Bringing Round-Robin Signature to Computer-Mediated Communication

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Abstract. In computer-mediated group communication, anonymity enables participants to post controversial comments without risking accusations of improper behavior. While this may encourage more open and frank discussion, it diminishes accountability. In addition, anonymous comments are perceived as weaker than non-anonymous comments. We propose a communication protocol that allows a user to send a strong message to the group without having to assume sole individual responsibility. The system posts an anonymous comment, and then calls for supporters. When sufficient numbers of supporters have been gathered, the system reveals the names of all supporters as a round-robin signature. This prevents the originator from being identified. We describe the implementation of this protocol in a text-based chat system, and report our experience operating it at two technical conferences.

Introduction

Group communication plays a major role in group decision-making, information exchange, and other social processes. However, it can be difficult to express honest thoughts to a group. For example, a new group member may feel uneasy about submitting a controversial comment that might irritate established members. This kind of difficulty is more profound in Asian cultures, where modesty is valued and improper comments by junior members are strongly punished by senior members.

Anonymity lowers this entry barrier by allowing such participants to submit a comment without the risk of being accused of impropriety. Anonymity is common in Web-based communications. For example, the news and commentary

Web site Slashdot posts both anonymous and non-anonymous comments. On the Japanese BBS site 2channel, nearly all of the posts are anonymous. Anonymity also appears in closed-group communications, such as group decision-making systems, and its effectiveness is a hot topic in psychological research (Jessup and George, 1997; Nunamaker et al., 1997; Joinson, 1999, 2001; Postems and Lea, 2000).

However, anonymous comments are often valued less than comments with signatures, and it can be difficult to send a strong message to the community through anonymous comments. On Slashdot, for example, anonymous posts are given lower default scores by the moderation system. Anonymous users are called "anonymous cowards," and their posts are likely to be skipped or filtered out (Lampe and Resnick, 2004). In other situations, such as in educational communications in schools or at academic conferences, anonymity is discouraged.

We propose a communication protocol that overcomes the inherent weakness of anonymous comments. Users can send a strong message to the community while avoiding the risk of assuming a large individual responsibility. The original comment is submitted anonymously and displayed to the group, along with a request for supporters. When the number of supporters reaches a certain number, the system reveals the names of all supporters as a round-robin signature, which conceals the identity of the first person to submit the comment. In this way, the protocol combines the advantages of anonymous and non-anonymous communication. It is most useful when provided as an extension to normal anonymous or non-anonymous communication.

We implemented the protocol on a non-anonymous text-chat system. The system was used during two technical conferences as a communication backchannel during presentation sessions. We analyzed the chat log and found that our system encouraged non-anonymous postings of sensitive comments.

Round-Robin Communication Protocol Design

We combined the round-robin signature method, which is traditionally used in petitions, with modern computer-mediated communication (CMC).

Round-Robin Signature

Round-robin is a group signature method in which the names of the signatories are arranged in a circle to represent equality (Figure 1). This form of signature list has been used in petitions throughout history when a risk of severe punishment was imposed to help groups conceal their leaders and prevent them from assuming all of the responsibility for the petition.
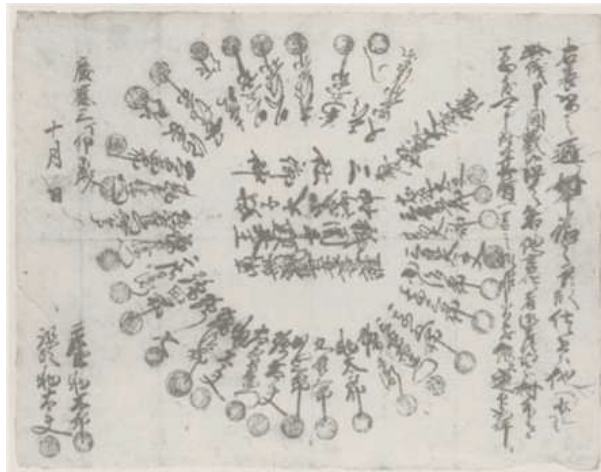
Figure 1. Example of a round-robin sigunature (from the work of Yamamoto, 1994).

This method has been practiced in many countries. For example, it was adopted by sailors petitioning officers in the British Royal Navy (Rediker, 1987), and Japanese farmers and peasants of the Edo period used this signature style when they presented a petition against misrule (Hosaka, 2002). We believe that this practice is universal, and can be effective in modern CMC.

Communication Flow

The protocol begins with an anonymous post by a user. Other users see the post and can choose to support the comment. These responses are hidden by the system until the post gathers a sufficient number of supporters. When this is achieved, the names of the originator and the supporters are revealed as a round-robin signature. At this point, everyone in the group knows who supports the original post, but no one knows its originator—except for that person. If the post fails to gain enough supporters, it remains anonymous. The number of supporters required to show the round-robin signature can be customized by the originator.

This communication protocol is designed to be an extension to anonymous or non-anonymous communication. When the protocol is combined with anonymous communication, users can enhance their influence with minimum risk. When the protocol is combined with non-anonymous communication, users can contribute to a discussion without the risk of being accused of making improper comments.

Benefits and Promising Situations

The protocol combines the best properties of anonymous and non-anonymous communications. Like anonymous communication, it lowers the barriers to entering a discussion, and yet, as in non-anonymous communication, gives weight to the comment. Furthermore, like moderating systems, it appropriately enhances or

weakens the influence of the post. Displaying the names of supporters in round-robin reminds the users of historical petitions, and strongly unites the signatories. These effects would be more apparent in closed-group communications, when users are able to easily identify others by their name.

In addition, the protocol is similar to a ritual in that it promotes coordination by forming common knowledge among participants (Chwe, 2001). With CMC, it is difficult to create a common knowledge base among the participants because they cannot view the activities of others. In the round-robin protocol, anonymous communication allows participants to safely examine the activities of their peers.

We believe that the proposed protocol can be useful in several situations. For example, in educational communication in schools or at academic conferences, when people are pressured to participate actively and anonymous participation is discouraged, the proposed protocol serves as an intermediate stage between anonymous and active non-anonymous participation. It can be provided as a backchannel for face-to-face communication in the classroom, as in Rekimoto et al. (1998) and Barkhuus (2005). This is particularly helpful in Asian cultures, in which people are generally too reserved to actively participate in a discussion.

In situations with asynchronous decision making by teams or groups, which typically occur on mailing lists or online discussion boards, silent members prefer to be seen as passive supporters. As a result, the responsibility for decisions is usually concentrated within a small group of active supporters. The proposed protocol can encourage active support by silent members and the sharing of responsibility.

User Interface Design

We implemented a chat system with the proposed protocol, Lock-on-Chat IKKI. It is based on Lock-on-Chat (Nishida and Igarashi, 2005), a text-chat system in which the users can share images and chat about the images in anchored windows. It has been used by audiences to exchange comments on slides during live presentations. 'Ikki' is a Japanese word meaning "riot" or "petitions."

Figure 2(a–d) shows a screenshot of the Lock-on-Chat IKKI client. It consists of four components: thumbnails for managing received images (a), a main image window for viewing and chatting about images (b), an icon palette for initiating the round-robin communication protocol (c), and a log that displays all of the messages in chronological order (d).

The user can upload images to the server by drag-and-drop to the client window and the uploaded images will be instantly shared by all clients. One of the images is shown in the main image window, and the user can switch to different images by clicking the corresponding thumbnails.
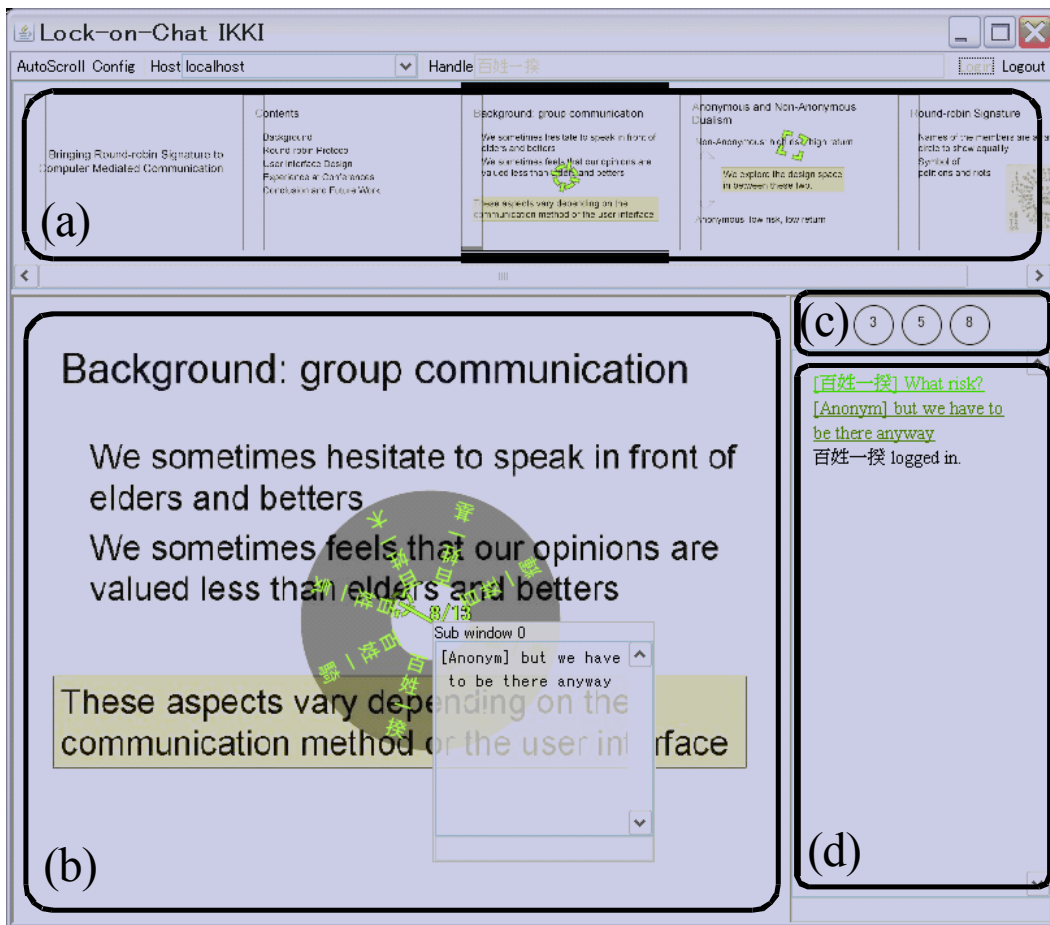
Figure 2. Screenshot of the Lock-on-Chat IKKI client.

Lock-on Message Posting

The user creates a new chat window anchored to an image (lock-on) by clicking on the image and typing in the first message (Figure 3). Other members are notified about the lock-on through multiple components.

Figure 3. Creating a new chat window (lock-on).

First, thumbnails indicate the location of lock-ons (Figure 2(a)). Second, messages in the anchored chat windows are also shown in the log component (Figure 2 (d)), and the user can jump to the corresponding image by clicking on the anchored messages.

We believe that this function is well suited to the round-robin protocol for several reasons. First, users have to be well prepared mentally before creating a new lock-on because it draws major attention from the group via multiple notifications. This barrier can be reduced by the proposed communication protocol. Second, users can easily create multiple communication threads and initiate several round-robin protocols simultaneously.

User Interfaces for the Round-Robin Communication Protocol

The round-robin protocol consists of three steps: an anonymous call for supporters, support by other users, and the appearance of a round-robin signature.

Figure 4(a) illustrates how round-robin communication is initiated. First, the user drags the icon from the icon palette onto the image. Then, the user types the first message into the input area that appears at the drop location. This will create a new chat window, as in lock-on messaging. A reminder is shown below the input area to avoid confusion with the lock-on function. The user can specify the number of supporters required to show the round-robin by using different icons with predefined numbers. To avoid clutter, we did not provide a precise control for this number.

Other participants who support the anonymous originator double-click on the anchor or select 'Support this topic' from the context menu (Figure 4(b)). All users will be notified immediately when the number of supporters has increased.
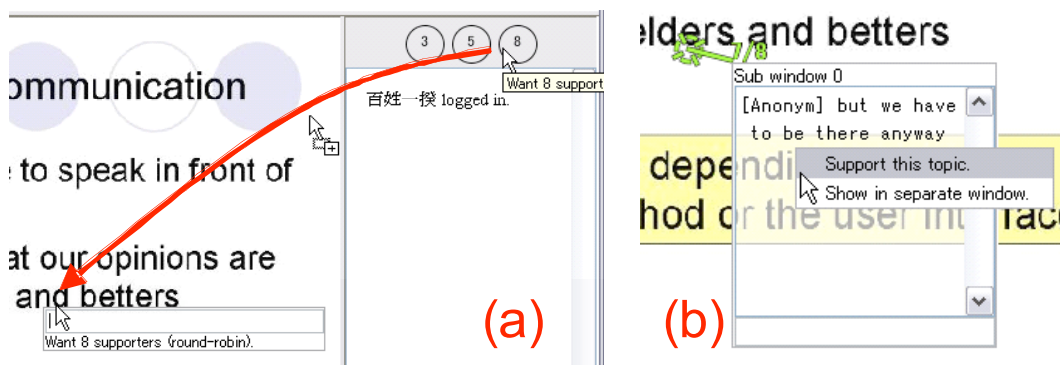

Figure 4. User interfaces for round-robin communication in Lock-on-Chat IKKI: (a) initiation and (b) response as a supporter.

The names of the originator and the supporters are revealed as a round-robin signature when the number of supporters reaches the threshold specified by the originator. The round-robin appears with an animation effect (Figure 5).
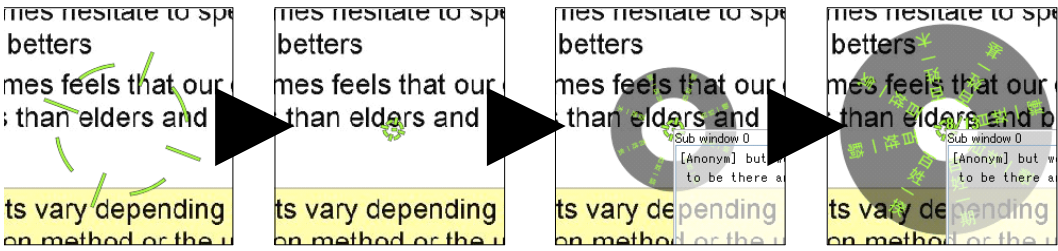
Figure 5. Animation effect when the round-robin appears.

Experience as a Backchannel at Conferences

We operated Lock-on-Chat IKKI at two technical conferences as a communication backchannel during the presentation sessions. During the presentations, most attendances were in the main conference room, equipped with their own laptop computer (Figure 6). The contents of the main screen were captured manually and uploaded to the server by an operator.
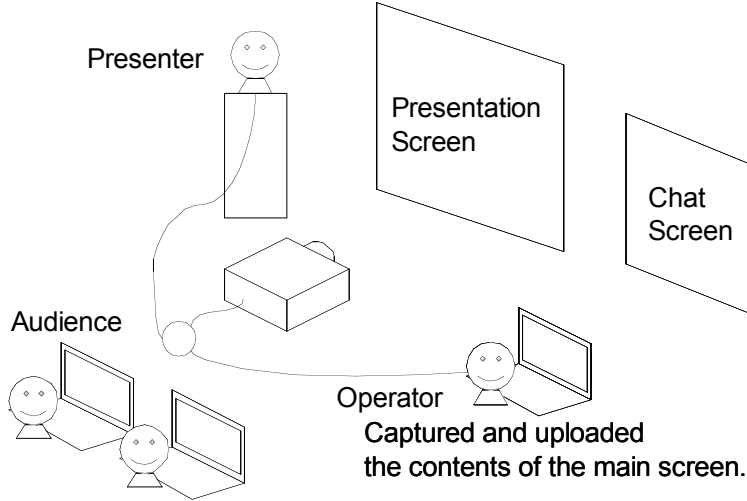

Figure 6. Operational setup.

First Trial Experience

The first operation took place at the Workshop on Interactive System and Software (WISS) 2006. WISS is an annual workshop in Japan focusing on user-interface technologies. It is a single-track conference and approximately 150 participants attend the workshop each year. Presentation sessions have been augmented by chat systems since WISS'97 and various chat systems have been tested

since then (Rekimoto et al., 1998). Most participants at WISS are familiar with Lock-on-Chat because it was used at WISS 2004 and 2005.

We provided icons calling for 4, 8, 16, and 32 supporters. Because it was our first trial, we had no previous information about the most appropriate setup.

Results and Observations

The system was used by 108 users. However, in the first day, they did not use the round-robin protocol except in some test trials. The users had to play with the user interface a few times to see what happened when they used it. Interestingly, most users agreed to use their real names or easily identifiable nicknames (91 users), although it was generally common for participants to use an unidentifiable nickname (59 out of 95 users at WISS2004). The round-robin protocol encouraged the use of real names.

Practical uses of the round-robin protocol were seen after the second day. It was mostly used to express critical opinions that were constructive but difficult to express. Examples were 'I'm suspicious of the scalability of this user interface,' 'I think this one (a related work) is more interesting,' and 'Is this an appropriate target with which to compare?'

More casual uses of the round-robin protocol increased on the third day. Some of them were just for fun and games. Examples were 'Crash, crash! (during the live demo)' and 'Anybody like the night session better?'

Just before the end of the conference, an anonymous call stated 'I will definitely come to WISS again.' While this kind of post is not risky, it can be a little embarrassing, and might represent another kind of situation to use the round-robin protocol.

The first operation highlighted issues related to the number of supporters required to reveal the round-robin signature. Many anonymous calls remained anonymous because they had gathered only about half of the original call. Some users commented that they felt disappointed when the round-robin was shown and the system did not allow them to join afterward.

Log Analysis

Figure 7 shows the number of calls and the number of revealed round-robins (the calls that gathered sufficient supporters). In total, about one-third of the calls gathered a sufficient number of supporters. Originators tended to require a larger number of supporters than actually joined. This low rate does not necessary indicate the failure of our approach, as it is preferable for only important posts that attract sufficient support to be revealed.

Most of the calls were for 4 or 8 supporters, but some users tried larger calls of 16 or 32. Larger calls were obviously more difficult to accomplish. The only exception involved a call for 32 supporters for the message previously mentioned: 'I will definitely come to WISS again.'
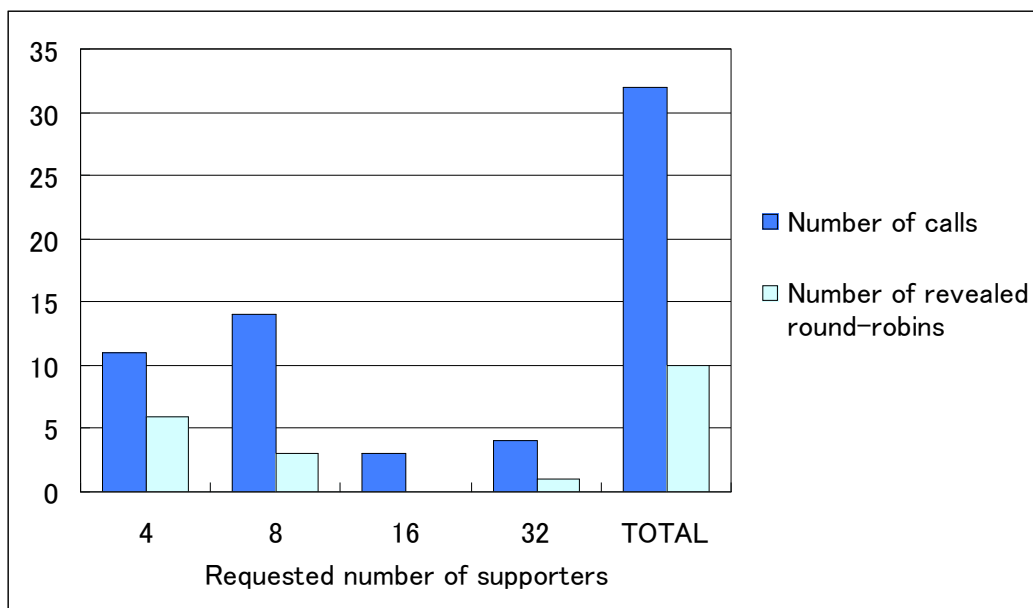
Figure 7. The number of calls for supporters and the number of revealed round-robins during the first trial experience.

Second Trial Experience

The second operation took place at the 48th Programming Symposium. The Programming Symposium is an annual meeting in Japan, focusing on programming and software technologies. It is a single-track conference with approximately 100 participants each year. Presentation sessions have been augmented by a normal text-chat, so very few participants had experience with Lock-on-Chat. We were not allowed to operate our system exclusively and it was run as a second chat system in parallel with a normal text-chat.

We modified the round-robin protocol so that it can welcome new users after the message is revealed. Such new members are not immediately added to the round-robin, but are included when certain numbers of additional supporters are obtained. A new goal was set higher than the original, in the manner of a Fibonacci sequence, such as 3, 5, 8, 13…. We chose this design to preserve the sense of accomplishment achieved when the post first gathered a large number of supporters.

Based on the first trial experience, icons for 3, 5, and 8 supporters were available. We also anticipated lower numbers of users because the symposium had fewer participants. We removed the icons for large numbers because of the protocol modification described above.

Results and Observations

The system was used by 30 participants. The general trend was quite similar to the first operation, except that users needed more time to become accustomed to the user interface. One user commented that a mental barrier was imposed to being the last person to support the post, and causing the round-robin to appear. We plan to test a modified version of the user interface that does not provide information as to how many more supporters are required to accomplish the call.

Log Analysis

Figure 8 shows the number of calls and the number of revealed round-robins. The round-robin protocol was used less frequently than in the first trial. The reason seems to be the smaller population of the participants and because it was used as a second chat system. As in the first trial experience, about one-third of the calls gathered a sufficient number of supporters.

Calls for 8 supporters were more frequent than calls for 5; however, they all failed to gain sufficient numbers of supporters. These calls were mainly for fun and games, with the protocol serving in a similar manner to normal anonymous communication. We could not completely remove these behavioral problems, but adding some penalties for unaccomplished calls might improve the method.
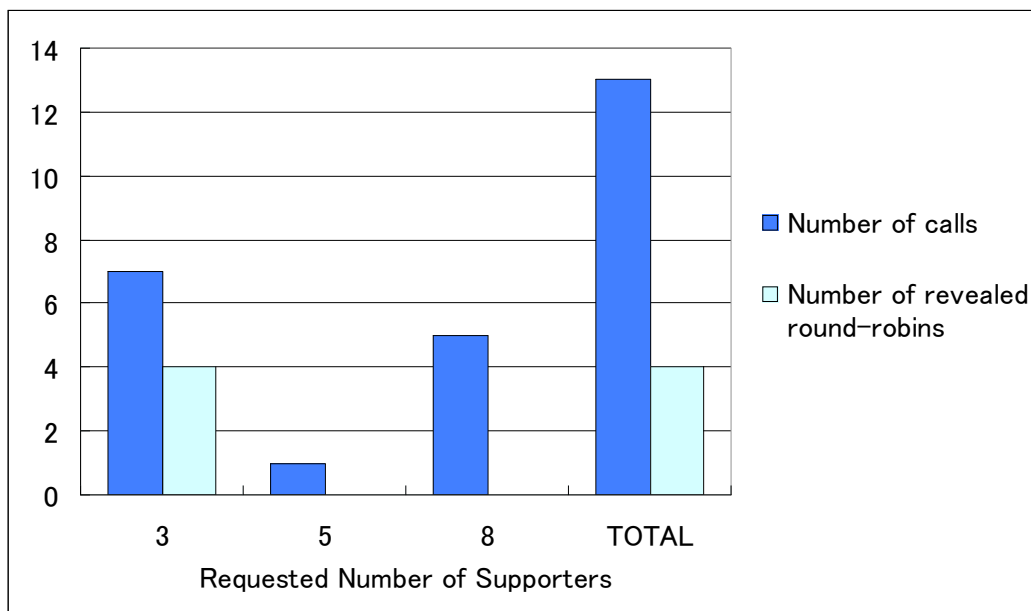

Figure 8. The number of calls for supporters and the number of revealed round-robins during the second trial experience.

Related Work

Anonymity is a hot topic in psychological research. Joinson (1999) studied the effect of anonymity on the results of Internet-based questionnaires and also examined the relationship between self-disclosure and visual anonymity (Joinson, 2001). Anonymity was considered the key to improving performance in group decision support systems (Jessup and George, 1997; Nunamaker et al. 1997), but these works were questioned by Postems and Lea(2000).

The effect of providing communication backchannels to face-to-face communication was reported by Rekimoto et al. (1998) and Barkhuus (2005). One of the most important characteristics of these backchannels is that they can add anonymity to the communication space. Here, we report the effect of adding another protocol, round-robin, as a backchannel to reality.

Conclusion and Future Work

This paper addresses anonymous and non-anonymous dualism in communication. We explored the design space between them by incorporating round-robin signature, a sophisticated method used historically in human society. We believe that the exploration of this space can enrich CMC.

We built a working system and operated it at two technical conferences. We observed both expected and unexpected uses of the round-robin protocol during the operation; the system gathered a great deal of controversial comments in addition to playful comments. Users also had difficulty in assigning an appropriate number of supporters.

Several areas require further revision. First, we plan to explore variations of the protocol. For example, imposing penalties to anonymous calls that cannot gather any supporters might improve the behavioral problems often observed in anonymous communication. We will also examine the effect of displaying or concealing the number of additional supporters required to achieve the round-robin signature.

Next, we plan to apply the protocol to other situations. For example, decision making in a smaller group would allow us to observe the effect of the protocol in detail. We will observe longer terms of use because the effects may change over time. It would also be interesting to apply it to anonymous communication, especially in open Web communication.

Acknowledgments

References

Barkhuus, L. (2005): "'Bring your laptop unless you want to follow the lecture': alternative communication in the classroom," In the *Proceedings of GROUP'05*, 2005, pp. 140–143.

Chwe, M. S.-Y. (2001): *Rational Ritual: Culture, Coordination, and Common Knowledge*, Princeton University Press, Princeton, NJ, USA.

Hosaka, S. (2002): "Hyakusyo ikki to sono saho," Yoshikawa Kobunkan, Tokyo, Japan. (in Japanese)

Jessup, L. M., and George, J. F. (1997): "Theoretical and methodological issues in group support systems research: Learning from groups gone away", *Small Group Research,* Vol. 28, No. 3, 1997, pp. 394-413.

Joinson, A. N. (1999): "Social desirability, anonymity, and Internet-based questionnaires," *Behavior Research Methods, Instruments, & Computers*, Vol. 31, No. 3, 1999, pp. 433–438.

Joinson, A. N. (2001): "Self-disclosure in computer-mediated communication: the role of self-awareness and visual anonymity," *European Journal of Social Psychology*, Vol. 31, No. 2, 2001, pp. 177–192.

Lampe, C., and Resnick, P. (2004): "Slash(dot) and burn: distributed moderation in a large online conversation space," In the *Proceedings of CHI 2004*, 2004, pp. 543–550.

Nishida, T., and Igarashi, T. (2005): "Lock-on-Chat: boosting anchored conversation and its operation at a technical conference," In the *Proceedings of INTERACT 2005*, 2005, pp. 970–973.

Nunamaker, J.F. Jr., Briggs, R. O., Mittleman, D. D., Vogel, D. R. and Balthazard, P. A. (1997): "Lessons from a dozen years of group support systems research: a discussion of lab and field findings", *Journal of Management Information Systems*, Vol. 13, No. 3, 1997, pp. 163-207.

Postems, T., and Lea, M. (2000): "Social processes and group decision making: anonymity in group decision support systems," *Ergonomics*, Vol. 43, No. 8, August 2000, pp. 1252–1274.

Rediker, M. (1987): *Between the Devil and the Deep Blue Sea: Merchant Seaman, Pirates, and the Anglo–American Maritime World*, 1700–1750, Cambridge University Press, Cambridge, UK.

Rekimoto, J., Ayatsuka, Y., Uoi, H., and Arai, T. (1998), "Adding another communication channel to reality: an experience with a chat-augmented conference," In the *Conference Summary of CHI'98*, 1998, pp. 271–272.

Yamamoto, T. (1994): *The History of Fukui*, Modern History 1, chapter 3, section 3, Fukui Prefecture, Japan. (in Japanese)