

# Understanding Interpersonal Awareness in the Home

Carman Neustaedter, Kathryn Elliot, and Saul Greenberg

University of Calgary

2500 University Drive NW

Calgary, AB, Canada

[carman, elliotk, or saul]@cpsc.ucalgary.ca

## ABSTRACT

As the development of home technologies continues to increase so does the need to understand and design technologies to support and enhance the everyday lives of home inhabitants. The focus of this paper is on one facet of home life that technology can be designed to support, namely *interpersonal awareness*. Specifically, we outline the beginnings of a conceptual framework for interpersonal awareness where we describe the types of people for whom this awareness is desired, the low-level details of maintaining this awareness, and the maintenance problems faced by home inhabitants in gathering this awareness. Our goal is to provide designers and practitioners with a unified and detailed understanding of interpersonal awareness that can guide the design of groupware applications to enhance the domestic routines of home inhabitants.

## Author Keywords

Interpersonal awareness, ubiquitous groupware, home technologies, contextual locations

## INTRODUCTION

Communication technology has been identified as a prime area for technology design in the home [1,4]. However, we cannot simply migrate ideas from the office environment into the home. Instead, technologists must have a rich understanding of the domestic routines of home inhabitants in order to design technologies that are useful, usable, and socially appropriate for the home.

The particular aspect of home communication that we are interested in is *interpersonal awareness*: a naturally gained understanding of the social relations of one's personal contacts. This awareness is vital for the micro-coordination of households. For example, parents often need to be aware of their children's extra-curricular schedules to coordinate rides. This awareness even extends beyond immediate household members, involving other personal contacts such as friends and the extended family. For example, friends may want to know about another's schedule to plan a night out or families may be concerned about the well-being of an elderly parent who lives elsewhere.

Submission to the ACM CHI Workshop on Awareness systems: Known Results, Theory, Concepts and Future Challenges (April, 2005).

Interpersonal awareness is largely predicated on one's existing interpersonal relationships. We are less interested in how these relationships are formed and maintained however; this is described in detail in the disciplines of sociology and social psychology (e.g., 5,10). Our interest instead lays in understanding the low level details of maintaining interpersonal awareness, how this awareness is manifested in the home, and how we can design technology to support it.

Our initial work has been the development of a conceptual framework for interpersonal awareness based on the results of contextual interviews. In this paper, we focus on discussing an early version of our framework, rather than describing the empirical basis behind it (found in 2,9). While others have done research on awareness in the home, be it through studies of domestic culture or technology design for point solutions (e.g., 1,3,8,11), our goal is to move beyond this work and provide a detailed and unified understanding of interpersonal awareness that can be used by designers and practitioners to guide the design of groupware applications for the home.

First, we describe the interpersonal relationships on which awareness is predicated and the specific awareness information that is desired by home inhabitants. Next, we outline the low level details involved in acquiring and maintaining this interpersonal awareness. Finally, we discuss the limitations and problems people face when maintaining interpersonal awareness and the role technology can play in supporting these limitations.

## FOUNDATIONS OF INTERPERSONAL AWARENESS

In this section, we describe the social groupings for interpersonal awareness and the specific awareness information people desire to know.

### Social Groupings for Interpersonal Awareness

Through our empirical studies [2,9], we have found that people desire interpersonal awareness for three groups of social contacts:

*home inhabitants*: the people with whom one lives, e.g., family members and/or roommates;

*intimate socials*: the people with whom one does *not* live but still maintains a close personal relationship, e.g., significant others not living together, close friends; and,

**extended socials:** the people with whom one does *not* live where the relationship is more casual, e.g., friends, extended family members or relatives.

While these social groups may appear simplistic, sociologists have found similar groupings for social relationships [5,6,7]. However, we caution that these groups are best viewed as broad clusters defining a spectrum of relationships *vs* strictly bounded groups. In general, we have found that the more intimate a person is with another, the stronger the need is to share and maintain interpersonal awareness. This *intimacy* is defined as a primary human need characterized by a mutual feeling of familiarity, closeness, or love between two people [10].

**Home Inhabitants.** Most individuals share a large degree of intimacy with their home inhabitants, e.g., significant others, immediate family members, roommates. This is because household members often have very intertwined lives, especially in the case of families. Households must micro-coordinate their day-to-day plans [6] and it is often necessary for household members to schedule their activities and events based on the activities of their cohabitants. This makes interpersonal awareness vital for one's home inhabitants.

**Intimate Socials.** People also maintain a high need for interpersonal awareness of intimate socials, yet the necessity for this awareness is generally not as high as for home inhabitants. Intimate socials do not live together and there is usually little need for the micro-coordination of activities. Despite this, there still exists a strong need to maintain interpersonal awareness, mostly because these individuals share a great detail of information about their lives; they share a fairly high level of intimacy. This need is often simply for the mere desire to know how an intimate social's life is progressing, be it in terms of social or work-related activities.

**Extended Socials.** People typically have a lesser need for interpersonal awareness of their extended socials. Here, the need is much more discretionary because the awareness gathered about extended socials is primarily used as personal knowledge; people simply like to know about the lives of their extended contacts.

We now describe how the level of need for interpersonal awareness affects the types of awareness information that is shared and desired by individuals.

### **Interpersonal Awareness Information**

The maintenance of interpersonal awareness is centred on knowing specific items of information about one's social contacts, depending on the individual and his or her context. In general, a strong need for interpersonal awareness equates to the desire to know very specific low-level details about one's social contacts; a more discretionary need for interpersonal awareness equates to the desire to know only high-level awareness information.

**Home Inhabitants.** People typically require low-level, day-to-day details of current and upcoming plans of their cohabitants, be it about social activities or work. This often involves knowing where people are, when they will be home, and when they are free to partake in shared activities. They are also interested in knowing specific details about outcome of activities that have already happened.

**Intimate Socials.** People typically require low to mid-level awareness details of their intimate socials. Rather than day-to-day detail of social activities, people desire to have a general understanding of an intimate social's upcoming events (over the next few days or weeks), the outcome of past activities, and knowledge about one's health and personal relationships. Others report similar findings for awareness information of intimate socials (e.g., 8,11).

**Extended Socials.** People generally only desire to know high-level awareness details of their extended socials. This includes knowing usually only about past activities or events but at a much higher level of detail where only major life events or changes are shared, e.g., health issues, changing jobs, getting married, having children.

While this awareness seems to be about fairly mundane things—schedules, activities and outcomes, locations, events, person's state—they are not divorced from sociality. Rather people use this low-level information to infer what is going on in other people's lives to build the bonds that tie the two together, and to motivate conversations and involvements about various life activities.

### **MAINTAINING INTERPERSONAL AWARENESS**

Interpersonal awareness information is typically gathered using one or more of the following techniques:

**face-to-face interaction:** when people are co-located with their social contacts they naturally converse and share awareness information;

**mediated interaction:** when separated by distance, people use handwritten notes and messages or technology such as the telephone, email, or instant messenger to maintain awareness; or,

**visual cues from domestic artifacts:** by observing the presence, absence, or status of artifacts in the home, awareness information is often naturally understood without direct interaction.

We now discuss each of these in turn, outlining their use by the three social groups of interpersonal awareness.

#### **Face-to-Face Interaction**

Face-to-face interactions between co-located social contacts reveal a large amount of awareness information. People prefer this type of interaction for gathering awareness because, naturally, they like talking directly to their family and friends [3,11]. This type of interaction also benefits people because it provides the complete context of a situation, e.g., people are able to see the gestures and body language that are associated with verbal conversation [6].

*Home Inhabitants.* Face-to-face interaction for gathering awareness is most prominently used by home inhabitants. This is for the simple reason that they are often co-located because they live together. Family members usually need synchronous communication at some point for the micro-coordination of daily life [6]. Significant others have even been found to streamline their conversations to develop short-hand interactions involving brief instructions or interaction episodes, which are generally only understood by family members [6].

*Intimate Socials.* People also use face-to-face interaction to gather awareness information about their intimate socials, yet because they do not live with them, these interactions are less frequent and other means for gathering awareness are needed. Face-to-face interactions with intimate socials typically occur during social outings or shared activities.

*Extended Socials.* Maintaining an awareness of extended socials does not often involve direct face-to-face interaction. These individuals are seen on a much less frequent basis, typically only during infrequent social outings or visits and, as such, there are few opportunities for face-to-face interaction.

### **Mediated Interaction**

Modern society is moving to an increased number of indirect relationships [6]; thus, it is not surprising that we see mediated interaction as one of the primary means for gathering awareness information. Mediated interaction is necessary for awareness maintenance when social contacts are separated by distance. Here, typically technologies such as the telephone, email, or instant messenger are used to share awareness information. One of the biggest limitations of mediated interaction is in the lack of context presented. People are unable to see the many social cues that are found in face-to-face interactions, e.g., gestures and body language. For this reason, people prefer mediated interactions that are as close to face-to-face interaction as possible [3].

*Home Inhabitants.* Mediated interaction is necessary for situations where co-habitants are not home at the same time, e.g., someone has gone to work. Often home inhabitants leave notes or messages around the house for their cohabitants to see [1,2], which can contain information about where someone went or when they are returning. Home inhabitants maintain a general sense of the routines of their cohabitants and will place these notes in locations that they know a particular person will frequent or see [2].

When using technology for mediated interaction, people typically favor using telephones and cell phones to maintain awareness of their home inhabitants. However, they may also rely on email and instant messaging systems like MSN Messenger or Yahoo! Messenger. Technically-inclined people were even found to use instant messaging from within the home to gather an awareness of other co-located home inhabitants.

*Intimate and Extended Socials.* The need for using mediated interaction to gather awareness increases for intimate socials and even more so for extended socials. These groups tend to be separated by distance more frequently than home inhabitants with fewer opportunities for face-to-face interaction. Again, technologies including the telephone, cell phone, email, and instant messenger are used to maintain awareness for these groups. Intimate socials tend to live in closer proximity, e.g., the same city, than extended socials and thus the telephone is often favored. While people prefer to hear the voice of one's extended socials, email is typically the favored technology for this group because it is asynchronous and less expensive than long distance phone calls.

### **Visual Cues from Domestic Artifacts**

The third way in which people can maintain interpersonal awareness is through visual cues from domestic artifacts. Here the *presence*, *absence*, or *status* of domestic artifacts can provide rich awareness information about home inhabitants. Households are displays; people leave imprints of their lives and activities throughout the home [3]. People are typically only able to use this information to garner a sense of awareness for their home inhabitants.

We found that home inhabitants generally know where their cohabitants leave their personal items and the *presence* or *absence* of particular domestic artifacts from these locations can provide awareness information. For example, seeing your spouse's keys missing from the key hook where she usually leaves them may indicate that she has taken the car and left for work. Conversely, if you arrived home after work and saw your daughter's vehicle parked out front of the house, you would know that she is currently at home and perhaps will be around for supper.

The *status* of domestic artifacts also offers rich visual information that can be used to gain an awareness of one's cohabitants [2,11]. For example, the status of a light, being either on or off can indicate the presence and location of household members [11]. A shopping list on the fridge that contains many items may indicate that a home inhabitant is planning to go to the grocery store soon.

### **PROBLEMS IN THE MAINTENANCE OF AWARENESS**

We found that three main limitations or problems exist for people in terms of gathering interpersonal awareness: *time separation*, *distance separation*, and *time limitations*. We describe these problems in turn and then discuss the role technology can play in enhancing everyday routines to reduce the effects of these limitations.

#### **Time Separation**

The first issue, time separation, is particularly problematic for maintaining an awareness of home inhabitants. Despite the fact that home inhabitants reside in the same dwelling, they are not necessarily always home at the same time. Because of this time separation, they are not able to rely on the typical face-to-face interaction episodes that can

provide much needed awareness information. As a result, they are forced to seek out and provide awareness information while relying on mediated interaction such as leaving notes or the use of technology including phones, email, or instant messenger.

### **Distance Separation**

The second problem, distance separation, is particularly troublesome for intimate socials and even extended socials. As social contacts become separated by distance, it is more difficult to gather awareness information because they must actively seek it out. That is, they are often forced to use mediated interaction techniques. This distance does not need to be large for it to be a problem. People even find it difficult to maintain an awareness of their social contacts that are in the same city.

Studies of domestic culture have articulated specific cases of problems with distance separation. Tollmar and Persson [11] found that families find it difficult to gain a sense of awareness of children who have recently moved out. Mynatt et al [8] describe the difficulties adult children have in gathering an awareness of their aging parents because they do not reside in the same location.

### **Time Limitations**

The third problem, time limitations, is particularly related to intimate and extended socials. People desire to maintain an awareness of more people than they can actually achieve given a limited number of hours in the day. Often people even find it difficult to maintain an awareness of more than just their cohabitants. This problem arises because awareness maintenance is time consuming for intimate and extended socials. Awareness most typically must be acquired through mediated interaction techniques. These require that an individual spend the time to, say, phone or email a social contact.

### **The Role of Awareness Technology**

The three problems that people find when maintaining interpersonal awareness all stem from the same basic premise: in almost all cases, interpersonal awareness must be gathered through direct conversational interaction techniques, e.g., face-to-face conversations, the telephone, email. The problem is that direct conversational interaction techniques require time and people are unable to quickly and easily gather awareness information using them. When people become separated by distance or time, technology must be used to provide awareness, yet most of the technologies used are not specifically designed to support awareness. Rather, they are designed to support interaction.

This suggests the need for lightweight technologies designed with the specific purpose of helping people maintain interpersonal awareness of their social contacts. However, we do not advocate doing away with direct conversational techniques altogether. Instead, we feel that technology designed specifically for supporting interpersonal awareness can augment the existing mechanisms people already employ.

## **CONCLUSION**

This paper presents a first version of an empirically-based conceptual framework for interpersonal awareness. Specifically, our contribution lays in the identification of the people for whom interpersonal awareness is desired, the types of awareness information maintained, an understanding of the current techniques people use to maintain this awareness, and a discussion of the problems people face in awareness maintenance. This initial understanding of interpersonal awareness provides designers and practitioners with a requirements analysis for the design of interpersonal awareness groupware.

While we have described our work in the context of the home, many of the ideas we present also relate to other work on awareness, e.g., awareness for co-located or distributed collaboration. We feel that it is vital for those studying the many forms of awareness to be able to discuss and share their experiences to further awareness research.

**Acknowledgements.** We thank NSERC and TRILabs for funding. Special thanks to Tony Tang for his ideas.

## **REFERENCES**

1. Crabtree, A., Rodden, T., Hemmings, T., & Benford, S. (2003) Finding a Place for UbiComp in the Home, *Proc. Ubicomp 2003*, Springer-Verlag, pp. 208-226.
2. Elliot, K., Neustaedter, C., & Greenberg, S. (2004) Time, Meaning, and Ownership: the Value of Location in the Home, Report 2004-761-26, Department of Computer Science, University of Calgary, Canada.
3. Hindus, D., Mainwaring, S.D., Leduc, N., Hagström, A.E., & Bayley, O. (2001) Casablanca: Designing Social Communication Devices for the Home, *Proc. CHI 2001*, ACM Press, pp. 325-332.
4. Hutchinson, H., Mackay, W., et al, (2003) Technology Probes: Inspiring Design for and with Families, *Proc. CHI 2003*, CHI Letters 5(1), ACM Press, pp. 17-25.
5. Korn, C. & Nicotera, A. (1993) Friend and Mate Relationship Literature, Empirical Propositions, and Methodology in *Interpersonal Communication in Friend and Mate Relationships*, New York Press, pp. 13-42.
6. Ling, R. (2000) Direct and mediated interaction in the maintenance of social relationships, *Home informatics and telematics*. Kluwer, pp. 61-86.
7. McCarty, C. (2002) Structure in Personal Networks, *Journal of Social Structure*, Volume 3, Number 1.
8. Mynatt, E., Rowan, J., Jacobs, A., Craighill, S. (2001) Digital Family Portraits: Supporting Peace of Mind for Extended Family Members, *Proc. CHI 2001*, ACM Press, pp. 333-340.
9. Neustaedter, C., Elliot K., Tang, A. & Greenberg, S. (2004) Where are you and when are you coming home? Foundations of Interpersonal Awareness, Report 2004-760-25, Department of Computer Science, University of Calgary, Canada.
10. Smith, D., & Williamson, L. (1977) *Interpersonal Communication: Roles, Rules, Strategies, and Games*, Wm. C. Brown Publishers.
11. Tollmar, K. & Persson, J. (2002) Understanding Remote Presence, *Proc. NordiCHI 2002*, Aarhus, Denmark, ACM Press, pp. 41-49.