REFLECTIVE INQUIRIES: A MULTI-DIMENSIONAL APPROACH TO DESIGNING FOR ELDERLY LIFE

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Abstract: As focus in the interaction design community continues to move beyond the office, a key challenge for researchers and practitioners interested in designing pleasurable products and experiences is developing a sensibility for understanding the real and situated complexity of everyday life. Human-computer interaction, as it owes to the traditions of cognitive science and engineering, has been effective at producing mental and behavioral models to inform design for the workplace; nonetheless these approaches are less helpful when applied to everyday contexts, such as the home, to inspire the design of engaging experiences. In this paper we describe the methods and process of a design-oriented approach to 'multi-dimensional' user research we conducted to better understand the nuances of elderly families' everyday lives. We conclude with a brief reflection on this type of approach and why it is important in the context of designing pleasurable interactive products.

Key words: Interaction Design, User Research, Ambient Interfaces, Social Connection

1. Introduction

As the field of interaction design expands beyond the workplace, a key challenge for researchers and practitioners concerned with experience-centered design is developing a reflective sensibility for understandings the *real* and situated complexity of everyday life. Accordingly, alternative methods continue to be developed to critically inquire into the rich subjective side of human experience as a means to, among other things, establish dialogical user-designer relationships [1], develop deeper levels of empathy [2], and inspire the design of pleasurable and engaging experiences [e.g. 3]. The process through which designers grapple with the complex 'messiness' of reality and arrive at a final worthwhile design outcome is referred to by many as *designerly* [e.g. 4]; and the uptake and treatment of reflective approaches to understand human experience in the design process can be seen parallel to a more *designerly way* of approaching research and practice in human-computer interaction (HCI). In this paper, we describe the methods and process of a design-oriented approach we employed to better understand the nuances of elderly families' everyday lives at home. Previous work in HCI has explored ways in which ubiquitous devices, such as digital photo frames [5], can support "aging in place" by recognizing emergent crises and supporting cognitive changes over time, which is of vital importance. However, the purpose of this *multi-dimensional* user research is to explore design opportunities aimed at evoking feelings of social connectedness—an area of particular significance for seniors as their social network generally decreases as they age, putting them at risk of social isolation and depression [6]:4.

We conducted several studies to probe multiple dimensions of our elderly subjects' experiences of everyday life. Specifically, we relied on approaches including (i) *semi-structured interviews*, (ii) *participatory sketching exercises* [method described in 7], (iii) *cultural probes* [1] and (iv) *technology probes* [8]. Based on results from each of these studies, we increasingly focused on exploring the deeper social and emotional sides of domestic life—and the role design interventions might play in supporting these aspects of domesticity. After

generating numerous design ideas, we eventually developed and implemented an ambient interactive prototype and conducted a technology probe study by deploying a pair of prototypes across two households. In what immediately follows we describe this process and conclude with a brief reflection on this type of approach and why it is important in the context of designing meaningful and pleasurable interactive digital products.

2. Study 1: Contextual Interviews

To develop a deeper understanding of everyday elderly life, we conducted in depth contextual interviews with two couples (P1, P2)—all participants were in their mid-70s and exhibited reasonably well health and activity levels. We drew on the previous literature investigating the essential role the home plays in ongoing identity construction [9, 7] and research on the emotional effects of aging [6] to ground our exploration of participants' relationships with objects and spaces in their homes. Our interview process involved: (i) asking participants about their activities and relationships, (ii) touring participants' homes and documenting personal objects they held deeply meaningful, (iii) observing participants sketching relationships among common domestic activities and objects, and (iv) posing general questions about their perceptions of non-digital and digital objects.

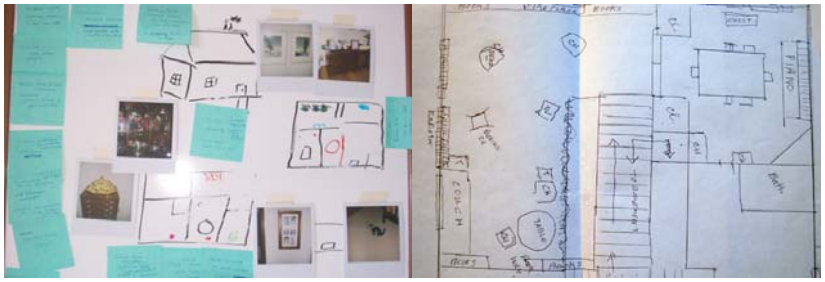

Figure 1. Maps of relationships between domestic activities and objects

3. Study 2: Cultural Probes

Based on our initial observations, we developed cultural probes [1] to reflectively explore how relationships and interactions among participants and their domestic environments connect to separated family members. The choice to use cultural probes was motivated by our interest in unobtrusively provoking participants to consider their personal and emotional relationships with objects, places, and people—and reveal them to us in their own unique ways. Specifically, we provided two elderly households (P3, P4) with diaries, disposable cameras, and an instruction sheet; after two weeks the probe packages were returned for analysis.

While both participants had a similar set of tasks to complete for the probes, their responses provided a variety of different outcomes. Pictures and responses from P3 tended to be more nostalgic and describe the histories of objects common to his everyday life, whereas P4 was focused more on mundane daily activities. The pictures taken by P3 illustrated her interests in sharing memories related to past professional occupations, care for the natural environment, family activities, and common domestic hobbies; pictures taken by P4 highlighted interests in collective family interactions, wild animal life around the home, antiques and activities for self-betterment.

4. Concept Development

Through ideation sessions, our design team explored probe data to identify patterns or interesting idiosyncrasies. Both households took several pictures of objects related to their extended family and noted they prefer to spend considerable amounts of time with their children and grandchildren whenever possible. Through interactions with the returned probed materials and reflective discussions in our design sessions, two general themes emerged: *caring*—taking care of various object and family relationships—and *sharing*—relating memories, personal

activities, and family information to others. We also consider the spectrum of possibilities ranging from introducing entirely new digital objects to augmenting one of the many existing things in the home. We used these themes to develop and categorize concepts to guide the design of a technology probe to further explore our evolving assumptions and ideas. We mapped concepts on a Cartesian plane and critiqued potential benefits and drawbacks offered by each (Figure 2).

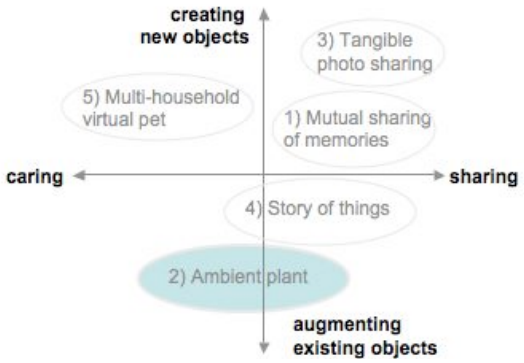

Figure 2. Conceptual dimensions of technology probe

While each conceptual idea touched on notions of our two themes, the ambient plant presented the most compelling case, offering strong potential to easily integrate into observed domestic ecologies and build on an already existing common practice (i.e. caring for houseplant).

5. Study 3: Technology Probe

Through the ambient plant pot, we aimed to explore ways in which feelings of social connection could be stimulated between separated family members and gauge participants' perceptions of ambient information and orientations to the device itself. The ambient plant pot senses local plant moisture levels and conveys this information through a range of colors produced by LEDs, which are diffused through translucent plastic on a plant pot-based display (i.e. red when a plant is dry shifting across color spectrum to green when it is wet). A parallel display conveys the condition of the remote household plant, allowing participants to observe the local state of their separated household's plant. Additionally, when a participant is in close proximity to their plant, an integrated IR sensor causes the distant household's pot to begin to glow brightly, potentially stimulating curious or serendipitous reflection on the real-time activity of separated loved ones— a notion motivated by [10].

Two prototypes were deployed across two households—an elderly couple (P5) and their daughter (P6). We visited both houses to install the prototype and conducted a brief interview in each. We asked participants about the ways in which they typically communicate with each other and where they would prefer to place the plant pot and why. We provided self-diary sheets for them to log reflections of their feelings about the pot during direct interactions with it over time. We also instructed participants to provide dates and times of all diary entries so that responses to events can be compared across households. After two weeks, we visited our participants again to collect diary sheets and ask participants about their overall experiences.

6. Findings

Both P5 and P6 reported changes in the display provoked inquisitive reflection on the behavior of separated family members, P5: "*I was almost sure my daughter is shaking hands to the plant pot.*"; P6: "*I can picture that my father was doing something around the kitchen.*" P6 mentioned it was comforting to feel connected through a

perceived shared space across households without "*doing anything special*," illustrating this mode of ambient interaction appears qualitatively different from engaging with static or asynchronous forms of communications, such as looking at photos, touching a device, or sending direct messages. Spontaneous interactions also emerged as the device transitioned from the ambience to the foreground when participants remotely interacted with each other by waving their hands to change the display color as sensors detected their close proximity movements.

Figure 3. Ambient plant pots deployed in participants' homes

The passive sphere of ambient information and sensing devices surrounding the plant appeared to provide subtle forms of connection, P5: "*They* [children] *are busy with their work; their time is more important than ours. …we have some kind of window into their world.*" Similarly, P6 remarked, "*I cannot really visit them as much as I want. …it's nice to know they're there* [i.e. represented by technology probe]." Additionally, P6 compared the plant pot to other devices: "*I had presented my parents digital photo-frames before, but they do not use them at all. This pot feels like more absorbed in our home because it does not have a screen.*"

7. Multi-Dimensional Studies

We drew on several different user research approaches to explore multiple dimensions of our participants' lives and inquire into the nature of their experiences. Our aim was not to extrapolate requirements to be applied to a general population, rather we employed a series of exploratory studies to investigate new design opportunities; by exploring these multiple dimensions of experience over time and space we developed understandings of particular nuances of domestic experience and refined our sensibility to *affectively* design for them.

Semi-structured interviews was a useful approach to obtain initial insights related to daily routines and domestic spaces; participatory sketching exercises were a particularly evocative way to elicit stories from participants. The cultural probe study was conducted to unobtrusively establish a dialogue with elderly participants and reveal interesting or overlooked idiosyncrasies to inspire exploration of new directions in the design space. Finally, the technology probe served as a catalyst to provoke concrete reflections on how ambient technology might affect participants' everyday lives in ways difficult to anticipate without *real* and situated interactions and experiences of use. Collectively, knowledge from this approach suggested two specific design themes we plan to experiment with in future prototypes:

- *Augmenting familiar objects and practices with ambient computational material.* Considering elderly participants' dense domestic ecology and potential cognitive or physical requirements, we augmented a common, familiar object (plant pot) and practice (nurturing plant) with dynamic, socially relevant information. The technology probe opened a space to explore how subtle uses of ambient computational material might enrich everyday interactions—particularly in terms of the *digital* material qualities embodied in physical interactive artifacts.

- *Leveraging passive proximities of information sensing and presentation to provoke sociability.* While the technology probe often remained peripheral to participants' everyday lives, its information presentation and sensing capabilities crafted sphere of information and potential interaction that participants perceived to imbue portions of their homes with qualities symbolic of separated loved ones. Nonetheless, this occurred in subtle ways that both invited participants to consider loved ones in everyday life, but remained passive enough to quickly disappear into the background. In the future, we plan to explore the ways in which attributes of future prototypes might shape participant perceptions and interpretations of these emergent symbolic qualities in domestic space.

7. Conclusion

In this paper we described a multi-dimensional approach to user research aimed at producing reflective understandings of our elderly participants' everyday experiences. Rather than triangulating user feedback for objective outcomes, this approach, in spirit and ambition, aims to generate insights about particular nuances of human experience as a means to inform and inspire design opportunities in a way useful to designers. As human-computer interaction design continues to embrace the fuzzy and relationally complex contexts of everyday life, it is important we continue to investigate ways of framing and grappling with such phenomena—particularly if we are to design products that will pleasurably and meaningfully enrich everyday life.

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