

Casual Multi-user Web Collaboration by Lowering Communication Barriers

Junko Ichino, Yasuhiro Kojima, Shun'ichi Tano, and Tomonori Hashiyama

Graduate School of Information Systems

University of Electro-Communications

Tokyo, Japan

{ichino, yas, tano, hashiyama}@is.uec.ac.jp

Abstract—Our goal is to support casual communication between users on the Web by lowering the various barriers --- community, psychological, and awareness --- that impede smooth communication on the Web. Our prototype system enables communication over the entire Web space (beyond Web community services), real-time semi-active communication, and mutual visualization of users. In an informal evaluation, the seven participants reacted mostly positively to the concept and expressed interest in using such a system.

Keywords—Web; casual communication; semi-active communication; communication barriers

I. INTRODUCTION

Interpersonal communication is essential to daily life. People are greatly affected by communications with others. From this communication, people can gather information and share opinions, which cannot be done alone, and can work cooperatively with others. In addition, they may even develop a sense of unity and provide mutual reassurance.

In antiquity, virtually the only medium of communication was face-to-face verbal interaction. In more modern times, the development of postal mail, telephone, facsimile and e-mail enabled and facilitated communications with people both near and far away. Now, with the continuing development of the Internet, various services on the Web such as message boards, chat, and social networking have appeared, providing new ways to communicate. Such services will likely enrich communication as well.

However, while these various new services are convenient for those who can master information technology or those who are willing to join a new form of community, the entry barriers remain high for others. We aim to encourage casual Web collaboration by lowering these entry barriers.

In the following section, we describe related work and analyze the communication barriers. In section 3, we present the concept of our system. We describe our interfaces in section 4 and our prototype implementation in section 5. In section 6, we discuss the results of a trial experiment. We conclude with a look at some open questions.

II. RELATED WORK AND ANALYSIS

People typically join online communities seeking information, encouragement, and/or conversation. Various

specialized communities have been created and proposed, such as one that enables users who concurrently browse the same music contents to exchange information [1], one that enables users to annotate scenes in TV programs [2], one that support communications with estranged acquaintances [3], and one that supports the formation of new Internet-based communities that are based on common interests [4].

Ironically, this explosion of on-line communities has made it harder for users to find ones that are attractive and to register with each community. Moreover, once a user has found one, it may not be easy to truly join the community if it is well established, with a particular culture and communication style [1]. Moreover, members may have trouble recognizing others in the community as individuals because of the lack of face-to-face communication. This can make it difficult for them to share a sense of unity or a sense of reassurance. Moreover, if a member temporarily leaves the community, he or she may lose touch with the other members, so they are unable to recognize one another's existence and/no longer aware of one another's existence and cannot interact with one another. In short, there are still many barriers to smooth communications on the Web.

We have developed a system that supports casual communication between users on the Web, by lowering the various barriers that impair communication [5].

III. CONCEPT

The concept behind our system is to promote barrier-free communication between users on the Web by overcoming three barriers to communication.

A. Community barrier

A user should be able to communicate beyond Web communities. Although many people visit many Web sites every day, they are generally unaware of each other's presence. The ability to communicate casually on the Web requires that users be able to interact freely with each other without being constrained by a community.

B. Psychological barrier

A passive participant should be able to express him or herself without hesitation. The participation of passive users as well as active ones would bring more diversity to the community. Reducing the mental burden of communicating on the Web requires the development of means that support semi-active communication, i.e., communication by means other than having to "talk" directly to someone.

C. Awareness barrier

Users should be able to communicate with an awareness of others. To gain a sense of unity and/or a sense of reassurance, it is important for users to be able to feel the presence of others on the Web.

IV. INTERFACE DESIGN

We designed a user interface that reduces the three barriers described above (see Figure 1).

A. Whole Web Space as Place to Communicate

To lower the community barrier, we make the whole Web space a place to communicate. Our first prototype is an original browser using Microsoft IE Component. A user can access any page in the same way as when using a general Web browser. The user can also communicate with other users who are browsing the same page at the same time.

B. Avatar Awareness

To improve awareness of others on the Web, we use avatars to represent users (see Figure 1). It has been shown that users can recognize the social existence of others through artificial conversation using an avatar or agent [6]. In our system, all users who are concurrently browsing a page are visualized as avatars. The avatars are displayed at the position on the page where the corresponding user's pointer is located. Each avatar moves in accordance with the pointer's movement. Moreover, as shown in Figure 1 (c), several boxes are displayed on the right showing the bookmarked sites along with the avatars of the other users who were accessing the bookmarked sites at the same time as the user.

C. Semi-active Communication

To support semi-active communication with less mental burden, we designed two different interfaces.

The first interface displays the user's browsing history to the other users (see Figure 1 (a)). This information reflects the user's interests and preferences and is presented next to the user's avatar. It includes the titles of the previously accessed pages (up to ten) and that of the page to which the user has moved once he or she has left the current page. Once a user moves to another page, his or her avatar, along with the browsing history, is shown at the edge of the page for 3 or 4 minutes (see Figure 1 (d)). Another user can thus easily follow him or her by clicking on the displayed hyperlink.

The second interface incorporates a function for automatically following, i.e., "piggybacking," another user's browsing activities (see Figure 1 (b)). For example, if Jimmy, one of the example users shown in the figure, finds that he shares similar interests with Annie, Jimmy can click on Annie's avatar, and, if Annie agrees, Jimmy's avatar automatically follows the movements of Annie's. As Annie's avatar moves around the page, Jimmy's moves with it. If it moves to another page, Jimmy's follows along. This means Jimmy can browse sites without doing anything.

These two interfaces enable users to communicate valuable information without directly interacting. We believe that this will lead to the next stage in user communication.

We also designed an interface that supports direct communication. Users who are browsing the same page can chat with each other by using text (see Figure 1 (a)) and graphics (see Figure 1 (e)). The messages are displayed on the screens of all users who are currently accessing the page.

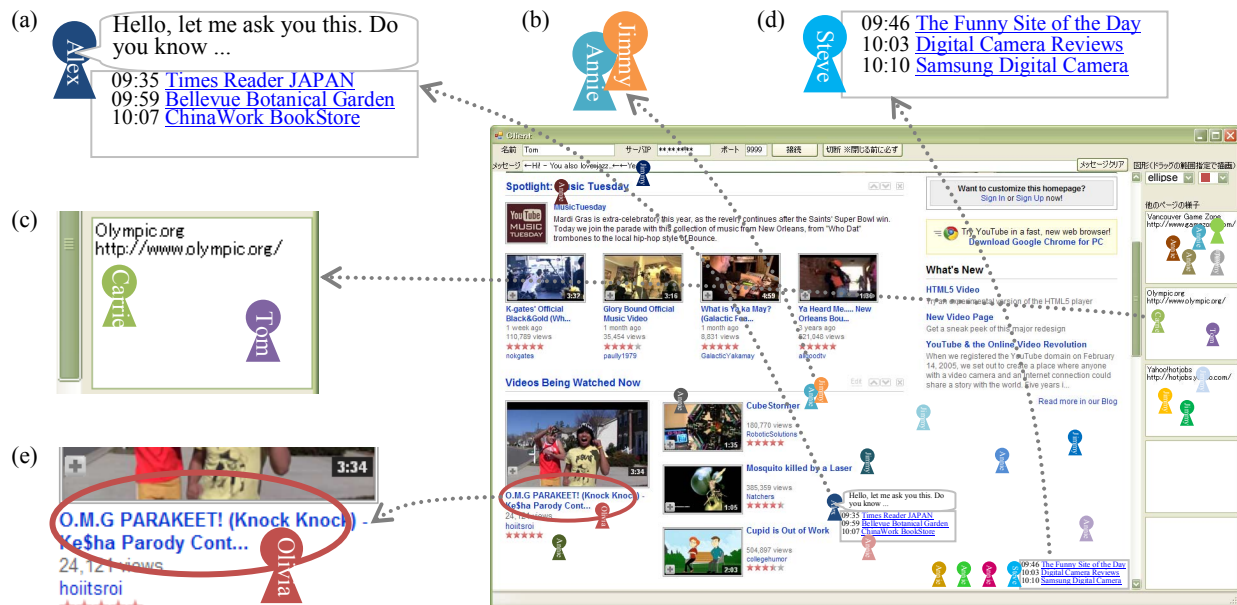


Fig. 1 User interface design.

V. IMPLEMENTATION

We implemented our system as a client-server system developed in Microsoft Visual C# on the .NET platform (see Figure 3, upper). We developed a client application, i.e., a prototype Web browser that can capture the client's browsing data. The captured data include

- the URL of the website being browsed,
- the location of the mouse pointer on the browser,
- messages to others,
- annotation data, including the types of graphic objects and their color, location, and size,
- and any piggybacking data.

Each client sends these data in real time to the server. The server in turn sends each client visiting the same Website the data for the other clients visiting that Website.

A future enhancement to the system architecture will enable any Web server with the proper plug-in to work as a server for our system (see Figure 3, lower). Not only would this disperse the load, it would enable Web service providers to obtain information about their service users, assuming, of course, that privacy issues are addressed.

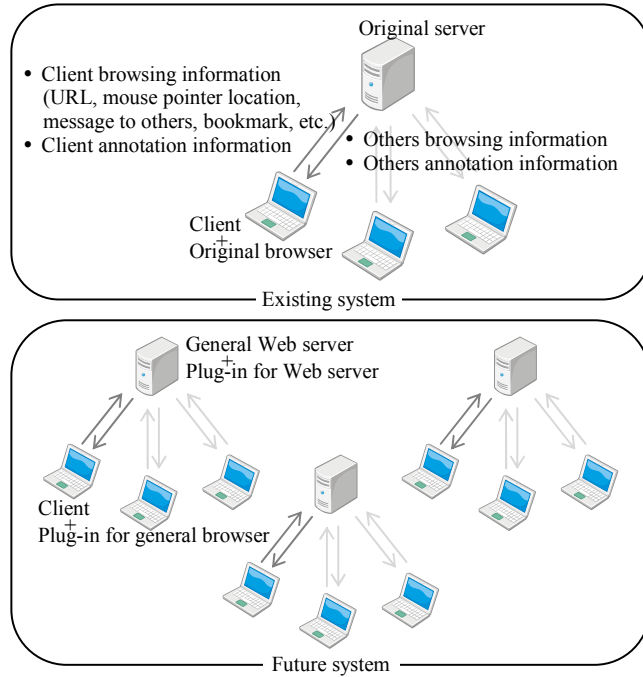


Fig. 2 System architecture.

VI. TRIAL USE

Seven participants used our prototype for one hour (see Fig. 3). We asked them to "exchange information on the international economic crisis with the other participants." Table 1 lists the number of participants used implemented functions. This result shows that users used a series of proposed functions.

Each participant was then asked to evaluate their experience by responding to ten questions using a five-point

rating scale. Positive evaluations were given for eight of the ten. In particular, the "piggybacking" function received high evaluation marks. On the negative side, they complained that the avatar and figure annotation interfered with the browsing.

We also realized the following points qualitatively from our observation. Almost participants communicated with others in a positive way through the experiments. There were little observations that participants hesitated or rejected to someone's message asking for acceptance of use of "piggybacking" function or move to another page together. However, there were a tendency to be interrupted their communication when they move to another page together. It seems that this is because the system delay and network delay cause a few seconds of absence of the user A who are supposed to follow the user B.

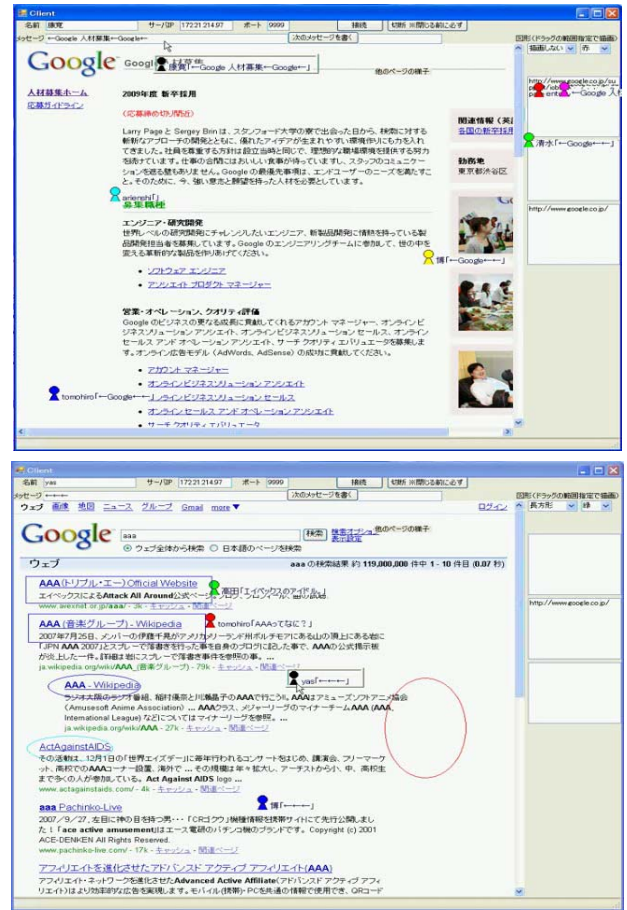


Fig. 3 Screenshots during the trial use.

TABLE I. NUMBER OF PARTICIPANTS USED IMPLEMENTED FUNCTIONS

Implemented function	Subject 1	Subject 2	Subject 3
Number of times subject chat with other subjects using text	14	10	19
Number of times subject chat with other subjects using graphics	6	0	2
Number of times subject moved to another page himself/herself	14	23	21
Number of times subject moved to another page using "piggybacking" function	5	7	2
Number of times subject followed other absentee subjects by clicking on the displayed other subjects' hyperlink.	4	2	1

VII. CONCLUSION

We have developed a system that supports casual communication between users on the Web. Our aim is to lower the various barriers to communication --- community, psychological, and awareness.

Many open questions remain for future research. Some of these are user interface issues. Should all avatars be represented? What are the best expressions for the avatars? For page with a great number of concurrent users, like Google's top page, the innumerable avatars would make it impossible to actually view the page. Other questions are more algorithmic and technical, such as, "how can we ensure user privacy?" Perhaps most importantly, from a legal standpoint, should a user be held responsible for his or her avatar's actions?

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