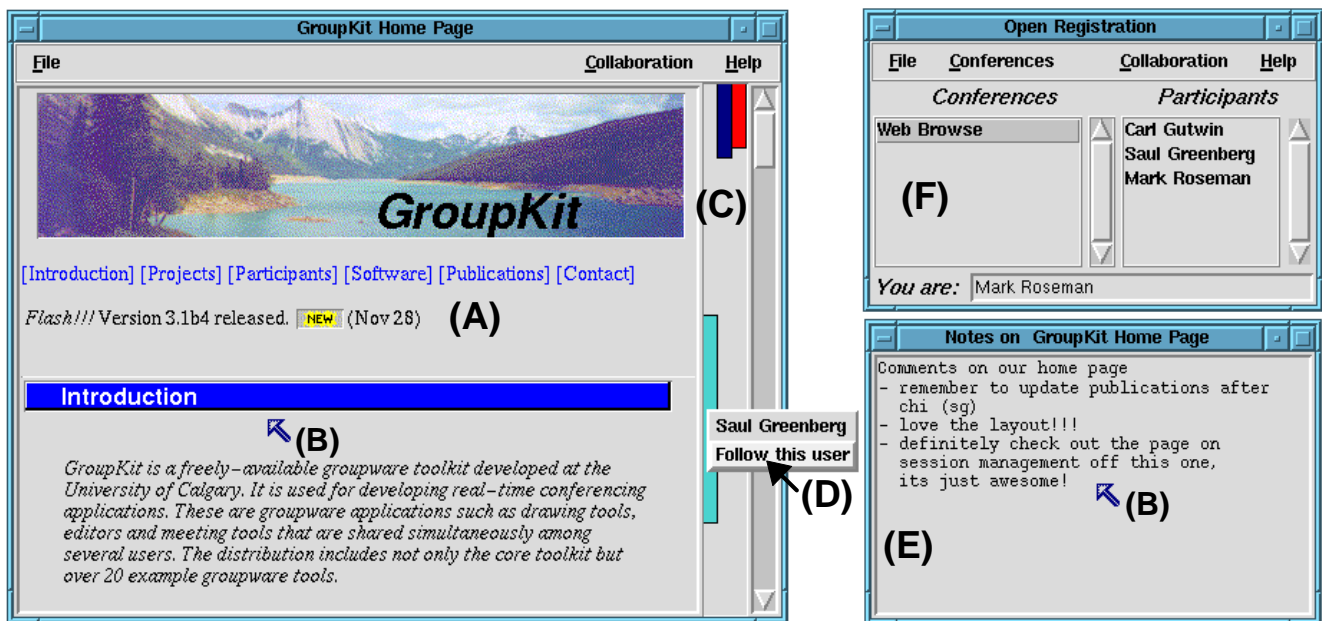


Figure 1. GroupWeb, showing (a) a shared web page, (b) telepointers, (c) multi-user scrollbars, (d) view-slaving controls, (e) a group annotation tool, and (f) a session manager for joining the GroupWeb conference.

WYSIWIS appropriate for loosely coupled collaborations, is the default. People can have viewports onto different parts of the page, with feedback on other's locations shown via multi-user scrollbars (Figure 1c). Each colored bar represents how much a particular participant can see, as well as the overlap between views, if any. Synchronized scrolling, on the other hand, automatically aligns viewports. To enable this, a menu on each bar is raised (Figure 1d), with the menu (and the bar's color) identifying the participant it represents. Selecting "Follow this user" causes the local display to scroll in synchrony with the other. Because synchronization is one-way (unless the other person also slaves the view), the local user can still scroll quickly to other parts of the page for quick glances.

Gesturing through telepointers

Hand gestures play an important role in any work surface activity, and presentations are no exception. We use them to enact ideas, to signal turn-taking, to focus attention of the group, and to reference objects on the work surface [2]. As with many groupware workspaces, GroupWeb uses telepointers as a way to transmit and display gestures (Figure 1b). Because the display is relaxed-WYSIWIS, telepointers are attached to letter positions rather than Cartesian coordinates. This means that the pointer will always be over the same text on all displays.

Attaching group annotations to pages

While the original web document is not editable, people can attach shared annotations to any page. GroupWeb includes an annotation tool (Figure 1e), which is a multi-user text editor. Users can enter and edit text at any time, which is displayed on all screens. As well, the annotation is

automatically keyed to the current web page. Changing to a new page clears the editor, while returning to an annotated page restores the text annotation in the editor. Annotations can be used for almost anything: group note-taking, collecting comments, suggesting revisions, and chatting.

DISCUSSION AND SUMMARY

We have described a system called GroupWeb which leverages the ubiquity of the Web by adding features found in real-time groupware systems. This combination can yield a powerful presentation tool that could be used for many purposes, including distance education, distributed meetings, and small group collaboration.

Groupware browsers, however, will have to evolve along with the capabilities of Web pages. Page synchronization works now because current pages contain mostly static information. With the recent introduction of both forms and the Java language, pages will have to synchronize themselves at the input event level (for forms) and script execution level (for Java) as well.

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