

Beyond being online: Exploring place-based presence

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ABSTRACT

Use of Presence and Instant Messaging (PIM) applications, which support ad-hoc communication, has grown very rapidly recently, not only at home, but also at work. Early studies on use of PIM applications in the workplace, however, indicate that PIM applications need to be adapted towards the workplace context. We are interested in adaptations that provide more detailed presence information. In our research, we explore place-based presence systems, i.e., presence systems that are not only able to answer people-oriented presence queries such as “Who is online?”, but also place-oriented presence queries, such as “Who is near?”. In this paper, we describe a design space for place-based presence systems, in which we identify the most important aspects and options that designers of place-based presence systems need to consider. Further, we report on our exploratory research approach that yielded this design space. We implemented a first prototype of a place-based presence system and evaluated it in an internal user study. Findings from this user study helped us to redesign a second prototype, which was deployed and evaluated in a small student community. Based on these two exploratory cycles of (re)design and evaluation, we conclude with lessons learned for future research in place-based presence systems.

Keywords

Place-based presence, Instant Messaging, CoCoBrowse

INTRODUCTION

Presence technology is conquering the Internet in a rapid pace. The first generation of this technology answers the question “who is online?” and is often combined with Instant Messaging in Presence and Instant Messaging (PIM) applications such as AOL Instant Messenger (AIM), Windows/MSN Messenger, ICQ and Yahoo! Messenger. PIM applications are probably the most popular type of tool for ad-hoc communication. For millions of users (see Table 1), keeping in touch with friends and family on the Internet via PIM applications has become part of their daily life. A

recent study [12] found that in March 2001, 74% of online teenagers in the US had ever used a PIM application, versus 44% of online adults. For 19% of online teenagers, PIM is even the primary means to get in touch with their friends when they are not with them, second only to the telephone, the primary means for 71%.

Despite a possible “teenage/gossip” image [7], PIM applications are beginning to move into the workplace. As can be observed from Table 1, especially the time users at work spent actively using PIM applications has grown considerably. This growth is remarkable, especially since most major PIM systems are not interoperable with each other. Such interoperability is seen by many as a prerequisite for large-scale use of PIM applications in the workplace. The major players in the PIM market, including AOL [21], were committed to work on adherence to the IETF SIMPLE standard [16] until recently. However, recently, AOL froze their efforts to achieve interoperability based on the SIMPLE standard [22].

Table 1. PIM use in the US [9]¹

USE OF AOL PROPRIETARY, AOL STANDALONE, AIM, ICQ, YAHOO!, AND MSN MESSENGER	9/2000	9/2001	UP
Unique users @home ($\times 10^3$)	41996	53772	28%
Total time spent @home ($\times 10^6$ min/month)	9172	13588	48%
Mean time spent/user @home (hr/month)	3.6	4.2	16%
Unique users @work ($\times 10^3$)	9951	13361	34%
Total time spent @work ($\times 10^6$ min/month)	2332	4891	110%
Mean time spent/user @work (hr/month)	3.9	6.1	56%

These figures show the growing use of PIM applications in the workplace, but they do not reveal to what extent PIM applications at work are used to keep in touch with friends and family. Neither do they reveal to what extent PIM applications are used to support one of the many other communication tasks at work that were found in a recent ethnographic study of PIM in the workplace [14], including quick questioning and clarifications, scheduling and coordination, organizing impromptu social meetings,

¹ More recent figures [10] show that over 72 million unique users at home and work in the US used PIM at least once during April 2002. That amounts to over 25% of the entire US population.

establishing a social connection, preserving a sense of conversational context, negotiating conversational availability and managing the communication situation.

A very recent study of PIM use at work over 16 months between 437 users, sheds more light on this: Isaacs et al. [8] found that contrary to earlier research, the primary function of PIM in the workplace seems to be extended work discussions, much more than quick questions and clarifications, scheduling and coordination and organizing impromptu social meetings. They also found that “Despite the perception that IM is commonly used for social purposes [...], it was relatively rare for our users to chat about personal matters in IM. Overall, 13.0% of conversations included any personal topics and only 6.4% were exclusively personal.”

Despite this evidence for the utility of PIM at the workplace, the introduction of PIM applications in the workplace is not guaranteed to be successful. An early adoption study of a chat application in the workplace [2] found its use to be “healthy” in some subgroups but “fragile” in other subgroups. In a more recent study, Herbsleb et al. [7] found that contrary to their expectations, introduction of PIM applications in the workplace proved difficult and adoption only slightly improved after modifications to the tool, to default permissions and to the way the tool was introduced in the organization. These results warrant further investigation whether and how the design of PIM applications should be adapted towards workplace use.

In our research, we explore design implications of workplace use for presence applications in general, and PIM applications in particular. We believe that place-based presence, a more fine-grained presence model that uses concepts such as space, place, location and distance, can enhance workplace use of PIM applications.

In this paper, we report findings from an exploratory study in which we aim to find the added value of place-based presence information in workplace use of PIM applications. First, we present an overview of the most salient features of current presence functionality in PIM applications. Next, we motivate the need for more extended presence information in the workplace. Subsequently, we illustrate a design space for place-based presence systems and describe related work in that area. Then, we describe CoCoBrowse, a place-based presence tool we implemented and the results of two subsequent evaluation studies with CoCoBrowse. Finally, we conclude with a discussion of lessons learned..

PRESENCE AND INSTANT MESSAGING

Instant Messaging

Like chat, instant messaging provides computer-mediated text-based near-synchronous communication (see Figure 1). After a sender types a message and hits the enter key or clicks a “Send” button, the message, preceded with the display name of the sender and possibly a timestamp, gets

appended as the latest entry in the conversation window, not only on the sender’s screen, but also on the receiver’s screen, usually within fractions of a second. Instant messaging has both characteristics of e-mail and of telephony. Like e-mail messages, instant messages are readable and reviewable, which affords self-paced reading and having multiple conversations at the same time, something most users find very hard to do with telephony. Unlike in e-mail, where the thread of conversation is usually constructed and reconstructed with quotes from the original message interspersed with replies, the context of an instant message is typically found only in earlier contributions in the conversation. Instant messaging is immediate like telephony, but it lacks non-verbal cues like intonation, which can be compensated to some extent with emoticons such as :-) and ☺. Some instant messaging systems provide features that regulate turn-taking, such as showing when a sender starts typing, or by showing letters as soon as they are typed by a sender [20]. Some systems support persistence: parties joining can review parts of the conversation that occurred before they joined.

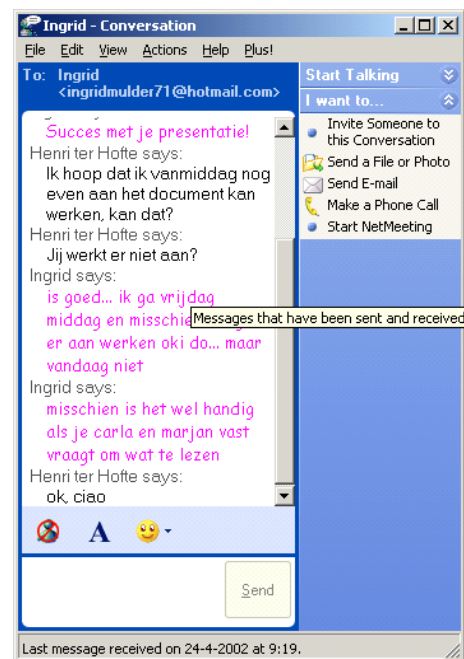


Figure 1: A typical Instant Messaging window

Getting into a Conversation

A distinctive feature of instant messaging compared to chat is the way people get into a conversation and the role that presence functionality plays. In chat systems, parties *join* a pre-existing chat room (also known as a “channel” or “topic”). Once inside, and only when inside a chat room, a party can become aware of the presence of other parties and get notifications of other parties joining and leaving the room. With chat, joining a room implies being available for conversation. In instant messaging systems, a user can *initiate* a conversation with another user (with a first

message) and in some systems a user can *invite other parties* to join a conversation. Upon receiving a first instant message or an invitation to join a conversation, conversational availability has not yet been negotiated with the receiver. Hence, like a telephone call, an instant message can be very interruptive.

Presence Information

In PIM applications, presence information of a receiver is shown to the sender continuously and changes are notified, not only during a conversation (as in chat systems), but also *before* a conversation is initiated (see Figure 2). Though this may seem a subtle distinction, this very feature makes PIM applications “socially translucent” [6], which seems to be crucial to negotiating conversational availability [14].

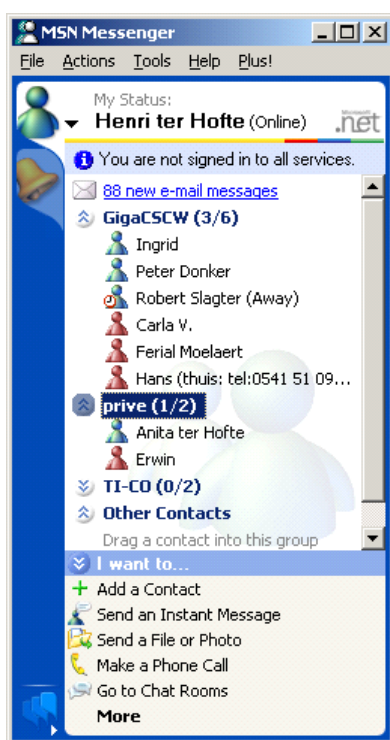


Figure 2: A typical window showing presence

To illustrate the concept of social translucence, Erickson and Kellogg [6] present the problem of an opaque door in a hallway that sometimes is smashed inadvertently into another person’s face when it is opened just at the moment when that person is approaching the door. One design to solve this problem is to post a note on the door telling people to open the door with caution. Another design (which adheres to the principle of social translucence) is to use a glass (window in the) door: now the person opening the door (person A) can see the other person (B) approaching, which helps to reduce the problem, not only because A is *aware* of B approaching, but also because social norms typically make A feel *accountable*: A is aware that B is aware that A is aware that B is approaching.

Just like the glass window in the door does not require additional effort of people approaching the door to make their presence known, most current presence systems can automatically derive some presence information, such as “online”, “offline”, and “away”, from user activity. Turning on the computer and connecting to the internet sets the status to online; a configurable duration of keyboard and mouse inactivity implies being away; new keyboard or mouse activity implies being online; disconnecting from the internet or turning off the computer implies being offline. Other presence information, such as busy, on-the-phone, out-to-lunch, be-right-back, requires user effort. Some systems allow a user that is logged on to appear offline.

So, current presence functionality in PIM applications can answer the questions “Who is online?”, “Is person X online?” and to a lesser extent: “What is person X doing?”. Using this presence information, a sender can observe that a particular person is likely to be available for communication, and the PIM application offers a lightweight means to initiate an IM conversation. The receiver, in exchange for giving up some privacy, hopes to be contacted at suitable moments, can screen incoming messages, can plausibly deny being present by not responding [14] and can respond later, simply by typing into the conversation window at a more suitable time.

Establishing Trust with “Buddies”

Instead of allowing everybody to see each other’s presence information at all times, which would run into serious privacy, information overload and technical problems, most presence systems currently apply a much more restrictive trust model. User A explicitly has to request user B permission to subscribe to his presence information. This process is usually reciprocal: after user B has granted user A permissions, they are “buddies”: not only is user B added to the “buddy list” of user A, but also is user A added to the buddy list of user B. The presence information of all buddies is shown in the buddy list window. Initiating instant messaging conversations with other users is only possible for users that are on your buddy list. In some presence systems a person can be “blocked”: his rights are temporarily and unilaterally revoked.

TOWARDS WORKPLACE PRESENCE

We believe that the nature of relations and interactions with one’s co-workers differs significantly from the nature of relations and interactions with one’s friends and family, which warrants exploring various adaptations.

A first observation is that the way of establishing trust scales poorly with respect to the number of users that want to establish buddy relations: to establish full trust between 4 persons, $4 \times 3/2 = 6$ bilateral agreements need to be established. Between 10 persons, already $10 \times 9/2 = 45$ bilateral agreements need to be established. This motivated some designers of workplace PIM systems (e.g., [7]) to choose a group-based trust model: if you join a trust group,

then all members of the trust group are on your buddy list and you are on theirs, which scales much better.

A second observation is that the trust model is very crude: either you establish a trust relation with someone (or with a group), in which case that person (/ the other members of that group) and you can *always* observe each other's presence information, or you don't establish a trust relation, in which case that person (/ the other members of that group) and you can *never* see each other's presence information and cannot engage in instant messaging conversations. This might not be very problematic when dealing with a small set of family and friends and with whom you expect to resolve unwanted interruptions easily. The trust model seems very crude when dealing with e.g., a larger set of co-workers in a multi-project environment. Of course, one could use multiple identities, or establish and tear down or block and unblock trust relations depending on, e.g., the project one is currently working on, but we believe this is too cumbersome for most workplace users. Another trust model emerges from community websites. Many community-support systems, "even inexpensive discussion boards, now have a list of who is on" [23], p.47. The presence model of these community-support systems consists of a group-based trust model; presence information not only indicates "who is online" but also "who is here", i.e., who is currently logged on to the community website. This presence model may work well for communities that use a community website as their primary resource. However, many groups and communities in workplaces often use a variety of such resources, including shared network drives, intranet/extranet/internet websites, newsgroups, etc.

A third and final observation is that in workplace environments, answering the question "Who is online" may not provide much added value, e.g., when co-workers are almost always online at the same time. In such cases – as well as in the future when more and more people use always-on Internet access technologies, such as cable, ADSL, and GPRS – more detailed presence information might be needed than just online/offline status.

Motivated by these observations, we started explorative research into more detailed presence mechanisms for workplace use. We set out to explore presence mechanisms that allow exchange of presence information with a certain subset of one's buddies (e.g., a particular project team from work) not *always*, but only *sometimes*, depending on context. In particular, we focused on context information that can be derived from the virtual places people visit during their work (such as websites, files on shared network drives, etc.), which gives rise to a new model for presence information we coined *place-based presence*.

PLACE-BASED PRESENCE: A DESIGN SPACE

Place-based presence systems can provide specific presence information, not only about people, but also about *places*.

That is, ordinary presence systems can only provide answers and notifications about person-oriented questions:

- Who is online?,
- Is person X online?, and
- What is person X doing? (to a lesser extent)

Place-based presence systems, in addition to the above questions, can also provide answers and notifications about place-oriented questions:

- Who is here/Who is near?, (where here and near may refer to locations, such as a (page on a) website, a file on a shared network drive, etc.),
- Where is person X?, and
- What is person X doing there?

Below, we describe a design space for place-based presence systems, i.e., a framework that identifies various aspects designers need to consider when designing a place-based presence system. Subsequently, we describe some related work in the area of place-based presence. We will relate various concepts in the design space to concepts from the spatial model of interaction [1].

We use the concepts identified in the design space to describe our exploratory research that involves multiple designs and evaluations of prototype place-based presence systems. In fact, the design space for place-based presence was not constructed a priori, but emerged gradually during our exploratory research.

Trust Model

Some presence systems allow anyone who has access to a presence server to see presence information of others (e.g., CoBrow [18]), other systems are more restrictive (like most PIM applications that only allow buddies to see presence information). The establishment of trust can be compared to the collisions of auras in the spatial model of interaction [1]. We distinguish four aspects:

- Opt-in / opt-out / fixed: In an opt-in trust model, others cannot see your presence information, unless you explicitly give them your permission. In an opt-out model, others can see your presence information, unless you explicitly denied them permission. A special case is a fixed model, where an administrator instead of the end users determines who can see presence information.
- Bilateral / group: In a bilateral trust model, you give or deny each person rights to your presence information separately. In a group trust model, you give or deny a group rights to see presence information.
- Reciprocal / non-reciprocal: In a reciprocal trust model, if person A (/group G) has the right to your presence information, you also have the rights to the presence information of A (/each member of G). In a non-reciprocal trust model, this may not apply.
- Permanent / blockable / place-based: In a permanent trust model, people can see your presence information as long as you gave them the rights to do so based on bilateral or group-wise arrangements. When you can

temporarily block persons from seeing your presence information, we call the trust model blockable. If the right to see your presence information can be based on the presence location (see below), we call the trust model place-based. Place-based trust models allow you to e.g., only give project co-workers rights to see your presence information as long as you are browsing in a project website, editing a project document.

Presence Location and Virtual Distance

When users access shared resources, e.g., browse the web, edit files from a shared network drive, or read or post in newsgroups, in a sense, they are present at a location in cyberspace. “In a sense”, because many assumptions we have when someone is present in physical space, such as being aware of someone’s presence, and being able to initiate contact and communicate with that person, do not necessarily hold in cyberspace; many systems that provide access to shared resources are not socially translucent [6].

In place-based presence systems, presence *location* information constitutes a primary form of presence information: not only the fact that a person is online (i.e., somewhere in cyberspace, without knowing where), but also which shared resource a person is accessing, constitutes presence information (e.g., *where* that person is in cyberspace) can be made available to trusted other persons. By relaying presence location information, systems can be made more socially translucent.

Presence location information is expressed by coordinates, e.g., URLs. Unlike in physical reality, users can be at multiple coordinates simultaneously (e.g., using multiple web browser windows). Presence location information is typically derived automatically when people access shared resources, thus providing for social translucence.

Place-based presence systems that only need to answer the questions “Who is here?” and “Where is person X?” typically only need to do equality tests or pass coordinates.

For place-based presence systems that also needs to answer the question “Who is near?”, it should be possible to calculate *virtual distance* between the coordinates. As explained in subsequent subsections, virtual distance can be used to determine who can and who cannot be seen in a list of currently present users. To calculate virtual distance, presence location coordinates need to be laid out in a space. Inspired by work from Dix et al. [4], and CoBrow [18], we distinguish three types of spaces and coordinates:

- Topological space, with coordinates such as <Netherlands. Enschede. University of Twente. KCT-building. H123> and <cscw. components. presence>. A topological space is organized as a hierarchy of spaces, that contain locations, which themselves can be spaces, etc. Distance in a physical topological space is expressed with terms such as “in the same room”, “in an adjacent room”, and “in the same building”. Virtual

distance is expressed with terms like “on the same web page”, “on the same website”, and “online”.

- Cartesian space, with e.g., 3D coordinates such as <2,4,5>, for a space that is best characterized by orthogonal dimensions. Virtual distance is expressed in terms like “within 1m.”
- Graph space, which consists of nodes (e.g., intersections in a road network or pages in the WWW) and edges (e.g., roads between the intersections, hyperlinks). Virtual distance is expressed in terms like “4 blocks away”, “2 clicks away”.

One way to derive a presence location is to interpret the URLs of a website as a topological space of nested locations, e.g., interpreted as a coordinate in a topological space, <http://www.microsoft.com/net/whatis.asp> would be contained within the space <http://www.microsoft.com/net/>, which again would be contained within the space <http://www.microsoft.com/>. Another way to derive a presence location is to interpret a website as a graph space, with the pages as the nodes and the hyperlinks between the pages as the edges. However, not all URLs have a meaningful structure (e.g., URLs in the ACM Digital Library: <http://doi.acm.org/10.1145/344949.345004>) and the number of clicks may not always be the best way to measure a meaningful virtual distance.

We believe that a mechanism should be available for authors and administrators of shared resources (e.g., websites) that allows them to make their existing website better suitable as meeting place by laying out their website in a virtual presence space and associate each resource with a presence location within that space.

Presence Scope(s)

A presence scope (similar to the “nimbus” in the spatial model of interaction [1]) specifies the maximum virtual distance at which another trusted user can observe particular presence information about a user. One user may use multiple presence scopes, e.g., “people with me on the same website can see me, but cannot see where I am within the website” and “people on the same web page can see whether I am focusing on that page”.

Awareness Scope(s)

An awareness scope (similar to the “focus” in the spatial model of interaction [1]) specifies the maximum virtual distance at which a user wants to get notifications about particular presence information of users that trust him. One user may use multiple presence scopes, e.g., “I want to know where people are that are with me on the same web page” and “I want to see whether people with me on the same web page are focusing on the page”.

Activity

What a user is doing at a location also constitutes presence information. For example, in addition to browsing a web page, this may also involve information whether the user is actually focusing on this page or not (since the user may

have multiple windows open), whether the user is editing this page or not (which is relevant for a WebDAV-based website [24], where users can also edit web pages). We consider this a secondary type of presence information.

Presence Awareness Service

The questions “Who is near?”, “Where is person X?”, and “What is person X doing there?” can now be answered based on a combination of the trust relation between two users, their presence locations and their presence and awareness scopes. That is, a user B only appears in the presence list of a user A when the following applies:

- B trusts A to see his presence information;
- A’s presence location is within B’s presence scope;
- B’s presence location is within A’s awareness scope.

For the presentation of place-based presence information, designers can choose basically between a 1.5D, 2D, and 3D presentation. A 1.5D presentation (list of users, grouped in a hierarchy, e.g., users on same page/site/anywhere) can be very concise. Representations in 2D and 3D can show of both virtual distance and direction of the presence location of other users.

Using the Concepts from the Design Space

The presence awareness service found in most current PIM applications can be characterized with the concepts from the place-based presence design space as follows:

- Trust model: opt-in, reciprocal, bilateral, blockable;
- Presence location: (does not apply);
- Presence scope: infinite
- Awareness scope: infinite
- Activities: online, offline, away (automatic), busy, on-the-phone, out-to-lunch, be-right-back (user indicated).
- Presentation: 1.5D

Related Work

The idea to visualize presence of people on the World Wide Web and to use that as a basis for chance encounters and real-time communication can at least be traced back to systems such as WebTalk from the Sociable Web project [5] and the Virtual Places platform from Ubique [17], a company later acquired by the Lotus (which again is now part of IBM), which now offers place-based awareness in their Lotus Sametime product [13]. Some PIM applications, such as Odigo [15] can show which other Odigo users are on the same page or same website. In these tools, presence locations are not laid out in a space and there is no virtual distance between places. CoBrow [18] is one of the first tools that supports virtual distance between web pages as presence locations, based on the number of hyperlinks that must be traversed between web pages. To our knowledge, our place-based presence tools, described below, are the first place-based presence tools to support activities on WebDAV-based websites (“locking here”) as presence information.

EXPLORING PLACE-BASED PRESENCE

In this section we describe our exploratory research into place-based presence, during which we gradually “discovered” the design space that was described in the previous section. First, we describe the design and implementation of a prototype of a place-based presence tool. Then, we elaborate findings of the evaluation of this first prototype in a small user study. Third, we describe the redesign for a second prototype of a place-based presence tool. Finally, we conclude with findings from the evaluation of the second prototype in a student association.

CoCoBrowse: First Prototype

Inspired by the CoBrow system [18] and research into informal and opportunistic communication [25], we designed and implemented the first prototype of CoCoBrowse [11], an add-on to Microsoft Internet Explorer (see Figure 3) that can answer “who is here”-style presence questions for web browsers. CoCoBrowse was designed to be one of the first components of our component groupware platform CoCoWare .NET [19].

The presence awareness service of this first prototype of CoCoBrowse can be characterized as follows:

- Trust model: none (open for anyone);
- Presence location: URL of page browsed to;
- Presence scope: this URL (toggle button in “Visible” position) / none (toggle button in “Invisible” position);
- Awareness scope: this URL (toggle button in “Visible” position) / none (toggle button in “Invisible” position);
- Activities: focusing, defocusing (on web browser window; automatically detected), locking, unlocking (on WebDAV files; automatically detected);
- Presentation: 1D.

Our first prototype of CoCoBrowse (see Figure 3) was a presence client that monitors Internet Explorer’s browsing activity and sends updates of presence information (indicating who is browsing to which URL) to a simple place-based presence server. This presence server was based on a servlet that required the client to periodically poll for presence state changes, which does not scale to larger numbers of users.

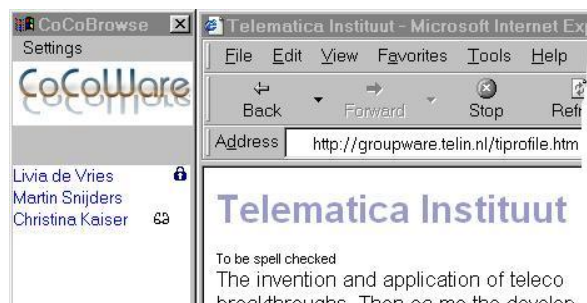


Figure 3. First CoCoBrowse prototype: 3 persons browse to the same file: Livia has a lock (does not focus), Martin reads (does not focus) and Christina reads (and does focus on) it.

On web servers that support the WebDAV standard, such as Microsoft's IIS5 and Apache web servers, users can lock and edit documents by pressing the "edit" button in Internet Explorer, or when they use Microsoft Office applications (from Office 2000 and up). The first prototype of CoCoBrowse could detect such WebDAV locks as presence information and notify other clients on that page of this changed presence information.

Users could start a real-time conference with any of the other users on the same web page, by double clicking on their name. This initiated a NetMeeting conference with that user (which provides audio and video conferencing, application sharing, shared whiteboard and file transfer).

First Evaluation: Internal User Study

In this first study, we asked 17 people to install the first CoCoBrowse prototype, to use it in their daily project work during four weeks. All were member of the project team in which CoCoBrowse was developed; a multidisciplinary team consisting of programmers, managers, social and technical researchers, and interaction designers. Only four were directly involved with the design and implementation of CoCoBrowse. Afterwards, we collected data with an online survey. Afterwards, we organized an evaluation meeting, in which we discussed the results of the online survey with all the participants. A small group of users decided to execute a stress test of the system by scheduling a six person meeting with CoCoBrowse at a pre-determined website. The users saved their chat-logs and made them available for our evaluation.

Survey: Main Results

The questionnaire was returned by 13 respondents. 2 persons indicated they never started CoCoBrowse, 7 persons sometimes, and 2 persons frequently started the CoCoBrowse software. 8 persons used NetMeeting via CoCoBrowse. From the 11 respondents, 6 used CoCoBrowse for other purposes, for instance to make sure that "other users can see that you are editing a document". All respondents were familiar with PIM applications; most respondents used one or more PIM applications: MSN Messenger (6), ICQ (3), or other tools (2). 8 respondents felt that CoCoBrowse added value to current PIM applications. They indicated that it is "good for collaboration through several websites", and "in order to see who else is at the same URL".

Discussion and Conclusions

In a meeting we evaluated the results of the online survey with the respondents.

The respondents indicated they felt the critical mass needed to test this kind of tool was not reached. Furthermore, they suggested starting CoCoBrowse in combination with Internet Explorer. In the first prototype you had to start a special version of Internet Explorer, not the normal Internet Explorer. This would give users more trust in one's online status. After all, if a person's status was presented as

"offline", this could also mean that the person did not start the special version of Internet Explorer with CoCoBrowse, although he was in fact browsing.

During the scheduled meeting, the respondents frequently lost track of each other and used other communication media (phone, other PIM applications). Based on the feedback from the survey and the evaluation meeting, we attribute this primarily to the "tunnel vision" that CoCoBrowse offered: you have to be at the exact same URL in order to see each other. People frequently resorted to asking "where are you"-type questions through other media. We also noticed that people (probably inspired by the name CoCoBrowse) assumed the system would allow people to browse together, e.g., by following another person, similar to the "navigate together" feature in many collaborative web browsers. Various resolutions were suggested by users, e.g., widening the tunnel vision (e.g., "who is on this site"), in combination with showing where a particular person is; providing a "user X browsed to URL-Y" or a "navigate together" feature (by one user described as "stalking") and presence indications that only slowly fade when users left ("who was here recently?").

Also, during the evaluation meeting, the differences in the trust model between CoCoBrowse (completely open) and most PIM applications (opt-in, bilateral) were noted.

CoCoBrowse: Second Prototype

Based on our evaluation, we changed the prototype (see Figure 4). We added a page chat window that was always visible below the page being viewed and that could be used to chat with other persons also present at that URL. Unlike the chat in NetMeeting, which required several clicks to initiate, this chat was readily available. As a workaround for the problem of losing track of each other when a person browses away from a URL: we implemented a trust model with a fixed set of buddies and a "My contacts" window that – when CoCoBrowse was active – showed online/offline presence status of those buddies. We chose a fixed trust model as a simple solution for the fixed user group we expected in the second empirical study. We also added a *personal chat* feature (not shown in Figure 4), which could be initiated both from the "My contacts" and from the window that showed people present on the same URL.

The presence awareness service of the additional "My contacts" service can be characterized as follows:

- Trust model: fixed;
- Presence location: (does not apply);
- Presence scope: infinite;
- Awareness scope: infinite;
- Activities: online, offline (automatically detected when CoCoBrowse was activated/deactivated)
- Presentation: 1.5D

To circumvent the need to remember to start a special version of Internet Explorer to be able to use CoCoBrowse,

the second CoCoBrowse prototype could be started from a button in the Internet Explorer toolbar.

The presence awareness service of the window that showed people present on the same URL remained the same, except for activities: it no longer supported focusing, defocusing, locking and unlocking presence activity information, since we switched to using one of the first versions the Virtual Presence System (VPS)[3], which was not yet able to provide this information. VPS did not require polling, but notifies clients of presence information updates, which provided better scalability for user trials.

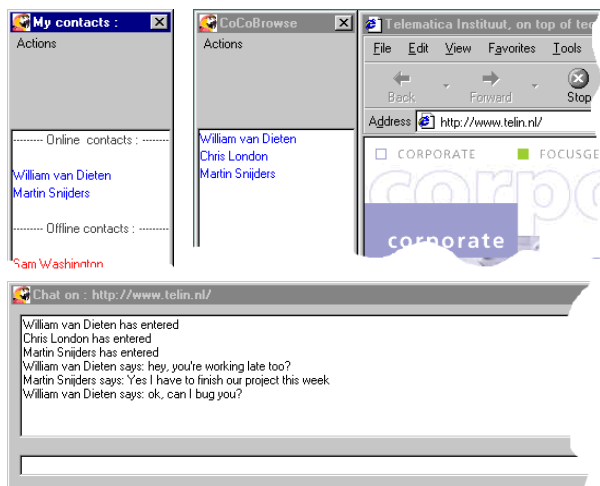


Figure 4: Second CoCoBrowse prototype: contacts William and Martin are online and on the same page, as well as non-contact Chris; contact Sam is offline.

Second Evaluation: a Student Association

In the second empirical study, we evaluated the second prototype of CoCoBrowse in a setting that did not involve people associated with the project in which the tool was made. We asked the members of various committees of *Inter-Actief*, a student association for computer-science students, to install and use CoCoBrowse for two weeks. Afterwards, we collected data with an online survey.

Survey: Main Results

The questionnaire was returned by 7 respondents. With respect to the use of the CoCoBrowse, 2 persons indicated they never started the software, 3 persons once a week, and only 2 persons started the software several times a week. When asked how often they used the software in an active way, 4 respondents indicated once a week. They explained that they made an appointment to test the software, and met each other on the *Inter-Actief* website.

Survey responses showed that all respondents already used one or more PIM applications. One user responded: "It is hard to get others to test [CoCoBrowse] for longer periods of time, because it does not catch on and because people are often already hooked on things like ICQ and MSN [Messenger], because their current friends are using that

already. Integration with those existing services would probably be of more use".

Discussion and Conclusions

Due to their small number, the students never met at a website by chance, but instead they made appointments for online meetings. Apparently, the critical mass of users required for chance encounters on the web was not reached. In retrospect, we feel that the fact that CoCoBrowse did not start the "My contacts" service (and announce the local user as being online) at system start up and that it did not start the "Who is here" window (and announce the local user as being here) by default when Internet Explorer was started, may also have hampered social translucence and trust in online status of others.

The respondents were experienced PIM users whose expectations were formed by earlier experience with PIM applications. It appears such people may not be prepared to spend time persuading their established contacts to use a new, incompatible system, if the benefits of that new system are unclear or too small. For the student association, instead of adding PIM features to a place-based presence system, it might have been better to add place-based presence features to existing PIM applications.

CONCLUSION

Recently, the use of presence and instant messaging applications has grown rapidly, not just at home, but also at work. However, early studies reveal that these PIM applications may have to be adapted to the workplace. We explored the design space for presence applications with two designs and evaluations of presence applications in real-life settings. In particular, we investigated whether place-based presence, i.e., presence enhanced with concepts from the spatial model of interaction, adds value to presence applications in workplace settings.

We learned the following lessons for future deployments of the CoCoBrowse place-based presence tool in our own project group and in an external student community:

- Place-based presence applications should be designed as an extension of existing PIM applications, which allow people to exchange place-based presence information with some contacts, and stay backwards compatible with other contacts.
- (Place-based) presence systems should require very little user effort to update presence information. Not starting a presence system by default at system start up or a place-based presence system at start up of the place-visiting application (e.g., a web browser) violates social translucence and may harm fidelity of presence information, which lowers trust in presence status.
- If a place-based presence system only shows other users at exactly the same URL, people hardly meet by chance and easily lose track of each other. Facilities are needed to avoid such "tunnel vision", e.g., with wider presence and awareness scopes for people to see each other.

With respect to the added value of place-based presence in general, we conclude that more work is needed to find out under what circumstances place-based presence systems can live up to the promise of providing additional useful information to discover and appropriate timing for communication with others. We look forward to pursue this research armed with the insights from this paper.

ACKNOWLEDGMENTS

Thanks go to Martin Snijders, Hans C.J. Kruse, William van Dieten, Carla Verwijs and other members of the GigaCSCW project, to the Distributed Systems group at Ulm University and the members of Inter-Actief for their contributions. This work is sponsored by the Dutch Ministry of Economic Affairs as part of GigaPort (www.gigaport.nl), by SURFnet and by Cisco Systems.

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