
The Whereabouts Clock: Early Testing of a Situated Awareness Device

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Abstract

We describe the initial deployment of a prototype device to support awareness of people's location and activities in an office environment. This is a first step toward the design and testing of a related device for the home. Findings from this workplace trial show its value in helping people have a virtual presence, in locating people, and in fostering a sense of group belonging. However, the results also suggest how the design could be made more flexible and expressive which we will explore in the upcoming home trial.

Keywords

Clock, communication, user trial, home technology, mobile phone, situated display, location-based systems

ACM Classification Keywords

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

Introduction

We report the results of an initial trial of a prototype device called the "Whereabouts Clock" intended for home use in support of family awareness and communication. The idea is to provide a new way for the family to socially connect by using cell phones to transmit family members' locations and activities to a display in the home. In doing so, this project draws on

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existing research both in the realm of location-based services (LBS) as well as situated displays.

The literature on LBS is in many ways quite separate from that on situated displays. The first goes back a long way, to Active Badges and similar, and was originally concerned with the ways in which the capture of real-time location information could support life within office buildings [e.g., 6]. More recently, with the advent of wireless networks, many different kinds of applications have been developed, but more centered on the consumer than on the worker. Some use location as a way of delivering context-sensitive information to tourists and shoppers [e.g., 2, 5]. Others are more properly called “tracking applications” in that they focus on the delivery of location information itself. Popular applications here include ways of supporting gaming, friendship and family [e.g., 1,8,10]. Further, because of the potentially sinister connotations of “tracking” or “monitoring”, much of this research is preoccupied with aspects of privacy [e.g., 7]. Nevertheless, such applications are not restricted to the research world, with commercial tracking applications now providing a variety of ways of monitoring children and friends. Common to all of these applications is that location information is typically delivered to the same hand-held devices that generate that information (such as to mobile phones or PDAs).

In contrast, the situated display literature reports an altogether different set of concerns, many of which have to do with the use of large displays designed to support community, whether it be in corporate life [13] or urban settings [4]. A few have explored ways of presenting information about location, but these do not normally relate to real-time data, confining themselves

instead to calendar-based information, where, for example, grandparents are offered views of events affecting their grandchildren [9], or, in the case of office settings, where the scheduled presence of staff is displayed on door-mounted screens [3].

The separation of these two literatures can be linked to the different affordances being leveraged in each case: for LBS it tends to be about the production and display of accurate information “on the hoof”, where having that information in the hand is paramount. For the situated display literature, the topic is how the persistent and “at-a-glance” display of information provides benefits in locations where the information is public or shared and is stable through time.

Motivation and Design Approach

In this research, we report an attempt to bring these two sets of concerns together by combining the use of situated displays that afford persistent, at-a-glance access to information with the dynamic, real time production of that information. We do so by drawing on previous work investigating the lifestyles of working parents [11]. This work pointed to the importance of awareness of the family’s whereabouts for managing activities, for a sense of reassurance, and as a basis for social communication. Later work in which we deployed a simple situated message board in the kitchen called “HomeNote” [12] also highlighted how family communication is often about conveying one’s whereabouts and activities. Furthermore, a message board allowed one to broadcast such messages to the whole family (not just to one person).

Taking this work forward, we wanted to build a different kind of situated display, specialized for

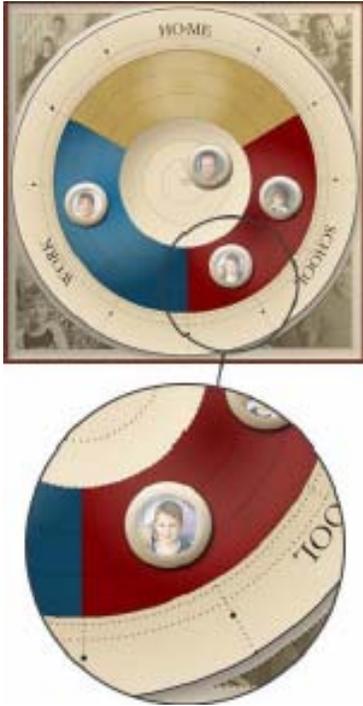


Figure 1. Initial interface design for the home version. Different members of the family are shown as icons which move depending on location. The middle section is for locations which do not correspond to “home”, “work” or “school” and thus can represent when family members are in transition between these places.

supporting knowledge of the family’s whereabouts. Whereas HomeNote was a general message board, this time we wanted to use location data to develop a more focused concept around awareness and reassurance. The result we call the “Whereabouts Clock”.

In designing the Whereabouts Clock, we used the metaphor of a clock as a starting point because it implied aspects of its design we felt were important:

- First, it is a situated display designed to be attached to the wall in a place in the home (like the kitchen) where it becomes part of the routine of family life, much as a clock does.
- Second, the interface is designed to let the family see information at a glance. One reason for this is that the display is “always on”, persisting in the periphery of vision in the way that information on a clock persists.
- Third, like a clock, it is designed to broadcast information to anyone occupying that space. This can be contrasted with a watch, for example, which is a personal device.
- Fourth, like many domestic displays, it can only be seen when physically in the home (not looked at remotely) which means only people who are entitled to be in the home can see the device.
- And fifth, it displays only coarse-grained information (i.e., it shows only that a family member is at “home”, at “work or school”, or “out”). Precise location isn’t necessary for the purpose of planning a meal, knowing someone is on their way home, or being reassured a child is at school. While this aspect is not necessarily clock-like, we felt it to be an important aspect of its design.

The idea of a clock displaying location rather than time, of course, is not new. In the Harry Potter books, the Weasley family has a magic clock with hands for each member of the family indicating their location or state. Our initial design for the home uses icons rather than mechanical hands, and displays only four categories of location (see Figure 1). We also rely on technology rather than wizardry to make the clock work!

Purpose of the Early Field Trial

In order to explore this new technology concept, we decided to first deploy a version of the Whereabouts Clock in-house with our own work group. There were three main reasons for doing this: to test the robustness and reliability of the technology; to discover whether this concept has any emerging value in use (and to evaluate aspects of its design which either enhance or undermine that value); and to provide a benchmark in an office environment against which its eventual deployment in a home environment can be compared and contrasted.

The Workplace Prototype

In developing the workplace prototype, we used a 19 inch LCD touch screen to display the clock interface attached to a PC hidden from view. For this version, we modelled the interface for the most part on the design for the home (see Figure 2). However, for the workplace, we decided to indicate three different relevant locations: “in the building”, “home” and “out” (“out” meaning any place other than in the building or at home). Another important design decision was to require minimal effort on the part of its users (all they have to do is switch their phones on). However, if users wished to broadcast their activity in addition to their location, they could do this by selecting from a list of

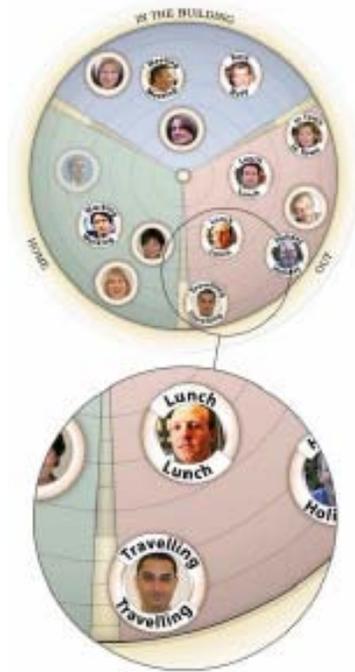


Figure 2. Interface design for the workplace version.

available activities (such as “busy”, “lunch”, “holiday”) which would appear as text around their personal icon. Finally, the icons of users who have the application switched on appear bright and also animated (appearing to float slightly). If users have the application or their phones switched off, their icons fade and become static.

How it Works

The Whereabouts Clock uses GSM cell ID available on mobile phones to provide the location data. In the current prototype, each participant carried an HTC Smartphone running a custom client application. When at home or in the building, users needed to first register these zones on their phones through a menu in the phone application. This had to be done only once for both zones. Upon registration, the Smartphone application records the underlying cell tower IDs within proximity for that particular zone. Whenever the phone is switched on, the application continually scans for cell towers in range, and maps the ID with highest signal strength onto a registered zone (indicating it as “out” if no zone has been registered for that ID). Updates are sent via SMS to the Clock display whenever the application determines that a person has moved from one registered zone to another. In addition, users can select one from a number of possible activities through a menu on the client application which is transmitted from the phone to the Clock via SMS.

Field Trial Method

The Whereabouts Clock display was fixed to the wall in the common area of our work group next to our whiteboard where presentations and meetings sometimes occur, and adjacent to our individual offices. After a week of debugging the system in use, we

installed the software on participants’ mobile phones and gave them a short training session on how to use the application. In total, 14 people took part which included every full time member of our research group.

Participants were interviewed twice: once at least one week into the trial, and then on completion of the trial six weeks later. In the first interviews, participants were asked about instances of their use of system, problems encountered, feelings about privacy, and specific questions about the design of both the mobile application and the Clock interface (such as the adequacy of the activity labels). All of these questions were posed both from the perspective of a “sender” of information to the Clock and as a “viewer” of the Clock. In the final interviews, participants were asked again whether the Clock had been of any value to them personally (and to give examples), what they would change about the system to make it better, and whether they would like to see its continued use. Notes were taken in all interviews and audiotapes were made.

Summary of Main Findings

The interviews revealed a range of ways in which the Whereabouts Clock showed emerging value. First, some users of the Clock said they liked the feeling of having a virtual presence when not in the office, and being more connected when absent. Further, the Clock provided a background way to do this. So, for example, rather than emailing everyone to say “working at home” or “travelling”, they could broadcast their whereabouts to the whole group in a more peripheral way.

Second, for people in the office there were many specific instances where they described using the Clock to check where people were, or to help locate them.

This was useful to see whether someone was working at home, was on their way into the office and so on. In particular, several people described what one person called the “wonder” of watching a person’s icon move in real time: for example, seeing the icon drift into the building, and then seconds later, seeing that person come upstairs into the common area.

Third, the Clock provided “at a glance” information about “what the group is up to”. Connected to this, participants said the visual representation fostered a sense of community and contributed to a communal feeling of being part of the group.

However, in addition to the emerging value of the Clock, it was clear that the current design did not realize its full potential. In terms of having a virtual presence while away from the office, many people wanted more expressiveness than was made available to them in the pre-configured activity menus. For example, everyone commented that sometimes they wanted to say more not necessarily about *where* they were, but more about what they were doing, how available they were, or how they could be contacted. Sometimes, they wanted to say “At home reviewing papers” or “My email isn’t working so call me”. Other times, it was important not to say what one was currently up to, but what one’s *intentions* were. For example, people wanted to say “Will be in this afternoon” or “At the Computer Lab, back soon”. The point is that location was often only the starting point for communication, and the design of the system as it was, hampered fuller expression.

A second issue had to do with the desire for more detail when looking for a particular person. Here, the “at a

glance” nature of the design worked well for the group but not necessarily for finding out more about an individual. Many people suggested that it would be good to see specific details such as more precise information about location (such as where they were in the building), plans such as forthcoming meetings (perhaps from their on-line calendars), and travel details such as what country, city or time zone a person was in if travelling on business. All of this implies that an added layer of detail would improve the design. Further, participants suggested a good way to do this would be through closer engagement with the screen, such as by touching a person’s icon.

Implications and What Comes Next

The implications of the trial seem very clear. The provision of location-based information on the Clock did have value for our workgroup in supporting presence, for finding people and supporting a sense group identity. Its design, too, was pleasing and added some degree of visual enchantment to a workplace that was otherwise quite ordinary. But the research also showed that this was not enough to justify the Whereabouts Clock. For this, the device needed to link location-based data with more freedom to communicate. The research made it clear that an individual’s location is sometimes important, but so too is information about what they are doing, where they are going and why. If the Whereabouts Clock were to do this, it would no longer be simply an indicator of someone’s physical geography, but would render visible more about what one might call people’s “mental” geography too.

Consequently, the Whereabouts Clock is being redesigned to allow users to convey their own text messages. As with the first version of the clock, this too

will use the cellular network, but will more fully leverage the SMS channel for this creative content. Users of the home version and the revised office version will be able to send in and append these messages to their icons. Further, we are designing a way that users can touch on icons and gain more detailed information about where a message came from, when it was sent and so on. Thus, we will experiment with a second more detailed layer of information through close-up engagement.

All of this may well mean a departure from the clock metaphor we used as our starting point. Further, the "clock" (or whatever it ultimately evolves into) will not offer a comprehensive means of communication but rather will offer an alternative and hopefully complementary channel for the home. We will have succeeded if we can show how this can be done in a way which users find both valuable and compelling. In our first trial, we have begun to define what this might be for the workplace. In our next trial, we hope to do so for the home.

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