Technology Probes: Inspiring Design for and with Families

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ABSTRACT

We describe a new methodology for designing technologies for and with families called technology probes. Technology probes are simple, flexible, adaptable technologies introduced into families' homes with three interdisciplinary goals: 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 about new technologies. We present the results of designing and deploying two technology probes, the MessageProbe and the VideoProbe, with families in France, Sweden, and the U.S. We conclude with our plans for creating new technologies based on our experiences.

Keywords

Design Methods, Computer Mediated Communication, Computer Supported Cooperative Work (CSCW), Home, Ethnography, Participatory Design and Cooperative Design, User Studies and Fieldwork

INTRODUCTION

In his book, *Bowling Alone* [20], Robert Putnam laments the loss of "social capital"— the interconnections we have with our family, friends, and neighbors— in American society. People participate in civic affairs less frequently, hardly know their neighbors, and socialize less often with friends. The HomeNet study at Carnegie Mellon [14, 15] indicates that computers and the Internet can contribute to this problem by isolating people from family and friends and increasing their daily stress levels.

However, this study also suggests that when used for communication, computers and the Internet can play a positive role in keeping people connected – email, instant messaging, and family web sites are just a few of the ways the Internet helps keep people in contact. Thus, people continue to question the value of computer technology in their daily lives [23].

Given this skepticism, it is important to continue to explore if and how technology can be used to support communication with and awareness of the people we care about. In the last several years, there has been an increased interest in both academia and industry in designing technologies for homes and families (e.g. [13, 17, 18]). Such design offers a number of interesting challenges. A huge diversity of ages, abilities, interests, motivations, and technologies must be accommodated. People are much more concerned about the aesthetics of technology artifacts in their home than at work [25], their values may influence their use of technology [24], and playful entertainment rather than efficiency or practicality may be the goal [6].

As part of the European Union-funded interLiving [11] project, we are working together with families from Sweden, France, and the U.S. to design and understand the impact of new technologies that support communication and coordination among diverse, distributed, multigenerational families. Using a variety of research methods from participatory design, CSCW, and ethnography, we have learned about the needs of the families, introduced them to new types of technology, and supported them in becoming partners in the design of new technologies.

BACKGROUND

One of the key objectives of the interLiving project is to experiment with different design methodologies. Each of the authors' organizations has long-standing experience in participatory design [22], which remains the core strategy

for the project. However, we each have different experiences and perspectives. Families, and the individuals within them, represent a new user group for all of us. InterLiving provides us with the opportunity to examine our differences, draw from our collective backgrounds, and integrate the most effective approaches.

Motivation

The interLiving partners use methods from the social sciences, engineering, and design. One of our key challenges is to develop new participatory design strategies in which family members can actively participate in the design of new technology. A typical HCI approach would be to interview the families, create a design, develop the technology and then test it to see what the families like or do not like. However, we would like to come up with methods that enable families to more directly inspire and shape the technologies that are developed.

We do not expect the family members to become designers, but we do want them to be active partners in the design process. If we only use the HCI strategy described above, we believe it can discourage active participation by users, as the design concept is already well established by the time the users see it. Their suggestions are likely to relate to details about the user interface and will not be fundamental contributions to the technological design [4].

Our original proposal for interLiving was to distribute "seeding" technologies into the families' homes, to provide families with ideas about what we would like to develop. We expected family members to critique these technologies and provide us with feedback that would affect our subsequent designs. As the project progressed, we shifted to the concept of a 'technology probe', which combines 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.

Definition

A well-designed technology probe should balance these different disciplinary influences. On the social science side, technology probes reject the strategy of introducing technology that only gathers 'unbiased' ethnographic data. We assume that these probes will change the behaviour of family members and the character of their inter-family communications. On the other hand, we recognize the benefits of collecting data in-situ and we are interested in observing how their communication patterns and their interpretation of the technology changes over time. On the engineering side, technology probes must work in their intended real-world setting. They are not demonstrations, in which minor details can be finessed. Therefore, all the main technological problems must be solved for the technology probes to serve their purpose.

On the design side, technology probes are similar to cultural probes, introduced by Gaver and Dunne [7], in that they are

meant to inspire users to reflect on their everyday activities in different ways. We have used a variation of two early types of cultural probes, providing family members with disposable cameras and diaries and asking them to generate maps representing their family relationships [26]. However, cultural probes tend to involve a single activity at a particular time and do not stress technology per se. Dunne and Raby's Placebo Project [5] is closer to the concept of a technology probe: they introduce thought-provoking technologies into people's homes for periods of time. However, they do not explicitly use the technology to collect data about its own use, nor are they asking users to participate in the development of new design ideas.

Our version of technology probes involves installing a technology into the families' homes and watching them use it over a period of time. A well-designed technology probe should be technically simple and flexible with respect to possible use. It is not a prototype or early version of a technology we are seeking to develop. Rather, it is a method to help us and our family design partners determine which kinds of technologies would be interesting to pursue. A successful technology probe is open-ended and should inspire new activities by the family. Once placed in the home, it should encourage family members to experiment with it in ways we haven't considered and reflect on aspects of how the family members interact with one another.

Because we instrument our technology probes, we can capture two types of data: the use of the probe itself and the relationships within the family. Successful technology probes should be explicitly co-adaptive [16]: we expect the families to adapt to the new technology but also adapt it in creative new ways, for their own purposes. Ideally, technology probes will spark new ideas and help the families articulate ideas for the prototypes we will build.

Features

Technology probes can be distinguished from prototypes or products as follows:

Functionality: Technology probes should be as simple as possible, usually with a single main purpose and two or three easily accessible functions. Prototypes may have many layers of functionality and address a range of needs, not all of which may even be implemented.

Usability: Technology probes are not primarily about usability in the HCI sense, so during the use period, we do not change functions. For prototypes, usability is a primary concern and the design is expected to change during the use period to accommodate input from users.

Logging: Technology probes collect data about relationships within the family and help family members (and us) generate ideas for new technology. We should provide ways of visualizing the use of the probes, which can be discussed by both users and designers. Prototypes can collect data as well, but this is not a primary goal.

Flexibility: Although technology probes should not offer many functionality choices, they should be designed to be open-ended with respect to use, and users should be encouraged to reinterpret them and use them in unexpected ways. Prototypes are generally more focused as to purpose and expected manner of use.

Design phase: Technology probes are intended to be introduced early in the design process as a tool for challenging pre-existing ideas and influencing future design. Prototypes appear later in the design process and are improved iteratively, rather than thrown away.

Implementation

In the interLiving project, we have discussed developing and using a variety of technology probes. Such probes can be used by individuals, groups of family members or everyone in the family. They may be designed for the home or settings outside the home. They may be fixed or mobile, hard-wired or wireless, large or small, new or existing.

Thus far, we have developed and installed two technology probes: the MessageProbe and the VideoProbe, described in the next two sections. Each was designed to gather data about a family's communication patterns while inspiring them to think about new ways of communicating.

MESSAGE PROBE

The MessageProbe is a simple application that enables members of a distributed family to communicate using digital Post-It notes in a zoomable space (Figure 1). It can function synchronously, with two or more family members writing and drawing from different locations at the same time, or asynchronously, with family members checking it periodically for new messages from other households. The probes are connected only to a small set of family members, removing the need for complicated setup and remembering names, addresses, or buddy lists. There is no mouse or keyboard – just a writable LCD tablet and pen.

Hardware and Software

The MessageProbe software was built using Java and three Java-based toolkits: the University of Maryland's Jazz, Sun's Java Shared Data Toolkit 2.0 (JSDT), and Interbind's XIO, all available for download [1,10, 12]. The hardware requirements include a writable LCD display, such as Wacom's PL 500 Series, or a regular graphics tablet, such as a Wacom Graphire, and a regular monitor. The software runs on Windows and Macintosh OS X platforms.

Architecture: We used JSDT to support communication between households. JSDT provides support for collaborative, networked applications with full-duplex, multicast communication. Multiple clients can join and leave sessions to exchange information. Each instance of the MessageProbe is a client that joins a session established by a central server. A separate JSDT registry proces keeps track of the clients.

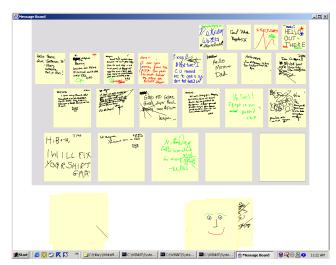


Figure 1. MessageProbe

We used Interbind's XIO to provide robustness in the event of a server failure. XIO is a Java package that can be used to read and write Java objects to and from XML files. The server uses XIO to write out information to an XML file about each message in the session whenever it receives an update. If the server crashes, all of the information can be retrieved from the XML file to recreate the message space.

Logging: In addition to recording the message information in an XML file, we also added a log file to each of the clients. This is a text file that records information whenever family members use any explicit functionality, such as creating a new message or moving an existing message.

Appearance and User Interaction: We used the Jazz toolkit for the spatial arrangement of messages. Jazz provides a two-dimensional scene graph structure for organizing graphical objects in a large, zoomable canvas. Messages are arranged on the canvas in a grid as they are created, with older messages shifted and scaled to less prominent grid positions. Individual messages can be zoomed in or out, and messages can be dragged out of the grid and placed in arbitrary locations on the canvas.

Design

The MessageProbe builds on work from three fields. First, the technology is influenced by synchronous shared whiteboard projects in CSCW [19] and asynchronous commercial communication software such as instant messaging. Second, in an effort to keep remote family members connected, we were also influenced by research in remote awareness [3]. Finally, our interface design is based on past experience with zoomable user interfaces [1]. For more details about the design and related work, see [9].

We decided to build the MessageProbe based on virtual notes because of the popularity of paper sticky notes for informal family communication. We lost the ability to stick notes on anything anywhere in the house, but gained an unlimited supply of notes and the ability to share them remotely with other family members.

With the potential for multiple remote family members to be viewing, manipulating, and writing on their devices simultaneously, there were a number of usability and synchronization issues to consider. Not only do family members at multiple locations share the message space, but also multiple family members at the same location share a single message creation and viewing device.

Thus, we chose to implement a bulletin board-like interface. All users share control of the notes in the message space. Anyone can write on or move a note in the space, regardless of who created it. New notes are immediately sent to all the devices in the family and are displayed in the same location on all devices. We did not want to force an organization of notes on users, but needed some way of arranging them initially. Notes are arranged according to their creation time in a grid, with older notes pushed higher and made smaller.

Organization of notes beyond the default placement is up to users. Notes can be dragged out of the message grid anywhere in the message space. Notes can also be dragged back into the grid, where they resume their place in the time-based order. As notes are added or removed from the grid, the grid reorganizes itself to fill up space. This design allows for some interesting interactions, which add to users' sense of remote awareness. Two users can draw on the same note at the same time or one user can move a note that someone else is writing on.

There is no delete function — users add to existing notes, create new ones, and move old ones. Our original design included these features, plus time and date information for each message. However, in keeping with the design goals of technology probes, we chose to remove these features. Since the idea was that the probe should feel different from a "regular" computer, we tried to take away common visual computer signs, like title bars, borders, bad typography, symbols to click on, etc. With this design, there was no need for complicated interactions or dialog boxes. Users simply tap a virtual pad of notes to create a new one, and then write on it. Tapping on a note other than the one that currently has focus zooms the focus to the other note.

Probe Deployment - U.S. Family

We deployed the probe in the three households of our U.S. family design partners for 6 weeks in early 2002 (Figure 2, left). These households included a nuclear family with two parents and two school-age children, and two sets of grandparents. We provided computers and high-speed Internet access to both sets of grandparents; the nuclear family already had both. While we wanted to provide all of the households with a writable LCD tablet, we only had one of these devices. One set of grandparents used this device, while the other households used graphics tablets.

For both the MessageProbe and the VideoProbe trials, we wanted to be able to place the probes in "high traffic" areas of the families homes, where family members would hopefully look at them and use them often. We were

relatively successful in doing this, but we had to respect the families wishes and compromise in some cases. In the U.S. family nuclear and maternal grandparent homes, the MessageProbes were located in the kitchen and main living areas, respectively, both high traffic areas. In the paternal grandparents home, the probe was placed in the basement, which was somewhat out of the way.

Overall, the family created over 120 messages and in all of the households, someone checked the probe at least once a day. The messages were almost exclusively text. The two grandfathers wrote the most notes, followed by the father. The two children wrote a few notes each and the grandmothers and the mother wrote one or two each. The two sets of grandparents didn't communicate with each other; they each just wrote notes to the nuclear family.

Status updates were the most numerous types of notes, but many of these had to do with technology problems. The maternal grandparents had a number of network problems in the beginning. During the course of the trial, the probe stopped working a few times due to server crashes and disk space filling up. Notes about minor news, feelings, and coordination were nearly as numerous, while there were also a few questions and reminders.

The only one who used the probe in the nuclear household regularly was the father. The children were frequently too busy, and the mother preferred the phone. The paternal grandparents had no prior computer experience. The lack of a delete function made the grandfather self-conscious about mistakes, so he wrote many of his notes on paper first. The maternal grandparents had the most trouble with the probe. They required a new modem, a visit from the cable company to get a new IP address, and had a problem with their pen due to electrical interference.

Many of the family members wanted a notification function, such as an audio cue, for new messages. The grandparents were disappointed that the grandkids didn't use it more, but the probe helped reveal that coordination between the nuclear household and the grandparents for childcare was an important issue. However, everyone felt that it was not reliable enough for such important communications. It was fun for writing unimportant things, but the phone was better for a quick response.

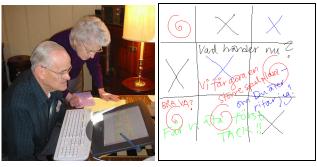


Figure 2. U.S. MessageProbe (left) and Swedish message (right). (Note that the keyboard was not used for the MessageProbe.)

Probe Deployment - Swedish Family

In Sweden, the MessageProbe was installed in two households of one family over several months during the summer of 2002. We provided both households with LCD tablets and Apple Cubes. The households included two sisters, one living with her boyfriend and the other with her husband and two small children.

The first sister and her boyfriend lived in a small apartment and placed the probe in their bedroom, next to their computer. This was a high traffic area, but they chose to switch the probe off at night because of the noise and light it generated. The second sister and her family placed the probe on an unused dining table in the downstairs of their house. The probe was visible from nearly every room downstairs because of the open floor plan in the house.

This family wrote over 200 notes during the course of the trial. There was considerable difference between how much the sisters used it vs. their husband and boyfriend. The sisters treated it as a natural continuity of how they already communicate - a constant flow of notes, with text and drawings, answering machine messages and telephone calls. Their use of the MessageProbe was just another way of leaving notes. By contrast, their husband and boyfriend did not have the same "note-culture" during their upbringing and did not use it as much.

In contrast to the U.S. family, the Swedish messages were more playful (Figure 2, right). One sister played remote "connect-the-dots" with her niece. The two children enjoyed the probe so much that at times they fought over the pen. For the adults, messages were often annotated repeatedly from both sides. When there was no more space to write, they continued on another note.

Like the U.S. family, the Swedish family discussed a visual or audio cue to provide awareness when someone on the "other side" was writing a message. However, they also noted that there was a negative side to such a signal because it could be distracting or annoying if you were occupied with other things. They had similar technical problems with the probe not working at times during the trial, and the zooming feature on their computers was rather slow. In spite of the problems though, they all enjoyed it and said they would miss it if we took it away.

Conclusions

The technology problems prevented the families from developing an adequate level of trust to send important messages using the MessageProbe. Despite these problems, many of the messages in the U.S. family still involved attempts at coordination for things like picking up children and getting together for activities, indicating that this is a promising area of research for new technologies. In addition, the playful use of the probe by the Swedish family indicated a desire for simple, fun ways of providing remote awareness between households. We discuss both of these possibilities in the Emerging Designs section below.

VIDEOPROBE

The VideoProbe (see Figure 3) provides a simple method of sharing impromptu images among family members living in different households. We use a video camera that takes a snapshot when the image it captures becomes steady for approximately three seconds. The images are collected, stored, and made available to anyone else in the network. Family members can browse the images with a remote control. Images fade over time and eventually disappear, to encourage families to create new ones.

Hardware and Software

The VideoProbe consists of an Apple Cube, a Wacom PL-500 LCD tablet, a Philips ToUCam Pro USB camera, a pair of Apple USB speakers, a Keyspan Digital Media remote control, a USB hub and an Apple Airport base for wireless networking. We selected the Apple Cube both for its unconventional look and its silence (it has no cooling fan). Even so, some families complained about the hard drive being noisy. The screen/tablet is used only for display, but we plan to use stylus input in other applications. The Airport base allowed us to install the VideoProbe just about anywhere in the families' homes. The software is implemented in C++ with the videoSpace toolkit [21].

Architecture: We use a client-server architecture, in which all images are exchanged through a central server to simplify maintenance and monitoring. The system launches the VideoProbe software at start-up, allowing the families to restart it without a keyboard or mouse. We can also access the software remotely for maintenance.

Interface: The system can be in one of three modes. When the camera does not detect any motion, it is in passive mode and the screen is black. When it detects motion, it goes into active mode where it tracks motion and waits for a steady image. In this mode, the video stream is displayed at full resolution and frame rate, and it is flipped horizontally so as to behave like a mirror. This helps family members frame a proper image. When the camera detects a steady image, a visual feedback indicates that the system is about to take a snapshot. When the snapshot is taken, an audio feedback is played, the image is displayed full-screen and immediately sent to the server. Note that the snapshots are not flipped horizontally, because family members can take pictures of written notes that need to be readable.





Figure 3. VideoProbe (left) and customized remote control (right)

We use a sophisticated calibration system to handle changes in lighting conditions and camera orientation. When initialised, the system takes a reference shot. Then, it detects movement by comparing successive images. The reference shot is updated as follows: when taking a new shot, the system compares it with the most recent one. If they are similar, the new shot is ignored. If yet another shot is taken that is similar to the previous one, it is ignored and becomes the new reference shot. This approach seems to give good results, with few false positives and false negatives. We calibrated the speed and the amount of time to wait before the system takes a new picture. If an adult wants to pose for a self-portrait, the three-second delay is not a problem. However, children find it difficult to remain motionless for three full seconds so we lowered the threshold for motion detection.

The third mode of the VideoProbe, browsing, is activated when a family member uses the remote control. The next/previous/first/last buttons are used for navigating the stream of images. Images fade out progressively, first by losing their colors, then their contrast. After 2 days, they are removed from the stream (although they are still on the server). One button on the remote is used to save an image in the album, bringing its colors back and stopping the aging process, and to take an image out of the album, reenabling the aging process. To simplify browsing, all images, including those in the album as well as local and remote ones, are stored in a single chronological file.

Logging: In addition to collecting basic data, i.e. the collection of images saved by family members, we also added a logging system. This records when images are taken and when the family members use any explicit functionality, such as saving an image in the album.

Design

The VideoProbe was inspired by research on mediaspaces [2], which demonstrated the power of video to support remote awareness. We have chosen to share still images rather than live video for several reasons that relate to the goals of technology probes. First, real-time video would have been difficult to achieve in a home installation. Second, still images support asynchronous as well as almost synchronous communication [3]. Third, the design requires family members to interact with the probe, giving us a way to capture usage data and discuss their patterns of use.

Considering the variety of devices and cables involved in the VideoProbe hardware, we had to develop a packaging design that was compact, non-intrusive and simple to handle. We structured the technology into two units: the computer and its power supply and a customised rectangular box that houses the screen and the rest of the equipment. These units are connected via a covered lead, which includes the video, power and USB cables.

The VideoProbe was designed to be usable in a variety of spatial configurations within the families' homes. The box

can stand alone on any item of furniture. A hole in the back allows it to be mounted onto a wall, like a picture frame. The unit may also lie flat on its back, so that it can be used for message/drawing applications.

We designed the display unit to exploit the high quality of the screen and video camera. At full resolution, the images do not fill the screen, so we covered the remaining parts of the screen and the rest of the box with white plastic. We wanted to keep the visual design as simple as possible, to blend in with any decor. The white plastic does not attract much attention and naturally disappears into its surroundings when the system is not active. When a family member approaches the VideoProbe, the video fades in and highlights the packaging with a glowing white semitransparent band, emphasizing the reactiveness of the unit.

The camera sits on top of the VideoProbe screen, similar to a webcam on a monitor. We wanted family members to be able to point the camera in any direction, so we created a notch filled with foam on the top of the VideoProbe. This makes it easy to lift up the camera, rotate it, and fix it into the desired position. The camera can be focused by hand and has a wide range, including objects that are only millimeters away. We provided a long cable, housed inside the box, to enable family members to take the camera out of the VideoProbe to take close up shots of things nearby.

To simplify the use of the VideoProbe, we created a custom-made graphic design for the remote control. Our earlier tests showed that even the few tasks executed by the remote control could be confusing. It was not obvious how to put an image into or remove it from the album, and these actions are not clearly related to culturally-established VCR control iconography, such as <<, >, >>. Note that users also face these problems when attempting to manipulate stored images on commercial digital cameras.

Probe Deployment - French Families

We knew that introducing a new, networked technology into the families' homes would be time-consuming and difficult. The system needed to operate 24/7 and each intervention at a family required several days before we could schedule an appointment and travel to their home. Additional technical and administrative hurdles to install DSL lines at the French families slowed us down. Despite these difficulties, we have installed four VideoProbes in the homes of the French families.

The first pair of VideoProbes was installed in the homes of two sisters, both living in Paris (Figure 4, left). The first sister designed a kind of 'media wall' for the probe in the corridor of her flat, due to the lack of space in the apartment. The corridor was designed as a substitute for a social lounge area and the VideoProbe fit very well into this environment. The second sister and her roommates let us drill a hole so we could place the VideoProbe on the wall. They also moved things around and were interested in finding a location that was integrated into their living space.

Unfortunately, she had to move soon after we connected the probe so we could only collect limited data.

The second pair of VideoProbes was installed in the homes of two brothers, both living in suburbs of Paris (Figure 4, right). These families decided that they wanted to place the VideoProbes in the main living area, where they could be seen from both the sofa and the dining room table. Unlike the two sisters, the settings were more formal and it was not possible to hang the probes on the wall. Instead, the families placed them on tables or sideboards, rearranged to accommodate plants, vases, and lamps.

Preliminary observations of the use of the VideoProbes already show a variety of patterns of use. Kids and young adults like to use it in a playful way, e.g. sending pictures where they make faces or taking strange close-ups. They also use it for communication purposes, e.g. taking a picture of a hand-written message. We expect these patterns to evolve when the probes are used over a longer period of time and become more integrated into the families' lives.





Figures 4. VideoProbes in the French families' homes

EMERGING DESIGNS

Our experiences deploying the MessageProbe and the VideoProbe in the homes of our family design partners has led us to two promising areas of research. Through log files, interviews, and workshops, the families have identified a variety of different interests, from practical to whimsical, for staying in touch with members between and within households. We are developing two types of prototypes that reflect this diversity: some to support family coordination and some to support playful interaction.

In addition, we have realized that families need a far better method of specifying with whom they communicate. To meet this need, we are exploring different approaches that will be integrated into our prototypes. Finally, our experience installing the probes to fit around existing objects in the home suggested that we should explore applications that take advantage of existing objects. We are designing our prototypes to address this need, by studying which objects in the home can be augmented to support coordination and playful interaction.

Family Coordination

The first conclusion we and our design partners drew from the technology probe installations was that coordination between and within households is important but difficult. Following the U.S. MessageProbe trial, we held a workshop with the U.S. family households in April 2002. The goal of the workshop was to brainstorm about ideas for family communication and coordination technology.

We motivated the discussion by discussing examples and events of coordination scenarios and breakdowns that we had learned about through the MessageProbe trial. We split the family into teams and gave them low-tech prototyping art materials (colored paper, string, clay, etc.) to use to design technology solutions for the scenarios.

The mother and father wanted to keep track of everyone's schedules. They built shared calendars embedded in the refrigerator and added features to their cell phones to connect them with this calendar. The grandparents wanted to keep track of people. They built key hooks by the door that noted who was home, and a ring that pinched the wearer if someone wanted to talk to them. The kids wanted small devices for keeping in touch with friends and parents – voice activated key chains for sending messages and watches that displayed after-school activities.

Overall then, staying connected with and aware of family was important, but people had different motivations for doing so and wanted to do it in different ways. As a first step to supporting them, we are developing new calendar interfaces to enable households to view each other's schedules. Later, we could extend this service to improve communication, portability, and tracking by supporting GPS-equipped PDAs, cell phones, and other small devices.

Family Playfulness

The second conclusion that became clear after the deployment of both the MessageProbe and the VideoProbe is that families want to have fun together, even at a distance. With the MessageProbe, we saw tic-tac-toe boards, connect-the-dots games, and family member caricatures, all bringing family members from different households into shared, playful activities. With the VideoProbe, early interactions included family members making funny faces at each other at a distance.

This is not a startling conclusion – Huizinga coined the term Homo Ludens in 1950, defining humans as playful creatures [8]. However, aside from games, the design of technologies has generally focused on tools to improve our efficiency, not to support our playful side. It is only recently that designers such as Gaver have begun to think about how to design to support playfulness [6]. Our technology probes build on his suggestion that the design of playful technologies be open-ended and ambiguous to inspire new uses, and the fun ways our design partners interacted with the probes seem to validate this approach. We are currently working on prototypes that build on these ideas.

CONCLUSIONS

We believe that technology probes are a promising new design tool for working with families as partners in the design of new technologies. Despite the technical difficulties encountered during the deployment of the MessageProbe and VideoProbe, we believe that as technology probes, they were successful in three ways.

First, they helped reveal practical needs and playful desires within and between distributed families. Second, they provided real-life use scenarios to motivate discussion in interviews and workshops. Finally, they introduced families to new types of technologies beyond the accustomed PC-monitor-mouse-keyboard setup, which we believe encouraged them to consider more whimsical and creative uses of technology in our design workshops.

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