

Cross-Generation Communication via Digital Picture Frames

Elizabeth D. Mynatt and Jim Rowan
Everyday Computing Lab
Graphics, Visualization and Usability Center
Georgia Institute of Technology
Atlanta, GA 30332-0280, USA
+1 404 {894-7243, 385-1102}
{mynatt, jrowan}@cc.gatech.edu

ABSTRACT

We introduce the concept of a “digital picture frame” that provides qualitative visualizations of everyday life activity. Leveraging a familiar household object, our design populates the digital frame with iconic imagery to depict current activity as well as long-term trends. In a final implementation, the digital picture frame would gather information from sensors in the home. To evaluate our design, we ran a pilot study simulating the sensors with daily interviews. The participants were able to interpret the contents of the frame and found the design engaging and useful.

Keywords: awareness, ubiquitous computing, light-weight interaction, aging, visualization, home

INTRODUCTION

Future home technologies have the potential to support social connections between extended family members, who possibly live great distances from each other. A particular need, exacerbated by the geographic dispersion of extended families, is providing new ways to foster positive relationships between grandparents and their grandchildren.

To help meet this need, we introduce the *digital picture frame*, that provides a qualitative sense of a person’s daily activity. Like a traditional picture frame, it is designed to be hung on the wall or propped on a mantle, blending with household decorations. Instead of a static frame, the digital frame changes daily, reflecting a portion of the person’s life. From general measurements of activity to indications of the weather, the picture frame attempts to capture the observations that would naturally occur to someone living in the same home.

In addition to providing a glimpse into another person’s day, we want to support sustained awareness of a family member’s well being by representing past activity. In the digital picture frame, the visualizations move outward over time, compressing and blurring, creating a long-term visualization of trends in the home.



FIGURE 1. Picture Frames for Constance & Caitlin

DIGITAL PICTURE FRAME DESIGN

There are several high-level goals for our design:

- The picture should convey relevant information about a person’s daily life to support low-level awareness of that person’s activity and well-being.
- The picture should depict trends over time.
- The visualization should provide a *qualitative* view respecting privacy concerns.
- The visualization should be aesthetically pleasing, a typical home decoration.
- The visualizations should be emotionally appropriate, conveying “negative” information (e.g. a bad day) in an appropriate manner.

Based on informal clustering of data from interviews with potential pilot subjects, we devised four categories of daily life. These categories are depicted on each side of the frame: health, relationships, general activity and special events (clockwise from the right, see Figure 1).

Each category is divided into three bands with the most recent information in the inner band to the least recent in the outer band. A typical photograph rests in the center. The density of icons in a band represents the measurement for that category for that time period. The greater the density of icons, the higher the measurement (see Figure 2).

Just as traditional picture frames carry meaning about their contents, the imagery in the digital frame is geared to represent the pictured individual. For example, the grandmother’s frame uses images from Impressionist

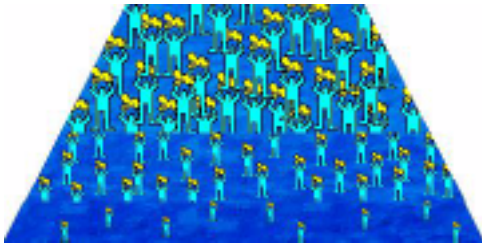


FIGURE 2. Depicting Trends in Time

paintings, providing a softer, more refined feel. The colors are subdued. In contrast, the digital frames for the grandchildren use images from Haring paintings, creating a crisp, more contemporary feel. Akin to how people use picture frames today (e.g. baby icons with a newborn portrait), the frames are matched to the contents, not to the viewer. As with other aspects of our design, our goal was to satisfy how people would want to be *represented to others*.

PILOT STUDY

In our nine day pilot study, we created daily digital picture frames for a grandmother¹ (Constance) and her two grandchildren (Mark and Caitlin) using phone interviews to simulate sensing infrastructure in their homes. We provided laptops, modems and Internet accounts so that they could view the digital picture frames as WWW pages.

Each day we interviewed them, asking about the events of that day. Later that day, they viewed the digital picture frames and answered a daily questionnaire. In the questionnaire, we asked them to interpret the digital frames and to provide their qualitative impressions

Constance and the kids reported enjoyment and confusion while trying to interpret the frames. The icons seemed to both get in the way of understanding, and make the interpretation interesting. Constance particularly liked the flower and ballet representations for herself and thought that the representations for the kids were fun. Of particular note, Mark was confused about fish icons representing his grandmother's activity level since she (unlike him) doesn't go fishing. By the end of the study, they seemed comfortable linking aspects of their life (e.g. gardening) to the icons (e.g. fish). All of them had limited success interpreting the trends. One surprise was that the kids *counted* the icons instead of reacting to the overall impression of density.

We were particularly interested in how the three of them would react to this design concept and how they thought it might work in their daily lives. They enjoyed sharing the information with each other and only expressed privacy concerns about outsiders being able to see their digital picture frames. Of course, they had complete control in what they told us. Nevertheless, they were quite open in telling us many details of their daily lives. Although many aspects of their lives mapped to multiple categories, e.g. playing outdoors with friends earned marks for both activity and relationships, the frame seemed sufficiently expressive to convey the breadth of their daily lives, albeit at a high qualitative level of abstraction.

1. The three participants in the study have consented to publication of the study details and their photographs. By their request, we use pseudonyms.

Despite some prior negative associations with computers, they found the digital picture frames fun and engaging. Constance remarked that the picture frames were a nice complement to phone calls, in that phone calls seem rushed and she could look at the picture frames multiple times a day. The kids looked forward to "seeing what Grandma was up to" each day after school.

FUTURE WORK

The HCI community is directing greater efforts at bringing seniors and computers together. Recent work explores using computing technology to help link older adults with their local communities [1]. Our work complements these efforts, focusing on strengthening the connections between older adults and their extended family. Akin to the "feather" [2], that shoots up and slowly floats back to the floor of its container whenever a family member views a photograph of the feather's owner, our goal is to create an emotionally-engaging, albeit light-weight connection between family members, engendering a sense of connection and familiarity.

There are many avenues of future work that we hope to explore. First, we will conduct another series of design iterations, working on problematic icons and colors. As a principal problem is perceiving trends, we will continue exploring alternative designs.

We also plan to conduct a longer-term field study in homes of target families. As before, we will create reciprocal picture frames for pairs of family members using daily interviews and perhaps some form of self-report. One difficulty in these efforts is creating a situation so that the picture frame fades into the background of daily activity, while daily interviews continue to bring it to the forefront of attention.

This research is part of a larger effort in future home technologies. We are working with other researchers in designing sensors that can feed information to the digital picture frames. In this regard, we use the term "sensor" loosely, referring not only to traditional sensing such as optical and noise sensors, but also to collating information from sources such as online schedules and phone caller-id. Clearly, privacy implications return to the forefront as control shifts from the occupant talking about their daily life to technology automatically gathering similar information. Thus, in our design work, we are focusing on guaranteeing how information is presented to other family members. Additionally, we will need to address supporting occupants controlling what information is gathered in the first place.

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