StickySpots: Using Location to Embed Technology in the Social Practices of the Home

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ABSTRACT
Ethnographic studies of domestic environments have shown the fundamental roles that *locations* and *context* play in helping people understand and manage information in their homes. Yet it is not clear how this knowledge can be applied to the design of home technologies. For this reason, we present a case study in home technology design that uses the understandings gained from previous ethnographic studies on domestic locations to motivate the design of a home messaging system. Our prototype, called StickySpots, uses locations to embed technology in the social practices of the home. We then use this case study to reflect more generally on location-based design in the home.

Author Keywords
Domestic technology, location-based design, messaging, ubiquitous computing, case studies

ACM Classification Keywords
H.5.2 Information Interfaces and Presentation (e.g., HCI): User Interfaces — evaluation/methodology, prototyping, domestic technologies.

INTRODUCTION
Many researchers have begun looking at how information is currently used in the home [e.g., 2, 7, 18]. We do this in order to understand current uses and patterns so that we can recognize opportunities for technology and design systems that fit into people's existing home lives to enhance them in appropriate and interesting ways. Our specific interest is in domestic communication information, which we define to be any item in the home that is used to communicate with other members of the household, or with the outside world.

There is considerable information of this kind in every home. For example, many homes have kitchen counters and communal desks covered with papers. Bulletin boards overflow with items, including continuously updated calendars and schedules, phone messages, letters, bills, pictures, newsletters, lists and sticky notes.

Although information display and management is something computers do very well, the home has not yet embraced computer technology for information management. This is not surprising, for existing work-oriented technologies and conventional desktop computers are a poor fit to the day to day "business" of running the home, and of managing all the information within it. The problem is that we need to design technology for the home.

This paper presents an example of how the results of ethnographic studies of home routines can be applied in technology design practice to support information management via ambient and tangible displays. We first summarize these past findings, highlighting the concept of *contextual locations* [5] and how they are a critical part of information management in the home. Following that, we discuss messaging in the home. Then we present our design case study – the *StickySpots* home messaging system, which uses these results to guide the design process. We then reflect on and critique this design. We conclude with future directions for our work.

We stress up front that this is not a standard 'design/evaluate' paper typically found in the human computer interaction literature. Rather, it is a design-oriented paper. Within this, our contributions are twofold. First, we flesh out a design whose value is that it is strongly linked to underlying theories of domestic routine. While we recognize that this design is imperfect and is just one of the many possible, it illustrates that the underlying theories can be used to generate meaningful design possibilities. Second, our reflection on the design reveals how we can use first-cut prototypes as part of the larger design process for home technology.

INFORMATION AND LOCATION IN THE HOME
Existing studies have shown that communication and interaction activities and artifacts are distributed throughout the home. Several researchers have looked at how these artifacts are distributed through the entire home, and how this distribution is related to the activities themselves, and to the social organisation of the household. [2, 5, 7, 18]

Crabtree et al. [3] found that communication media and artifacts moved from one place to another in the home as people interacted with them. They called these locations *"places of communication"* [3] and defined three sub-types:

- *Ecological Habitats*, where artifacts live;

- **Coordinate Displays**, where artifacts are left for others; and
- **Activity Centres**, where artifacts are worked with.

Household members implicitly understand these places, since the way information flows from one place to another over time is a routine action sequence for this household, and is part of their social organisation. Artifacts and activities are *"...spatially and temporally distributed throughout the home" [3]*.

Rodden et al. [15] talks about this as the Space-plan and the Stuff of the home.
- **Space-plan** is the interior layout of the home, including features such as the furniture, shelves, floor-plan etc.
- **Stuff** is the artifacts located within the Space-plan.

They state that the Space-plan and the Stuff of the home are *"...organizational features of interaction."* The Space-plan *"...does not simply 'contain' action then, but is interwoven with action in various fundamental ways"* while Stuff is *"...dynamic, coalescing around different sites at different times for the practical purposes of the activity at hand" [15]*. That is, the way that artifacts in the home are arranged, grouped and moved throughout the space of the home during day to day activities form an organisational system for the household.

These organisational systems are examined in detail by Taylor and Swan [18]. The communication places in the home – the Ecological Habitats, Activity Centres and Coordinate Displays [3] – are incorporated into larger, overall organising systems, that is, *"heterogeneous collections of artifacts are enrolled to capture, integrate arrange, and convey information" [18]*. Taylor and Swan found that the 'work' in the home (e.g., scheduling, errands, chores etc.) rely on these organising systems. These systems are not static, but are frequently redefined to meet the changing needs of the family, making them very personalized and idiosyncratic. These systems both come out of and create the family's routines. It is part of *"...the very business of parenting" [18]*. Artifacts used in these systems also move from one location to another. The school letter, for instance, may be gathered during a walk home from school, then placed on the sideboard so it will be seen in the course of the evening, and finally taken to the phone for scheduling [18].

Crabtree et al. [3] calls the way that artifacts travel from one place to another *"discreet and recurrent sequences of action" [3]*. The way that mail routinely moves through the home, from Coordinate Displays, to Activity Centres, to Ecological Habitats is an example of such a sequence of action. Harper et al. [7] found that the way that paper mail can be moved around the house supports the social organisation of the household, and is one reason why email has not entirely replaced paper mail.

The routines that create these action sequences are known by all household members, and actually provide them with resources to manage their activities [3]. The activities people do in the morning when they get up, in the afternoon when they get home from work, and in the evening while they plan for the following day *"...provide the grounds whereby the business of home life gets done" [19]*. O'Brien et al. [12] found that *"One of the clearest facets of everyday home life (...) was the importance in all households of 'daily routine', of things 'being as they should be'" [12]*. These all-important routines are subtle and ill-articulated, and emerge from the daily ways that households organise their lives. Technology is often interwoven with these routines, and may even help construct them, such as a TV show that is always watched in the morning before going to work [12].

Finally, our own study results [5] show that the selection of such routine places for information provides household members with valuable context and meta-data about the information placed there. We call these places *contextual locations* [5]. Contextual locations include such places as refrigerator doors, entranceways, living room mantles, even key racks. These locations allow information to be interwoven with not only action and activities, as described by Crabtree and Rodden [2, 3] but also with *time, ownership* and *awareness,* meta-data associated with a location through the routines and patterns of the household [5].
- **Time** meta-data gives household members a sense of information urgency, dynamics or status. Contextual locations are chosen for *when* they will be seen. A frequent example was the placement of items by the entrance to the home. This could include DVDs to be returned, notices to be taken to school or cheques to be mailed. Placing them by the front door ensured that they would be seen at the right time – when leaving – so they wouldn't be forgotten.
- **Ownership** is how people know who information belongs to, who is responsible for anything that needs to be done with it, and whether or not they need to pay attention to it. These locations are chosen for *who* they are associated with. The fridge door is a common example of a public location – the household knows that anything placed there is for everyone to see. Doorways to bedrooms or piles on one's desk are personal spaces – messages placed there are primarily for one person, and other household members don't need to worry about them. People often place items in such personal locations as requests for actions, as in a child placing a notice to be signed on his mother's pile so she'll see and sign it at breakfast. In this way, people also know what *actions* need to be taken.
- **Awareness** information is more subtle. It gives inhabitants a way to monitor and support each other, and lets them know what others are up to. An example of this is a wife seeing that her husband has not yet paid the bills because they're still in his pile on the counter. She knows he's been busy so she takes on the job of paying them herself. He is then aware she has done this because the bills have been moved to the computer.

Household members combine time, ownership and awareness with their understanding of each others' routines and interactions. From this, they know *who* a message is for, what *actions* need to be taken on it, and *when* they need to see it, by the context of *where* the message is placed. This location meta-data is a big part of how people manage information in the home.

The movement of artifacts in the space of the home also provides household members with information – the

placement of artifacts thus becomes an interface into the organisation of the household [5, 18]. And while paper is very prominent is such systems, households also appropriate a variety of other objects to communicate – such as shoes in the doorway indicating who is home, or laundry piled outside a bedroom assigning a chore [5]. This relates to concepts from tangible interaction such as Configurable Materials (providing meaning by moving objects around) and Inhabitable Space (meaningful places where people and objects meet) as defined by Hornecker et al [9].

The design implications of these findings include such suggestions as the identification of these contextual locations (e.g., Ecological Habitats, Activity Centres and Coordinate Displays) as prime sites for ubiquitous computing technology in the home [3]. This could include, for example, using electronic displays to augment Activity Centres, or digitally extending Coordinate Displays to be available outside the home [3, 5]. Tangible displays should also be considered, as they may be especially valuable. New technology also needs to be able to be situated at the wide variety of sites used for activities within the Space-plan [15]. This may seem fairly simple, but the wide range of the kind of places used in the home and the current demands of technology – power, space for stands etc. – make this very challenging.

It is also not enough to simply put these devices into the communication places in the home. It is easy to carry a piece of paper from one room to the next. Technology designed for communication in the home needs to make it

equally easy to move digital media [15]. In addition, every household has a unique set of places, and a unique way of using these places. Its occupants are not (usually) system administrators, so the devices need to be flexible and easily configured, as well as simply combined, and connected to other devices [18]. The nature of action sequences indicates that artifacts could be augmented digitally [19], for instance to be aware of where they are located and modify their displays accordingly. Digital media also needs to be designed to be more flexible in terms of how they can be moved from one place in the home to another seamlessly [3]. Technology that can be easily moved, combined and configured would be more likely to fit into, and eventually become part of, the daily routines and social organisation of the home, which is when they would have the most value [18].

In the rest of this paper, we use these observations and results, along with the related work, to help create and reflect on a *location-based design*.

MESSAGING IN THE HOME

One way in which these prior findings can be used is to articulate problems that might be addressed with technology. In our earlier study [5] we saw that considerable information in the home takes the form of short notes scribbled on sticky notes or papers, e.g. reminders of things to do, phone messages, requests, notices about where someone has gone or when they will be home, a scribbled web link for a soccer schedule, etc. These notes are often temporary; once they have been read

Figure 1: Short messages are left in a variety of home locations.

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and dealt with they are usually thrown away.

Figure 1 shows examples of these types of messages from real households. What is typical – and critical – in these examples is that messages are left in a wide assortment of meaningful locations, including tables, computer monitors, cupboard doors, the fridge, by the phone and even on other pieces of information like the family calendar. The important thing is that there *are* a variety of locations and that each is specific to the household's routine, as discussed in the related work [3, 5, 18].

As a fictitious example of how this messaging currently works in the home, meet Anne, a working mother, who needs her teenage son Dave to put the casserole she has made into the oven. She needs him to do this as soon as he gets home from school, so that they can eat dinner before his evening band practice. She knows he's going to forget, so she writes him a note. She needs him to see the note right when he gets home, so she sticks it to the TV screen (as in the top left image of figure 1). He won't miss it there because she knows the first thing he does when he gets home from school is play video games. Her knowledge of his routines helps her know where to put the message so that he'll see it in the right *context* – time and place [5].

The other notes in Fig. 1 are similar. We see phone messages left by answering machines and on cupboard doors, notes about where someone has gone and when they'll be back on the kitchen table, and activity details and to-do lists next to the calendar. What is key in these seemingly mundane examples is that they are carefully positioned to exploit family routines: each message is located where it will be seen by the right person, at the right time.

Messaging is also one of the most popular computing applications. Examples include instant messaging (IM), emails, SMS text messages, etc. These electronic messages can include rich content like web addresses, emoticons, pictures and other multimedia. Many study participants [5] mentioned using these kinds of systems in their homes. They would email themselves reminders, or send each other links to pictures or websites. Instant messages and mobile text messages were often used for awareness information such as where other people were or when they'd be home. In households where there were multiple computers, roommates or siblings would even IM each other from different rooms within the house.

These observations suggest that one area in home communication information that might be easily augmented by technology design is messaging. Since it is already a common activity, and already something computers do well, looking at how to design a digital messaging system specifically for the home is a natural choice for domestic technology design.

Location-Based Messaging. As described in the previous section, we saw that the location of messages in the home is chosen by household members to give the message valuable time, ownership and awareness context, and to embed such messages within the social organization of the home [5, 18]. The message is more valuable because of

where it is. Household members know how urgent a message is, who it is for and even what needs to be done with it by where it is placed or seen. Even in households that used electronic messaging, these were never a replacement for the scribbled paper note, because participants couldn't put these electronic messages in any home location other than wherever their computer was – usually a home office or bedroom isolated from the rest of the house. For instance, in our Anne and Dave example, if Anne had emailed or IM'ed her son that note, he would not have seen it until much later, and the casserole wouldn't have been ready on time, because checking his email isn't part of his after school routine. A messaging design solution should therefore be *location-based* if it is to be successful.

There are several existing home messaging systems in the related work that use location. One such example is HomeNote from MSR Cambridge [16]. HomeNote lets people send a text message from their mobile phones to a display set up in a public area of their home. Household members and guests can also scribble handwritten messages on the display.

On_message@home [13] is a display-based system similar to HomeNote, augmented through the inclusion of multimedia messages, including video and pictures sent from cell phones or cameras to the display. This system is intended to include several locations within the home, but doesn't treat them as a way to manage or provide context for information, but rather as places to copy messages that have arrived at the main display.

Though not targeted specifically for the home, Place-Its [17] allows users to set text reminders on a GPS enabled mobile phone, so that they will be triggered when they go to certain places, such as work, home or the store.

While all these examples are location-based messaging in some sense, and definitely have value, they use location in a larger, macro way – using one public location in the home (wherever the household locates the display or wherever the reminder is triggered by GPS) as an access point, thus in some ways treating the home as containing a single digital location unit. Even the on_message@home system, which may use multiple connected displays within the home, sends all messages to one display initially, thus still providing one digital access point in the home.

While incorporating displays for home messaging into public, easily accessed places in the home is an improvement over the tucked-away PC, contextual locations [5] suggests that there is even greater value in extending this idea and allowing messages to be sent to *many specific locations within* homes. Current messaging practices within the home use location in a more micro or specific sense, e.g. the kitchen table, the mat by the front door, the fireplace mantle etc. so that the home contains multiple location units. It is these more specific locations that provide the contextual time, ownership and awareness information that people choose from their knowledge of domestic routines. Our design insight is that *technology should use these micro locations* rather than thinking of the home as a single place, or providing a single digital access point, if it is to enhance what people currently do.
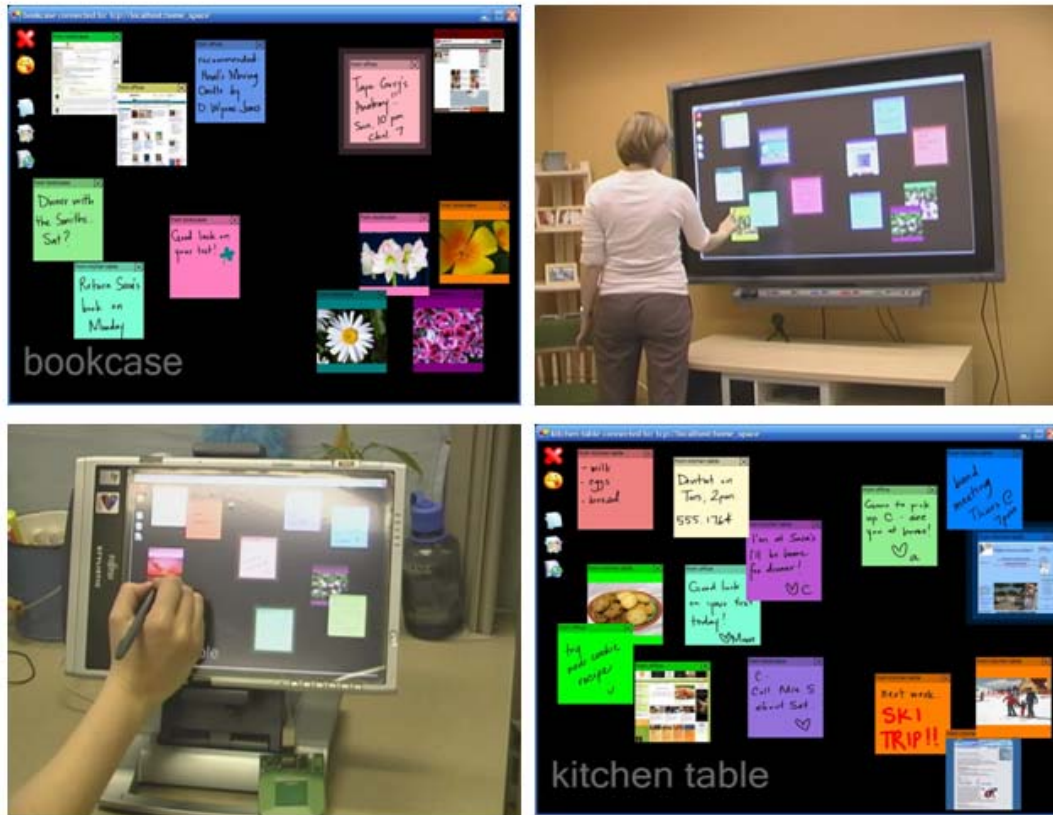
Figure 2. The StickySpots messaging system, designed to run on multiple displays in various locations within the home.

STICKYSPOTS

This different way of thinking about location in the home is exploited by our design solution, called StickySpots. StickySpots is a *location-based messaging system*, as illustrated in Figure 2. It is designed to send and receive messages in many specific locations within the home, and to provide remote access to these locations. Messages are

Figure 3. Examples of notes sent using StickySpots

shown on a network of displays incorporated into these specific locations within the domestic environment. Displays would include the new wave of digital consumer televisions typically found in living rooms (Figure 2, top right), existing personal computer monitors often located in home offices or atop a shared public desk (as in Figure 1, top middle), along with mobile displays that could be integrated into any location within the home, e.g., tablet PCs (Figure 2, bottom left), the new Ultra-Mobile PCs recently announced by Microsoft, or even very small displays as found on the backs of cameras. While such a network of displays is currently cost-prohibitive, it is reasonable to imagine that future smart homes would have many networked displays – even touch sensitive ones – in a wide variety of locations.

In StickySpots, each display in the home is signed in to a central server, so the messages can be sent to any of these displays from any other one. With the displays placed in locations important to the household as message centres, this becomes *location-based messaging*.

System Description. StickySpots is currently designed to look like a bulletin board (Figure 2). It allows household members to create and colour simple handwritten notes (as shown in Figures 3a and b) through a pen-based Note Editor (Figure 4), reflecting the manner in which people already leave messages (via pen and paper). We also use ink or touch input for practical reasons: it can be cumbersome to situate keyboards and mice throughout the home or to attach them to small displays. Previous studies [8] have also shown that handwritten electronic notes are
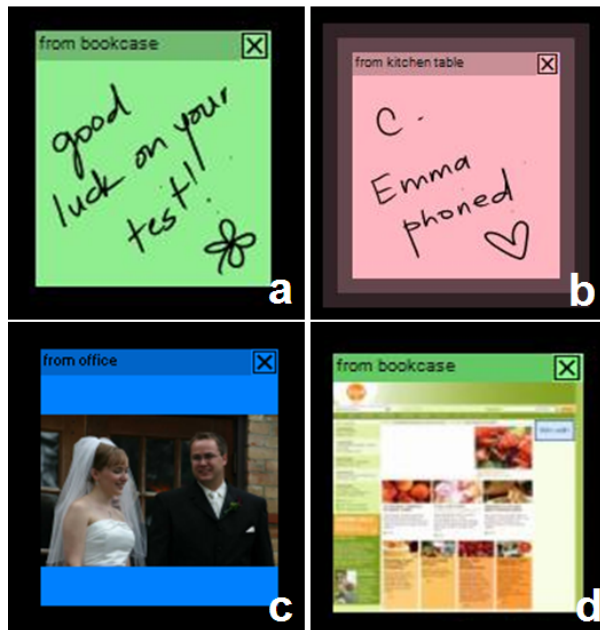
very effective in homes.

Notes appear in a random arrangement on the display, but people can move them around as desired by dragging them, e.g. into piles or groups. Touching the note shows when it was sent and where from. Notes are opened to a larger size by double tapping, and replies are easily added and sent.

Figure 4. The Note Editor

Web links and small images can be included within a note via the icons on the screen's left (Figure 4). Examples are shown in Figures 3c (photo) and 3d (web link). Double tapping on a web note opens the link in a browser.

The colour of a note is chosen by the sender (Figure 4, right side), and thus can be used to communicate anything the household chose – for instance a bright colour for urgent notes or a colour per person. New notes have a soft halo to indicate their status (Figure 3b) so household members can easily see changes.

A person can send messages to locations in two different ways, using the drop-down menu in the Note Editor (Figure 4). First, one can send it to an actual location, e.g. the living room TV. Senders create a new note, select a destination, and the note appears on the receiving display.

The second way that messages can be sent to a location is to send them to a person as a sort of location proxy. These messages then appear on any display close to that person. The display identifies people through either having them sign in explicitly through a simple dialog, or by sensing their presence via jewelry-based RFID tags. Figure 5 shows an example of this later case. An RFID tag is
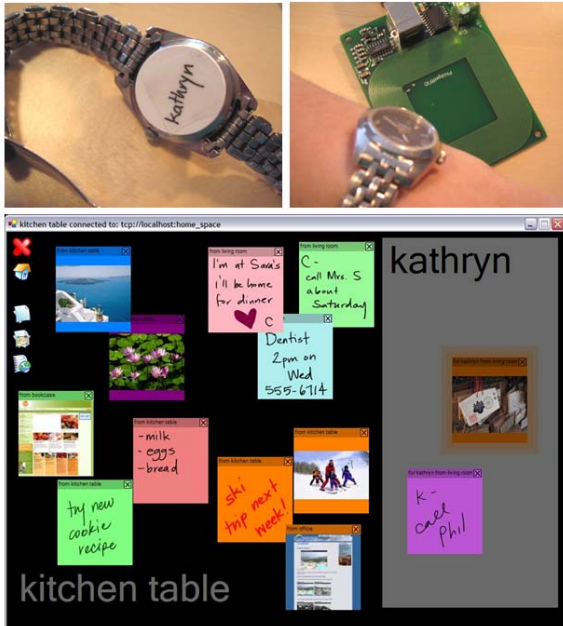

Figure 5: RFID tags, small enough to be worn, identify people, and bring up their personal messages (in the pane on the right).

attached to the back of a wristwatch, and each display contains an RFID reader. As a person is detected, the display creates a small grey side pane on its right side (Figure 5) labeled with that person's name, which shows that person's messages within it. This allows messages to be sent to wherever the person is, without the sender needing to predict where they are or will be, or to wait for the recipient to go to a specific location.

Because StickySpots is networked, it is also possible to send messages to home locations from outside the home, such as when some home occupants are at work or while traveling. These remote locations can also be places of their own, e.g. Mom's office as a location messages can be sent to. It is also possible to sign in to an existing home location remotely, in order to see and access the messages located there. For example, one could sign into the kitchen location to see a grocery list posted there. This is a major benefit of technology; people temporarily outside the home can now use their natural understanding of household routines to place the note in the right contextual location, or to access information that normally would be unavailable outside the home.

Implementation. StickySpots was built using several prototyping toolkits. GroupLab.Networking enables the easy creation of a server to store and share information between locations [1]. The multimedia notes are created using the Collabrary [1]. The system uses Phidget RFID readers to identify people [6]. Pen input is built atop the Microsoft Pen API. Otherwise, the system is a straightforward client/server architecture.

DISCUSSION

While valuable as an invention, we don't claim that StickySpots is an ideal solution, or even (for now) a practical one. Its main importance is that we can now use it to reflect and critique it as a design.

Why No Evaluation? StickySpots is currently an unevaluated system. This is intentional for several reasons related to domestic evaluation of technology. First, deploying such a system to the home is extremely costly. It requires robust software, a solid infrastructure, a no-fail network, and specialized hardware – many displays of varying sizes. As well, a meaningful evaluation means that such a system should be in use for an extended period of time – several months – in order to see how it is incorporated into the routines of the household, and how it changes or enhances such routines, as well as where it fails to do so. Both requirements are unreasonable for early prototype testing. While we absolutely believe that such an evaluation (while difficult) is important for later testing of better-developed prototypes, we strongly believe StickySpots to be immediately valuable as a way to *reflect* on location-based design, and as an example of how to take the findings of ethnographic studies and apply them to home technology design – a gap that is not always easy to bridge. Through reflection, we can predict successes and failures. These can be used to correct existing designs or suggest new ones, before investing the time and expense involved in carrying out a full-fledged user study. Reflecting on first cut prototypes of new technologies (such as StickySpots) will hopefully allow such user

studies to be conducted on more mature technologies, thus making them more valuable and informative.

Adding Value. Returning to our earlier scenario, we can see how StickySpots adds value. As before, Anne has just finished making a casserole for dinner and has put it into the fridge. While still in the kitchen, she uses StickySpots (running on the fridge's built-in display) to quickly write a note to Dave asking him to put it in the oven the next afternoon. She selects the location where she knows her son will see the note when he comes home – the TV – and sends it. The note then appears on the TV as a small coloured "sticky note", like those in Figures 2 and 3. Anne also sends the note specifically to Dave, so that on the off chance that Dave decides to do homework instead of play video games when he gets home, the display in his bedroom will sense him and the message will show up there. Unlike email, which he may read at school and forget, Dave will see the note at the right time (after school) and in the right context (in the home), and remember to put the casserole in the oven.

StickySpots adds value in that messages can be sent from anywhere: Anne can send it right from the kitchen as she's cooking or even from the office after she has left home. It also allows for more flexible messaging choices: she can send to a specific location, to multiple locations, or even send the note to Dave and have the system sense his location. In addition, messages can be media rich. Anne's message could contain a link to the casserole's recipe online so Dave can see the time and temperature details, and even a picture of the finished product.

Extensions. We could easily extend StickySpots to provide even more value, including allowing rich text, audio or video stickies (similar to those allowed by on_message@home [13]) along with handwritten ones; and providing support for sending messages to and from mobile devices, such as phones and PDAs. Knowing that physical notes also exploit time, we would add the ability for users to create *timed reminders*, perhaps from a calendar, that would appear at the selected location at some specific preset time. Because notes are used for awareness, *automated messages* could be sent to a preset location when a web page or other information of interest is updated. We also believe that future homes will contain a wide variety of information display types. Thus StickySpots should be extended to send messages to other kinds of displays: small text LCDs, tangible and/or ambient appliances, movable projection systems [14] and even audio displays. As the system is essentially simple and flexible, it becomes easy to extend and enhance.

Critique. StickySpots is not intended to, nor can it, replace existing home messaging techniques. Rather, we see it as complimenting them. For example, a display-based StickySpots does not address all the nuances of how households use locations for messages. Households use not only location contexts, but also physical contexts – attaching notes to existing but meaningful piles, items or surfaces. A design alternative is to have small, cheap and mobile displays that can show an electronic note, but also be attached to objects, i.e., a truly electronic and tangible version of a sticky note. While this means that a person must be present to attach it to the object, its content can be edited and added to from a distance. Another alternative is projector-based mixed reality displays that project electronic information atop physical media [14], but this too has its own set of problems.

StickySpots currently assumes that household members can choose, add and remove locations easily, even though this assumption has not been tested. It also assumes they can easily name locations in any way that makes sense to them, position a display at that location, and somehow link all this together as part of the home 'network'. This flexibility along with the ability to easily reconfigure and add to the system is an important part of how the home is organised [18], yet this systems administration aspect [4] is not well handled by StickySpots, nor is an easy solution apparent. This problem is worsened when small mobile displays are used.

Next, StickySpots bases its design on existing practices. This base in the real routines of the home is generally beneficial. However, we believe that, like any technology, its introduction will produce some changes in household routines. This could include unwanted changes, e.g., people may send excessive notes to locations simply because it is now easy to do so. This could result in the equivalent of email overloading. There could also be social consequences. For example, having messages follow people could change the power and control structures of the home by perhaps removing plausible deniability – it is harder to deny seeing a message if it follows you. We hope that the benefit is to give households an easier method to create notes 'at a distance', and to enrich these notes by electronic content related to its person.

More generally, our work concentrates on directed messages. This is perhaps too limiting, as location-based messaging is only one of the many uses of contextual locations [5]. For example, people also contextually locate *reminders* and *task lists* in the home. Yet commercially available systems that supply reminder and task list functions (e.g., calendaring programs) are not well suited for the home because they require the user to be sitting in front of a conventional computer to receive it. Reminders in the home are spread out over many locations so that they will be seen at the right time and in the right context. For example, GateReminder [11] is a prototype system that lets reminders be sent to the home's entrance way, and then displays them as people leave – a good extension on how people leave DVDs or other items at the door so they don't forget them. Extending this system to other locations in the home, perhaps by incorporating it with something like StickySpots, would be another way to apply location-based design.

Another problem is that StickySpots is not integrated into existing electronic messaging systems. It is possible to address this issue through some of the extensions discussed earlier. For example, we could allow people to send conventional email notes or IM messages to StickySpots locations, or we could add calendar reminders by incorporating timed messages.

Future Work. StickySpots is an initial prototype of the larger location-based design concept. We believe that the

next steps involve taking the critical reflections from this paper and incorporating them back into the design. Following that, we believe that StickySpots could have great value as a technology probe [10]. Technology probes are simple, flexible technologies intended to not only field-test the technology and see how it fits into the real world, but also to demonstrate concepts and get ideas and feedback from users on new possibilities. This feedback could then be used to create more specific location-based designs that can then be deployed in real households to see how these technologies are actually appropriated. Finally, all these insights, along with the original ethnographic studies can be combined to create guidelines or heuristics for location-based design.

CONCLUSIONS

Overall, StickySpots contributes a location-based home messaging design that seeks to support the flexible practices that households use to communicate and to manage information. It supports micro-locations – many specific locations within the home – as these micro-locations provide household members with meta-data about the messages within them, and gives these messages more meaning then they have alone [5]. This system seeks to explore the rich repertoire of behaviours and organizing systems that households use for information, which are inadequately supported by the standard PC.

StickySpots is not intended to be a perfect solution. Rather, we intend it as providing a point of comparison where we can think about technology in the home and how it can enhance existing organising systems, what is lacking, and what we still need to do to achieve and augment the flexibility and richness of home systems.

In this broader context, we contribute StickySpots as a case study that illustrates one method of doing domestic technology research. Ethnographic studies of domestic life, such as the ones provided in our review of information management within the home, are critical to define and understand areas for technology application. Yet while study findings often provide very detailed and valuable information, they are not always the easiest to apply to design. StickySpots shows that findings from ethnographic studies of domestic routines and locations can be translated to the design of home technologies and first-cut prototypes. Furthermore these designs, whether conceptual sketches or working systems, are important even if they remain unevaluated. They provide proof of concept systems that help designers reflect on the uses and misuses of the system, how these systems fit or change family routines, how technologies limit or afford what can be done, and how the design should be reconsidered, or even suggest quite different new designs.

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