Examining Presence and Lightweight Messaging in a Social Television Experience

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We report on a field evaluation of a prototype social television system (Social TV) that incorporates lightweight messaging as well as ambient awareness of user presence on the system. This evaluation was conducted over a two-week period and involved the participation of ten households. Participants appreciated the ability to see their buddies' presence on the system, the ability to see or suggest the programs they were currently watching, and the ability to send short messages to one another. The presence facilities available in Social TV also allowed participants to learn more about one another's TV viewing habits and preferences, and fostered a sense of connectedness between them. However, they also felt constrained by the limitations of the communication options available to them and demanded free-form text or voice chat to be able to fully express themselves.

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1. INTRODUCTION

The concept of social television has been proposed by researchers as an experience that can strengthen bonds between users. Given the technology to connect them, remote users can choose to treat TV viewing as an opportunity to communicate with one another over a common shared experience. In this paper, we describe the results of a field trial used to evaluate our ongoing effort to enable a social television experience by allowing noncollocated friends and family to feel connected while viewing common broadcast content.

The field trial described here is one stage of a larger iterative prototyping and evaluation effort towards creating a TV viewing experience. Ultimately, we hope to support this experience through a variety of communication and awareness channels, including voice and text chat, presence and history

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information, and lightweight messaging. To understand the value that the various channels bring to the experience, we are conducting our evaluation of the system in separate phases intended to target different aspects of the user perspective.

In the first phase of the larger study, we focused on the value that *free-form communication* brings to the experience of watching TV with remote friends and family. Although some awareness information was built into this version of the prototype, the main communicative functionality was open voice chat that allowed people in various households to communicate with each other through a natural and expressive medium while watching TV. The results of this first phase of research in our ongoing social television effort were reported in Harboe et al. [2007].

Participants responded positively to the ability to voice chat with friends while watching TV. We were interested, however, in whether voice chat was necessary to create a feeling of connectedness, or whether that experience could be achieved through simpler means. The second phase of the study, on which we report here, explores the role that *lightweight communication* plays in the social television experience. In this phase, we focused on conveying presence awareness of friends and family through ambient information in the environment, and offered lightweight, minimal interaction messaging as an alternative to freeform communication. This phase represents a step toward providing the presence, awareness, and seamless social bonding described by Chorianopoulos and Lekakos [2008] in their overview of social television. In evaluating our prototype, we sought to discover whether a similar social and shared TV watching experience could be achieved through these lightweight cues and mechanisms. In fact, we found that free-form communication was greatly desired by our participants as a means of expressing themselves and reinforcing their social bonds. The results of these two phases of evaluation have helped us to determine the combination of awareness cues and lightweight and free-form communication channels that will be implemented and evaluated in the final phase of this research.

This article reports on the second research phase, the evaluation of a prototype social television system called Social TV. We document the uses of, and reactions to, Social TV. We also report on implications for ongoing work in combining presence and awareness with voice and text chat in our next Social TV prototype. One aspect of the study, dealing with ambient displays for social television, is discussed in detail in Harboe et al. [2008], and is covered only briefly in this paper.

Social TV allows remotely located friends and family to experience some of the benefits of sitting next to one another on the couch and watching a TV program together. Current Web-based applications, such as MSN Messenger TV[1] and Joost,[2] are already tying together TV content and communications. While our initial work precedes these offerings, it is based on the same hypothesis—that people want to enjoy certain content together. To provide a television-based experience, we created a system that supplements typical TV functions with two additional features: Viewer presence and awareness information, and the ability to send and receive lightweight messages. These messages consisted of emoticons in the first group, and a combination of emoticons and predefined messages for the second group. We recruited two groups of five households each to participate in a two-week-long trial of the prototype. The research was designed to determine how and when people use the various features of the prototype, how the system affects users' TV viewing experiences and their enjoyment of TV, and how presence and awareness information about TV viewing habits of family and friends might affect their social relationships. Learning how people use the system and how they use the knowledge they gain from the system are instrumental in understanding whether or not the system can facilitate sociability or provide value to users in some other way.

[1]http://messengertv.msn.com/
[2]http://www.joost.com/

During the course of the study, we found that the presence and awareness features of our prototype drew participants into the social television experience [Harboe et al. 2008], fostering a sense of connectedness and interaction through television. We found that engaging with the prototype helped our participants feel as if the others were around. They often joined their buddies, even if only for a few moments; sent short, predefined messages and emoticons; and sometimes even called one another. The closer we got to free-form, real-time communication, the more our participants realized that it was missing, and the lack of support for rich communication (such as IM-like text messaging and voice calls) limited our participants' enthusiasm for the system as a whole. However, their comments on the need for freedom of expression indicate how presence and awareness information can be combined with richer modes of communication to create a sociable TV experience.

2. SYSTEM DESCRIPTION

The prototype is a laptop computer connected to an incoming TV feed and running GB-PVR[3] media center software. Social TV is implemented as a plug-in to GB-PVR, and adds windows, menus, and other controls over the TV image to provide the user interface. The picture from the laptop is output to a TV screen, and all on-screen information is formatted to be legible on a standard definition TV from a distance of approximately ten feet. All interaction with the system is performed with a standard remote control. For our field tests we used a modified TiVo® remote control with several buttons relabeled and remapped to correspond to the features of our system.

The main components of the on-screen user interface consist of a main menu, a buddy list, dialog boxes for events and confirmations, and transient pop-up messages (toast notifications) for status updates and information. The prototype has been designed to behave in many respects like a traditional television system (e.g., changing channels works in the same way), and implements some features, such as a program guide and a channel banner, that show current channel and program information, found on many set-top boxes. Notably, the prototype allows users to schedule an upcoming program, much like on a digital video recorder (DVR). However, lacking the capability to actually record, the system will merely alert the user when the program is about to start, and if there is no response, change the channel to show the scheduled program.

2.1 TV Presence and Awareness

A key requirement for encouraging participation in Social TV is the ability to make users aware of when their friends and family are logged into the system and watching TV. On screen, this information is provided through the buddy list and pop-up messages. The deployed system has two presence states: watching TV and away. The away state is intended to inform buddies that a user is not currently watching TV. It is set automatically when the TV is turned off, and also when no interactions with the system are detected for some time and the current program has ended. Users can also disconnect from the social component of the system if they wish to watch TV in privacy (see Figure 1), and will then appear to others to be away. However, in this state many of the features of the system are disabled, preserving a see and be seen reciprocity.

Users can view who is watching TV and what channel and program they are watching by going to the buddy list (Figure 2, left). From the buddy list they can also change to the same program that their buddy is watching. Pop-up messages update users on what their buddies are watching, and a list of other people watching the same channel is integrated into the channel banner (Figure 2, right).

Two additional presence and awareness options are available as well. A user can see the viewing history of themselves and their buddies, as well as the schedules of the programs she and her buddies

[3]http://www.gbpvr.com/

Fig. 1. This screen shot shows the main menu for the prototype. If a user wishes to watch TV in privacy she or he can select "Leave Social TV."

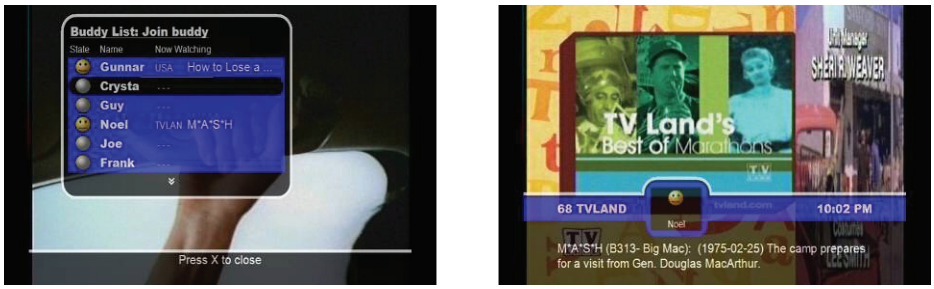

Fig. 2. These screen shots show the buddy list for "What your buddies are watching" (left) and the channel banner when a user has joined another buddy (right).

are planning to watch. A buddy's viewing history is a list of all the programs he or she has watched for at least 10 minutes (in one broadcast, though not necessarily continuously) while online. Users can see the viewing history of all other buddies as well as their own history. They can edit their own history, but not the histories of others. Users can also view a list of shows scheduled by each of their buddies. Furthermore, shows scheduled by one or more buddies are indicated in the program guide by a smiley face, and the program details for that show list the specific buddies who have scheduled it.

2.2 Messaging

Users can send suggestions to invite a buddy to watch their current show with them (see Figure 3). Suggestions appear as dialog boxes on the buddy's TV. If the buddy accepts the suggestion, the system automatically changes the channel to that program. The buddy can also close the dialog to ignore the suggestion. The person who sent the suggestion is not provided with a description of their buddy's action or inaction, because we hoped to provide users with some degree of plausible deniability if they chose to reject a suggestion. Users can also send suggestions to their buddies to watch shows in the future, a kind of recommendation system. If the buddy accepts a suggestion to watch a show in the future, that show is included in his or her schedule.

When two or more buddies are watching the same program, the prototype allows them to send predefined messages to each other that also appear as pop-ups on the TV screen. In the first round of this study, the system included only three different messages, in the form of graphical thumbs-up, thumbs-down, or shout-out emoticons. After this deployment, we received feedback that our participants wanted to send a wider variety of messages. Therefore, for the second group, we implemented a new feature that replaced the generic shout-out message with a list of approximately 20 predetermined

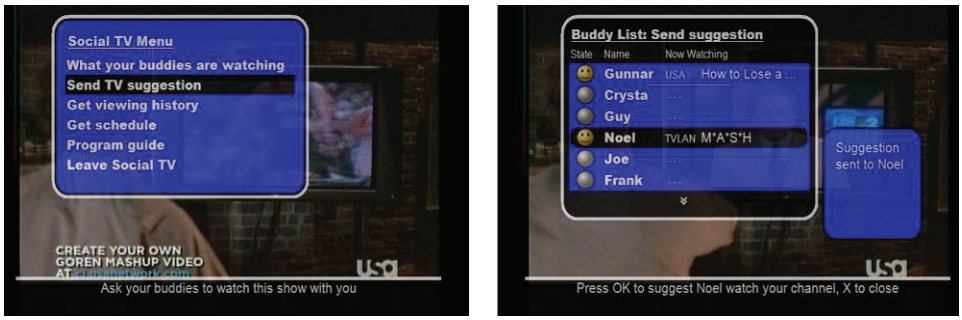

Fig. 3. A user sending a suggestion to a buddy.

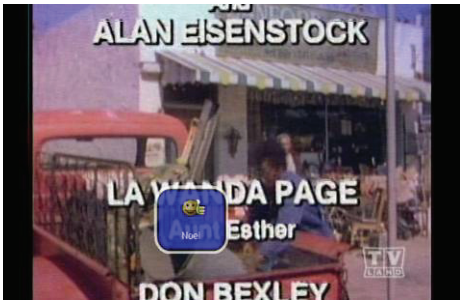

Fig. 4. A user receiving a thumbs-up from a buddy. The pop-up shows a smiley with a thumbs-up sign and the name of the buddy who sent it.

text messages, such as “How is this show?”, “This sucks!”, or “Call me.” The list includes a number of possible replies as well, and we retained the thumbs-up and thumbs-down emoticons.

2.3 Ambient Devices

While Social TV’s on-screen windows provided presence awareness on the television, we wanted another means to convey this information when the TV wasn’t on, or when users were in a different room and unable to see the TV. We chose to use separate displays capable of communicating information unobtrusively, visible from anywhere in a room, and which would fit in as household objects. The system has two different display devices to meet these needs.

As our primary ambient display, we chose the Ambient Orb, a color changing lamp from Ambient Devices, Inc. and modified it to convey the current number of buddies watching television. Different colors are used to indicate whether no buddies (yellow), one buddy (blue), or more than one buddy (purple) are currently watching TV. The orb was connected via serial cable to our prototype, and therefore had to be placed close to the TV. As people often spend much of their time outside of the living room [Aipperspach et al. 2006], we wanted to include a second display for times when users could not see the primary ambient display. The Chumby is a WiFi-enabled Internet appliance with a 3.5″ LCD color display. Though we would have preferred to use a second orb, the Chumby provided faster updates and more reliable wireless reception than the orb’s pager-based network alternative. (See Figure 5.) We wrote a Flash widget for the Chumby that followed the color of the living room orb in near-synchronization (within 15 seconds).

Fig. 5. The photos show the two ambient devices used in the field trials. On the left is the orb; on the right is the Chumby.

Besides providing information about the number of buddies online, we wanted to use the displays to attract users to the system when a friend or family member invited them to watch a show with them. To signal this, we designed the displays to pulse slowly between the current color and black. The displays also pulse to indicate that a scheduled show is starting. We did not want the flashing to be too distracting, but wanted users to notice it so that they could come to their televisions if they desired.

3. METHODS

In the design of our field study, we were interested to see whether the included features met our design goal of encouraging social interaction around shared TV experiences, if it led to other forms of communication, and how it would ultimately affect the feelings of connectedness between our participants. Striving to understand these patterns of behavior is an essentially qualitative question, and our approach was largely exploratory. We ran two separate in-home trials. Five households were recruited for each trial, and each trial was conducted over a two–week span, sequentially, in the Summer of 2007.

3.1 Recruiting

Participants were recruited using an independent recruiting agency that was instructed to find social groups in which the various household members were mutual friends, and all had strong ties with one another. The actual relationships between the recruited households varied (Figure 6). In both trials there was a central hub, a person who knew and recruited all the other participants, but there were also at least two households who were more peripheral, without strong ties to the rest of the group. The ages of participants in Group A ranged between 26 and 33, and in Group B between 46 and 57. All participants were either married or engaged, and reported watching television on a daily basis. Three of the five families in Group A had either one or two small children, while all five households in Group B included one or two teenage children. In both trials, the central hub was a woman, and the four friends she recruited were female. In the case of Group A, two of the participants were sisters. However, in each group some of the participants' husbands knew each other, and in Group B two of the husbands were best friends.

While there were some husbands in both groups who knew each other well, and some of the teenage children in Group B knew each other, their relationships, for the most part, mirrored those of our female main participants. Thus, we had a number of different kinds of relationships represented in the two social groups, but neither group was uniformly tight-knit.

3.2 Deployment

For each household, the Social TV system was installed in the room participants reported as being the most common place for watching TV. As mentioned earlier, Groups A and B received slightly different versions of the software, as a result of an iterative design process on the basis of Group A's feedback.

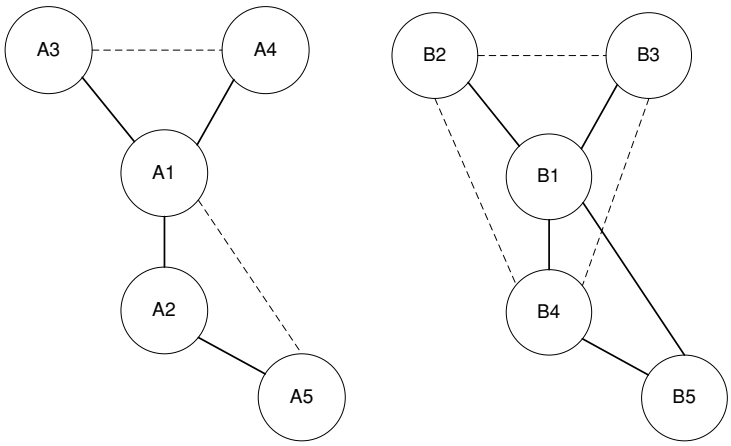

Fig. 6. These diagrams depict social ties between households in our two sequential field trials (Groups A and B). The dashed lines represent acquaintances.

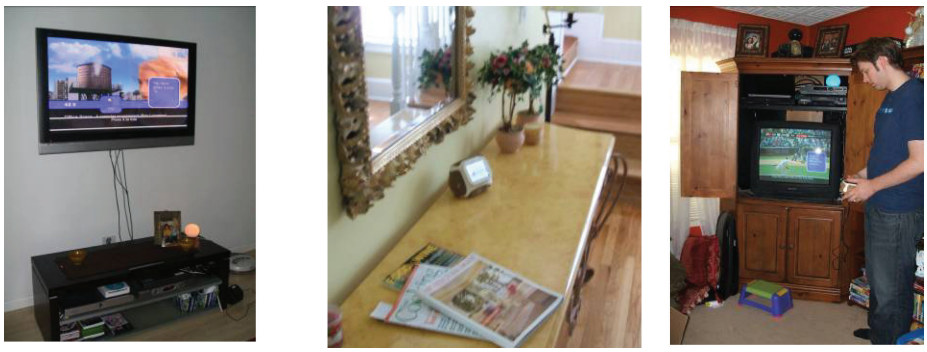

Fig. 7. Photos showing the prototype and ambient devices in participants' homes.

Each household was given one orb and one Chumby. The orb was tethered to the system, and thus had to be placed in proximity to the television. Orbs ended up in and on top of armoires, on shelving units, and even on the floor, but were always within approximately 2 feet of the television. We allowed participants to place the Chumby in any part of their home where they spent a significant amount of time or passed by frequently. Six participants put it in the kitchen, and two in a hallway. One person kept the Chumby in the bedroom where the prototype was installed, next to the orb, and refused to move it to another location in the house. The last Chumby malfunctioned and was not used. (See Figure 7.)

Participants were given a brief (20-minute) introduction to the system and its features and a technical support number they could call at any time. We asked each participant to use the system as they would if they were not in a study, and explained that they did not have to use every feature, or any feature, unless they wanted to.

3.3 Data Collection

We used multiple methods for data collection, including interviews, automated usage logs, and voice mail diaries. We audio-taped three sets of semi-structured interviews for each household. The initial

Fig. 8. The affinity chart – final level of team-based analysis.

interview lasted about half an hour and was used to collect background information about viewing habits, communication routines, and social relations between the participants. In a phone interview after the first week, lasting between 15 and 30 minutes, we gathered data about the participants' use of and reactions to the prototype during the first week. The final interview, lasting from an hour to an hour and half, was structured to collect more detailed information on their use of and reaction to the prototype. Whenever possible, we asked other household members to participate in the interviews, and thus we collected data from some of the husbands as well as some of the teenagers.

We logged all interactions with the system in order to document actual usage, corroborate reported usage by participants in interviews, and allow us to examine interesting incidents in detail later. We logged when the Social TV system status changed to idle and when it returned from idle, and when the ambient presence status indicators changed, as well as button presses during system use. We thus have some evidence of sequences of actions. Unfortunately, the number of confounding variables limits what we can say based on log data alone. For example, we have no data on when participants were home, when they were in a room from which they could observe the ambient indicators, or who was using the system at any particular moment in time. The caveats described here make results from the log data much more difficult to interpret and articulate. Although certain interview comments (such as when messages were sent and what the messages said) can be verified, the logs themselves often provide only anecdotal support for portions of the interview data. Cameras or sensors in the home would have been useful to put the log data in context, but we felt this would be too intrusive and technically complex for the purposes of this study.

Instead, voice mail diaries were used to collect information on behaviors we could neither log nor directly observe, and that we were afraid would be forgotten prior to the interviews. We devised questions about behaviors surrounding the ambient presence/awareness features, communications with other people in the study, and use of Social TV's other features. So that the questions would not influence our participants' behavior in advance, the participants were given 14 sealed envelopes, one for each day of the study, each containing that day's questions. Thus, participants had the questions in front of them as they provided their feedback.

3.4 Analysis

We conducted a team-based analysis of the qualitative data, which we have referred to in other papers as a grounded theory affinity process [Metcalf and Harboe 2006]. Taking the same two selected phone interviews, each team member individually identified what we considered the important data points and then met as team to compare what we had extracted and level set the data extraction. Once we all had the same idea of the kind of data to extract, the team split up the data and individually pulled out

items referring to the use of, and reactions to, the prototype and its various features. We identified the items for analysis by focusing on "events, behaviors, statements, or activities that stand out because they occur often, because they are crucial to other items, because they are rare and influential, or because they are totally absent despite the researchers' expectations," [LeCompte and Schensul 1999, p. 150]. We then put these items together into groups or categories, a dialectical process of "comparison, contrast, and integration" [LeCompte and Schensul 1999, p. 155] that reveals patterns and themes. To efficiently organize these patterns as a team, we used an affinity-like post-it chart [Beyer and Holtzblatt 1998, pp. 154–163].

Here we followed Bernard [1998]: As the categories were identified we would "pull all the data (that is, exemplars) from those categories together and compare them, considering not only what [items belong] in each emerging category but also how the categories are linked together," a process during which the patterns we discuss here emerged. We also examined the log data and extracted some basic quantitative measures about the frequency of use of various features.

4. RESULTS

During the course of the study we found that having Social TV helped people feel like others were around, pulled them in to the TV viewing experience, and encouraged new TV behaviors. Seeing the ambient light would often pique curiosity about who was watching TV, which prompted our participants to turn on the TV. Once their TV was on participants could see what was being watched and their curiosity was stimulated further: they would take a peek at the shows their buddies were watching. In some cases participants changed their schedule of viewing based on what they saw others doing. A few of the participants were even compelled to call one another once they had established initial contact through Social TV. However, our participants were sorely disappointed that they were unable to have "real" conversations using the prototype, and considered this a major drawback of the system.

4.1 Ambient Devices

It is apparent from the numerous comments of our participants that the ambient lights did tend to draw people's attention to the TV. A number of our participants commented on the power of the ambient lights to attract their attention, even when the TV was off, and stimulate their curiosity enough for them to turn the TV on. In many cases our participants pointedly acknowledged the attention-getting properties of the ambient lights. One participant told us, "As soon as I come into the house or I wake up or come into the room, that's the first thing. It draws my attention, and the first thing I do is turn on the TV," (A2), and B1 told us, "Every time I passed by, a thousand times a day, I would look to see what color it was. Every single time. . ."

Without turning on their TV, if the orb was blue or purple they knew only that someone was on, not who. Our participants turned on the TV because they wanted to know who was on. In a voice mail, A3 told us that the orb "has made me a little bit more aware, makes me want to, when it does change colors, to see which of my buddies are on." B3 told us, "I always look to see who's on." A1 conceded that while it may not be "time to watch TV" in her mind, she still turns it on: "It's just more out of curiosity than anything, it might not necessarily mean it's time to watch TV, but I see it's pulsing and I think, 'Oh let me just see who's on.'"

4.2 Presence and Awareness

Our participants reported frequently turning on the TV and going directly to the buddy list to see who was watching, where they could also see what programs their buddies were watching. According to the interviews it seems that seeing what programs their friends were watching was as much of a

motivation for turning on the TV as seeing who was watching TV. A1, for example, who said that it might not be the time she would normally watch TV, told us, "I'll quickly turn it on and see who's on and what they're watching. . ." One conceded, "I kinda look forward to seeing who's on, because it's kinda fun," and another said that "to see what everybody else is watching" was "the best part." A4 admitted, "I think that's kind of interesting, to know what they're watching."

Once their TV was on, participants could see not only who was watching but what was being watched. This stimulated their curiosity further: they would often take a peek at the shows their buddies were watching. Said one participant, "If they're watching it, then maybe it's a good episode or something." Some participants used what their friends were watching as a "menu" of program options to choose from. No one needed to suggest a show; they would simply be curious and join them. A3 explained, "Something they were watching might grab my attention more than what I thought I was going to watch." A5 expressed her reason for this behavior well: "Sometimes you turn it on and you have nothing to watch, you turn it on [and] 'oh, so-and-so's watching this, let me check it out.'" A2 agreed: "Instead of even going through the guide I would just see what they were watching and then just put it on."

There were other behavior changes associated with the introduction of Social TV as well. A3 told us that with Social TV she developed "a different viewing habit. It was more in tune to what other people were doing versus just based on what I felt like watching." B4 even planned her viewing around when she thought she was most likely to find someone else on STV: "I come in here a lot at night because it's quiet and I can hopefully find someone on."

Knowing who was watching and what they were watching helped our participants keep an eye on what their friends were doing and in the process learn more about them. Knowing what programs the others watched allowed our participants to learn about their friends' and acquaintances' interests. In fact, while many participants told us in the initial interviews that they thought they had similar tastes to the others in their group, they in fact learned that their interests differed more than they thought. A1's husband expressed it well: "I have noticed that for the most part we don't watch a lot of the same shows." This recognition occurred in the other group as well. Both B1 and B4, for example, thought that the B2 household watched what they variously called "weird shows" or "crazy movies," and B2 similarly recognized the mutual difference in taste: "They watch something totally different from what I watch." While general preferences were learned, specifics were also discerned. Our participants noticed and recalled that others watched specific shows such as *The Ellen DeGeneres Show*, *The Office*, and *Everybody Loves Raymond*. B1 noticed that B3 "watches tennis all weekend long," and even sisters were able to use the system to learn more about their siblings: A5 said she "had no idea" that her sister watched as much of the Food Network as she did.

This information did not simply come from turning on the TV and seeing who was watching at that particular time. Our participants learned about the others by looking at their viewing history. B4, for example, said she was curious about others' viewing histories as well as her own: "I just think it's cool to see what people have watched and then what we've watched." A5 said she used the viewing history "just to get a feel for [the others], and because I don't have anything else to do." But viewing history was more than a diversion; it was also a mechanism for gathering information about buddies. For example, B2's son used the history to see if anyone in the study had similar viewing interests to his own, but "I didn't see anyone that had the same taste." A4, while professing a simple curiosity, also used the viewing history to get a sense of others' tastes: "It was kind of funny just to see them like, 'This person is addicted to the news,' all they do is watch the news all day long." While the viewing history was useful in certain ways, and was certainly checked, our participants expressed doubts about its inclusion. B2's husband was particularly unconvinced: "Why would I want to know what Joe Blow has watched over the last week unless I'm doing a survey of what he's watched over the last week? It's something to take up space, but who's going to go on and see what someone's watched?" Some even considered it invasive,

like B2's teenage son, who told us explicitly that the viewing history "is kind of invasive." A5 said of the viewing history, "It's not really personal information, but it's not information required for anyone else to know." These, and other, participants were simply not comfortable with people being able to see everything someone watched in list format. A2 assured us that she did not care, but thought others might: "Some people might find it to be an invasion of privacy if people can view their history." B4 recognized the capability of monitoring using the viewing history: "It wouldn't work, because they'd be like 'All you did was watch TV. Look at that! Ten hours. . ."

Information about whether or not someone was watching TV, and when they were watching, also gave our participants a general sense of what was happening with the other people in their group. B1 told us that she would occasionally stop to see "who is going to be watching TV on this beautiful hot day, or who's home in the afternoon?" B3 would similarly find herself interested and would wonder, "What are they doing in the middle of the day?" or "What's so interesting on TV now?" A number of participants indicated that the system provided a feeling that others were around, and they liked that. According to some of our participants, this led to a feeling of connectedness. One described it this way: "I'm not saying I'm feeling closer to them, but it's kind of like a connection. That's it: a connection."

Participants seemed to associate presence on Social TV with presence in the home, perhaps contributing to their sense of others being "around." For example, B1 looked at the orb one morning and observed, "The orb was yellow and no one was on, so I'm assuming everyone was already at work." Naturally, the presence information was a helpful supplement to the ambient devices for this purpose. Other participants explicitly mentioned that "what was going on" mapped, in their minds, to "is she home, is she out": "'Yeah, she's home, she's watching TV.'" (A5). B2 told us that the presence and awareness information from the prototype told her that her friend was watching Oprah, and this helped her "know she was home." A3 agreed, and thought that this gave the prototype an advantage over the phone: "The phone is different because you can't view what's going on, so you don't know if the other person is near their phone. . ." She did not, however, see it as an advantage over IM because "through IM you do know when they are near the computer."

4.3 Messaging

Perhaps the most important features in terms of our evaluation were the lightweight messaging capabilities offered by Social TV. We found that while the combination of presence and messaging changed and initially enhanced the TV viewing experience, the limited expressiveness provided by the messaging features resulted in eventual disuse and a desire for more free-form communication.

Viewing Presence as Availability. Because Social TV presence is a proxy for being home, it was also used as a proxy for availability. If our participants interacted with Social TV, the others thought they might be available and would try to get in touch. Having seen what their buddies were doing, our participants were sometimes tempted to initiate communication. According to A2, "It could be like 11:00 at night, it doesn't matter. I'll go to Social TV and then I'll go to see what my buddies are watching, because I know someone is on. I'll see what they are watching and I'll usually send out shout outs based on what they are watching, or the thumbs down or whatever." Deliberate communication was often used to send an acknowledgement to others that they were present together, and that they were enjoying the same program. For example, A1 said it was more like "Hey you're watching the same show, good show, kind of. . .acknowledging." A3 said, "It was just, 'oh that's neat' that someone else is enjoying the same thing."

Sometimes assumptions of availability extended to availability for more intimate or extended conversations. B3, for example, told us, "I might pick up the phone at that moment. . . know she's home now. So I'm gonna call her now." B5 told us, "It would tell me who was home so I would pick up the phone and

say 'hi'. . ." B1 alleged, "Just about every time I turned it on, if I saw somebody on I called their house." B1 seemed to be the one who used the system most as a way to time phone calls: "This past week I called B2, B3, and B4. It made me call them when I'd sit down here and I'd see 'Oh, B3's home, she's watching tennis, I'm gonna bother her!" Some participants would ping the others with a quick message or thumbs, waiting for a response before engaging in more in-depth communication. B3 explained:

> I use thumbs-up but now that I've gotten into the groove of the messages and know how to do it, I do that more. The thumbs-up are so quick and easy, they're not really saying much. I do thumbs-up, thumbs-down, wait to see if there's a reaction, and if there is I'll send a message. It kinda tells me they want to interact.

B1 used this technique as well: "When I was watching with B4 a couple days ago I wrote, 'Call me,' and then she called me. . ."

Suggestions as Communication. Explicit suggestions, another means of communication, also played a role in social influence and pulling group members into a shared TV experience. Group A sent 26 suggestions during their two-week trial period and 38% of those were accepted. According to A2, for example, "we would all end up watching the same thing because we would send suggestions to each other." Members of Group B, on the other hand, sent 152 suggestions and had a 12% accept rate. While the percentage of accepted suggestions was lower for Group B (perhaps because of their difference in TV viewing tastes mentioned above), they said they enjoyed some of the suggestions, and learned about new shows. B3, for example, enjoyed suggestions from B5, whom she does not know at all: "She watches the Food Network a lot, she's given me some funny suggestions for things to watch, where I normally wouldn't tune in, so I've taken her suggestions and I've gone to them." B4 said she was introduced to *The Office* and she watched it, thinking "it was cute." But simply making a suggestion was often not enough. B1 and B3 both acknowledged their desire to convince others to watch what they themselves enjoyed. B1 told us "I have bumped over to their shows so I can talk to them and say, 'Oh come on, change to my show,' but they don't budge." There was some evidence of social pressure when suggestions were ignored or rejected. Given that participants received no feedback on whether their suggestions were acted upon, one participant (B3) suggested having a way to tell someone, "You've got to turn on Channel 2! Why won't you do it?"

Limited Expressiveness and the Need for Free-form Communication. While the system could convey the feeling that someone else was around, and even foster communication, it did not quite cultivate the sense of connection that our participants were looking for. While thumbs and shout-outs and predefined messages were used to say "hi," and comment on the shows themselves, these messages were seen as insufficient. For example, B1 told us "It doesn't do enough for me to really be watching TV *with* the other people." A4 felt similarly: "It's just sharing information, really, right now. But it's not as interactive as you would be among your friends." B5 told us that if she "could press a button and say 'B4, are you there?" that it "would take it up 100 notches." As it was, she said, "It's so. . .impersonal. . ." B4 expressed the same sentiment: "I wouldn't even be using a telephone, if I had that with the TV." Without rich communication they weren't really connected at all, they seemed to say, "I wish I could really be attached and talk to people that are on the other side," (B4). Simply knowing what others were watching and being able to watch at the same time was not good enough. A5 told us, "It would be nice if it wouldn't be just a thumbs-up and down, if there was a little bit more that you could do with that."

In Group A, participants complained that all they could send were thumbs-up and down and shout-outs, and a number of them suggested putting in predefined messages. Subsequently, we added predefined messages for group B who, in turn, bemoaned the fact that they could not use their own words. Indeed, giving slightly more communicative abilities seemed only to increase the hunger for richer

modes of communication. No list of messages, they felt, could cover everything they wanted to say. And despite the fact that Group B sent 185 messages during the study, B3 said, "The little snippets you've given me are so limited." B1, likewise, told us, "This is very limited, as far as really a discussion about the TV: thumbs up, thumbs down, 'this sucks.' It's too confined."

In the end, our participants wanted freedom of expression, which, they believed, would provide them with the experience they were seeking: watching TV *together*. One person explained: "I feel like the whole purpose of this, in my mind at least, is that I'm able to connect, communicate through live TV." It was apparent from the research that our participants wanted a communication medium that allowed them the freedom to express themselves fully, and we found our participants asking for both free-form text and voice capabilities. B3 said it well: "If there was, like, a microphone, and you could hear them and you could talk back and forth and laugh together, that would be a whole different thing. I was thinking Social TV is going to be intimate conversations, whether it's about the television show or the weather." B5 lamented, "Normally we just pick up the phone and call each other. And I like hearing her voice anyways, it's like, 'Ok, cool, my sister's on the TV,' but I want to hear her voice." And while the thumbs-up and thumbs-down were used quite a bit more often than shout-outs in Group A (38 times versus 21 for shout-outs), and Group B used thumbs extensively (sending 120 in the two weeks), a number of the participants still did not consider them expressive enough. According to our participants there were not enough possibilities for exchange in our prototype. It did not support the give-and-take of natural conversation. A5 told us "I feel like it's a human interaction, but not really." B4 used the thumbs only 4 times during the two weeks, saying, "That doesn't do much for me. I like to talk."

5. CONCLUSIONS

We found that engaging with the prototype helped our participants feel as if the others were around. They often joined their buddies, even if only for a few moments, sent messages, and sometimes called one another. During the course of the study, we found that our prototype encouraged sociability among participants and influenced their TV viewing habits to support socialization. The absence of rich modes of communication was considered a severe drawback, and greatly influenced a negative overall evaluation of the prototype. However, the desire for richer communication, combined with results from our earlier study, suggest that presence and awareness information can be combined with free-form expression to create a sociable TV experience, even when viewers are not collocated.

5.1 Richness of Communication

The simplest use case for Social TV is to make two people watching the same program in separate locations feel as if they are watching it together. In order to accomplish this, two basic system features have to be enabled: the ability to see who is watching what program, and the ability to communicate with them. However, rich modes of communication such as free-form text messages similar to IM on the TV screen, or voice communication, have the potential to interrupt content viewing. Thus we included basic, very minimal communication mechanisms to see if the ability to simply remind someone that you're there was enough to promote sociability. One of the strongest conclusions we reached during this study was that lightweight messages alone were simply insufficient and too impersonal for fostering a feeling of connection. Adding communication capabilities actually lowered our participants' perception of the usefulness of the prototype. When we had only thumbs and shout-outs, our participants were not nearly as negative as when they were provided with predetermined messages. The reaction of our participants to impersonal messages may be likened to people's purported reactions to humanlike robots. According to Masahiro Mori (1970), the closer a robot gets to being human, the more the nonhuman characteristics stand out, and the greater the potential for repulsion. While this is a controversial theory, for our prototype, the closer the messaging got to being the kind of communication participants already engage

in (phone calls and IM), the more they realized what was missing, and the more they criticized the capabilities they were given.

In contrast, the ambient devices, in particularly met with a nearly uniformly positive response from participants in how they enhanced the Social TV experience. The devices added additional richness to the communication shared experience by providing context and awareness about participants' friends and family. Although information afforded by the ambient devices was also lightweight both in what they communicated to the viewer as well as the interaction necessary to communicate that information, participants did not express desire for more control or to express more detail via these channels. Perhaps because the ambient information was understood to be communicated through incidental action as opposed to intentional or explicit action, the displays suited participants' expectations and needs better than the explicit lightweight messaging capabilities offered by the system. This again suggests that lightweight messages could play an important role the Social TV experience, and that understanding what contexts and purposes they are suited for could lead to designs that better support communication needs and create a true feeling of connectedness.

5.2 Connectedness and Togetherness

We did not believe that simply knowing others were watching and who was watching would produce a feeling of sociality, and yet these were the features that seemed to best promote feelings of connectedness. Just seeing that someone else was watching TV, and being able to see who it was and what they were watching helped our participants feel as if others were around. Indeed, because watching TV became a proxy for being home, our participants had a clearer mental picture of what their friends were experiencing at that moment in time.

Similarly, even though the ambient devices did not provide specific information about who was watching TV, the information that they conveyed clearly helped to foster the feeling that the system created a connection between the participants. The devices conveyed to participants that others were logged onto Social TV even when they themselves were not watching TV, which allowed the connectedness to extend beyond the TV watching experience. Additionally, the fact that the devices prompted participants to log onto Social TV to watch with friends or even just see what their friends were watching illustrates how they drew people to take part in their friends' experiences at a variety of levels of engagement. Ambient cues in the environment not only fostered a sense of connectedness, but also prompted participants to initiate activity that furthered that connectedness.

5.3 Learning and Discovery in Social Groups

We included the viewing history and scheduling features because we believed they have the potential to increase social behaviors centered on the TV viewing experience. Both would allow users to learn about their buddies' viewing behaviors. In addition, simply observing the patterns of TV viewing (by seeing when the ambient devices changed colors, and looking at who was watching TV), they learned their friends' schedules. All of this data allowed users to learn what kinds of shows their friends and family enjoyed, and some people were surprised by what they learned. While they thought they knew, or could guess, their friends' viewing behaviors, they learned that they did not necessarily know all that they thought.

The system was also used to discover new shows. We enabled the sending of suggestions as another way to promote social behaviors during TV viewing, including suggestions. A suggestion would communicate both that the sender is thinking of the receiver as well as that the sender thought this was something the receiver would like to see. Here again, we found that although there seemed to be some inclination by participants to suggest and share programs, the impoverished nature of the communication channels hindered the use of this feature. Participants needed to be convinced to change

their channels—knowing that someone wanted them to switch, and being able to see the title of the program in the suggestion was simply not enough in many cases. Using voice or free-form text our participants might have been able to make a convincing argument that their friends and family members should join them, but as the prototype was designed, there was no way to do this effectively, which frustrated participants. While it was difficult to convince one participant to join another given the prototype design, when they did go to the channel their buddy was on they sometimes found something new that they enjoyed watching. This suggests that the design of Social TV and like systems should focus not only on enriching the experience of watching a program together, but on sharing, recommending, and learning about content through features and communication channels that best support these practices.

6. RELATED WORK

Other social television systems include AmigoTV [Coppens et al. 2004] and Telebuddies [Luyten et al. 2006]. AmigoTV includes voice chat capabilities as well as a buddy list and presence information. Telebuddies uses social networking information to match users with suitable communication partners. However, these systems have seen limited evaluation in lab studies and small-scale trials.

A few studies have looked at the use of different communication modalities in social television systems. Geerts [2006] compared text and voice communication in a within-subjects lab trial of two different systems, and found that voice was considered more natural, although young people preferred text. Baillie et al. [2007] compared voice communication to emoticon-based communication in a similar experimental setup, concluding that enjoyment and social presence was higher with voice. Weisz et al. [2007] and Regan and Todd [2004] examined groups or pairs of friends and strangers using text chat while watching videos or TV together. Similarly, Oehlberg et al. [2006] studied groups of friends and acquaintances watching television, both in collocated groups and connected via an audio link.

In all of these cases, studies did not examine the use of systems over time, nor did they examine the circumstances, process, and rationale behind communication that took place through the system. Our work complements these projects in that it provides a first evaluation of a social television system in a natural setting over a prolonged period of time.

7. CONTRIBUTIONS

We report on an extended in-home trial of a social television system. As stated in the previous section, user studies in the literature have restricted themselves to lab tests or single-session trials (often both). By observing people's behaviors in a realistic setting, we identify patterns of use that suggest problems and design imperatives. For example, we observed a clear progression in how participants would first notice the presence of friends on the system, initiate communication using lightweight messages, and then potentially escalate to richer conversation through phone calls.

Social television systems that have been proposed in the past vary in the type of communication modalities offered. The system tested in this study supported a very restricted set of communication options. This design choice allowed us to investigate the appeal of a social television experience oriented around presence and awareness, and recommending TV programming. Our findings strongly indicate that this experience is not by itself satisfying for users, who adamantly demand richer communication.

Our current plans are to take these results and apply them toward the next phase of our research program, where we will incorporate more flexible communication options such as voice and text chat. Future study of this enhanced prototype will involve examining the choices participants make between these options, their reasons for doing so, and the implications of the prototype on the sociality, intrusiveness, and enjoyment of the social television experience.

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REFERENCES

AIPPERSPACH, R., RATTENBURY, T., WOODRUFF, A., AND CANNY, J. 2006. A quantitative method for revealing and comparing places in the home. *Proceedings of Ubicomp 2006*.

BAILLIE, L., FRÖHLIC, P., AND SCHATZ, R. 2007. Exploring social TV. In *Proceedings of the International Conference on Information Technology Interfaces (ITI'07)* 215–220.

BERNARD, H. R. 1998. *Handbook of Methods in Cultural Anthropology*. Altamira Press, Walnut Creek, CA.

BEYER, H. AND HOLTZBLATT, K. 1998. *Contextual design: Defining Customer-Centered Systems*. Morgan Kaufmann Publishers, San Francisco, CA.

CHORIANOPOULOS, K. AND LEKAKOS, G. 2008. Introduction to Social TV: Enhancing the Shared Experience with Interactive TV, *Int. J. Human-Comput. Interact. 24*, 2, 113–120.

COPPENS, T., TRAPPENIERS, AND L. GODON, M. 2004. AmigoTV: towards a social TV experience. In *Proceedings of the European Interactive Television Conference (EuroITV'04)*.

GEERTS, D. 2006. Comparing voice chat and text chat in a communication tool for interactive television. In *Proceedings of the Nordic Conference on Human-Computer Interaction (NordiCHI'06)*, pp. 461–464. ACM Press.

HARBOE, G., MASSEY, N., METCALF, C. J., WHEATLEY, D., AND ROMANO, G. 2007. Perceptions of value: The uses of social television. *European Interactive Television Conference*. 116–125.

HARBOE, G., METCALF, C., BENTLEY, F., TULLIO, J., MASSEY, N., AND ROMANO, G. 2008. Ambient Social TV: Drawing People into a Shared Experience. *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI'08)*. to appear.

LECOMPTE, M. AND SCHENSUL, J. 1999. Designing and Conducting Ethnographic Research. Altamira Press, Walnut Creek, CA.

LUYTEN, K., THYS, K., HUYPENS, S., AND CONINX, K. 2006. Telebuddies: Social stitching with interactive television. In *Extended Abstracts of the ACM Conference on Human Factors in Computing Systems (CHI'06)*.

METCALF, C. J. AND HARBOE, G. 2006. Sunday is family day, *Proceedings of the Conference on Ethnographic Praxis in Industry*, No. 1, 49–59.

MORI, M. 1970. Bukimi no tani The uncanny valley (K. F. MacDorman & T. Minato, Trans.). *Energy 7*, 4, 33–35.

OEHLBERG, L., DUCHENEAUT, N., THORNTON, J. D., MOORE, R. J., AND NICKELL, E. 2006. Social TV: Designing for Distributed, Sociable Television Viewing. In *Proceedings of the European Interactive Television Conference (EuroITV'06)*. 25–26.

REGAN, T. AND TODD, I. 2004. Media center buddies: Instant messaging around a media center. *In Proceedings of the Nordic Conference on Human-Computer Interaction (NordiCHI'04)*. 141–144.

WEISZ, J. D., KIESLER, S., ZHANG, H., REN, Y., KRAUT, R. E., AND KONSTAN, J. A. 2007. Watching together: integrating text chat with video. In *Proceedings of the ACM Conference on Human Factors in Computer Studies (CHI'07)*. 877–886.

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