Livemaps for collection awareness

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With the increasing proliferation of chat applications on the web, the old vision of “adding people” to the web is becoming a reality. Along with collaboration tools, more and more sites offer people awareness mechanisms to let the site visitors know about each other. This reflects the dual nature of the web as a place for virtual meetings as well as an information repository. While standalone chat tools became the killer application of the Internet, site-related awareness applications did not quite catch on. In this work, we suggest possible reasons for this phenomenon and propose a new paradigm for awareness and social navigation. We identify three main obstacles to the existing site-related awareness applications: high sensitivity to the “critical mass” requirement, inflexible meeting place granularity and poor visitor visibility. To address these issues, we extend the well-known “document awareness” concept to a more general one that we call “collection awareness”, which better reflects the graph structure of the web. We introduce a new tool for high-level awareness and collaboration, called Livemaps, which projects live information onto a web site map. We demonstrate how Livemaps addresses the obstacles we pointed out and describe a user study conducted on a “fan” web site for the “Friends” comedy series, so as to verify whether Livemaps actually improves social awareness.

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1. Introduction

The World Wide Web (WWW) is a giant assembly of “virtual places” that web surfers visit at will, without being, in most cases, aware of other web surfers activities. It had been proposed, in the early days of the WWW, to “add people to the web” by associating them to “virtual places” (Shapiro, 1994). But this approach never really caught on, probably because most of the models required a modified browser, or in the best cases a plug-in. On the other hand, the extraordinary success of instant messaging applications such as ICQ,† and of chat rooms on a large-scale basis, as well as the (re) emergence of computer-supported cooperative applications demonstrate the increased interest in collaboration and synchronous communication around the web, as well as the existence of a stable infrastructure for collective surfing.

†ICQ, http://www.icq.com/
In the last few years, several companies started efforts to make web surfing a collective experience (Gooey, ICQSurf, netElement). It was only natural and reflected the fact that web was becoming a virtual meeting place rather than just an information repository. These efforts have not had a significant impact so far, and hence site awareness applications are not yet in wide use.

In this work, we examine web-based awareness and collaboration applications, starting from research [like CoBrow, (Sidler, Scott & Wolf, 1997)] to commercial ones (see footnotes). We analyse the main challenges that such applications are facing, namely the critical mass requirement, the people awareness model, the places representation model and the indication of awareness information.

This paper is organized as follows. Section 2 gives an overview of most of the existing web-based awareness applications and tries to see why they failed to conquer the web. Section 3 introduces our approach for tackling the issues identified above. We address the places representation problem by extending the well-known “document awareness” concept to a more general one that we call “collection awareness”, which better reflects the graph structure of the web. We suggest to represent people awareness information in an easily perceptible way by using the “social navigation” model (Chalmers & Dourish, 1994) embodied in a novel visual clue: the “water filling gauge” for awareness. This section also describes our deployment model. Section 4 describes how the above concepts were embodied into Livemaps, a tool for high-level awareness and collaboration, which projects live information onto a web site map. Note that we concentrate here mostly on the awareness and collaboration aspects of Livemaps since the underlying site mapping and visualization technology has been described elsewhere (Maarek, Jacovi, Shtalhaim, Ur, Zernik & Ben-Shaul, 1997; Herscovici, Jacovi, Maarek, Pelle, Shtalhaim & Ur, 1998; Ben-Shaul et al., 1999). Section 5 shows the effect of our approach on user experience by presenting the results of a user study conducted on an active fan web site. Finally, Section 6 outlines some future directions and proposes possible extensions to our approach for a better user experience on the web.

2. Previous work

Awareness and chat capabilities are offered in different shapes and flavours on the Internet. From simple instant messaging applications such as AOL IM, ICQ (see footnote) or Sametime Connect to web-based chat rooms, interfaces range from the traditional textual input to advanced graphical paradigms such as the avatars that are proposed by systems like The Palace or Comic Chat (Kurlander, Salesin & Skelly, 1999). While avatar-based systems provide contextual information about other people who are present even if passive, they require a great deal of screen real estate. A more

¶netElement, http://www.netelement.com
recent graphical chat approach consists in using abstract shapes such as bubbles (Erickson, Smith, Kellogg, Laff, Richards & Bradner, 1999), or circles (Viegas & Donath, 1999) to represent both the identity and activity of chat participants. One major advantage of these systems is that the real estate thus saved is used to convey useful information on the dynamics of the conversation. These abstract systems, though, are still centred around one single virtual place and are detached from the web as an information repository.

Some other collaborative applications do take the web into account, by allowing users to meet at a web site, chat, surf together or share a browser. WebPath, by Moody (1998), and PrairieDog, by Day and Foley (1998) to cite just a few, are examples of such systems. Webl ine offers a co-surfing option via its “shop with a friend” feature deployed at the Lands End commerce site. Such co-surfing can also be very helpful in web Help desks (Kobayashi, Shinozaki, Sakairi, Touma, Daijavad & Wolf, 1998).

Other applications deal with collaborative web browsing. ICQ Surf (see footnote §), NetElement (see footnote ¶) and Gooey (see footnote ‡) enable users to chat while simultaneously surfing on the same web page. When a registered user of one of these programs visits any web site, a window on the user’s browser lists other registered users who are also visiting the site at that very moment. This approach, which was referred to as “co-browsing” is different from sharing a browser with someone. Perhaps a more appropriate name for it would be “chat in context”, because people meet in the context of some document. In this work, we focus on this latter type of applications.

2.1. WHY “CHAT IN CONTEXT”?

“Chat in context” greatly differs from the regular chat applications. While chat applications mostly deal with people, who are acquainted with one another (usually referred to as “buddies”), “chat in context” applications create an environment where total strangers can meet and talk. Thus, the goal of a chat application is to simply connect people who wish to talk to each other and sociological factors are generally not a major issue in those solutions. But sociology plays a big role in “chat in context” applications. The idea of “chat in context” is based on the hypothesis, that there is a greater chance for strangers to talk if they are given a common background and a common environment. To put it in simpler terms, seeing other people on the same web page as you are, gives you a context to talk to them.

An attempt is made here to create a “place” for web surfers. As Dourish and Harrison (1996) pointed out, while “space is the structure of the world”, “place is a space, which is invested with understandings of behavioural appropriateness, cultural expectations and so forth”. Following their view, we can define the web as the space in the surfer’s virtual world. The “chat in context” approach “re-places” this space by taking each web page as a place in this world.

This view is somehow counter-intuitive, since, except for the context, there is usually nothing special on a web page that falls under the above definition of place. In addition, not every web page context is interesting or attractive enough to make it a good

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“place”. There are applications that try to solve this problem by building virtual places on the fly, based on the context and browsing activities of its users. A few examples for such applications are the CoBrow tool (Sidler et al., 1997) and more recently I2I (Budzik, Fu & Hammond, 2000), where people meet as they browse pages with similar context. Therefore, assuming that web pages are a good place for collaboration, why should users choose to communicate while browsing? And why should they take their socializing to the web, when they can easily talk to their friends using conventional chat applications?

The great difference between chat and “chat in context” applications, as we stated before, is the ability to meet strangers. The key question then is, why should someone talk to strangers? The answer to this question depends on the contents of the site. On a fun, entertainment or news site, one can wish to talk to someone about the new developments in politics or the previous night episode of a sitcom. Professional sites are drastically different. The Usenet Newsgroups experience, even if asynchronous, demonstrated that strangers are willing to help each other to resolve issues that remained unsolved in a circle of friends. Studies actually demonstrated that participants originating from various horizons would have a more fruitful interaction than colleagues working in the same topic or project, due to the diversity of their background (Whittaker, 1996; Whittaker, Terveen, Hill & Cherny, 1998). In summary, the greatest challenge for a “chat in context” application is to create a good place for collaboration on the basis of the web, and to facilitate communication between friends as well as strangers.

2.2. CURRENT PROBLEMS WITH “CHAT IN CONTEXT”

A great deal of problems arise while developing an adequate “chat in context” application. The major one, as mentioned before, is that a web page by itself is not the ideal choice for a collaboration place. In addition, several technical issues must be resolved.

Let us first consider the place model. The granularity of a web page as a place is usually not good enough to bring people together. If you can only see people who visit the same page as yourself, you can easily miss someone interesting or familiar, who visits another page. On the other hand, if the application takes the whole site as a meeting place [as Gooey (see footnote ‡) does], it misses the point of bringing people together on the basis of the same context. Many sites contain pieces of information so diverse, that knowing that someone is visiting the same site as you, does not necessarily imply common interests. Even worse, popular sites hosting more than a few dozens visitors will force users to define buddies list to avoid being overwhelmed, and the ability to meet with strangers is then lost.

The second issue is the deployment model. “Chat in context” applications (like many new applications) greatly suffer from a “critical mass” problem, as pointed out by several works analysing the adoption of communication tools in general (Ehrlich, 1987; Grudin, 1988) as well as in specific cases (Bradner, Kellogg & Erickson, 1999). Most of these applications require some initial effort from users in installing a client component. This initial time investment often discourages users (even early adopters), and therefore reduces the adoption rate. This is problematic, as a collaborative application cannot
succeed if too few people adopt it, because users might feel very lonely on the site and decide to abandon the application. The last, but not least, issue is privacy (Hudson & Smith, 1996). Even when users are not required to authenticate themselves and use only nicknames, they feel threatened if someone else knows where they browse. By installing a “chat in context” application, people declare that they agree to reveal their location to others. Then, when someone opens a chat session with them, they do not experience the “Big Brother” syndrome. In general, whatever deployment model is chosen, it is crucial that users are aware of being watched and agree to it.

3. Our approach

3.1. COLLECTION AWARENESS

When in 1994 Shapiro introduced Virtual Places in the context of the web, he also defined place-based awareness as “document awareness” (Shapiro, 1994). This approach was somehow limited in the sense that it did not consider at all whether a document was indeed a “good” place for collaborating. We claim here that the definition of place must be extended, and propose to generalize the concept of document awareness to that of collection awareness, where eventually the collection must be defined in accordance with its aptitude to be a good meeting place. For the sake of the example, let us consider a typical collaboration server that supports awareness—namely Lotus Sametime Server (see footnote ‡‡). It supports two concepts that are used in most collaboration servers (sometimes under a different terminology though).

(1) “People awareness”: which can be explained as the knowledge of who is “on-line”. Being on-line means being logged-in to a given site and/or to the associated collaboration server. It provides the basic event information needed to support synchronous applications among on-line people such as instant messaging.

(2) “Document awareness”: which can be explained as the knowledge of the people who are at the same instant visiting a virtual place like a chat room, or a web page.

Document awareness is the basis for collaborative surfing on the web. However, when applied in its strictest sense it presents the major drawback of forcing people to agree on a meeting place in advance. If this is not the case, the awareness of co-visitors at an arbitrary page (single page or document awareness) might be too small for productive collaboration, and relevant people browsing in the neighbourhood of that page would be missed. On the other hand, using the root of the site as a meeting place for all visitors of the site wherever they are on the site might be too coarse. It seems that a better level of granularity would be to define a collection of pages as the meeting place, the size and shape of the collection depending on the targeted communities. Note that it might well happen that there are so many visitors at one single page that the page itself is too coarse. In that case either the collection needs to be assembled differently or the visitors filtered. As pointed out earlier, filtering visitors by “buddies” is not always the best option, since it reduces the web awareness to conventional “buddy”-type awareness. While one could define more sophisticated filters, we believe that tuning the collection
granularity is a preferable solution. In our view, a single item in the collection can vary from a cluster of pages to a segment of a page. There has been some work by Donath and Minar (1999) for visualizing the dynamics of crowds in web sites by replaying post-mortem web server logs on a site map. Such an approach is not applicable in our context as our primary goal is to encourage synchronous collaboration, and therefore live awareness is a prerequisite. Pioneering work in live awareness has been done by Liechti, Sifer and Ichikawa (1999) in the context of web site monitoring. They devised an approach for the live monitoring of web presence on large sites with site regions granularity activity. We propose to follow the same approach here in the context of collaboration and extend it by adding collaboration features to their social awareness triggering concept.

We believe that by allowing a finer-grained awareness, surfers could form dynamic communities around common interests as defined by a set of related pages within a site or across sites. Collaborative surfing would then be provided both to “buddies” and to casual acquaintances made on the site. We thus propose to extend the awareness concepts and define collection awareness as the knowledge of people who are at the same instant visiting the same collection of virtual places, with a single place granularity. An immediate benefit of collection awareness is providing an abstraction on top of document and people awareness that allows users to see from a high-level view who visits where.

3.2. COLLECTION REPRESENTATION

Given this collection awareness definition, it is crucial to represent collections so as to ease navigation within the collection, while keeping a global view of the context (and thus help understand who visits where). We propose here to support collection awareness by projecting document awareness onto a collection abstraction such as a site map. The site map is a visual representation of the structure of a collection of pages, commonly used on the web, manually or automatically (Olsen, Korfhage, Sochats, Spring & Williams, 1993; Maarek et al., 1997; Liechti et al., 1999) generated and can range from a simple list of pages to a full graph representing the underlying hypertext structure. Each map element, or node in the graph, represents a portion of a page, a single web page, or a group of related web pages. We take advantage here of the Mapuccino automatic site mapping tool that was introduced by the authors elsewhere (Maarek et al., 1997). One of the advantages of Mapuccino is its versatile visualization applet that offers a variety of views, from the simple tree-control view for novice users, to an advanced graph like fish-eye view for more sophisticated ones. Note that unlike other works such as SGF (Liechti et al., 1999), Mapuccino is not targeted to very large collections and is best for visualizing a few dozens of nodes; however, this is not a restriction in our context as we believe that huge maps while needed for site management for instance are not adequate for awareness and collaboration.

3.3. AWARENESS REPRESENTATION

Adequately visualizing awareness on top of a collection representation is also an important issue. We list below three key requirements for awareness
representation.

(1) Compactness. Since site maps already require a significant amount of real estate on the user’s screen, the first requirement is that awareness indicators be as compact as possible and yet informative.

(2) Scalability. While it is not a necessity for the map itself to display a huge number of places, it is crucial for the awareness indicators to carry information about possibly huge number of people visiting a virtual place simultaneously. A common way is to abstract visits or avatars by circles [see (Donath & Minar, 1999) for visits on a website] or bubbles [see (Erickson et al., 1999) for chat-room participants]. While being preferable to realistic avatars, this abstraction unfortunately does not scale up. As the number of visitors grows, it creates a feeling of “crowded site” rather than “crowded page”. Hochheiser and Shneiderman (1999) propose using Starfield visualization for large web logs, but their 2D views, while supporting large amounts of data, do not seem adequate for representing real-time awareness information.

(3) Translucence. The final requirement for an awareness indicator is to be “translucent” to adopt the definition of Erickson et al. (1999). In other words, the indicator must be easily perceivable and yet non-obtrusive.

Our proposed answer to these requirements is a small graphical component that mimics a “water filling gauge”. This small gauge (12 \times 19 pixels in size, and possibly smaller) typically supports a range of 0–10,000 units (and may be tuned for larger, or smaller ranges), where a unit is mapped into a visitor of the place. Using a logarithmic scale, the gauge is sensitive to differences between small amounts where every unit counts, and less so for large amounts, where one unit is less significant. The gauge uses different shades of colour, where a fuller gauge indicates more units, and a darker colour indicates a larger order of magnitude. From the user’s point of view, the simple “rule of thumb” is: the darker the gauge is, the more people it represents (see Figure 1).

The “water filling gauge” fulfills the three requirements identified above. Indeed, it is compact enough to necessitate little additional real estate on the screen. It is scalable as it can represent thousands of visitors. Finally, the water metaphor is easily interpreted (especially when visitors leave and enter places). Note, that the role of the gauge is not to indicate the exact number of visitors on a page, but rather to supply an approximation of the quantity of visitors at a specific page. The gauge is even more useful for comparisons. With one glance at all map gauges, one can easily determine which are fuller (or darker) and thus understand which pages are more visited at a given point in time. It is both non-obtrusive and clear enough, thus translucent.

Attaching the gauge to each node on the Mapuccino site map plays another important role. It gives new visitors a visual clue of the most popular pages at a point in time.
time. This information is useful not only for the obvious reason that at these places one has the most chances to meet someone else, but also because a large number of visitors implicitly recommend these places. Therefore, augmenting the site map with a “water filling gauge” is an implementation of the “social navigation” concept, presented by Dourish and Chalmers (1994). Figure 2 presents a Livemap of the IBM alphaWorks Web site, where one can see the Mapuccino map augmented with the gauges, representing the awareness information. The user-interface could be extended further, by refining the type of information provided on the map. For instance, the simple qualitative information, such as presence or absence of a chat session (binary information) could be replaced by Babble-like bubbles (Erickson et al., 1999), which would visually indicate the degree of participation of each chat member. Other types of quantitative information, such as the access history of pages, or the web page quality as proposed by Terveen and Hill (1998) and Hill and Terveen (1996), could easily be represented by additional gauges.


Figure 2. Livemap of IBM alphaWorks site.
3.4. DEPLOYMENT MODEL

As mentioned earlier, the “critical mass” problem is an obstacle to many applications. Most of the existing “chat in context” tools require installation on the user’s machine. The simple action of visiting a web site is thus not sufficient for joining a place, because users need to spend additional effort for local installation, before actually enjoying the benefits of collaboration. We thus suggest minimizing the effort needed to join in by using a Java applet mechanism (rather than a plug-in or local application install). Simple collaboration tools, like chat or simple whiteboard, actually do not require access to local data and therefore do not need violating the applet security model †††.

Yet, the user needs to proactively join a place to ensure that she/he is fully aware of her/his being monitored. Advanced servers like the Lotus Sametime server, that we use as a reference in this paper, provide not only identification of visitors for people awareness but also authentication. In order to avoid the “Big Brother” syndrome, a user entering a Livemaps-enabled site must actively acknowledge his/her willingness to see others and to be seen by others by pressing the “join in” button, as shown in Figure 3, top clip. She/he can then remain anonymous and pick an unauthenticated pseudonym, or be fully authenticated if she/he has already registered with the site (Figure 3, bottom clip).

While using an applet model makes Livemap easier to try out for first-time users, yet it is not sufficient to ensure that enough people are motivated to join in.

4. Architecture and implementation

The Livemaps system builds upon two existing technologies and extends them: the Mapuccino site mapping tool for collection representation and the Lotus Sametime

server for awareness and collaboration. In this section, we briefly describe the basic architecture and implementation issues of the system and explain what is involved in enabling an existing web site with Livemaps.

4.1. BASIC ARCHITECTURE

The Livemaps system consists of two main components in addition to the Sametime server: a visualization and collaboration Java applet (which we call observer) and a Javascript-based reporting engine (that we call visitor). Each web page to be monitored embeds a small piece of Javascript code that detects page entering and page leaving events and reports them to the Java applet. The Java applet forwards these events to the Sametime server, which broadcasts them to all interested parties (Figure 4).

The visitor component reports the current user activities to the Sametime server, while the observer component receives events about other users’ activities. The observer consists of an event module and a visualization module. The event module registers with the Sametime server to receive events. The visualization module, currently based on Mapuccino, is implemented as an event listener to the event module and can therefore be easily replaced by any other visualization. The Sametime server is also used as a messaging server, supporting instant messaging and some limited application sharing capabilities as long as they do not break the security model.

4.2. ENABLING AN EXISTING SITE

The two lines of Javascript code that need to be embedded into each page for monitoring can be added automatically. For static pages, we built an automatic tool that puts Livemaps snippets on required pages. For dynamic pages, the code responsible for generating these pages must be slightly modified to account for these two Javascript lines. According to our experience, enabling an existing site with Livemaps technology requires only little effort by the webMaster.

5. User study

To verify the capabilities and qualities of our approach, we conducted a user study on an unofficial fansite of the “Friends” comedy series. This study had several goals. The first one was to determine how collection awareness influences the socializing behaviour of people if at all. The second one was to examine the usability and interpretability of the “water filling gauge”. Users were also encouraged to give more general feedback on the features of Livemaps.

First, we did not divide our users into predefined groups, preferring to work with casual visitors of the site. The new technology was publicized by the WebMaster on the site homepage so as to ensure that all visitors are aware of the new “chat in context” feature. We asked the users to fill the registration form that included personal questions (nickname, age, hobbies) along with Internet and instant messaging usage preferences. Every once in a while, users were requested to fill an overall impression form.

This first part of the experiment was conducted for 2 weeks and its results were not encouraging. Only eight visitors ever logged-in to Livemap and most of them did not do it simultaneously. We explain this phenomenon by the fact that Livemap was installed on a mirror of the main site and it was not natural for people, usually browsing the main site to also log into the mirror. Indeed, after analysing the log file of the web server we found that there were only few simultaneous visitors on the mirror site.

We therefore switched to another experimentation mode. We assembled a group of users both from our work group and from the usual visitors of the “Friends” site and created a game for them, based on the site contents. It was a “treasure hunt” kind of game, where the treasure was a piece of information hidden in one of the site pages and there were several clues, one after another, that lead to the desired page. People were invited to join during a window of time. In addition, only the mirror site was enabled for the game. Users got instructions from the game moderator in a common chat room and could use every feature of Livemap (e.g. collection awareness, chat and visitor paths) in order to find the “treasure”.

This time we had no difficulty in bringing people in. So for 40 min, we had 16 users, simultaneously and actively using Livemap. The users were divided as follows: eight men and eight women, five people under 20, one from 20–25, five from 25–30, four from 35–40 and one over 40. They also came from different countries—nine from Israel, five from the USA, one from Brazil and one from the Netherlands. The vast majority (nine) were Friends regular watchers, two never watched Friends, four watched it from time to time and one used to watch, but stopped entirely. Again, six people were fans of the series, five usually enjoy it, three were neutral and three hate it.
As for the Internet habits of the participants, all of them were familiar with the Internet, using it on a daily basis. Five use it mostly for work, nine mostly for personal use and two for both. It is interesting to notice here that the majority of people who participated in the study used to learn new things about their hobbies from Internet sites and personal friends, and only four said that they use chat to find interesting information. In terms of chat, only three participants stated that they love using chat applications, three said that chat is good only for very specific tasks and six people preferred not to use chat at all; four other participants elaborated more on their chat habits, two said that while they “love it for buddies and colleagues” they do not like to talk to strangers. As one of them put it, “[I] won’t talk to a stranger unless I have a very specific question someone might be able to answer”. Two users pointed out that they do not like chat-rooms for being “like parliament sessions, when everyone talks but nobody listens”, but they love one-on-one chat. To cite one of them: “…[one-on-one chats] have some very interesting characteristics that do not appear in any other form of real time one-on-one conversations, such as the ability to think about what you say for a reasonable amount of time before you say it.”

After the game, we asked all participants to fill out a Livemaps study form that mostly referred to collection awareness, the “water filling gauge”, chat usage and our deployment model. Every feature got a score from one to four as detailed below.

(1) For chat: the scores were used to indicate the preferred usage; 1—for game purposes only, 2—for talking only about other issues, 3—for both the game and other issues and 4—for no usage. We do not elaborate further on the chat analysis results as this is out of the scope of this paper.

(2) For collection awareness: the scores were used to indicate the preferred awareness model; 1—for people who found the collection awareness much more useful than conventional document awareness, 2—for people who could navigate in collection awareness model but preferred to use the document awareness, 3—for people who didn’t understand the collection awareness and 4—for those who did not like the idea of web-based awareness at all.

(3) For the water gauge: the scores reflected on clearness and usefulness; 1—for clear and useful, 2—for clear and useless, 3—for unclear and useful and 4—for unclear and useless.

(4) For the deployment model: the scores reflected on the need for triggering preview; 1—for no need, will join anyway, 2—for medium need, 3—for strong need, 4—indifferent, will never join.

Figure 5 summarizes the results on this survey per feature. It shows that three users had some reservations against awareness in general. Most of the participants found the map very useful, especially during the game. To state one of them: “I could easily see where other people go and find paths I never thought of.” There were also a few participants who preferred the document awareness model. They mostly complained about the method for accessing people on the same page they were at: while making several clicks to find out who was on different pages is justified, making the same amount of clicks to find people on your page is annoying. This is definitely a valid point and weakness of
our user interface. Some other users had trouble understanding collection awareness and complained about the dynamic movements on the map. “It was really hard to follow people,” said one of them. “I felt a little dizzy trying to focus on people movements”. While we still believe that the global dynamic view is useful, this criticism could be addressed by adding a filtering feature that would enable focusing on the moves of a single visitor (or a group).

The next question was about the “water filling gauge”. Most of the users found the gauge clear and useful. A few commented, though, that while the gauge gives a clear high-level comparative view of the quantity of people at different places, it was hard to infer the order of magnitude of visitors from the gauge fullness. A remedy to this would be to indicate the actual order of magnitude of the number of users via a tooltip appearing when positioning the cursor over the gauge. We would then hope that after a while, users would automatically map the gauge colour and fullness to an approximate numerical value. Those who understood the gauge well, but found it useless, were those who did not like the idea of collection awareness at all. The third group, who did not understand the gauge, found it very difficult to handle the abstraction of “the fuller the gauge is, the more people are at that place.” As put by one of these users: “I was addressed by another user and only in chat he told me that he is on the Pictures page. Otherwise I would never have figured it out.”

The final question we asked was about our deployment model. During the first part of the experiment, while occasional visitors of the site were supposed to use Livemaps, the WebMaster of the site received many complaints from people, who did not enter the map, simply because they did not know if somebody was on it. This made us realize that in order to solve the critical mass problem, awareness needs to be “jump started”. Indeed, a natural attitude for people joining places is that they do not want to be the first there and wait for others. They will join only if they see enough people already “there”. As a result, we decided to incorporate into Livemaps a “triggering preview” that should act as a teaser to attract participants and is depicted in Figure 6.

![Usability study results](image)

**Figure 5.** User study results.
The idea is to let visitors know about both the number of people browsing the site and the number of people using Livemaps, without actually logging into Livemap. Let us consider the following example: there are seven users on the site and none of them are logged into Livemap. Without a “triggering preview”, they are not aware of each other, so as far as they are concerned they are alone on the site. When the first one eventually logs in, she/he sees an empty map and neither she/he nor others know, that they are actually together and can collaborate. So she/he closes the Livemap and most probably will never come back and if she/he does, she/he will be much more skeptical. With the teaser we believe that users will be tempted to see who are the people already on Livemap and why are they there, by a simple curiosity effect. This will create both improved awareness (knowing about presence and activity of others with no effort) (Dourish & Bellotti, 1992) and intersubjectivity or accountability (Erickson et al., 1999), that in our example can be put as “others know, that you know, that they know you are on-line, so they might join you, because they realize you logged in especially to talk to them”.

While a new experiment should be conducted to verify our hypothesis that a teaser will attract participants, we decided to submit another feedback form to the participants of the previous experiment that would question them on the deployment model in general and the teaser in particular. We asked them to score the deployment model as a whole according to the scoring scale given previously. Twenty-five percent of the users liked our deployment model as is, without the teaser. They stated that they felt reluctant about using other “chat in context” applications, because of the installation process, and were perfectly satisfied with the “no-install” applet approach. Other visitors felt excited about the “triggering preview” feature and the majority of them stated that on a real web site they would enter an application such as Livemaps only if the “triggering preview” was enabled. Considering this encouraging feedback on the teaser, we plan to conduct a new set of experiments on a variety of sites in order to verify how many users are tempted to join thanks to the teaser.

6. Conclusion and future work

The contributions of this work are three-fold.

(1) The notion of collection awareness was defined as an extension to document awareness, in order to refine and tune the granularity of virtual places.
A graphical “water filling gauge” was introduced as an indicator for social navigation.

Finally, a simple deployment model was proposed to start using “chat in context” with minimal effort.

As we learned from our user study, our new awareness model was accepted positively with some reservations. These reservations refer mostly to GUI problems, namely the access to information and the catching of graphical events. The “water filling gauge” was understood by two-third of users which, while being positive, is not enough and was probably due to the short duration of the experiment. We, however, believe that modulo small additional annotations like tooltips, we could accelerate the learning curve for interpreting gauges. As for the deployment model, we verified that “chat in context” applications need a critical mass of users to succeed. We see two different contexts in which critical mass can be achieved.

The first one is using Livemaps in specific environments, where the system is used to assist in accomplishing missions that require collaboration. One artificial example is the treasure hunt game that served as a basis for our experiment. A more promising one though is, for instance, distant learning. We are in the process of deploying Livemaps in an educational environment, where the web site consists of a collection of lectures and exams. Each student gets a conventional “who is on the same page” view, while tutors get a Livemap of the entire on-line course. Students can see others, taking the same lesson and all the tutors. Tutors can see the entire course and follow student activities in all parts of the course, being able to give them quick help. Like in our treasure hunt game, by “forcing” students to join the class, the critical mass effect is achieved. Besides distant learning, another example of a typical CSCW application is customer-relationship management, where customer-support representatives could ask customers to browse a support collection and monitor them at the same time.

The second context of application and perhaps the most profitable one is in our opinion e-commerce for proactive marketing. In this context, our deployment model must be further enhanced via mechanisms such as teasers to make users use the map more willingly and ensure that critical mass is achieved.

The observers would be sales people who monitor visitors as potential customers and offer real-time help, based on the visitor’s path through the site, personalized data, etc. Livemaps could be the basis for a virtual “may I help you?” service as long as we make sure that the technology is not intrusive. Indeed, like most recent web applications, privacy and security need to be enforced in order for the technology to be accepted.

Finally, it should be clear that all the features discussed here could not make strangers meet and talk in all circumstances. Indeed, unlike chat-rooms where people come specifically to meet with strangers, chat in context is proposed to users who came to a place for its contents rather than for its other visitors. A non-intrusive and convenient framework, might increase the motivation to collaborate and make collaboration more convenient, but to encourage strangers to meet, additional techniques are required. We intend to take Livemaps as a basis for our further research and study how to trigger instant collaboration between members of a same project or group, as well as casual acquaintances. We also plan to experiment with different visualizations to overcome problems that were exposed in the user study.
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References


