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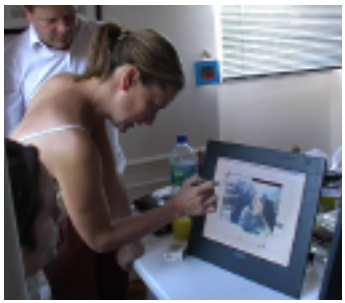
interLiving

Designing Interactive, Intergenerational
Interfaces for Living Together. IST-2000-26068
http://interliving.kth.se



Cooperative research with families

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The interLiving project has been based upon a Swedish-French multi-disciplinary research consortium that integrates social science, computer science and design. We established multi-year relationships with six families, each with multiple generations in two or three households, three in Sweden and three in France. The family members, ranging from children to grandparents, were active partners with the researchers, letting us observe them at home and participating in a series of collaborative design workshops. They not only provided us with information about themselves, but also tested novel research methods and prototyped a variety of design ideas.

Based on the needs and desires that emerged from the families, we decided to focus on interfamily communication: lightweight ways to stay in touch and facilitate everyday interaction. Although the family members actively use telephone (and some, electronic mail), it was clear that more subtle, less intrusive forms of communication were missing. We began with shared surfaces across households and then expanded our designs to incorporate ideas from the families and ourselves. We developed a set of working prototypes which we installed and evaluated in the families' homes over weeks and months. Our experience with these installations, and the feedback from the families, has generated requirements and the basic architecture for a new category of technology, which we call *communication appliances*.

Introduction

interLiving had two objectives: to create longitudinal, collaborative relationships with distributed families as the foundation for exploring new methods of collaborative design, and to support the needs of these families by developing and testing a variety of innovative artefacts that disappear into the 'fabric' of everyday family life.

interLiving started with a specific goal: to crisply define design requirements for a new generation of communication artefacts for families, derived not from technological possibilities but rather from families themselves. Our initial focus was on understanding how distributed families stay in touch with each other in the course of their daily lives.

We strongly believe in cooperative design: for interLiving this meant moving beyond the work place and establishing new ways of interacting with families. Building on research methods from social science, design, engineering and computer science, we worked

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collaboratively with three Swedish and three French families for three years. Approximately 50 family members, ranging in age from an infant born at the start of the project to a 76-year-old, have engaged in a wide variety of activities, including home interviews and observation, cultural probes (such as using still or video cameras to capture aspects of their home lives), and a series family workshops (sometimes with individual families, groups of families from one country, or with both French and Swedish families).

Working closely together in multi-disciplinary teams

Both the Swedish and French research laboratories are multi-disciplinary, with expertise in computer science, social science, as well as industrial and graphic design. This proved to be an enormous advantage, providing different perspectives and creative solutions, but was also a risk, due to the potentially large communication gap involved in 'handing over' information from one discipline to the other. Our solution was to involve everyone in all activities, with at least two researchers from different backgrounds present whenever we worked with family members. This mean that computer sciences learned to interview, and ethnographers learned to prototype. This naturally gave us a broader perspective on family communication in its context, but also increased the level of shared understanding among the researchers.

Working with real people

interLiving was conducted in the Scandinavian cooperative design tradition. From previous projects that interLiving researchers have been involved in we understand that designing in close relation with the users is an effective way to generate ideas and to ground them in the project.

We know that we cannot simply ask users to just tell us what innovative technologies they want: Instead, we have to provide tools and a creative environment that encourages them, and us, to explore novel ideas together.

Contextual and aesthetic considerations

We cannot simply decide which technologies families might be willing to bring into their homes and their lives, in terms of what they should do and how they should work. We must consider the whole picture, including the products' appearance and expression. Artefacts must be designed so that families accept them, which involves not only function and aesthestics,

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but also more subtle aspects such as status and exclusivity.

Triangulation

We quickly realized that working with families would have to take into account their different ages, skills, needs and desires. A four-year-old cannot do the same things as a 14-year-old or a 40-year-old, but still offers a unique and valuable perspective. We engaged family members in different activities, as individuals or in varying cross-sections within and across families, to learn about diverse aspects of their lives.

We developed a variety of collaborative design methods including observation, interviews, cultural probes and technology probes in their homes and family workshops with scenarios, film-scripts, design games, mock-ups, video prototyping and presentation of novel technologies in family workshops. Our approach, getting complementary and overlapping information with different methods is called triangulation. We mix and match design methods, both to broaden our perspective and to better understand the advantages and disadvantages of the methods themselves.

The work was partly carried out through a series of workshops,

and partly through probes and prototypes that were installed in the families' households.

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Probe photos.

Top: A shared surface in the hall. The family members can by a quick look on the drawer easily see who is home, etc.

Bottom right:
'This is so nice that it qualifies for a photo.'

Bottom left:
An example of a well working strategi for getting important notes read. The note lies loosely on the toilet seat.

'Home' Work

After initially establishing contact with the families, we gave them a cultural probe kit with disposable cameras, diaries and relationship maps as well as simple instructions. They sent back a variety of items informing us with a view of their lives and relationships, while providing them with an initial idea of how were going to work together.

We followed the probes with interviews, discussing the items they created: annotated photos, relationship maps, diaries and scrapbooks. The artefacts provide a physical trace of their real-life experiences and helped guide the interviews, so that we collected a large number of detailed real-world stories of their family lives. Since a key goal of a cultural probe is to inspire design ideas, we also used them as the basis for scenarios and later prototyped designs that would fit within the circumstances identified by the cultural probes and interviews.

Family Workshops

Family workshops have at least two objectives: to generate design ideas and to get to know one another, both across families and with the researchers. Each workshop activity starts with an introduction that frames

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and focuses the work, such as showing video clips of interviews from the households.

After the introduction the participants express something real and recent that has had some meaning to them, a *use scenario*. It could deal with something problematic, like a breakdown, or it could be something nice that had happened to them. Usually this scenario involves some type of communication with others. The concrete, experienced scenarios help to keep the work relevant to and reflecting their real life, expressing real needs and desires. We also tried a variety of brainstorming activities and design games, which help us and family members explore different design ideas

Far more is revealed and communicated through real action instead of only relying on spoken language. Therefore we want the family members to show us how they would like things to work, how they want to interact with the artefact and in what context. The groups developed *design scenarios* and built simple low-tech prototypes of with a variety of prototyping materials. The design scenarios were acted out with the help of the prototypes. These were often presented as *video prototypes*; the acting out was recorded on video, thus demonstrating novel technologies that they might want to have in their homes.

A storyboard of a 'use scenario' describing several problems encountered when one daughter tried to have lunch with her mother.

The BongoFax, a design idea for a device that teleports you to for example your grandmothers house if you need to borrow a bathroom or a phone. It was made at one of the workshops.

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Technology Probes

We developed a multi-disciplinary design method, called a technology probe, to take the next step in the design process. Technology probes combine the social science goal of collecting data about the use of the technology in a real-world setting, the engineering goal of field-testing the technology and the design goal of inspiring users (and designers) to think of new kinds of technology. They helped us both study how family members communicate in situ and, at the same time, motivate them to think about new kinds of communication technologies.

A well-designed technology probe is technically very simple and very flexible with respect to possible use. It is open-ended and should inspire new activities by the family members. It is not a prototype or early version of a technology because it is not planned to be developed further. Rather, it is a method to help us determine what kinds of technologies would be interesting to pursue.

We created and installed a series of working technology probes, connecting multiple households of four of the families, for periods of weeks or months. Family members experimented with these technologies, identifying uses we had not previously considered and contributing to the design of later prototypes.

Top left: The videoProbe displays still images that are taken at the remote household.

Top right: Two versions of a story telling probe, the storyTable and the Mimo. It is controlled by a physical interface and the video recorded is blended with the previously recorded material.

Right: Examples of communication with the messageProbe which is a shared drawing surface. What is drawn in one household shows up at the others within the same family.

Far right: The TokiTok is a sound probe. If you knock near it, light and sound will appear at the connected remote household.

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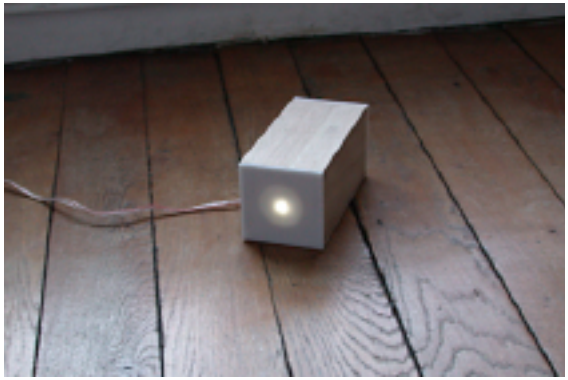

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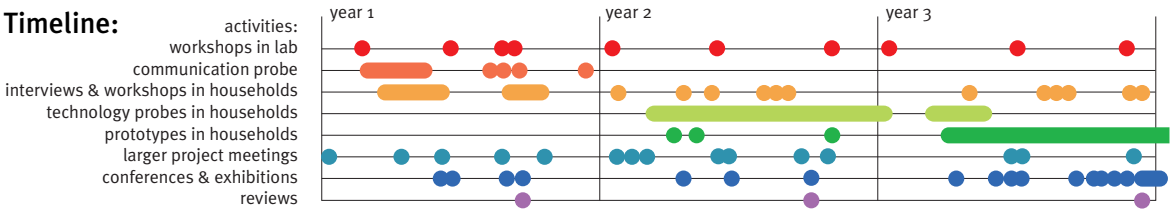
Timeline:



Prototyping in context. A discussion about a software protytype of the InkPad in one of our families' households.

A low-tech prototype used to understand what type of written messages different individuals found meaningful to 'send' to others.

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The interLiving process has successfully:

- increased our understanding of multi-household family communication, via a longitudinal study of six families, and of co-adaptation of technology by users;
- generated novel design methods (specifically, *technology probes* and the *Interactive Thread* as design methods), which have been published and actively shared with other projects;
- developed and tested innovative distributed communication artefacts using shared surfaces (including four technology probes: VideoProbe, MessageProbe, Mimo and TokiTok as well as three prototypes: MirrorSpace (proximity-based shared video), FamilyCalendar (paper interface to an on-line calendar), and InkPad (shared disappearing ink).
- identified the foundation for a new category of technology devices, called communication appliances, which provide small, secure networks for exchanging personal information within co-located and distributed families.

These innovations in context, process and technology result from our multi-disciplinary approach and have served both to define new research problems as well as solve them.

The InteractiveThread is a 'Participatory Design Toolkit'. This was an experiment to gather data and ideas for innovative family technologies from the audience at the DIS2002 conference in London. The Interactive Thread is a collection of participatory design methods from a variety of disciplines that span the design process. It was designed as a series of design exercises that ran throughout the conference. In the context of the conference, our goals were to facilitate interaction among conference attendees, teach new design techniques that cross disciplinary boundaries, and to provide a forum for discussing design issues. From the perspective of the InterLiving project, the Interactive Thread provided a wonderful opportunity to obtain a large amount of detail-rich data and design ideas from an audience with particular expertise in this area. The toolkit is available from our website.

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The InkPad installed in one of the households. It is a digital message surface for drawing/writing and sharing notes in real time at a distance, e.g. between households. The ink is supplied by pens handled with interaction device, e.g. mouse, pen or finger, and can have temporal properties such as disappearing after a while, recurring every Monday morning etc. This makes the InkPad useful for messages, reminders and real-time communication both within households and between households. Our intention is to enable communication of both important facts and more informal chatting in a way both youngsters, adults, and elder members of the family, computer literate or not, could find useful and "fun".

Impact

The design methods described above have already begun to be adopted by other researchers and have been actively sought by industry to help them define requirements for technologies for the home. Our longitudinal studies of families provide unique insights into family communication and our published results will add to the relevant research literature. The specific prototypes described above have been or will be published in research articles, the software for some is currently available via the web under a free software licence, and the MirrorSpace has been exhibited in several prestigious exhibitions in France, including an extended run of four months at the Pompidou Centre in Paris, in 2003-2004.

However, the largest potential long-term impact will derive from our strategy for developing and deploying *communication appliances*. Although this will require additional research in a future project, the expected impact could be very large, enabling a whole new set of technology artefacts of a style that are currently limited to laboratory research prototypes, but should be usable by a large proportion of the general public.

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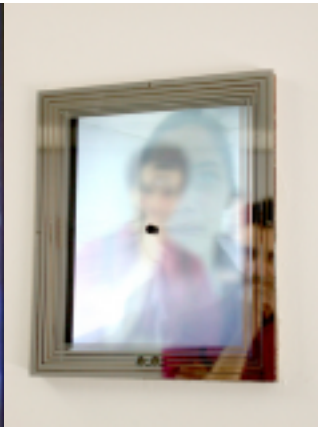
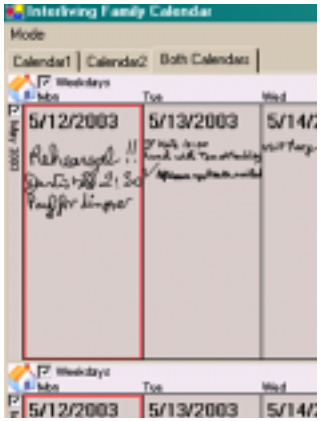


MirrorSpace is a physical telepresence video appliance. In an empty space, MirrorSpace looks and behaves like an ordinary household mirror. It is in fact augmented with a live-streamed video and is linked to other mirrors that are distributed in remote or local locations.

An ultrasonic distance sensor affects the video image rendering in real time. Depending on the physical distance between people and their mirror, the image of themselves and other people will alter. The live video streams from all active places are superimposed onto MirrorSpace, so that two people can make eye contact and merge their portraits into one.



The Family Calendar is a system facilitating the sharing of calendar information between remotely located family members. Users can choose to write by hand on digital paper calendars or to enter information into a computerized calendar. All of the information is automatically shared among everyone in the distributed family.

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French and Swedish families together with researchers at a joint workshop in Paris May 4, 2002. The location was the Maison de la Mutualité.

Acknowledgments

We extend a warm thank you to our family design partners in Sweden and in France: you let us invade your homes with people and technology, and generously shared your time, needs and desires. Without you, this work would not have been successful, nor as much fun.

We also acknowledge Molly Bartling and Henrik Färlin, whose illustrations and reflections have inspired the project work.

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The research philosophy of the interLiving project has been to put families, not technology, first, using a multi-disciplinary, cooperative design approach. Our goal has been to explore a new design space, i.e. technologies for distributed, multi-generational families.

The project has clearly met all of the original stated objectives in terms of work with families, development and sharing of innovative design methods and creation of novel communication technologies. We have also been fortunate to identify a whole new research area and we are now ready for the next step, which is to clearly articulate this new type of family network and its associated applications.

The project was supported by EU IST FET, through the Disappearing Computer Initiative.

Further information is available at http://interliving.kth.se

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