Using Mobile Phones for Accelerating Interaction

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The authors discuss asynchronous communication and its tool in design collaboration on the Web. This paper focuses on using Internet-connected mobile phone in design collaboration between distributed members especially in similar time zone, and a support system which improves interaction through asynchronous communication, is examined.
***Keywords:** Design Collaboration, Asynchronous Communication, Communication Response Time, Mobile*

Background

Collaborative design projects via Internet have been held between educational institutions due to emergence of Internet and computer technologies (Mieusset, 2000; Kvan, 2000; Hirschberg, 1999; Kawasumi and Yamaguchi, 1999; Naka, 1999). Recently, it becomes possible to collaborate synchronously or asynchronously using web-pages for pinup, whiteboard, e-mail, or video-conference systems. Some research groups have developed typical pinup systems effectively to access to database of design information (Kurmann, 1999), to share design process (Jeng, 2000; Matsumoto and Yamaguchi, 2000), to support team awareness (Mieusset, 2000), to manage project (Morozumi, 1999), to teach architecture (Fowler, 1997; Kvan, 2000). While pinup systems are useful especially for distributed participants working in different time zone, asynchronous tools like web-pages for pinup or e-mail are entirely passive to send and receive messages from members. Urgent messages to other members are left unknown until someone makes access to web-pages or mailbox.

Internet-connected mobile phone applications such as e-mail or web-page browsing is spreading rapidly in Japan, because of its simplicity to access to the web and of course extreme portability (See Appendix). Remarkable advantages of mobile phone are; as soon as new e-mail is posted, mobile phone ring without accessing to mailbox. What will this tool brings design collaboration?

Introduction

In VDS'96 (Morozumi, 1997) and CDS2000 (Chiu, 2001), international projects between three universities, three web-servers were set up in each university. On the contrary, our resent projects (VDS'97, 98, 99 and 2000) were managed by a central-web-server, which includes web-pages for information sharing, learning materials and communication tools. Each student subscribes ISP (Internet Service Provider) and has his/her own homepage as a sketchbook for the project. These pages are linked to the central-web-server. Through this environment, diffused students could participate in the project from any place; classroom, home, mobile or other place.

Communication time lag, which is one of merits in asynchronous communication, is utilized most effectively in international projects between different time zones. However, in case of similar time zone such as domestic projects, communication time lag sometime prevents members from communicating smoothly. Particularly, in asynchronous

communication between distributed members, time lags lead to the difficulty of awareness what other member is doing and what is going in the team. Furthermore, any delayed response from other member is dangerous enough to break up team-union. In fact, many students wasted a lot of time to grasp member's condition of each other or to wait other's reactions during past VDS projects.

Firstly, this paper depicts that there is communication response delay, which causes irritation and sometimes breaks up team-union. Secondly, the authors propose an active way of messaging in asynchronous mode of communication using mobile phones which is capable to access to the internet, and we examine it to improve the communication response time, and even to improve the awareness whether other member is active or not.

Analyzing response time in asynchronous communication

VDS2000 project was carried out between 3 schools of Architecture in Japan (Kyoto Institute of Technology,

Tokyo Denki University and Towa University) from May to July (8 weeks), each school is 500 km apart each other within one time zone. 28 undergraduate students participated, and form 6 teams of 4 or 5 students each. Communication data logged in database during this project counts up to 1032 pieces of 544 design proposals and text (85938 characters). In this project, the existing web system includes two types of Digital Pinup Board as Figure1; one is for messaging and another is for design proposal and discussion, both of which are asynchronous communication tools. Based on the analysis of logged pinup data, we found over all average of response time, which is the length of time between sending and receiving information between members, was 8h:47; team average's max. 14h:1, min. 5h:51, max. of all 266h.

Graphs in Figure2 show changes of response time in typical 2 of all the 6 teams through project; base line in each graph means the average of each team. However, both of the two teams pinuped a lot; 307 in Team6 was the highest, 200 in Team2 the second of all the 6 teams, aspects of exchanging information were truly different.
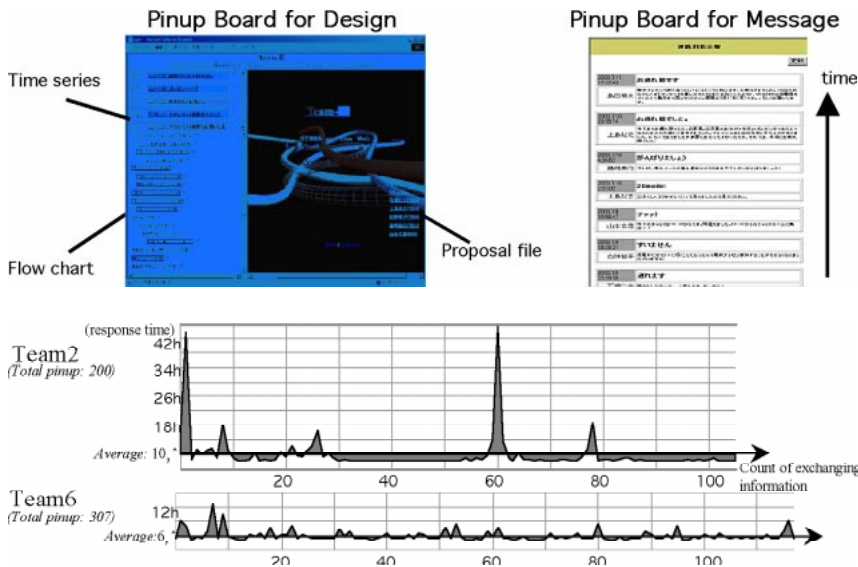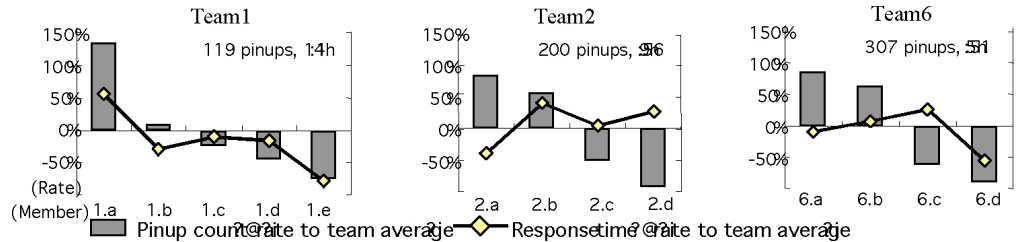

Figure 1. Two types of Pinup Boards used for asynchronous communication in VDS2000.

Figure 2. Graphs (typical 2 team's); changes of response time through the project.

Figure 3. Graphs (typical 3 team's); response time and pinup count of menders

Team1 — 119 pinups, 1:4h

Team2 — 200 pinups, 9:6

Team6 — 307 pinups, 5:1

Pinup count鑑rate to team average ◇ Responsetime鑑rate to team average

From analyzing, contents of pinups suggest that almost high waves of long response time in Team2 were not scheduled. Team2 seems to tend to communicate more asynchronously than Team6. In contrast, calmer wave of Team6 was resulted from member's efforts to check other's pinups and to pinup constantly at school and also at home or other place. In fact, some members in Team6 were checking pinup board every 2 or 3 hours (from survey after the project).

Graphs (Figure3) show member's average response time and pinup-count of each; bar charts show rate of member's pinup-count to team average. Points on line show response time of each member. To compare 3 graphs, it is known that lots of pinups not always reduce response time. Total pinup-count of team generally is in inverse to average response time of team.

Response time in this analysis means the length of time from someone's pinup to other's pinup, in other words a pinup is left unknown until the response returned. Response time includes waiting, working, and thinking idea, of course, sitting in class, sleeping, eating and so on. However, reasonable response time such as sleeping is also one of the advantages of asynchronous communication, particularly between globally distributed sites (Mieusset, 2000; Naka, 1999). The problem is that members are able to control the response time or not. In case of existing web system, students could not control it easily except by checking pinup-board continuously in front of PC. So there should be more or less unreasonable response time through project.

Proposed system

The authors developed an active messaging system named AMPIS (Active Messaging of Pinup Information Service), which was added to the existing passive web-based design collaboration support system. When some member pinups some information onto DPB, AMPIS sends a message automatically to other members via e-mail of mobile phone. The configuration of system is the following as Figure4.

AMPIS is consisted of database, mail software, CGI program, and message filtering, which are added to the existing web-based system. The major functions of AMPIS are the followings:

Messaging

Someone's pinup from mobile or desktop PC rings other member's mobile phones and sends a message, which includes subject of pinup information, registrant's name, date and time. Registrant can add a short message and require other member's response to the message (by e-mail). Advisers are able to send messages to all the members in the project, and also receive a simplified (filtered) message, which indicates only the count-up of pinups in each team on the day specified or accumulated.

Selection of response mode

Registrant of pinup can select response mode; please check the pinup, no response needed, RSVP, Yes-No RSVP. On receiving a message, which includes the response mode text, one can access directly to the page of pinup by clicking the text.
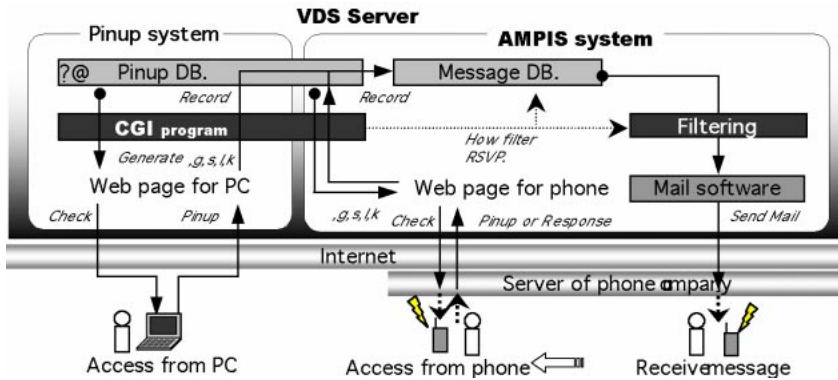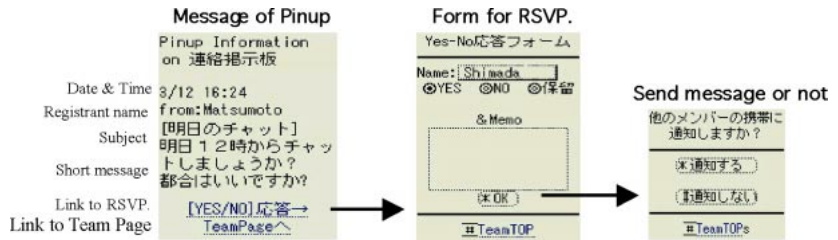
Figure 4. Configuration of AMPIS

Figure 5. Screens of AMPIS (Message and Response)

Facilitating the startup of synchronous communication

It needs some procedures to start a meeting smoothly on synchronous communication tool such as chat or video-conferencing. In fact, students repeat "Hello!" and wait for other member responds before a chat session starts. Usually, members need to communicate each other when to start meeting, or reserve the time to start. AMPIS send e-mail automatically, which announces when to start to all the members, just before meeting start. Then, members send attending/absent/late for meeting message, or start up chat program.

Web-pages for Internet-connected mobile phone

Internet-connected mobile phones provide with not only e-mail, but also browsing web-pages which is described in Compact-HTML or HDML in Japan. AMPIS system has Compact Digital Pinup Board (C-DPB) for mobile phones to communicate each other in a team. Using Internet-connected mobile phones, members can access the top page of VDS exclusive for mobile phones. Although members cannot register pictures onto C-DPB (at the present), they can browse or check newest pinups and pinup simple text message by using C-DPB from anywhere.

Evaluating the system

N-project was selected as a case study to test and evaluate AMPIS. In this project, three members (one young architect and two graduate students) used this system for the 8 weeks design competition of N Village Hall. The three used only DPB for PC during the first six weeks, and AMPIS was added in the last two weeks.

In case of "sending message" by AMPIS (users could select whether send a message or not), response time is reduced by 80% (Table1). During first 6 weeks without AMPIS, average response time

Table 1. Response time in VDS2000 project and N-project.

VDS2000	All period	First 6 weeks	Last 2 weeks		Rate
Team1	14h.1	16h.37	9h.21		56.30%
Team2	9h:56	10h:59	8h:33		77.78%
Team3	8h:5	10h:29	5h:54		56.28%
Team4	8h:12	17h:13	4h:9		24.10%
Team5	6h:38	8h:3	5h:6		59.88%
Team6	5h:51	7h:5	4h:23		61.94%
All teams	8h:47	11h:49	6h:14		52.80%
N-project	24h:28	27h:33	*(Period of using AMPIS)*		
			No response-requested	17h:4	61.94%
			Response-requested	5h:35	20.31%

was 27h:33. For the last 2 weeks, in case of sending message by AMPIS, it was 5h:33. Compared with VDS2000, 6h:14 to 5h:35. Even if this reduction includes usual last rushing to finishing the design, AMPIS is seems to contribute to managing response time and smooth communication. And a survey after N-project also shows AMPIS makes members more easy to get aware of other members and check what is going on in the project as soon as possible the member wants to know, even from anywhere. One of interested comments is that just phone-ringing or -vibrating (major function of Japanese mobile phone) by AMPIS was most effective to get aware other member and team-union directly, regardless of contents of the message (table 1).

Conclusion

This paper focuses on using Internet-connected mobile phone in asynchronous communication for design collaboration between distributed members. From our experiences and surveys of past projects including VDS2000, we realized that long or unreasonable response delay often irritates students and enough to causes breaks up team-union, but controlling response time is not easy. So we analyzed response time to grasp the state of asynchronous communication in existing PC based pinup system.

The proposed system named AMPIS provides four major functions; (1) Messaging support to control response time, (2) Accelerating interaction and generating active communication by selection of response mode, (3) Facilitating the startup of synchronous communication, (4) Web-page for mobile phone making asynchronous communication more seamless.

The results of case study projects are enough to prove advantages of AMPIS. This paper shows one of potentials of adding mobile environment to design collaboration on the web through development of prototype system and evaluation.

Appendix

From 1999, Internet-connecting service for mobile phone started in Japan. Its pervasion was so remarkable that number of users reaches about 41 million during 2 years (as of 2001.3); 60% of all mobile phone users, 30% of population (Figure6). Especially for Japanese students or young people, mobile phone becomes the most popular communication tool for e-mail, browsing web-pages, seeking any information and of course talking. Although AMPIS system proposed in this paper aims to support smooth interaction in asynchronous communication and particularly in project between similar time zone, it becomes needed to improve and adjust this system for global design collaboration. As global and broadband mobile network achieved, the future research will involve considering how to coordinate mobile environment with existing environment of design collaboration or education.
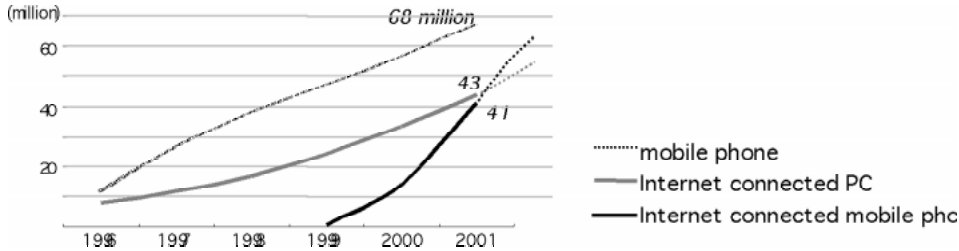
Figure6.Statistics; mobile phone in Japan (referred from reports of the Japanese Ministly of Post and Telecommunications)

Acknowledgements

References

Mieusset, K. H.: 2000, Supporting Team Awareness in a Collaboration, Proceedings of the Fifth Conference on Computer Aided Architectural Design Research in Asia, pp.25-44.

Fowler, T.: 1997, The World Wide Web as New Models of Mind and Medium for Capturing The Design Process for Learning and Teaching, Proceedings of International Conference on Systems Research, informatics and Cybernetics, pp49-57.

Kvan, T.: 2000, Teaching Architecture, Learning Architecturre, Proceedings of the Fifth Conference on Computer Aided Architectural Design Research in Asia, Singapore, pp.181-190.

Hirshberg, U., Schimitt, G., Kurmain, D., Kolarevic, B., Johnson, B., and Donath, D.: 1999, The 24 Hour Design Cycle: An Experiment in Design Collaboration Over the Internet, Proceedings of the Fourth Conference on Computer Aided Architectural Design Research in Asia, pp.181-190.

Kawasumi, N. and Yamaguchi, S.: 1999, A Study of Design Information System for Network Collaboration, Proceedings of the Fifth Conference on Computer Aided Architectural Design Research in Asia, pp.190-199.

Naka, R., Yee, S., Mitchell, W. J., Wilhelm, M. and Li, A. I.: 1999, Virtual Design Studio on the World Wide Web, Proceedings of International Conference on Systems Research, informatics and Cybernetics, pp157-165.

Morozumi, M., Shouda, Y., Homma, R., Iki, K. and Murakami, Y.: 1999, A Group Ware for Asynchronous Design Communication and Project Management, Proceedings of the Fifth Conference on Computer Aided Architectural Design Research in Asia, pp.171-180.

Morozumi, M., Shouda, Y., Homma, R. and Murakami, Y.: 1999, On Development and The Use of GW-Notebook2 -Group-ware for Asynchronous Communication and Project Management-, Proceedings of International Conference on Systems Research, informatics and Cybernetics, pp125-134.

Matsumoto, .Y, Sasada, S. and Yamaguchi, S.: 2000, Making The Collaborative Design Process Observable –Visualization of collaborative process in a VDS project -, Proceedings of the Fifth Conference on Computer Aided Architectural Design Research in Asia, pp.45-54.

Jeng, T.: 2000, Towards a Process-Centric, Asynchronous Collaborative Design Environment, Proceedings of the Fifth Conference on Computer Aided Architectural Design Research in Asia, pp.15-24.

Morozumi, M., et al.: 1997, The level of communications achieved through network in an international collaboretion design project: an analysis of VDS'96 project carried out between Kumamoto University, MIT and Kyoto Institute of Technology, Proceedings of The Second Conference on Computer Aided Architectural Design Research in Asia, pp.143-152

Chiu, M.L., Yamaguchi, S., Morozumi, M.: 2001, Supporting Collaborative Design Studios – Scenarios and Tools, Proceedings of the Sixth Conference on Computer Aided Architectural Design Research in Asia, pp.125-134.