Instant Messaging on Handhelds: An Affective Gesture Approach

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Text communication can be perceived as lacking in chat spontaneity, or plastic, due to medium limitations during interaction. A form of text messaging, Instant Messaging (IM), is now on the uptake, even on mobile handhelds. This paper presents results of using *affective gesture* to rubberise IM chat in order to improve synchronous communication spontaneity. The experimental design makes use of a text-only IM tool, running on handhelds, built with the Session Initiation Protocol (SIP) and the SIP Instant Messaging and Presence Leveraging Extensions (SIMPLE). The tool was developed with a novel user-defined hotkey – a one-click context menu that fast-tracks the creation and transmission of text-gestures and emoticons. A hybrid quantitative and qualitative approach was taken in order to enable data triangulation. Data collected from user trials affirms that the affective gesture hotkey facility improves chat responsiveness, thus enhancing chat spontaneity.

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1 INTRODUCTION

Text communication can be perceived as lacking some components of communication that are essential to sustain interaction during conversation. Such *plastic* text communication is devoid of intonation, pitch, gesture, facial expression and visual or auditory cues. Nevertheless, Instant Messaging (IM), a form of text communication, is on the upward uptake both on PCs and on mobile handhelds. It would be beneficial to *rubberize* this plastic text messaging to improve co-presence for text conversations thereby improving synchronous textual discussion.

One element of interaction is gesture, which can be viewed as a natural way of doing things. Attaining some level of interaction naturalism requires synchronous communication spontaneity, partly achieved by enhancing input mechanisms. To enhance input mechanisms for interactive text-based chat on mobile devices, there is a need to facilitate gesture input. Enhancement is achievable in a number of ways, such as input mechanism redesign. We explored affective mode on handheld devices without a major physical or interface redesign of mobile devices.

This paper presents a text-only IM system built with Session Initiation Protocol (SIP) and SIP for Instant Messaging and Presence Leveraging Extensions (SIMPLE). It was developed with a novel user-defined hotkey that provides a one-click context menu to "fast-track" text gestures and emoticons. The hotkey mechanism acts as a one-click Affective Gesture (AG) that attempts to instantly represent a Face-to-Face (F2F) expressive gesture. Facial expression provides an important spontaneous parallel channel for emotional and social display of communication. Drawing on the premise that text communication possesses expressive discourse with some degree of presence (e.g. co-presence, awareness), we seek to show that text communication can be enhanced with one-click AG fast-tracking of text gestures and emoticons.

A hybrid quantitative and qualitative approach was applied to experimentation with users. First, quantitative collection of hotkey usage was instrumented into the IM system. In addition, pre- and post-trial questionnaires were used to collect user feedback. Lastly, short unstructured focus group sessions helped to triangulate findings. Results show that an Affective Gesture approach improved IM chat spontaneity/response rate slightly. Feedback from the user trials affirms that the AG hotkey fairly improves chat responsiveness, thus enhancing chat spontaneity.

The next section provides a background to text communication, introduces related work and identifies four main issues to consider. Section 3 presents the methodology for the experimentation, where the research approach and AG details are discussed. Section 4 presents the system design of overall IM environment as well as the AG hotkey mechanism. Experimental design and layout are discussed in section 5. User trial results and analysis are addressed in section 6. The paper concludes in section 7 and a future line of research is suggested.

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2 BACKGROUND AND RELATED WORK

Text communication can be perceived as plastic because it lacks some components of communication essential to sustaining interaction or conversation [Adesemowo and Tucker 2004b]. Nevertheless, text communication persists and continues to gain ground as a mode and medium of communication, especially Short Message Service (SMS) and IM. In order to situate the novel AG hotkey mechanism, the reasons for text pervasiveness need to be established. These include the presence properties in written text itself, and the co-presence in IM environments drawn from awareness capabilities. These are then positioned within the mobile domain, considering a handheld's limited screen real estate and restricted input/output mechanisms. Four areas of interest are therefore discussed: IM services and interoperability, co-presence, handheld Human Computer Interface (HCI) issues, and IM fast-track feedback mechanisms.

2.1 IM Services and Interoperability

Work has been done that examined several modes of communication and their relative effects on task performance, especially in Computer-Supported Cooperative Work (CSCW) [Nardi et al. 2000]. Much of this work has looked into the appropriateness of Computer Mediated Communication (CMC). Riva and Galimberti [1998] put CMC in a social interaction context while Connell et al. [2001] explored the social psychological perspective to study the effectiveness of different communication media and how they influence interactions in social groups and organizations. Despite CMC's seeming limitations [Herring 1999], purely text-based SMS has proven quite popular on mobile phones, and Instant Messaging has spread dramatically on the Internet [Isaacs et al. 2002; Tang et al. 2001]. In the last two years, much effort was made to enhance interface mechanisms for IM, as seen in the volume of short papers to this effect (see section 2.4). In this paper's context, IM is seen as a communication medium rather than a communication tool [Adesemowo and Tucker 2004a].

O'Neill and Martin [2003] define an IM system as a quasi-synchronous channel. This draws from the fact that delivery of IM text messages is nearly instant. IM protocols such as SIMPLE and eXtensible Messaging and Presence Protocol (XMPP) now support session mode, which provides a synchronous channel [Sparks 2002]. Nevertheless, IM systems remain quasi-synchronous, when we consider macro delay: with either or both parties' temporarily away or distracted from the IM window [Glaser and Tucker 2004]. O'Neill and Martin state that whereas IM applications tend to primarily support messaging between two participants, text chat applications can support multiple participants. Traditional two-party IM has evolved into a multi-party paradigm with open protocols such as SIMPLE and XMPP.

The essence of text communication input facilitation is restricted by the limitations of the textual medium itself. Despite text chat interaction features, it lacks dyadic interaction coherency [Herring 1999]. O'Neill and Martin pointed out the limitation on control on turn positioning, or turn-taking. Affective interaction spontaneity was also found lacking [El Kaliouby and Robinson 2004; Bodine and Pignol 2003]. Yet, text presence in itself is found in speech oratory of text and in its action descriptors [Gelléri 1998]. Beyond text presence, IM provides online presence awareness mechanisms like IsTyping (which indicates when another party is typing), and status info on chat participants. Protocols such as SIMPLE offer enhanced mobility and provide a framework for resolving mobility concerns in text-based communication [Mahy 2004]. Moreover, SIMPLE has in place a mechanism for enriched, synchronous text messaging.

2.2 Co-Presence

The definition of social presence forms the basis of co-presence. In light of concepts presented by Short et al. [1976], social presence relates to the social model as part of the Non-self. Text communication, and more specifically, IM can be viewed as a communication medium rather than a communication tool or tele-operable entity. Parties in an IM chat, the Imessagees, have presence knowledge of not only themselves (oneself) but of others (non-self) in the chat medium. A social presence is formed around them within and without sense of presence. Entity and communication environment relationships in CMC can be grouped as follows: Human → Machine (Remote) termed teleoperation, Human → Place (remote) telepresence and our interest, Human → Human (remote) co-presence [Adesemowo and Tucker 2004b, Zhao 2003].

Rosenberg [1994] explains the tele-presence attribute of a tele-operable entity. Rephrasing him, we can say that the ultimate goal of these efforts is to produce a transparent human link. In other words, we seek a user interface through which information is passed so naturally between operators that the user achieves a sense of presence within their "site". With respect to text communication, the notion of co-presence narrows down to online presence and awareness. If we consider this IM site as a social space and place as in Harrison and Dourish [1996], the IM medium has a user interface (IM User Agent) through which information (context data) is passed naturally between operators (Imessagees) within an open environment such as SIP/SIMPLE. Therefore, this paper proposes specific IM user interface features as a way of facilitating co-presence, to provide that transparent link, in order to aid chat spontaneity.

Beyond oratory text presence, IM co-presence is further enhanced by its awareness capability. Cadiz et al. [2002] rightly pointed out the emergence of the word "awareness" in CSCW, noting its definition as 'understanding of the activities of others, which provides a context for your own activity'. Applied to IM, awareness helps to ease interaction through user-awareness of interlocutors, for example with buddies and other GUI features that show awareness state. In the context of this paper, awareness relates to who is online or not online in the IM social space. Presence indicators tell what interlocutors' actions are [Adesemowo and Tucker 2003].

2.3 Handheld Interface Issues

With the emergence and impact of mobile communication devices, handheld computing is on the rise and spawning new application domains. We have seen a phenomenal success of text messaging with mobile phone users, especially SMS in Europe. However, rapid uptake on handhelds of other text messaging systems like IM is limited by screen real estate and input mechanisms.

The limitations of screen real estate on a handheld are obviously not by choice, but exist due to factors that are inherent in its design. Mobile device screen estate has evolved over the years from one line, two line and multi line mobile displays (seen in pagers and 2G handsets) to Grayscale TFT trans-reflective screens found on a Personal Digital Assistant (PDA) and 2.5G/3G mobile device [Mackenzie and Soukoreff 2002]. Newer screens found in Smartphones and PDAs are coming to match desktop screens in full colour, but still suffer smaller screens. However, they now come in bigger sizes than earlier devices.

Mobile text input rests within two competing paradigms: pen and keyboard based input. We might ask, why not just apply the QWERTY keyboard to the mobile paradigm since there exists an inherent familiarity on desktops? Early devices such as HP200LX demonstrated that a QWERTY keyboard could be adapted to mobile computing. However, it suffered from bulkiness and unwieldy touch-type size ratio [Mackenzie and Soukoreff 2002]. Foldable full size QWERTY keyboards are attachable to some handhelds and smart-phones. To reduce bulkiness, the idea of a fabric keyboard (http://web.media.mit.edu/~rehmi/fabric/index.html) that occupies no space more than a cloth wrapping for the device has been explored. Virtual on-screen soft keyboards are already in use, while virtual laser keyboards are being touted (http://www.vkb-tech.com/technology/foursteps.asp). One-hand input mobile devices are being revisited with QWERTY keyboard text input, such as the Blackberry. User I/O technologies are important as they can facilitate text entry. Another input mechanism of interest outside our scope is speech recognition (TTS and ASR) that is always 'about to emerge'. However as ASR engine matures, they will be of keen interest [Hinckley et al. 2000].

Facilitated gesture input needs to be defined in context, as this paper does not attempt to present the best or most appropriate mode of input on mobile devices. Our interest is in looking for ways to facilitate existing gesture input for mobile text communication, taking into consideration the IM social context in which the techniques are to be deployed. Therefore, device-based gesture text input such as predictive and reactionary input technology does not form the focus for this research. Rather, a contextual multimodal gesture approach has been taken.

2.4 IM Fast-track Feedback

One way of designing interaction techniques appropriately is with effective multimodal interaction and accessibility [Bourguet 2003]. For this, a trade-off has to be made between rich and thin clients in the mobile space. While a thin client ensures ubiquitous access, a rich client provides enhanced features, albeit hindering portability. However, platforms such as .NET and Java go a long way in easing this. The Sun Lab Instant Messenger (SLIM) was built as a thin client (http://research.sun.com/projects/slim/) whilst the AT&T Hubbubme, as rich client [Isaacs et al. 2002]. Both provide adequate functionality as an IM system. Hubbubme is more multimodal with enhanced text and sound features.

Researchers working on text communication tool feature extensions have opted to redesign chat interfaces in an attempt to address observed limitations in text communication [O'Neill and Martin 2003]. IM chat interface redesign forms the basis of this paper. Facilitated gesture input mechanisms have been put to use in varying degrees. Much of the work involves a multimodal approach, which includes menu extension, facial affect, kinetic, haptic, and aural feedback.

The Typography-based Kinetic IM (KIM) was built on a text typography engine, a system that changes text appearance over time, as a new form of expression due to its ability to add emotional content to text. KIM sought to address several design issues that sprang from integrating kinetic typography and IM [Bodine and Pignol 2003].

The desktop-based ConNexus was extended to the mobile domain as Awarenex, which integrates multiple mobile devices. It provides subtle awareness cues, but it mainly supports intended rather than opportunistic interactions [Tang et al 2001]. On the other hand, AT&T HubbubMe was designed to support awareness, opportunistic conversations, and mobility. It employs TTS to provide sound cues (earcons) in addition to Palm Graffiti text input [Isaacs et al. 2002].

Haptic IM addresses the touch sense of emotion to develop an IM system that offers haptic communication by allowing users to send messages (hapticons) enriched with haptic effects [Rovers and Van Essen 2004]. Reality IM draws on the concept of a bulletin board to inject virtual reality into IM chat within a social context [Chuah 2003]. El Kaliouby and Robinson's [2004] Facial Affect IM (FAIM) is based on MSN Messenger 6.0. FAIM analyzes a user's facial affects in real time and arguments the dialogue with an emotive character representing them. The MSN messenger's static user picture is replaced by an animated graphic drawn by an animator powered by the affective state manager. The state manager is built on the facial affect analyzer to provide a simulation of facial emotional state.

These desktop based IM systems attempt to address text communication limitations with mechanisms that could easily be moved to the handheld domain. However, they would need to take into consideration handheld interaction issues. Most IM available on handhelds (MSN, Rivotek, and AOL) taps into facilitated provisions the operating system offers, such as predictive text input and clicking. IM such as Hubbubme extends facilitated input further with sound ID using Text-to-Speech features. The Viktoria Institute Amigo image IM allows free-form images as well as handwriting to be sent between people, taking advantage of touch sensitive display, transcribing and inking technology of mobile devices [Fabersjö et al. 2003].

Extensions to predictive texting facilities include 'My Text' available in IM such as MSN Messenger® (Pocket PC version) that offers user pre-defined text in a conversation. However, MSN MyText is not dynamic enough. It lacks on-the-fly editing when in a conversation and on-the-fly sending as MyText selected is inserted inline into the text box before sending.

3 METHODOLOGY

This paper presents an AG hotkey that extends the MyText feature with dynamic editing and sending on the fly. The hotkey is serialized into XML allowing for portability and ease of extension. Emoticons are handled as well. The novel AG concept [Adesemowo and Tucker 2004a] draws largely from Affective Feedback (AF), which is defined as 'the process of using technology to help people achieve and maintain specific internal states' [McDarby et al. 2003]. AF in medical sciences essentially tries to create immersive systems that encourage people to reach a specific state such as relaxation or concentration, and "teaches" them how to control it. AG in the IM context, however, attempts to create a system that encourages an IMessagee to react spontaneously and control the chat (e.g. hotkey profiling, AG → in-line texting) depending on the mode and nature of the ongoing conversation. Provided that a redesign of the chat interface might allow for enhanced interaction in text communication, AG hotkeys and emoticons, like other chat features discussed earlier, could help build better text-based communication tools and provide a framework for doing so.

3.1 Research Question

Given that text communication possesses expressive discourse with some presence level, this paper explores the efficacy of one-click editable text gestures to improve co-presence via chat spontaneity. In other words, can a fast-tracked Affective Gesture improve chat spontaneity? A related question regards presence levels. How can an IM system can be extended further with presence indicators, awareness and facilitated text-gesture input, specifically in a wireless handheld domain? Also, can emoticons handled as AG ease interaction spontaneity in text communication? Understanding the limitations of input and output on handhelds, we therefore propose that IM typing economy and emoticons can be improved with one-click user-defined hotkeys and emoticons.

3.2 Research Approach

Discussion in the Related Work (section 2) took a critical look at presence in text communication, specifically via the expressive discourse of text itself. In order to explore the research questions, we coded an IM system with the AG hotkey mechanism, set up a small collection of handhelds running the software over a wireless LAN (WLAN), and carried out user trials with a hybrid quantitative and qualitative approach to data collection.

A SIP User Agent (UA) was developed with functionality to learn how AG hotkeys and emoticons could enhance IM in the mobile and wireless domain. Experiments were conducted with mobile participants, for whom a WLAN was set up. Software development followed a two level iteration, incorporating user feedback into a second stage of development, and a subsequent trial.

Most IM related research has taken an ethnographic approach based on analysis of server logs in an IM system [Muller et al. 2003]. The ethno-methodological approach has proved effective for large subject groups and large conversational log data. Others have sought answers to research questions by considering IM chat interface reconstruction. Example of this approach include the Amigo project [Fabersjö et al. 2003] and Facial Affect IM (FAIM) [El Kaliouby and Robinson 2004], both discussed earlier in section 2.4. With this approach, a small user base is normally sufficient to validate the feature extensions. This is the basic approach taken in this paper.

To examine AG, a hybrid quantitative and qualitative approach was undertaken. Quantitative usage of hotkeys were logged with code instrumented into the IM system. In addition, pre- and post-trial Computerized Self-Administered Questionnaires [Babbie and Mouton 1998] were used to collect users' usability and usage feedback based on their experience with the IM enhancements (AG hotkeys and emoticons). The pre-trial questionnaire captured participants' IM background knowledge and introduced the AG feedback concept. The post-trial questionnaire captured feedback on the AG hotkeys and emoticons introduced during the IM experiment. Feedback from an initial trial was incorporated into an IM redesign, and a subsequent trial. Two qualitative techniques were also implemented. Short unstructured review sessions with focus groups helped to triangulate findings from logs and questionnaires [Babbie and Mouton 1998]. Furthermore, test trial participants were closely observed in the initial trial, and loosely observed in the second trial. This quantitative and qualitative crossbreed method attempts to compensate for any result analysis limitations.

4 SYSTEM DESIGN

A handheld-based AG fast-track feedback IM system was developed to facilitate the methodology [Adesemowo and Tucker 2004a]. Pocket PC handhelds connect to a SIP server over a WLAN, and run the AG Feedback IM (AGFIM) software. Standard IM text features are supported with additional features. These include user-definable text hotkeys shown in Figure 2 [Adesemowo and Tucker 2004a] persisted to XML and loaded into memory as a dataset, a two-level hotkey history, AG on-the-fly sending as well as switching between AG and traditional in-line text. IM runs via a message session setup and coordinated by SIP as shown in Figure 1, the architectural layout. This text-only IM system was built on the IETF open standard SIP/SIMPLE using Microsoft Real-time Communication Library (RTCClient).

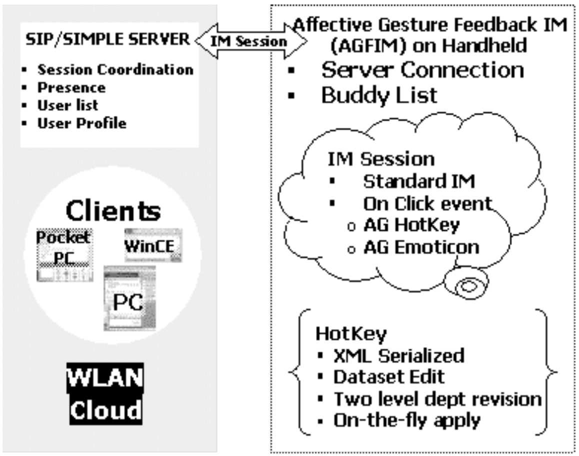

Figure 1: *AGFIM Architecture Layout*

The AG Feedback IM (AGFIM) client, a SIP User Agent, runs on handhelds and connects through terminal services over a WLAN to SIP/SIMPLE network that coordinates sessions. Hotkeys are persisted into XML files and loaded into memory as datasets. User profiles (buddies) are stored on the SIP server and persisted to XML on the client.

Figure 2: *The AGFIM client interface*

Screen shot of the AGFIM client showing text chat on a handheld (top) with user-defined Affective Gesture hotkeys below.

5 EXPERIMENTATION

5.1 Initial Trial

Thirty-four people were e-mailed to fill in the online pre-trial questionnaire. Out of the twenty-three respondents, three were outside the University of Western Cape. Questionnaires were hosted on www.surveyconsole.com.

Two separate trials were conducted with groups of four and five participants, respectively. The group of four comprised non-techies, with two people unfamiliar with IM, and one who had not used IM at all. The second group of five was drawn from Computer Science post-graduate students. Each participant was tasked to create a terminal session from his or her handheld to the server. Then they ran AGFIM, which was carefully designed to fill the PDA screen enabling a normal PDA application look-and-feel (in reality, due to application development platform limitations, AGFIM ran on the handheld with terminal services). Upon login, each participant started an IM session with an intelligent agent (bot) UA. The bots offered on-screen help (by keyword) and guided participants to successfully accomplish the task of creating a distribution list and chat room. Thereafter, a multiparty chat session was started among all of the participants, which further enabled them to use the IM system features further.

On completion of their trial session, a short follow-up discussion was held with each group. Only group two completed the post-trial questionnaire, as they were the only group to make substantial progress with the trial. In each group, one participant was on a Sony Vaio notebook with the rest on Pocket PC PDAs.

5.2 The Test Bed – Final Trial

Feedback from the initial trial was analyzed and incorporated into an AGFIM redesign. AG→in-line switching was added to allow chat users to switch between AG and in-line text mode. Another feature enabled was extending text hotkey profiles to three – Personal, Family and Official. Chat users were able to edit on the fly and switch between the three profiles. Bugs were fixed to allow AGFIM to create IM sessions and send messages when connected to other SIP servers such as Vovida's Vocal. This enabled interoperability for the SIP standard. Changes were made to the pre- and post-trial questionnaires. In order to incorporate this and enable advance features, paid subscription was made to www.surveyconsole.com.

One hundred and ninety-four (194) people including all of initial trial participants were e-mailed to complete the extended online pre-trial questionnaire. Out of the sixty respondents, thirty-eight were outside the University of Western Cape: one in Canada, four in the USA, five in the UK, fifteen in Nigeria and thirteen in other locations in South Africa.

Twelve people were selected for the final trial, comprising eleven males and one female: ten Masters students with one Honours student from Computer Science, and one Management Honours student. Fifty rand was paid (in addition to small gifts of a Microsoft pen and SADeveloper community 2005 calendar) to each participant upon trial completion (after filling out the post-trial questionnaire and returning the handheld). The PDAs were borrowed from www.bridges.org. The experimental setup for the final trial followed a similar approach taken for the initial trial, except there was no notebook user, and tasks were further streamlined.

Unlike the initial trial, participants made extensive usage of the AGFIM system. The PDAs were given out on Friday for participants to get accustomed to them over a long weekend. The actual trial began on Monday with the AG → in-line switching not enabled. Network connectivity and system usage difficulties were quickly resolved, albeit pushing the trial forward by a day. On Wednesday, a new version of the AGFIM was released with AG → in-line switching enabled and a more appealing user interface. The trial ended on Thursday. Participants completed the bot tasks at their own pace. Chat with other users was at individual liberty. Aside from ongoing dyadic discussions, all participants were invited to a central conversation chat. This central structured chat session followed the same concept in Farnham et al. [2000] except for the timing aspect. A short informal discussion preceded the completion of the online post-trial questionnaire.

6 RESULTS AND DISCUSSION

Results show that an Affective Gesture approach improved IM chat spontaneity/response rate slightly. 57.14% from the initial pre-trial questionnaire said AG would 'Definitely would be helpful', and 45.45% from extended survey of 60 respondents (with only 9% not sure) indicate usefulness. Post-trial results followed in a similar vein with 55.56% of respondents choosing 'Yes, Helpful in some ways' while none said AG was not useful. Feedback from users after trials affirmed that the AG hotkey improves chat responsiveness, thus enhancing chat spontaneity.

While the AG hotkey improves IM chat response rate, thus enhancing chat spontaneity, this was not the case for AG emoticons. When asked if the AG emoticons will enhance chat spontaneity, 35% affirmed, 'Definitely will prefer AG emoticon' while none said, 'Will not'. Interestingly 5% still preferred their emoticons to remain unchanged. A similar shift was noticed after the trial from 'Definitely' to just 'Yes' in the post-trial response (see Figure 4).

One of the early-adopters in the initial trial suggested the AG → in-line text switching feature. It was found that this switching capability was not only welcomed by participants but also helped in determining the usefulness of the AG hotkey. Almost half of the final trial participants thought the AG hotkey offered flexibility in improving their IM chat spontaneity. They found the AG hotkey worthwhile and useful for IM chat, as 22% hardly switched from AG to in-line because there is practically no need for them to switch.

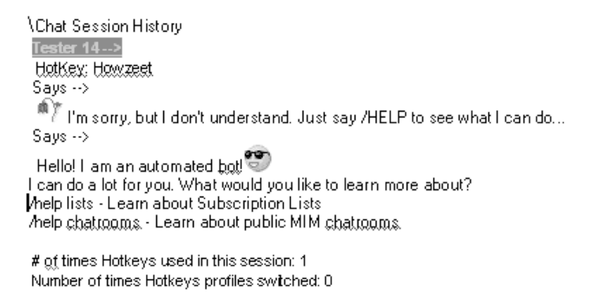

Figure 3 *Snapshot of a chat log file*

The chat log file shows placement and instances of hotkey usage. The number of times of profiles switch are also noted.

Would a user-defined "My Text" hotkey AG feature be helpful in your IM chat?

1 *Definitely will be helpful*
2 *Probably should help*
3 *Not sure would be helpful*
4 *Probably would not be helpful*
5 *Definitely will not be helpful*
6 *Don't know*

Definitely Very Helpful
Yes Helpful in some ways
Think so bit of help
No Don't think it's of much help
Not at all

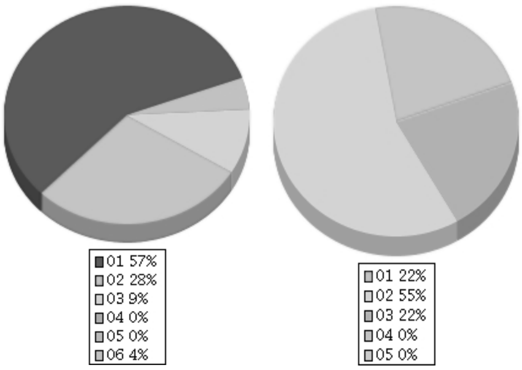

Figure 4: *"My Text" AG hotkey usefulness question*

This pre-trial questionnaire chart shows results for respondent responses. On the left are results from the pre-trial, and on the right, post-trial. There was a noticeable shift from 'Definitely' to 'Probably' AG was useful. System usability may account for this. Other factors are discussed under open discussion.

Scanning through the conversation log for the final trial, few of the users' logs indicate switching away from AG to inline text, as shown in Figure 3. A number of hotkey usage instances were recorded. However, while users did switch from one profile to another, very few instances of hotkey editing were recorded. A few users completed creating the distribution list and chat room with the automated bot. This affirmed use of the text chat. However, one completed the tasks without using a hotkey or profile switching. In another log, hotkeys were used only once while profile changed three times.

Nevertheless, the AG mechanism found more usefulness with text than with emoticons. AG would require further enhancement for it to really improve chat spontaneity, thus enhancing IM chat. Non-effectiveness of the AG mode might not totally be attributed to its non-adoption. Other factors like handheld design limitations could also contribute.

In the first trial, the first group of non-techies faced a myriad of difficulties in getting the IM to work. None of them could chat effectively nor create a distribution list or chat room with the intelligent bot. The most experienced user amongst them, however, noted that the AG features might be useful in her chat could there have been more time to engage the handheld further. In the second group of techies, two of the participants completed the task of creating a chat room, while all of them modified and used the hotkey feature. In the final trial, a large proportion of the participants were able to create the chat room and distribution list. They also put the hotkeys and AG → in-line switching to meaningful use in their chat. Handheld design limitations were brought close to a constant negligible factor for the final trial by allowing the participants time to acclimatize to the PDAs.

6.1 Discussion

The degree of IM chat spontaneity improvement is greater for computer techies classified as "early-adopter" and much less for the non-techie folk representing typical users. We are not able to draw a conclusion as to why the non-techies could not use the AG IM system at least to a functional level. Would this be the limitation of handhelds (small screen space and limited input facilities) or the ineffectiveness of the AG features? Is it a combination of both?

Further work needs to be done to determine if the AG feature would be able to enhance text communication for a typical non-techie user. One of the techies pointed out the benefit of having a dual gesture input that offers the user a choice of which mode to use: either AG hotkeys and emoticons or traditional text in-line. Hopefully, this might help in a subjective within and without experiment. The two categories would have to be grouped together in an extended trial. Encouraging results from the early adopters tend to show that enhancements to IM such as AG features are on track to improving text communication spontaneity. With IM increasingly popular in the social space, other users are expected to play "catch up" with the early adopters. SMS has already demonstrated this by its usefulness in meeting the need to communicate cheaply and easily, even if it means communicating in text with tiny displays. Ahonen [2004] also reasons along this line when he discusses finding the killer 3G application.

CONCLUSION

From the pre-trial questionnaires, we found that AG approach is likely to improve IM chat spontaneity/response rate. The post-trial questionnaires and discussions affirm this. The concept of redesigning the chat interface has proved a worthwhile approach to enhancing input mechanisms for handheld IM systems. Facilitating gesture input is expected to increase co-presence between handheld users and their desktop-based counterparts while in a synchronous discussion. This brings about 'naturalism' and chat spontaneity. We feel that the AG text hotkey gives chat users immediate response capability with synchronous affective feedback.

Further work is required to run the AGFIM natively on a handheld rather than with terminal services, as done in the trials. This limitation impaired user acclimatization with the program outside the experimental WLAN coverage. A multimodal interface incorporating the AG approach to sound IDs, facial affect, handwriting and imaging, and other types of sensing would be interesting areas to explore. It would also be worthwhile to expand trial participation to at least twenty participants and extend duration to at least two weeks. A multi-location experiment, allowing participants to roam amongst different locations with wireless Internet connectivity would also be a worthwhile test bed to explore.

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