

Photo Displays in the Home

Laurel Swan

School of Information Systems, Computing and Mathematics, Brunel University
Uxbridge, Middlesex UB8 3PH, UK

laurel.swan@brunel.ac.uk

Alex S. Taylor

Microsoft Research
7 J J Thompson Ave
Cambridge, CB3 0FB, UK

ast@microsoft.com

ABSTRACT

This paper examines an under explored area of digital photography, namely photo display. Using examples from a study undertaken with six families, we examine photo displays on mantelpieces, sideboards, and hallway walls, and in home-offices. Using the examples, we make a case relating to the material properties of photo displays, suggesting that families routinely (and often unintentionally) express something of themselves in the ways they display their photos. The very ideas of family and home, we suggest, are tightly interwoven with the methods of photo display. This position is used to offer up some early design considerations for digital photo displays. We outline some basic properties that might be designed around and contend that the ideas of family and home impose constraints on which of these properties might be best combined and exploited. We also present three design concepts to illustrate how we have been developing this position.

Categories and Subject Descriptors

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design, Human Factors.

Keywords

Digital photography, photo displays, domestic technology, family, home, ethnography.

1. INTRODUCTION

Look around a home, a family home for example, and you are immediately confronted with an idea of that place and its inhabitants. The layout, the colour of the walls, the furnishings, its tidiness (or lack there of), and so on all come to express something of the home and family within. Of course, the mapping is not perfect. Homes are pieced together over time; things are placed where they are for a variety of reasons including sentimentality, convenience or simply because they have nowhere else to go. Nevertheless, a home's material arrangements come to shape our ways of looking and thus our ideas of the place and those who live there.

In this paper, we wish to elaborate on this notion of looking and

the ideas we can have of a place by examining a particular aspect of the home, the display of photographs. We report, specifically, on an exploratory study of photo displays in family homes—of photographs in frames and on a home's walls, for example. We use the word 'display' with caution here, recognizing that different photo arrangements have varying degrees of forethought or attention behind them, and that the term 'display' might thus appear to suggest too strong a sense of intentionality. Yet, as with the other material features of a home, photo arrangements inevitably do come to function as displays in this sense, albeit not always intentionally. For both family members and visitors alike, they portray or at least hint at some idea of home and family. Indeed, the possibility of photo displays being an integral part of our ideas of home and family is one of the central themes we will develop later in this paper.

To date, relatively little work has gone into examining, in detail, the material properties of photo displays and how these properties relate to everyday life at home. There is the work on smart digital photo frames from Kim and Zimmerman [12,13] where household interviews were used to layout the different locations of photos displayed in homes and broadly characterise different spaces for photos as formal or informal. Their work also demonstrates how shared narratives and social interactions are prompted through the display of photos. The actual properties of the displays and interactions these properties afford are not, however, the immediate focus. There have also been projects targeted at building and trialling digital picture frames designed to support remote presence and specifically the ties between families and their distant, aging relations [5,16]. These projects though are understandably more concerned with issues of awareness rather than the physical arrangement or inherent properties of frames.

Two studies, one by Petersen [17] and the second by Martin and Gaver [15], stand as exceptions to the limited attention paid to photo displays and their material features. Presented in its early stages, Petersen's study provides a number of reflections on photo capture and display in the home by devising a novel and playful system, *Squeeze*. In designing the system, emphasis was given to the materials used and how they might afford physical intimacy between a household's members. Martin and Gaver explore a range of design proposals that could be used to capture and view/hear photos combined with audio recordings. Purposefully speculative, the proposals were aimed at provoking unconventional photographic practices through new combinations of artefacts and technologies. In contrast to the focus of this paper, however, both Petersen's and Martin and Gaver's studies are generally concerned with promoting novel experiences surrounding digital photography rather than understanding and building on the established, materially bound practices associated with household photo displays.

Although indirectly, the research focused on sharing photos compliments aspects of the work we will present (as well as much of the work above). Numerous studies, for example, in-

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

DIS 2008, February 25-27, 2008, Cape Town, South Africa.
Copyright 2008 ACM 978-1-60558-002-9/08/0002...\$5.00.

investigate the varying ways people look at photos together when physically collocated [2,8,10] and distributed [6,14,21,22]. Looking at photos, in this sense, is seen as something that mediates social relations, whether between family and friends viewing paper-based photo albums or online users navigating electronic collections [11]. For instance, Frohlich et al. [10] give close attention to the talk around photos when they are shared and describe different forms of *photo-talk*. Relevant to the materials presented here, what they nicely illustrate is how memories are jointly produced in the sharing of photos, or in broader terms how our ways of looking and understanding are shaped by some of the common material practices involving photos.

Our aim in focusing on the display of photos, then, is to extend, in a fashion, the work by Frohlich, Petersen, Martin and Gaver, and others. In short, we aim to draw attention to the displays themselves and explore how the methods used to materially display pictures might shape our ways of looking and, ultimately, the ideas we have of our families and homes.

1.1 Display design

A significant motivation for this work emerges from an apparent disparity. Currently, we are witnessing an unparalleled proliferation of capture devices capable of producing still-picture and video content. Indeed, it seems reasonable to assume that the quantity of digital photographs can only be set to increase—and massively so—with digital cameras now outselling their analogue counterparts [4], and the increased incorporation of cameras in devices such as personal computers, PDAs, music players and, of course, mobile phones. This growth, however, has not been matched with a parallel output in novel display technologies. If anything, our options for photo display have remained fairly limited. Beyond the digital picture frame, which is hardly new, there seems to be very little in the way of novel display solutions. This is particularly true in homes, where we largely remain tied to our tried and tested paper-based displays. There are, not surprisingly, good reasons why paper-printed photos remain prolific; as more general research into work-practice reminds us, paper has affordances that are often hard to beat in the digital realm [18]. What's more, the distinctive qualities of a paper-printed photo appear to exhibit certain 'instructions' that shape how we think about and recall the photographed moment [3]. An intended outcome of this paper is thus not to seek out ways to replace our use of paper in photo displays, but to consider what possibilities digital solutions might provide.

We have begun this research in an exploratory fashion by investigating what it is family households currently do in displaying photos and how it is they do so. Our underlying premise—one derived from the field research we have undertaken—has been to suppose that in their homes, in quite particular ways, people get their photographs to do certain things (sometimes intentionally and sometimes not). So, just as the material a photo is printed on 'instructs' us in how to look and think in a particular way, so too might the socially situated nature and/or material properties of the display. By placing a picture in a frame, on a living room mantelpiece, someone expresses something distinctively different than putting it, say, on a bedside table or even in a locket around his or her neck. Displays are enlisted to do a particular sort of 'work', as it were, transforming photos into more than merely a visual still of some moment.

Having developed these ideas using examples from our field research, we aim in this paper's closing remarks to reflect on what such a position might mean for the design of digital photo

displays. By drawing attention to a number of distinct and what we see to be basic material properties of existing displays and how they shape our ideas of home, we hope to provide a basis from which to inspire novel designs. Novelty, we aim to demonstrate, can emerge by sensitizing design to the materially bound practices that people are already familiar with and by building on our long established ways of looking at and making sense of physical displays of photos. This approach, we'll contend, offers a point of departure from technologies such as the digital photo frame that, while perfectly functional, combine properties that feel at odds with our expectations. To illustrate these ongoing thoughts, we'll discuss what we see to be the weaknesses of the digital photo frame and then go on to describe three early design concepts of our own.

2. FIELDWORK FINDINGS

In the following empirical section of this paper, we present six examples drawn from fieldwork conducted with six households in London over the course of five months.¹ Five of the households were two-parent families with children, ranging in age from less than a year to twelve years old. One household was composed of an elderly widow living with two grandchildren. The fieldwork consists primarily of observations and interviews. Due to the nature of what we were looking at, i.e. photo displays, all the households also ended up giving us tours of their homes in one fashion or another. Our discussions and interviews took place mostly, but not exclusively, with the adults in the family, partly because some of the children were quite young and partly because that's who happened to be at home and talkative. We analysed the collected field materials collaboratively by watching the videoed interviews and observations, and through repeated readings of the field notes. We aimed, specifically, to be sensitive to the manner in which the participants saw their pictures and how it was they tried to have us, as researchers, see them in similar ways.

In taking this overall approach, where emphasis was given to participants' methods of presenting and talking about their displays, we should emphasise this study is not meant to be exhaustive nor generally representative of family households; rather, our hope has been to provide preliminary but detailed insights into the displays of photos in some family homes and, in turn, open up the *play of possibilities* for design [see 1]. In other words, the fieldwork materials (and subsequent designs) are presented as a means to sensitise future design to how photos get displayed and how, in certain ways, they are made see-able.

2.1 A Mantelpiece

To begin let us briefly look at what is possibly the archetypal site to display photos, the mantelpiece. Elsa, aged 87, lives in a small London flat with her two grandchildren. In her living room, five framed pictures, a clock and several other items of memorabilia have been carefully arranged on the mantelpiece (Fig. 1a).

As Elsa takes us on a tour of the photos displayed around her flat and on her mantelpiece, she picks up one of her framed photos. While discussing it, she wipes off an invisible speck of dust and carefully places it back into its former spot. From her conversation and gestures such as this, it becomes clear that

¹ Excerpts and observations from two of these examples are presented elsewhere [19] but with an emphasis on the collaborative aspects of family photo displays.

each photo has its particular place; they are not meant to be left anywhere, haphazardly. There is also a visible symmetry to the mantelpiece arrangement; the larger framed pictures have been placed either side of the mantelpiece and the pictures, all framed in brass, are balanced in their size and placement around the clock. There is some symmetry to the content of the pictures too. Atop of the clock is a small photo of Elsa's now dead husband, placed in a heart shaped frame (Fig. 1b). Pictures of her husband (with Elsa) and granddaughters (when young) are placed closest to the clock and a more recent picture of one daughter and a picture of her grandchildren sit on the mantelpiece's outer edges.



(a)



(b)

Figure 1. Elsa's mantelpiece and close up of centre.

Something quite particular emerges as a result of this arrangement of mantelpiece photos. By framing her photos the way she has, and arranging them just so on the mantelpiece, Elsa's assemblage of photos takes on an almost 'shrine-like' quality—made sacred, if you will, are the family members and the visible relations between them. It's not that all photos on mantelpieces achieve this quality; as we shall see in our next example, this is not an inbuilt aspect of mantelpieces. Rather, the purposeful, careful placement and choice of pictures is what transforms the assemblage; a recognizable formality is interleaved with a family lineage and history (and indeed a politics of inclusion and exclusion) to imbue the arrangement with a certain significance. In a sense, Elsa has enshrined an idea of her family through the deliberate, formal arrangement of the photos and her choice of who is included and who is placed where.

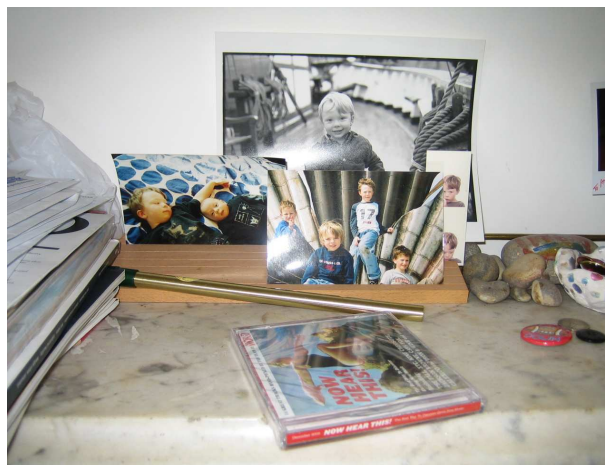
2.2 A Propped-up Photo

In another example of a living room mantelpiece, we see something quite different being achieved. This household's mantelpiece has a framed photo to one side, housed in a homemade

frame, and several photographs—taking centre place—propped up, and frameless. What is immediately striking about this arrangement (Fig. 2a) is its casualness and offhandedness, qualities not typically expected in a household's living room. What's more, we find the photos, all of children, are somewhat lost in and amongst piles of books, papers, and other odds and ends.



(a)



(b)

Figure 2. Jane's mantelpiece and propped up photos.

When Jane, the mother in this household, describes the things on the mantelpiece, it emerges the surface has become the holding place for routine to-dos and objects of day-to-day importance. Thus bills are stacked waiting to be paid, and books and magazines are piled in the midst of being read or waiting to be read. The mantelpiece has been appropriated as an *ecological habitat* [7], as it were, for the home's daily miscellany. As Jane describes the centrally placed photograph (Fig. 2b), we catch sight of how they fit into this assortment of things.

So that's Sam, Andrew, Henry and Benjamin. And I love it because they just look like boys outdoors having a good time, because boys outdoors they know what to do. You know, they just see something and they climb on it. You can tell by the muddy knees on Henry's trousers they were just having a really good time. It was a really great day and it was nice. I like it because it was Aldeborough. I'm very fond of Aldeborough.

For Jane, at least, this photo is evocative of a place and time, and most importantly a sense of her 'boys being boys'—something dear to her. The photo, then, is as much for Jane as it

is for the mantelpiece and household visitors. Indeed, we might postulate that the picture (and the others surrounding it) have ended up where they are, amidst the piles and to-dos, not because this is a mantelpiece on-show to guests, but because this is a space that Jane cannot help but glance at in her daily to-ings and fro-ings. The collection of photos have found their way to just this spot to evoke, albeit momentarily, a feeling for Jane. Crucial is that they don't insist on her attention, but are placed awaiting her transitory engagement. They may go unseen on any one visit to the mantelpiece and for days on end. The point is, though, that they are there waiting for her to attend to them.

Through this example we see photo displays as things that might engage us at particular moments and in particular places. Jane's mantelpiece pictures are arranged—if that is not too strong a word—for her, but evidently as peripheral, glanceable objects, ones that she might find evocative when the time is right. We cannot assume their placement has been made with this intention. On the contrary, the way in which they rest, propped up and set against the formality of the mantelpiece, would suggest otherwise. What's important to note is that the personal, evocative character of the pictures is not achieved simply through their content, but also because of their placement. The casual, almost offhanded arrangement, discordant with the piles of to-dos on the one hand and the formality of the mantelpiece on the other, are what makes the pictures 'work'.

2.3 A Family Wall

In our next example we see a similar interplay between space and engagement. This time though, the photo display appears quite intentionally to be on show, offering a prompt of sorts for our informant to talk about her family.

In a hallway outside her living room, Jennifer has put together what she (and her family) refer to as “the family wall” (Fig. 3a). The photos are a mixture of her immediate family, extended family, various sets of grandparents and ancestral portraits. Thus her son's baby pictures are juxtaposed against a 1910 photo of a family reunion of her husband's relatives. All the photos are either black and white or sepia toned, and all are framed in black, white or burnished gold. The overall effect is quite arresting, and covers three walls of the second floor landing.

The physical arrangement of the family walls allow for a variety of interactions. Jennifer points out a portrait of her maternal grandmother placed just at eye level where the stair landing turns (Fig. 3b). The portrait is larger than its counterparts, not far off life-size, and in the photo her grandmother has a particularly compelling gaze. As we make our way up the stairs, past the family wall, Jennifer describes how she is drawn to the photo:

It's lovely to feel like, you know, my grandmother's still kind of looking out for me. Looking at those eyes, you can't help but feel like, even though I didn't really know her well, she died when I was eighteen months old, she's still- she's there, she's looking out for me. It's just a really nice feeling.

What is interesting here is how the photo, by dint of where it's placed, serves as a resource for Jennifer to talk about her family. The portrait is viewable at eye level, where the stairs change direction; it's difficult to avoid those watchful eyes. The photo appears to operate as a prompt for Jennifer to express a sense of tenderness and caring between family members, even dead ones. As with Jane's mantelpiece photos, this purpose may have been unintended and may not always be evoked. However, the picture's arrangement in space repeatedly allows for it.



(a)



(b)

Figure 3. Part of family wall and Jennifer's grandmother.

A 'surface' narrative continues to unfold along the walls as one climbs the stairs; via the wall, a representation of family is present for those who have rights to or are invited upstairs. A deeper, family narrative awaits, though, hinted at in the arrangement but only available upon interrogation. Cooperation, if you like, between photos, onlookers and narrators is delicately worked out through the orchestration of movement through space and social etiquette: of what is on show, where one can go and what can be asked.

So we might suppose the engagement with the family wall works on two fronts. First, without exception, the display is seeable on negotiating the stairs. Photographed faces and eyes are set towards visitors and household members alike; the photos are seen in an enforced sequence dictated by the home's physical geography. Second, there is a history interleaved with the display. The wall quite literally portrays family; the family members are interleaved and cast in some historical light through the black, white and brown tones and the carefully chosen and juxtaposed frames. These features, in turn, provide

Jennifer and other household members with a readily available resource to express more of their family; the very particular arrangements allow for certain ideas of family to be repeatedly reproduced.

2.4 Wedding Photos

Turning our attention to another example, it is evident that this differentiation or prioritization of pictures (and their inferred narratives) can be achieved in far less elaborate ways. In a household of three (mother: Jennie, father: Simon, and daughter: Sophie), we find something as simple as a difference in light and shadow casts emphasis on one framed photo over another. The two frames in question both contain posed photos from two different family weddings and both are of Jennie, Simon and Sophie. They are placed near to one another, one on the living room sideboard and the other on top of a shelving unit holding CDs (Fig. 4).

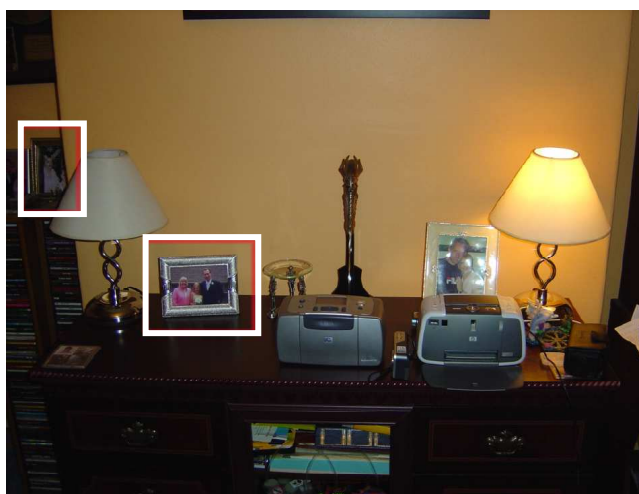


Figure 4. Family wedding portraits on CD rack in shadows (far left) and on sideboard (left of centre).

Explaining why one of the frames has been given prominence over the other, Jennie, Simon and Sophie produce an elaborate story behind the two pictures. Talking, first, about posing for the framed photo placed in the shadows, Jennie recalls the circumstances under which they were taken:

Yeah this one [picks up frame], which is really quite funny, because it shows you the difference in the weddings... My second youngest brother, it was his wedding in April and everybody was kinda of like: 'hmmm, let's make an effort' you know, 'it's a wedding!'. Whereas this one [points to photo on sideboard] you can see people were actually happy and they enjoyed it more. You know it's not being nasty but [looks back to frame she's holding]... but nobody kinda liked his partner and it was all like, 'oh, let's make an effort'. You know it's his choice of who he marries and we just have to kinda lump it. So everybody's like, 'hmm, yeah smile' [said with sarcasm]. Whereas that one [points to frame on sideboard again], because it was a really nice day and people enjoyed the wedding, it kind of comes across more in the photo.

To the undiscerning eye, there is little difference between the two framed pictures and certainly no visible difference in how happy (or unhappy) Jennie, Simon or Sophie were on each occasion. What is salient though is the choice made to display both pictures in such a way that their prominence is unequal. As

with Elsa's mantelpiece, there is an implied sense of obligation in displaying certain types of pictures and preserving a degree of equality or balance between the displays of family occasions. One can easily imagine the offence caused if Jennie and Simon chose to display one wedding picture but not the other. Thus an obligation is met, but a subtle distinction is achieved by placing one photo in the light whilst leaving one in the shadows.

We are cautious about making any strong claim about the definite meanings of photo displays and, in this example, the relative positioning of photos. Jennie and her family are clearly involved in producing an account for us as part of our fieldwork exercise; in fact, when returning the frame she has removed from the shelving unit, Jennie swiftly retracts the lengthy explanation they have given for the arrangement of the wedding photos. Jokingly, she retorts "... but that's mainly cause there's no backing" to offer an alternative explanation for leaning the frame in the shadows, against the back wall. Despite the apparent contradiction, it is this possibility for explaining one thing or another that is afforded by the material features of the photo arrangements that is at the heart of the point we want to make. More interesting than the precise nature of what a single arrangement of photos means and how it comes to be meaningful, is how we see the material properties of photo displays being enlisted as a resource for certain sorts of doings, family doings relating who is counted as family and who is not, and who in the family is given privileged status. In short, the social organisation of family is partly made of these material doings; it appears we unceasingly interleave the material with our ideas of family so that the social order to a home is given material shape and form.

2.5 A Bookcase

Next, we want to consider an example of a very different sort of arrangement, almost a non-arrangement. In this example, we consider the material qualities of photo displays further, suggesting that the juxtaposition of particular methods of display can have distinctive organising qualities.

In Tessa's study, on the top floor of her family house, is a set of bookshelves where "a gamut of stuff" has been placed on display (Fig. 5). The shelves hold a haphazard collection of photos of family members, close and distant, constituting, in their entirety, a "perfect junk memory" as Tessa evocatively describes it. Some of the pictures are leaning, frameless, against the books, some are arranged in an assortment of frames, and others are simply laid flat where there is space on the shelf ledges and books. Several framed pictures are placed side-by-side, sometimes one in front of the other, obscuring most of the books that are pushed to the back of the shelves. Like Elsa's mantelpiece and the family wall, all the photos are of family members, but there the similarity ends.

Interesting about Tessa's bookcase is the difference in the ways the photos are displayed and the way their mere placement is transformative. The placement of photos in frames (frames of different shapes, sizes and histories), out of frames, against books, on books, layered, stacked, lent-this-way-or-that, askew, etc. inscribes something more into each of them, over and above the visible content. In some cases this is specific to a particular family or personal history, so that Tessa's old frames that hold sentimental value have taken on the power to imbue their content with personal significance; even old postcards persist in their placement because these frames are not for any old (or indeed new) thing. In other cases the picture can be further defined by the more general features of its arrangement. Unframed pictures propped up on a shelf, for instance, are im-

mediately more transient than their framed counterparts. Less effort and commitment have gone into getting them where they are and less effort is required to remove them from their display state. In contrast, the operation alone of framing a picture immediately distinguishes the picture and classes it as separate and relatively persistent. The differences in arrangement, sometimes seemingly subtle, thus succeed in separating out photos, dividing them into different classes of things—things that have persistence, that are in transit, temporary, and so on.

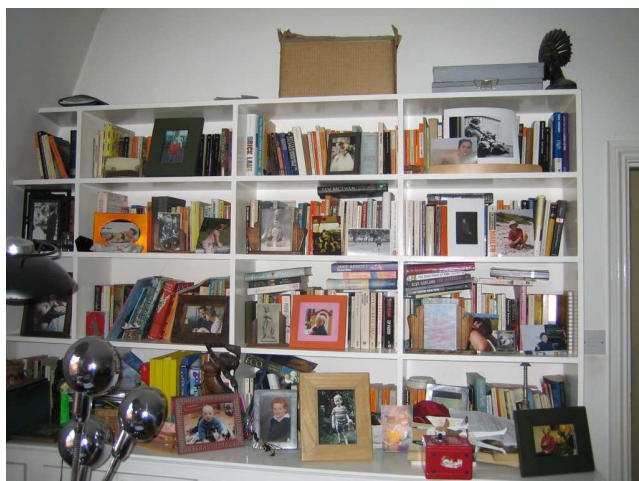


Figure 5. Bookshelves in top floor study.

There is an overriding sense of unfinished business to the bookshelf display. Indeed, we'd be amiss to suggest Tessa has worked, intentionally, to express anything in the motley collection of photos and frames. Key here though is that whatever her intentions, the method of arrangement—or non-arrangement—of the photos unavoidably conveys a casualness, even a palpable sense of disorder. In contrast to Elsa's mantelpiece and the family wall, for example, a striking informality is achieved quite simply because the display's contents don't appear to abide by any carefully prescribed arrangement. Indeed, Tessa readily moves the pictures around as she describes the 'display' to us, propping up some pictures that have been lying flat and moving others in a fluid, seemingly off-hand casual fashion. So it seems that the displays of family can come about without careful thought or deliberation, that the demonstrable qualities can emerge unintentionally in arrangements that are never quite finished. Nevertheless, the material properties of displays continue to be resources for expression.

2.6 Collage

Our final example has much in common with Tessa's bookcase, but the end result is distinctly different in physical appearance. In a room which functions as Jane's home-office, a collage of children's artwork interspersed with photos is affixed to the wall, above the computer (Fig. 6). Jane explains that there is an empty safe in the wall, and that she found the door unsightly. She describes the origin of the collage: "I started to just put up things that are, whatever really, just to cheer me up when I'm working". The items on the wall include her two sons' artwork, a few of their school photos, a printout of a camera-phone picture, one son's passport photo and a postcard from her other son.

Jane's collage has several interesting features. One is its material arrangement, with items skewed and overlapping. There is a clear sense that things have been put up casually, in a haphazard fashion. The lack of definite contours is also notable. Al-

though originally intended to cover the unsightly safe door, the collage has grown beyond the initial borders. Because there is no predefined space other than the wall itself, this flexibility allows the collection to expand or contract according to Jane's wishes. Another noteworthy feature is the mixture of media. Along with the display's haphazard arrangement, the juxtaposition of photos and paintings serves to imbue the overall display with a distinctive feel. Jane's combinations of media of different types and sizes, layering of some pictures, masking of others, and so on, transforms each separate piece into a single display, an assemblage of things to cheer her up. Although not particularly evident from the examples described so far, this mixed-media quality of displays seems, if anything, to be the norm in homes. Tessa's use of old postcards, Elsa's mementos on her mantelpiece, a collection of Star Wars memorabilia in Jennie and Simon's living room, all underscore the idea that people assemble collections of things that are significant or personal to them and make judgements about what sorts of combinations of things to display.

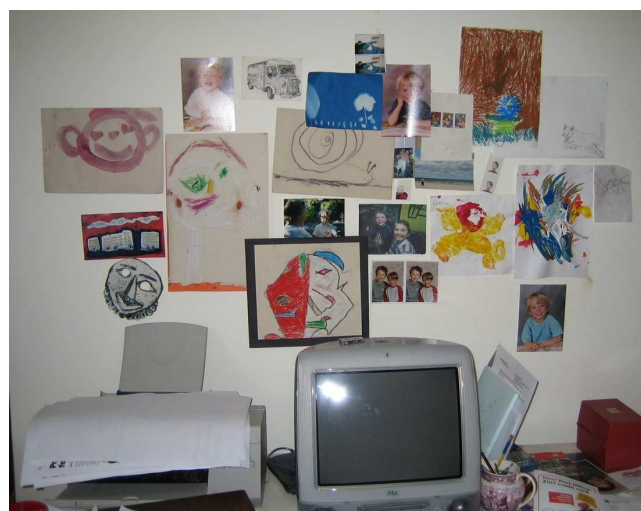


Figure 6. Collage in home-office.

We should note, too, that this collage is not of the pre-constructed sort, assembled all of a piece. Rather, it consists of individual items adhered to the wall with *Blu-tack* (a removable adhesive compound). Thus, the collage has been constructed over time and across space: it grows and shrinks dependant on what is added or subtracted. We can imagine this allows Jane to change the nature of the display, perhaps taking down old artwork, putting up new photos, to reflect in a loose way the evolving nature of her family, or perhaps not. Like Tessa's bookcase, this sort of display has a flexibility, unlike formal displays. Thus, with both Tessa and Jane's examples, we have displays that feel less purposefully constructed, but instead have evolved through, if you like, trial and error.

3. DESIGNING PHOTO DISPLAYS

Evident in the examples above, as well as the many examples we've not had space to write about, is the diversity of photo displays in family homes. We've seen how all manner of things can be used to display family photographs and how the displays can in each case come to do, in one way or another, something quite particular. In order to think about design, we'd next like to consider the above examples in more general terms and, through this, hopefully come up with some conclusions relevant for design.

3.1 Properties of display

Perhaps the most straightforward conclusion to be drawn from the materials presented is that families express particular meanings in arranging and displaying their photos, or at least make available certain ways of looking. In our examples we see, for instance, that placement in a particular room and on a particular structure can be expressive. The mantelpiece display, arguably by default, expresses formality. However, a similar placement can also express quite different qualities: set against piles of todos, mantelpiece photos become less formal and can be personally evocative. The importance and formality of photos is also influenced by their impression of persistence (or temporariness) and their apparent deliberate versus unintended display. The means of support also plays a role; frames add to a photo's formality, their propped-up, frameless cousins lessen it. Size has yet another influence: a large display demands presence, attention and sometimes even reverence. These properties combined do yet more.

The key here for design is that there appear to be practiced methods for photo display that enable us to be expressive. The "instructions" in photos themselves that shape our thinking and recollection of the photographed moment, that Chalfen [3] writes of, are also expressed through displays, but in the latter's case the instructions arise out of the methods for framing, hanging, affixing, combining, etc. In short, our methods of display regularly enlist particular material properties as resources for expression. For the purposes of clarity, we have drawn out the most basic properties that are used in this way:

In contemplating display design, we'd like to suggest that this list offers the early basis for a primitive design vernacular. Each of these properties—alone, or more likely in combination—can be seen as a resource for expression and, more specifically when situated in the home's ebbs and flows, for the expression of—as we will now go on to discuss—ideas of home and family.

Table 1. Examples of display properties.

Property	Examples
Setup	framing, hanging, propping up
Placement	living room, hallway, study, bedroom mantelpiece, wall, table, bookshelf
Means of support	freestanding, wall-mounted, framed/unframed
Form	size, colour, material
Persistence	in time or space
Portability	movement of display(s) between locations
Emphasis	layered, bright vs. dark, mixed-media, mixed functionality
Uniformity	in size, colour, material, content (or non-conformity)
Symmetry	in placement, means of support, size, colour, material (or non-symmetrical)
Sequence	in form, in size, in content (e.g. temporal, family history)

3.2 Family displays

Beyond the straightforward reading of the presented materials, there is something more substantial we want to say about photo displays and their design. After all, the suggestion that there are certain material features in the world that we can and often do put to good effect is, in itself, hardly news. We want to consider the possibility that we, as families, might use photo displays

amongst other things to transform the physical structures we live in into *family homes*; that we use displays as very real and practical resources to talk about, construct and even to will or wish for our *ideas of home* [see 9]. As we shall go on to explain, we believe such a position is important for design because it indicates how display properties, such as those above, might be oriented.

Apparent in the empirical examples above is that homes and more particularly the rooms within them have photo displays with different characteristics. They can be fluid, persistent, deliberate, formal, modest, imposing, and so on. Further, we find there are times to engage and disengage with these arrangements: sometimes it is enough to simply have family members on display; equally, it can be the case that particular arrangements must be accounted for and talked about. What we want to draw attention to in these examples are the ongoing relations between people and their material surroundings. It is not that homes have some inborn character by default. Instead, it would seem that we actively shape our homes; we, through our attendant practices, come to make our homes what they are.

This prospect might seem some way from the problems of design. The interesting thing about photo displays though—and the thing that might give us a starting point from which to consider design—is that there seem to be some fairly recognizable constraints to the potential for diversity. There is a known about order around which we express difference; it's not that anything goes. For example, photos of an intimate nature, which might be tucked away in a drawer or perhaps displayed on a bedside table, could feel out of place on a living room mantelpiece. There are, as it were, social conventions—or what in sociology might be referred to as a moral order—that put limits on how we organise our homes and how far we can acceptably go. We thus enlist the material world in fairly routine and intelligible ways to get photo displays to do what they do.

Families it would appear play with the 'moral dimensions' differently. Some are more carefree about the arrangement of their displays, some are deliberate and pay far more attention to convention. For example, Elsa's mantelpiece or the family wall in Jennifer's home conform to a familiar type of order, one that expresses a formality if not reverence to family relations, whereas the mantelpiece in Jane's living room confounds such expectations. Exceptions like Jane's though lend support to the rule as they are in some way jarring. It appears we expect particular types of photos to be displayed in particular ways and that the conformity to or deviation from these expectations is unavoidably expressive. One's formal wedding photos, for example, express something very different if affixed to the fridge rather than placed in elaborate frames or special albums. The main point this raises is that the very properties we listed earlier in Table 1 are inexorably moral; the judgements families make in displaying photos in the ways they do say something not just of their aesthetic, but also of their ideas of family and home. It might not then be surprising to hear that the casualness and nonchalance of Jane's mantelpiece and collage are in many ways characteristic of her home in general and that the experience of Jennifer's home is not so far off the orderliness of the family wall.

What we're not aiming to do in this argument is oversimplify the complexity of the family home. It is, of course, immediately apparent that a photo display does not make a home, or *vice versa*. What we have sought to assert, however, is the strong interrelation between the material and social, and even moral. It's with this that we might then claim that in the design of

novel photo displays we are not merely in the business of asking what in the material world we should make pliable or mutable, i.e., Table 1. We should also be concerned with where and when to do so and, crucially, how to do so with a coherency of expression. As we will go on to demonstrate, taking this approach does not mean constraining or restricting our possibilities for novel digital displays; rather, it can be used as a jumping off point: by carefully considering the distinctive qualities of photo displays, we should be able to fashion them so that they build upon and further reinforce our expectations.

3.3 Directions for design

We want to express the points above in more practical terms, first, by reflecting on one of the few dedicated photo display products now available, the electronic photo frame, and, second, by outlining three design ideas of our own. Presented as concepts, our ideas are meant to be illustrative of an early attempt to address the problem of making digital photos available for display—in a sense, making digital photos visible so that they can be used, expressively, in the ways we have discussed. Generally, we hope the ideas, although modest, demonstrate how we have been using the above materials to flesh out a space for display design in an informed fashion.

Over and above its standard paper-based equivalent, the electronic photo frame boasts two main features: one, it allows for the automatic cycling of photos; and, two, it permits remote accessibility. With at least some adoption in the consumer market, a picture-cycling, remotely accessible frame clearly has appeal. However, in some ways it feels problematic when considered *vis-à-vis* the reasonings for framing we found to be prevalent in our fieldwork. Frames, as we know them, are often used to assign a certain significance to a picture. They might add import to the photo of a person or celebrate a past event, and when assembled in a particular arrangement, serve to enshrine some idea of place, time or family. Under these circumstances, the very act of choosing the picture, possibly cropping it, and placing it neatly into a chosen frame has potency. Moreover, the photo's persistence seems critical to its importance.

In these terms, the remotely controlled display and programmed cycling of pictures feels counterintuitive, if not slightly unnerving. The problem, as we see it, hinges on the curious combination of properties: the electronic frame combines the flexibility of display over time and space (i.e., manipulating the property of persistence) with the known conventions of the frame. The design decision arguably interferes with our reasonings, moral reasonings, of what frames are good for. We are careful here to point out that it's not that we oppose the possibilities of sending photos to dedicated displays in the home or having a place to cycle through pictures. They are both appealing. The problem is one of whether a frame is the right display for the job given how we think of it and where it's often placed. A frame that continually cycles through pictures on one's own mantelpiece (or its equivalent) and that displays pictures others have chosen contravenes what many of us would expect frames to be used for, i.e., personal significance, reverence and persistence.

Of course, we are capable beings and have the capacity to reappropriate things in ways we see fit. It would be of little surprise to find electronic photo frames in locations other than the mantelpiece in many homes. The point though, in the perspective we have been seeking to articulate, is that it enables us to reflect on why photo displays should not simply be constructed of questionable amalgams of digital and analogue possibilities and how it is displays can contravene our expectations. The properties in Table 1. are consequently not to be mixed and

matched at will, but to be chosen mindful of how, through our display arrangements, we actively produce our homes and the rooms within them as moral places. The job for design becomes one of contemplating the (moral) intention as well as the operational and functional characteristics, and building upon these. The following three concepts will hopefully show how this position has helped us to exploit the unique properties of afforded by digital technology, whilst building on our expectations of how displays act as resources for expression in our homes.

3.3.1 Photo cube

How then might we progress with the design of photo displays? Our efforts so far have focused on drawing out the properties of displays so that might have traction in the digital domain, but doing so in ways we think to be consistent with our ways of looking and our methods of expression. Take, for example, Jane's mantelpiece photo. We've suggested that Jane is able to ascribe a personally evocative quality to the picture of her boys and that the photo's distinctive means of support, placement, and portability, in part, enable this. Something, though, we want to give particular thought to is the ease with which the photo has been put on display, a property we rather crudely term 'setup'. The seemingly casual, offhand way in which the photo has been made visible—its setup—appears to be crucial to its personal character. As we saw with Elsa, if the photo were placed, meticulously, in a frame on the mantelpiece it would feel distinctly different. Alongside other properties, it is as if the apparent effort involved in the setup of a photo has an influence on what is being expressed.

One of our concepts illustrates how we have been attempting to draw on the qualities of displays like Jane's to inform design and specifically how we have considered the ease of setup as a mechanism for expression. The concept consists of a cube with pictures displayed, electronically, on each of the six sides. An archive of photos is navigated by manipulating the cube using prescribed gestures or a random set of six pictures can be displayed by shaking the device. Although modest and using a form of interaction seen elsewhere [e.g. 20], the cube incorporates something of the properties we've identified above. Most notably, it illustrates how we might begin to introduce lightweight methods for choosing and setting up digital pictures to be on display. In effect, we've sought to provide a simple way of making digital photos visible so that they can allow for the sorts of expression we see in Jane's propped up picture.

3.3.2 Photo slider

A design challenge highlighted through the example of the cube is one of making visible the content of digital photo archives in novel ways, ways that allow for digital photos to be easily put on display. These sorts of broader challenges do not, of course, have to be imitated, literally. We would like to imagine that our concern for the ideas being expressed and the methods of display don't just encourage imitation, but also promote lines of design inquiry.

An example of this is illustrated in another concept derived from Jane's mantelpiece photo. The concept involves the projection of a virtual, horizontally stacked collection of photos. The photos in the virtual stack can be seen by sliding a sheet of card towards or away from an integrated camera-projection system (Fig. 7a). Any displayed photo can be left on display by placing the card in a holder at a chosen distance from the system (Fig. 7b). The slider thus combines a system of navigation with a method of display.

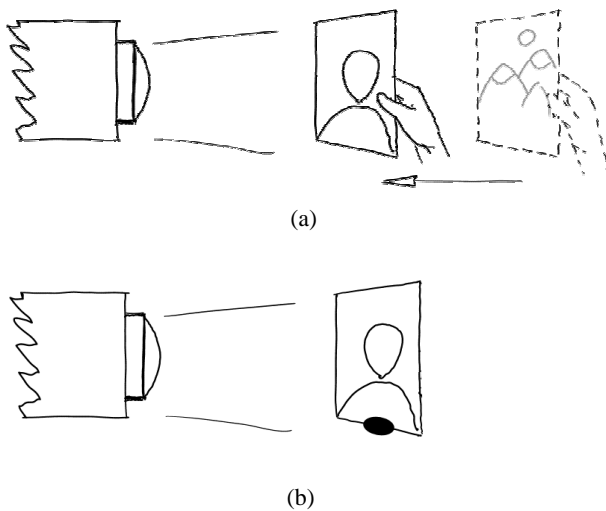


Figure 7. Concept of photo slider.

It is again the setup of display, as a property, that we want to foreground here. Motivated by the sense of informality and casualness in Jane’s propped up photo, what we’ve aimed to enable is a simple and lightweight means of visualising content for the purposes of display. In effect, the photo slider offers an alternative to the effort usually required to put a digital photo on display. It bypasses what we refer to as ‘lean-forward’ types of engagement demanded by technologies such as the personal computer (PC). It is not that the sorts of things we can do with photos on a PC are unnecessary, but rather that the PC and slider offer two very different methods for setup and consequently achieve different end results. In short, we’ve tried to capture a general sense of casualness and informality by orienting the properties of the slider so that digital photos can be displayed on a whim or in passing.

3.3.3 Photo mosaic

In the third sketch, we want to consider another of the empirical examples presented above, specifically the family wall in Jennifer’s home. Continuing with the design theme above, this third concept is used to further explore the idea of making digital photos visible and thus available for display. Tying it in to the expressive aspects of the family wall, we also use the concept to illustrate how design can address the ways people engage with a display’s photos to varying degrees.

The concept is based on the display of a 5-by-5 matrix of tiles (the number could vary). Photos retrieved from a digital archive are displayed in each tile so that the overall effect is one of a mosaic of images. The images might be changed manually (e.g., through simple gestures) or might be chosen automatically and change after a set interval—the latter displaying a constantly changing mosaic of images. Tapping on any tile enlarges the respective photo so that it takes over the entire display. Tapping again returns the display to the matrix view.

The mosaic has been designed to build upon a number of properties of the family wall. In a fashion, it mimics the patterned, grid-like appearance of the wall. Similarly, its appearance and, specifically, the constitutive properties of symmetry and uniformity encourage it to be seen all of a piece. One can also be prompted to move towards the larger display to view a particular photo. With the mosaic, we’ve aimed to be sensitive to how this shifting between the larger display and the individual photos can be expressive. Stand back, and like the wall, the mosaic

interleaves an array of imagery; hinted at are a family’s many trajectories and the interrelations between them. Move closer, and each photo offers a resource for something more detailed—a story of a photographed family member, friend, place, etc.

It’s with an awareness of these expressive qualities that we can frame other design choices made about the mosaic. We could consider, for example, the interaction techniques for changing the photos on the display, i.e., manipulating the persistence of the photos. We’ve already mentioned that the pictures could be changed using gestures or automatically. One might also integrate lightweight methods for transferring a photo or even short video from a digital camera or mobile phone. By enabling these techniques, the mosaic lends itself to discovering photos and their relationships rather than portraying a pre-specified family history. What is notable is that the ease of change and flexibility alter the emphasis of the display; again, we see an expression of casualness rather than formality. Accommodating this, we might consider how to refine the mosaic to stand as an informal, more casual equivalent to displays like the wall, offering a place for all family members, including children, to establish a visible presence.

Bringing this section back to the broader ideas in this paper, we want to reiterate that the three concepts above are presented very much as thought pieces. Whether they are of merit as solutions in their own right is questionable. More important is that they stand as an attempt to tease out our ideas around photo displays in the home. We hope, then, for the concepts to be seen as objects of reflection in the design process, to sensitise ourselves and hopefully others to a particular perspective on display design.

4. CONCLUSIONS

In this paper, we’ve described and reflected on the ways (some) families display photos in their homes in the hope of offering guidance to future display design. We’ve argued that families, sometimes intentionally and sometimes not, express something of themselves in their displays of photos; that photo displays in all their varieties—sometimes meticulously arranged, sometimes unintended, and often unfinished—come to enact specific ideas of family and home. So it seems that photo displays play into the shaping of a moral character to the home and the rooms within.

We’ve suggested that various properties of photo displays enable this mechanism for expression. Whether it’s as a result of established traditions, careful thought, sensitivity, or mere chance, photo displays come to be expressive through the material properties used and accentuated. These properties and particular combinations of them do not, then, just serve as superficial aesthetics. In some everyday sense—as a feature of regular household doings, choices, decisions, disagreements, etc.—they are bound up with the ideas of what it is to be a family and how it is we live in our homes.

In the latter part of the paper, we have aimed to show how this position has useful implications for display design. We’ve called attention to the role played by specific material properties, and how these properties can be expressive when part of photo displays. Drawing on this, we’ve described how we are trying to think innovatively about the design of digital displays, considering novel combinations of properties that remain sensitive to our ways of looking and established methods of expression. Our design ideas—presented as preliminary concepts—are intended to show how we might apply such a sensitivity to the problem of making digital photos available for display. We

hope these examples, although limited, to be illustrative of the broader point that we have come to in this work: that in display design there is much to be learned from how we look at and express ideas through our material surroundings.

5. ACKNOWLEDGMENTS

We are grateful to those families who participated in this study. The richness and detail in the empirical materials are due, entirely, to them. Many thanks must also go to Abigail Durrant, David Kirk, Mark Perry, Barry Brown, Abigail Sellen and Richard Harper for their thoughtful feedback on this paper's early drafts.

6. REFERENCES

- [1] Anderson, B. Work, ethnography and system design. In *The Encyclopaedia of Microcomputers* (eds Kent, A. & Williams, J. G.). Marcel Dekker, New York, 1997, 159-183.
- [2] Balabanovic, M., Chu, L. L. & Wolff, G. J. Storytelling with digital photographs. In *Proc. CHI '00*. ACM Press, 2000, 564-571.
- [3] Chalfen, R. Family photograph appreciation: dynamics of medium, interpretation, and memory. *Communication and Cognition*, 31 (1998), 161-178.
- [4] Chute, C. *Worldwide still camera forecast, 2003-2007: the emerging digital solution*. Report #29662, IDC, 2003.
- [5] Consolvo, S., Roessler, P. & Shelton, B. E. The CareNet display: lessons learned from an in home evaluation of an ambient display. *UbiComp '04*. Springer, Nottingham, England, 2004, 1-17.
- [6] Counts, S. & Fellheimer, E. Supporting social presence through lightweight photo sharing on and off the desktop. In *Proc. CHI '04*. ACM Press, 2004, 599-606.
- [7] Crabtree, A. & Rodden, T. Domestic routines and design for the home. *JCSCW*, 13 (2004), 191-220.
- [8] Crabtree, A., Rodden, T. & Mariani, J. Collaborating around collections: informing the continued development of photoware. In *Proc. CSCW '04*. ACM Press, 2004, 396-405.
- [9] Douglas, M. The idea of a home: a kind of space. *Social Research*, 58, 1 (1991), 287-307.
- [10] Frohlich, D., Kuchinsky, A., Pering, C., Don, A. & Ariss, S. Requirements for photoware. In *Proc. CSCW '02*. ACM Press, 2002, 166-175.
- [11] Kapoor, N., Konstan, J. A. & Terveen, L. G. How peer photos influence member participation in online communities. *Ext. abs. CHI '05*. ACM Press, 2005, 1525-1528.
- [12] Kim, J. & Zimmerman, J. Cherish: smart digital photo frames for sharing social narratives at home. In *Ext. abs. CHI '06*. ACM Press, 2006, 953-958.
- [13] Kim, J. & Zimmerman, J. Cherish: smart digital photo frames. In *Proc. Design & Emotion*, 2006.
- [14] Kindberg, T., Spasojevic, M., Fleck, R. & Sellen, A. The ubiquitous camera: an in-depth study of camera phone use. *Pervasive Computing*, 4, 2 (2005), 42-50.
- [15] Martin, H. & Gaver, W. Beyond the snapshot: from speculation to prototypes in audiophotography. In *Proc. DIS '00*, ACM Press, 2000, 55-65.
- [16] Mynatt, E. D., Rowan, J., Jacobs, A. & Craighill, S. Digital family portraits: supporting peace of mind for extended family members. In *Proc. CHI '01*. ACM Press, 2001, 333-340.
- [17] Petersen, M. G. Squeeze: designing for playful experiences among co-located people in homes. In *Ext. abs. CHI '07*. ACM Press, 2007, 2609-2614.
- [18] Sellen, A. J. & Harper, R. *The Myth of the Paperless Office*. MIT Press, Cambridge, Mass, 2002.
- [19] Taylor, A. S., Swan, L. & Durrant, A. Designing family photo displays. In *Proc. ECSCW '08*. Springer-Verlag, London, 2008, 79-98.
- [20] Terrenghi, L., Kranz, M., Holleis, P., and Schmidt, A. A cube to learn: a tangible user interface for the design of a learning appliance. *Pers. Ubi. Comp.* 10, 2 (2006), 153-158.
- [21] Van House, N., Davis, M., Ames, M., Finn, M. & Viswanathan, V. The uses of personal networked digital imaging: an empirical study of cameraphone photos and sharing. *Ext. abs. CHI '05*. ACM Press, 2005, 1853-1856.
- [22] Volda, A. & Mynatt, E. D. Six themes of the communicative appropriation of photographic images. In *Proc. CHI '05*. ACM Press, 2005, 171-180.