OpenMessenger: Gradual Initiation of Interaction for Distributed Workgroups

ABSTRACT

The initiation of interaction in face-to-face environments is a gradual process, and takes place in a rich information landscape of awareness, attention, and social signals. One of the main benefits of this process is that people can be more sensitive to issues of privacy and interruption while they are moving towards interaction. However, on-line communication tools do not provide this subtlety, and often lead to unwanted interruptions. We have developed a prototype message system called OpenMessenger (OM) that adds the idea of gradual initiation of interaction to on-line communication. OpenMessenger provides multiple levels of awareness about people, and provides notification to those about whom information is being gathered. OpenMessenger allows people to negotiate interaction in a richer fashion than is possible with any other current messaging system. Preliminary evaluation data suggest the utility of the approach, but also shows that there are a number of issues yet to be resolved in this area.

Author Keywords

Instant messaging, awareness, privacy.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Many researchers have studied the subtleties of informal human interaction in face-to-face settings. These interactions are critical to many types of collaborative work [8, 10], and are characterized by people's ability to gather and interpret multiple kinds of signals about others' behavior, activities, availability, and attentional focus. In particular, people who work in face-to-face environments seem able to naturally manage the tension between awareness and privacy. On the one hand, it is well known that informal interactions do not occur without awareness information about who is present and what they are doing [2]. On the other hand, people also need some privacy to work effectively – both in terms of protection from unwanted interruptions and in terms of the ability to keep certain activities and materials confidential [4].

One of the aims of CSCW research is to try and support the natural subtleties of face-to-face interaction in distributed environments. Doing so while balancing privacy and awareness in online environments has proven problematic, however, as evidenced by early media space systems that were plagued by complaints about video cameras invading privacy and about the lack of subtlety in the way that conversations were initiated [7]. This latter concern raises the critical point that awareness information must also be useful in the service of facilitating interaction. Too little information may mean that this constraint is not satisfied; too much information can mean privacy violations and unwanted distraction [5].

In this paper we introduce a prototype messaging system called OpenMessenger (OM) that adds elements of this interactional richness and subtlety to on-line communication. OM has two main design goals:

- to recreate the progressive disclosure of information that occurs in the real world – that is, the closer you move towards someone, the more information you can gather about them;
- to explicitly show people how others are gathering information about them, and to tie the visibility of others' actions to the amount of information they are able to gather.

BACKGROUND

OM is rooted in a critical, but often overlooked, difference between face-to-face and distributed environments. In face-to-face groups, the gathering and usage of awareness information are highly correlated – awareness information is gathered by looking around the room at others, and looking occurs when that information is being used [3].

Moreover, there is an additional correlation in face-to-face groups between physical proximity to somebody and the amount of information that can be gathered about them.

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People routinely glance across the room to see if somebody is present or not [1], and might then move closer to that person to see how busy they are and maybe try to get their attention. In this way, the obvious nature of attention in face-to-face environments mediates the tension between privacy and awareness [3].

People have fewer concerns about privacy because it is clear when others are looking at them and what information is available, and awareness information is shared simply by virtue of being in the same space together.

These two key relationships break down in distributed groups, however. Attention from others is non-obvious in that awareness tools (i.e., keyboard activity monitors in instant messaging clients or media space webcams) constantly gather and disseminate information about one's behavior, but provide few if any cues about when and how this information is being used.

This breakdown causes two critical problems in providing awareness information in distributed groups, both of which are addressed by OM. First, the gradual process of initiating interaction is constrained by the lack of a natural progression from high-level awareness information to more detailed information and, possibly, interruption [9]. Second, privacy concerns arise in that the non-obvious nature of attention means that people do not know when others are paying attention to them and must therefore assume they are constantly being monitored.

GRADUAL ENGAGEMENT IN OPENMESSENGER

The current version of OM resulted from a 12-month iterative design process involving three versions. The software was built with two goals: a) an application with which we can conduct field evaluations of the principles on which it is based, and b) developing an infrastructure for future laboratory studies exploring the utility of different forms of awareness cues and notification.

Design Rationale and System Operation

OpenMessenger is a Java-based instant messaging system that is designed for collaborative workgroups. Each group runs its own server, and all participants using a particular server have the same people on their contact lists. The general design approach behind OM is to provide an analog to working together in an open-plan office, an environment where interaction is frequent and where a wide variety of awareness information can be gathered [1, 3].

Each person shown in an OM window is represented by a 'ticket' consisting of a user-uploaded photo avatar, a user name, and a visual 'handle' that can be pulled to get more information about that person (see Figure 2).

Users can rotate their avatar to indicate how busy they are. An avatar in full view indicates that the user is available, and the more the picture is turned away, the busier the user is (Figure 1). This is intended to mimic the way in which people face their colleagues and paying attention to their surroundings differently depending on their workload. The amount of rotation affects information gathering, as described below.

Our intent in the basic contact list representation is to make it easy to 'look around the room' and see who is present and how busy they are, as people frequently do in real-world open offices. While our current system requires people to explicitly rotate their photos, there are several automatic means of determining interruptability that could also be used (e.g., [6]).

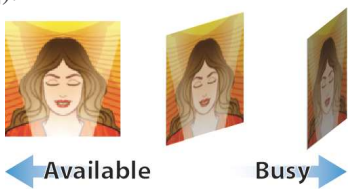

Figure 1: Avatars and rotation in OM.

Awareness Information Gathering

There are several ways for users to gather more information about a colleague using OM. In the descriptions below, we refer to the information gatherer as the *observer* and the person being observed as the *target*.

To see more information, the observer pulls down on the target's handle (see Figure 1a). As the handle is pulled, the target's ticket expands in the observer's contact list, and more awareness information is revealed (see Figure 1), in the following progression:

Self-reported status (Figure 1b). A status message is set by users at the bottom of the OM window and allows people to convey more information than the photo rotation; for example, the message "working on CHI paper" might indicate to co-authors that they could interrupt, even though the target's avatar indicates that he or she is busy.

Window title of current application (Figure 1c). This level provides information about the target's activities, but without showing any detail about the contents of the activity. It is often possible to infer from this basic information what the target is currently doing, such as reading email.

A blurred screen snapshot (Figure 1d). Due to privacy concerns, screen contents are revealed only with the permission of the target. Again, the intent is to give a high-level sense of what the target is working on. The screen snapshot is likely to be most useful for people who do visual work – for example, people in real-world design offices have been shown to look briefly at others' screens as they walk through the office, to get a high-level sense of what others are doing. People do not always admit to these glances, however [3], which is why we blur the snapshot and require the target's permission.

Interaction options: chat or leave a message (Fig. 1e). When the handle is dragged as far as it can go, two buttons appear in the expanded ticket that show interaction options. One button ('call') allows the observer to initiate a chat

session with the target, and another ('leave a message') allows them to leave an email message instead of continuing towards a real-time interaction. This choice of interaction styles is the analog of the real-world situation of walking closer to a person in the real world, and then either moving ahead with the interruption, or simply indicating that you will come back later. In cases where the observer requests a conversation, the chat window opens only when the target accepts the request.

We also wanted to make it harder to interrupt people who were obviously busy. We accomplish this by having a user's availability level (indicated by avatar rotation) affect the amount of effort that the observer must expend to gather information. When a target is fully available, their handle can be dragged quickly; when an avatar is less available, the handle must be pulled much further to get the same amount of information. The metaphor is one of an elastic cord that pulls down on a handle which has varying degrees of friction.

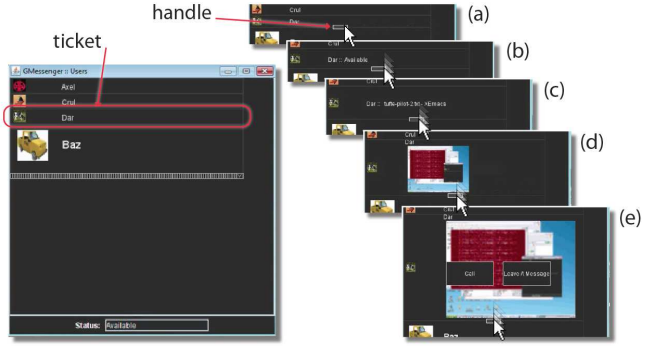

Figure 2: OM Contact list with the progression of ticket expansion shown to the right.

Notification of Observation

One of the goals of OM is to make information-gathering an obvious activity, just as it is in the real world. In addition, we want the activity to become more visible as people gather more information. This is also analogous to the real world, where real-world observers become more obvious the closer they approach.

In OM, as an observer progressively gathers information about a target, the target is notified using several auditory and visual cues (Figure 3).

Stage 1: When a handle is first pulled down, a soft piano tone is played by the target's OM system, and the observer's avatar moves slowly back and forth. Both cues fade if there is no more observer activity – which could occur when the observer sees the target's status message, and decides not to go any further.

Stage 2 (Figure 3a): When the observer expands the target's ticket further to see the target's current window title, the system plays a louder piano tone and the observer's avatar grows and moves more quickly .

Stage 3 (Figure 3b): When an observer pulls far enough to request a screen snapshot, the system plays the piano tone several times in succession. The observer's avatar continues to move, and an icon of a pair of eyeglasses appears in the observer's ticket. If the target holds their cursor over the glasses icon, the observer is sent a blurred snapshot of the target's screen (Figure 3c). If the target does not give permission, the expanded ticket contracts back to its default size on the observer's screen.

Stage 4 (Figure 3d). If the observer requests a chat session by pressing the 'call' button, the target's system plays a louder tone and displays a speech bubble icon in the observer's ticket. If the target holds their cursor over this speech bubble, a chat window opens.

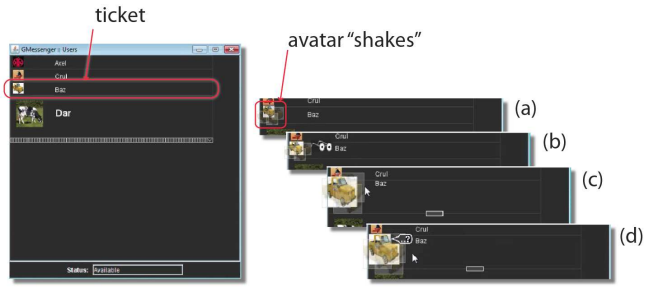

Figure 3: OM notification progression as seen by the target.

Making Interactions Public

Another aspect of behavior in real-world open offices is that it is on public display for all in the office to see. This serves two useful purposes that we wanted to replicate in OM. First, the public nature of interruption and interaction in open offices makes overhearing the conversations of others a routine occurrence [1, 3]. This is not always desirable and there are times where people in these environments seek out more privacy [3], but some overhearing can be useful for awareness. OM makes interaction public by creating a new ticket in everyone's contact list for each in-progress chat session. This ticket consists of the names of all people involved in the conversation; others can click to join the chat if they wish. While the current version does not support more subtle ways of approaching these existing conversations, we plan to add this functionality in the future.

Second, the public nature of awareness gathering in open offices serves to moderate people's behavior, because everyone can see what everyone else is doing. Those who deviate from norms can be seen doing so. OM makes attention public by drawing lines between the tickets of users who are observing each other. These lines make it possible to see if, for example, somebody is constantly observing somebody else. It is our hope that making observation public will support the natural enforcement of social standards about privacy and surveillance that occurs in the real world.

EVALUATION: FIRST IMPRESSIONS AND DISCUSSION

We conducted a small informal evaluation to gather first impressions about OpenMessenger in real use. Eight people (including the authors) at several institutions used the

system for several trials over a two-week period, and shared their impressions via a free-response questionnaire.

Aside from a few technical problems, people were generally able to understand OM's design, and were quickly able to start using its novel features. Participants were interested in the gradual-initiation mechanisms, and tried them often enough to get a reasonable impression of how they would work in realistic use. Several people stated that they liked these features, and that they would use OM for workgroup awareness and communication.

There were a number of comments, however, that show that there is more work to be done in the details of supporting rich interaction and gradual initiation. We discuss two issues below, relating to the way information was presented, and the way privacy was handled.

The information presentation isn't quite right. Our participants agreed that having multiple levels of awareness information and notification was useful. However, they felt that OM did not always deliver information they wanted or in the way they wanted it. Two said that the screen snapshot was too small to be useful, and another said that the status message was less useful because others rarely updated it.

On the notification side, all participants said that the notifications (that an observer was looking) were too distracting. One wanted the indications to be much more subtle because she had already agreed to make her information public and didn't want to be bothered when others looked at it. Another said that the sounds "demand a lot of attention," that the icon to approve the screen snapshot was not intuitive, and that approving the screenshot also required too much effort. One suggestion was to show a 'request pending' indicator that could be represented more subtly.

There were some privacy concerns. Participants' first reactions indicate that there were some privacy concerns, particularly with the screen-sharing feature. While our participants were not averse to sharing this information, they did have concerns about exactly what others could see and for how long. In the next version of the system, we will add an indicator to show when a screenshot is being sent, and how long and at what level of detail it can be seen by the other person. It is also possible that moving to other sources of information (e.g., sensor data) that are more useful and less intrusive than screen shots will eliminate this problem.

Another participant was uncomfortable with the system precisely because attention was public. She said that when she realized others were hearing sounds when she pulled on their handles, she stopped gathering information, for fear of disturbing them. It is likely that this problem would subside as norms developed around acceptable usage of the new tool, but this comment shows the extent to which public displays of information gathering activity can quickly change behavior.

Future Research

As indicated by our preliminary study, the awareness cues and notification techniques require further design work, and this will continue as we produce further OM prototypes. OpenMessenger provides us with a useful infrastructure for testing new representations and presentations for different forms of data (e.g., from sensors) and notification methods (e.g., via peripheral displays). We have planned a series of laboratory and field investigations to test these new designs.

One obvious limitation of this work is the lack of a rigorous field evaluation. Therefore, we also plan to conduct a field test of a revised version of the software in a real distributed workgroup, to gain more design insights and a better understanding of how the issues described here can supported in distributed groups.

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