

SUPPORTING RELATIONSHIPS WITH AWARENESS SYSTEMS

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ABSTRACT

The paper describes the design of a novel end-to-end communication system for helping elderly people and their grandchildren keep in touch in a pleasurable, low-pace interaction. The paper focuses on the requirements gathering process that combined diaries with field testing of prototypes and interviews; thereby bringing elements of more 'playful' design to a well-structured requirements engineering process.

Keywords

Awareness systems, affective media, diary study.

1. INTRODUCTION

"Can you imagine the look on his face when he opens the door!" Anybody who has ever witnessed a surprise party will recall this collective anxiety when awaiting the *moment suprême*. This situation combines three concepts that are essential to understanding a communication system that may be capable of supporting ongoing relationships.

- Immediacy - the people at the party are eager to see an immediate reaction to their action.
- The salience of facial expressions.
- Co-Presence - both the crowd and the target of the surprise party have to be there at the same time for the plan to work.

This paper describes the design case of an *awareness system* that explores these concepts in supporting the communication between grandparents and grandchildren. By an awareness system we mean a computer mediated communication system that enables communicators to maintain a peripheral awareness of each other's activities effortlessly for prolonged periods of time. Our target users are primary candidates to benefit from this type of

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technology, as they might live far away from one another or simply find it difficult to see one another in person as often as they would like.

The remainder of this paper is structured as follows: Section 2 discusses related work concerning the communication needs of elderly people and awareness systems. Section 3 discusses the essence of the design concept and its rationale. Section 4 describes the requirements gathering activities, their results and the more general lessons learnt. Section 5 outlines the implementation and early user testing. Finally, section 6 presents some open questions and future work.

2. RELATED WORK

Older adults are very selective with their social relationships and invest energy in socializing and telecommunicating very parsimoniously, tending to restrict communications and socializing to close family [11]. Our design challenge has been to design an awareness system that would be acceptable to the elderly people and their grandchildren alike, and that would match their respective needs and daily routines. Our approach adopts the thesis by Hollan and Stornetta [7] who advocate capitalising on the strengths of Information and Communication Technology (ICT) to augment and complement face-to-face interactions, instead of emulating them via second-best substitutes such as video-conferencing.

Reticence to adopt and learn new technologies is not an issue with children. At least in western societies, children are immersed in technology, perceiving and assimilating new technologies as an integral part of the world in which they grow up. Designing for children requires their timely and active inclusion in the design process. Sections 4 and 5 present the steps taken to involve both target user groups.

The application of awareness systems to support interpersonal relationships has been the subject of several projects. One recent and notable example is the Family Portrait developed at Georgia Tech [12]. Compared to that work we opt for a display of concrete rather than abstract information (i.e. we display photographs and video-clips) and we study a symmetric set-up rather than a one-way communication, which can easily be perceived as a surveillance system [4]. A few design concepts related to ours have been produced by the Aroma



Figure 1. A diary page

project [14]. These were non-functional industrial-design prototypes, with minimal interactivity, and which emphasized the form of the devices. The present study focuses on interactivity and the emerging user experience in the intended context of use. Heeter [6], showed how the prolonged live video connections between elderly people supports awareness and can provide personal benefits. However, such connections can also threaten privacy or be deemed meaningless (e.g., watching a room where nothing happens) and, crucially, constrain both parties to synchronise parts of their daily routines.

3. DESIGN CONCEPT AND RATIONALE

Emotions play an important role in ongoing relationships. Therefore, systems that support ongoing relationships should be able to convey emotions in an adequate way. We identified the following factors as crucial:

- Support a high level of immediacy.
- Use an expressive medium to convey emotions.
- Non-synchronicity.

Why is this the case? First, the more time between an event and subsequent reactions, the more time a person can cognitively mediate his reaction to the outside world. Thus, immediacy may result in a more genuine reflection of that person's emotional state. Second, a conveying medium that only allows for a limited number of emotions and gradations, e.g.,

through an avatar-based display does not convey adequately one's true emotions. Even the use of language may sometimes give less information than seeing someone's face. Finally, synchronous communication can be perceived as obtrusive and not ideal for linking people at all times of the day [1].

We set out to discover what grandparents and grandchildren want to share with each other and incorporate these findings in an awareness system that combines the 3 key factors successfully. After an extensive literature review and some first interviews (described in section 4) the general concept for the awareness system was shaped up as follows:

The system should support grandparents and their grandchildren to capture and send each other pictures, messages and video-clips easily throughout the day. While viewing a received item, the facial expressions of the viewer will be captured automatically. These reactions will be sent back to the sender of the original item.

This concept addresses the requirement for non-synchronicity. We opted to capture and display facial expressions since they provide a rapid, emotion-specific and largely innate system for the reliable interpersonal communication of emotional state [5]. Social context is not a prerequisite for spontaneous facial expressions: even when people are alone affective media such as pictures can elicit facial reactions [9]. There appears to be a strong link between facial expressions and emotions [8], so people seem to be well equipped to encode emotions through facial expressions. In addition, there are neural mechanisms that enable them to decode these expressions rapidly and reliably [13]. By sending across facial expressions a system may portray the emotional state of the users quite accurately; by capturing facial expressions while viewing the pictures, immediacy is maximised. A concomitant advantage is that no user input or cognitive mediation is required to convey emotions. This conveying medium is very expressive due to the wide range of facial expressions [3]. Related work is the KAN-G prototype [10] for sharing photographs on the web and conveying friends' reactions to the pictures through "canned" auditory reactions resembling emoticons, an approach lacking in immediacy and expressiveness.

4. REQUIREMENTS ANALYSIS

The requirements gathering technique can be thought of as a mix of ethnography and experience prototyping [2]. It involved field-testing of mock-ups at the homes of our informants during repeated visits, simulating daily use. Early exposure to prototypes or mock-ups during the requirements gathering phase helps move beyond the commonplace and unspecific understanding of user needs and gives insight into its potential fit to our users' daily life. We believe that this approach has an exciting potential for designing technologies that must be appreciated and enjoyed as part of people's daily lives. Our aim during this process has been to understand what is important to the target users regarding each other, what they need to or would like to know and what they are prepared to do to keep in touch with each other. In addition, we had to understand the current and the desired interactions for both user groups.

An initial survey involved a visit and a few interviews at a special home where elderly people live independently with some support for their practical needs. Interviews with them and their grandchildren established that, in general, they both would like to communicate more with each other about their daily lives. The initial design concept was then formulated.

To test whether users liked our concept, we performed a diary study incorporating interviews and prototyping. The prototype was emulated and tested in the intended context of use and care was taken to ensure as much realism as possible for the testing situation.

3 Older adults with ages 81, 76 and 57 participated in the study. The main criterion for their recruitment is whether we could also involve their grandchildren in the study. The children were 14, 12, 9 and 7. The main criterion for their selection was that they had to be old enough to express their wishes and to take pictures or write brief messages.

4 Visits to each participant were conducted. In the first visit a structured interview was conducted and the subjects were given a diary, where they were asked to record instances when they wanted to send something to or share something with their counterpart. They were also given a camera to take pictures throughout the day that they would like to post to their counterpart.

The elderly participants and their grandchildren received different types of diaries. Since diaries as artefacts can set the tone of the interaction between informants and researchers, a lot of care was put into designing appropriate diaries for the grandparents and their grandchildren. For example, diaries were crafted to be playful, pretty and happy to avoid the image of austere and dry data collection instruments.



Figure 2. The “pin-board” interface, showing pictures and captured reactions to the pictures

The diaries included instructions and the first page was filled in. We did not structure diary-pages as forms, so as to give freedom to informants to record instances where they would have an impulse to capture something for their counterpart and send it. We provided several prompts at the margins to cue the participant as to what kinds of information we were looking for without forcing them to address each and every one of them. Figure 1 shows a completed page.

Participants made pictures during the day. These pictures were sent across when the designers visited the subjects. As designers were present simultaneously at both ends of the communication, they would use e-mail to mail the pictures, paste them on a collage and show them to the participant. In the 2nd visit, a picture was taken of the participant recording their facial expression when they first glanced at the pictures they received. This picture was then sent to the other party in order to assess whether seeing the facial expression is valued. In the 3rd and 4th visits the same was done, but this time informants were aware of being photographed. Results can be summarized as follows:

- Participants (both groups) enjoyed sending and receiving pictures and text messages and wanted to share some daily activities with each other.
- Participants appreciated seeing the reaction of the other; facial expressions were perceived as helpful to strengthen the emotional relationship.
- Participants stressed that the device should blend in the background and should be decorative, as the preferred context of use is the living room.
- Interaction should be simple and efficient.

5. IMPLEMENTATION AND TESTING

A working prototype was built following a client-server architecture. On the client side, a small application was written in Visual Basic in order to access the digital camera and store the captured pictures into the file system in a transparent way. The main application was developed using Macromedia Director 8.5 Shockwave Studio. The Server Side involved the Macromedia Multi-user Server (MUS) and a normal FTP server. The MUS distributes messages across the two clients and synchronizes them, while the FTP server transfers the different media types.

The first prototype was evaluated with 2 children and their grandmother at their homes. The interface was shown and the main tasks were simulated. Afterwards they were prompted by the designers to indicate whether the main requirements were met. Preliminary results indicate that the interface is fairly easy to use for both user groups. The use of the "pin board" metaphor (see figure 2) for the shared display was clear to them. After seeing the screens for a couple of times, it was clear how to operate the system. However, for the 7-year old participant, the amount of text on some of the buttons was somewhat excessive: by the time she read the text of one button, she had already forgotten the previous one. The amount and nature of text on the buttons has been modified in the redesign. For the 9-year old subject the text on buttons was not an issue. He did mention that one screen was a bit confusing since the general organization of the buttons was not entirely clear.

6. CONCLUSION

The combination of the three key factors led to promising results. However, some questions remain:

- How should facial expressions be conveyed: as a single image, a few frames or a video sequence?
- Would users like to control the capturing and sending of facial expressions? Our informants suggested that they did not mind their expression being captured. Will that be so in actual use?
- Would users like to annotate the items they send?

Future work shall try to answer these questions, improve the quality of the prototypes and experiment with automatic capture mechanisms. Further, we recognise the urgency of user testing in the field, to test if our results hold in actual usage of the system.

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