SocialSense: A System For Social Environment Awareness

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ABSTRACT
SocialSense is a system designed to provide additional social information about nearby people. SocialSense detects Bluetooth devices and uses them to infer the presence of particular people, pulling their profiles and status from online social networking sites. SocialSense differs from existing mobile social awareness systems by integrating live feeds from multiple sources. Information is shown to the user via a head-mounted display, and the user controls the system using buttons mounted on a ring input device or "Magic Ring". The aim is a system that can be used unobtrusively, allowing users to go about face-to-face interactions in a normal manner.

Author Keywords
social networking, wearable computer, presence sharing.

ACM Classification Keywords
H.5.3 [Information Interfaces And Presentation (e.g., HCI)]: Group and Organization Interfaces — Collaborative computing

INTRODUCTION

As people go about their lives, they pass through spaces filled with other people. They will interact with some of these people, but most will be passed by without interaction. One barrier to interaction is unfamiliarity: people are less likely to talk to a stranger they don't know anything about. There is also forgetfulness, such as remembering someone's face but forgetting their name, organizational affiliation, and interests.

This paper describes a system called SocialSense that allows users to be more aware of the social background of people in the environments they inhabit. SocialSense allows the user to explore the profiles and status information of nearby people who have agreed to participate in the system. Profiles are retrieved from an online community site, while status comes from the Twitter microblogging service [14]. Twitter status information consists of a message of up to 140 characters, similar to mobile SMS messages, and provides a potentially dynamic snapshot of a person's current thoughts or activities. The current prototype scans for nearby Bluetooth devices as a proxy for the people in the user's vicinity. The profiles are shown to the user via a head-mounted display (HMD), and the user controls the system using buttons mounted on a ring input device or "Magic Ring". We see the combination of technologies in SocialSense as particularly important. The HMD allows us to display profile icons in the user's peripheral vision to be attended to or ignored based on the user's wishes, as in the eye-q system [3]. The Magic Ring is a deliberately simple input device, designed to allow users to navigate the user interface as easily as possible. While the current SocialSense prototype is quite bulky, we aim to develop a system that can be used unobtrusively, which is important for a system designed to aid social interactions.

For example, a SocialSense user could be walking through a University courtyard filled with people on their way to lunch. As the user is walking, a thumbnail picture of a colleague appears at the edge of their field of view, indicating that the person is nearby. Without this notification, the user might not have noticed the presence of the colleague. Picking them out of the crowd, the user approaches the colleague and asks if they are free for lunch. As they walk to lunch, the user can see their colleague's most recent Twitter status update regarding a paper submission to an upcoming conference. The user is also going to that conference, potentially providing a fertile topic for lunchtime conversation.

RELATED WORK

SocialSense brings together research on location-based social networking systems and alternative input devices.

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Location-based Social Networking Systems

Social network services such as MySpace and Facebook allow users to create profiles for themselves, such as uploading a picture and specifying friendship links with other users. Commercial systems for mobile and location based social networking services make use of self-reported location (e.g., SocialLight), GPS (e.g., Loopt), and Bluetooth (e.g., MobiLuck) in order to leverage location and context specific social information. All Bluetooth devices are capable of 'device-discovery', which allows them to collect information on other Bluetooth devices within 5-10 meters [5]. This information includes a unique Bluetooth MAC address (BTID), device name, and type. The BlueAware system [5] runs in the background on MIDP2-enabled phones allowing them to record and timestamp BTIDs in a proximity log and making them available to other applications. Researchers have been using the BTID patterns to analyze and predict relationships between users and organizational rhythms [5, 13]. Bluscreen is a public advertising system [16] that detects users via their Bluetooth devices and has advertising agents bidding for screen time. Commercial social networking systems such as MobiLuck allow mobile phones to detect all nearby Bluetooth devices, ringing or vibrating when found, supporting message and photo exchange. WirelessRope also uses Bluetooth and supports contact between groups of colleagues at a conference [11]. The Jabberwocky system [12] investigates the "familiar stranger" concept of people who have seen each other in public places on multiple occasions but have never met. The Jabberwocky devices log Bluetooth IDs and no central server is involved, unlike SocialSense.

These systems give us a feel for the possibilities of consumer devices in the mobile social networking field. In addition, there have been many custom social networking applications developed in the wearable computing field including the infamous lovegety [8], GroupWear [2], Smart-Its Friends [7], nTag, and SpotMe. Particularly interesting is the development of systems that incorporate gestural language. For example, iBand [9] is a social networking device that creates connections between two users when they shake hands.

Input Devices

Effective interaction technology is also important when using a head-mounted display and there have been a number of gesture-based interfaces developed including Ubi-finger [17], GestureWrist [15], FingeRing [6], and Twiddler (http://www.handykey.com/). There have been several input devices developed in a ring form factor. FingerSleeve [18] has a six-degree-of-freedom tracker, with which you have ability to sense all movement, and translation and orientation changes. However, it is unsuited for our application because of its size and wire connection, and because SocialSense does not require that level of tracking functionality.

Figure 1: SocialSense user interface, showing an abbreviated profile (redacted for privacy)

PROTOTYPE DEVELOPMENT

SocialSense consists of a computer with a Bluetooth adapter that continuously scans for nearby Bluetooth devices. For each Bluetooth device discovered, it contacts a server to see if there is a profile associated with the BTID of the discovered device. If a profile is found, the information is downloaded and added to a list of nearby devices. In addition, if there is a Twitter account associated with the profile, the latest status message is retrieved. Devices that are not associated with a profile are also displayed, but the only information that can be displayed is the name that the device provides (which can sometimes be helpful, such as "Adam Smith's iPhone") [10].

Software Implementation

The SocialSense client is written in Java. This decision was made early on because Java allows for cross platform development and deployment. Of particular note is the availability of a cross-platform specification for using Bluetooth with Java, known as JSR 82 (http://jcp.org/en/jsr/detail?id=82).

The user interface is simple by design. It displays the detected users by name and thumbnail image on the right hand side, and the currently selected profile in the center. Log messages are displayed at the bottom of the window showing the status of Bluetooth scans and any errors encountered. Figure 1 shows the user interface.

The interface uses white text on a black background because on some optical see-through HMDs black is transparent thus avoiding unnecessary occlusion of the real world.

To select a device, the user shifts the selection up and down in the list. Moving the selection off the top or bottom of the list causes the profile area to be cleared, allowing the user to focus on his or her physical environment instead of the interface. When a person is selected, that person's abbreviated profile is displayed, showing their name, picture, phone number and Twitter status. The user can then toggle between an extended profile that displays the person's full bio and the abbreviated profile.

Currently the server side of SocialSense is implemented in Ruby on Rails as part of the larger disCourse online collaboration system. The ability to associate BTIDs with an individual was added to the existing disCourse profile system. The SocialSense client makes a HTTP request (via WiFi) containing each BTID discovered to the server. If there is a profile associated with a BTID, the server replies with a XML document containing the profile contents, which is then parsed by the client. If the profile has an associated Twitter account, the latest 'tweet' is retrieved from Twitter.

Hardware

The SocialSense prototype runs on a Samsung Q1 UMPC (Ultra Mobile PC). UMPCs are like miniaturized laptops, but they run full versions of Windows. The Samsung model has built-in Bluetooth, WiFi, 2 USB ports, and a VGA port for connecting to the HMD.

We initially used the LitEye LE-750, which is an optical see-through device, for the HMD, but found it too bulky and unsuited for social computing applications. We settled on the Creative Display Systems i-Port as a less obtrusive display. The i-Port consists of a modified pair of Oakley sunglasses with the display mounted onto the right hand side. Unlike the LitEye display, the i-Port is not an optical see-through HMD so it does partially occlude the right eye, but it does not occupy the user's full field of view so it allows some situational awareness.

For input to SocialSense, we developed a "Magic Ring" device to match the simplicity of the user interface. The Magic Ring consists of three small buttons attached to a metal ring, which is attached by wires to a wrist-mounted controller and battery. The wrist-mounted device communicates wirelessly to the receiver module, which attaches to the UMPC via a USB cable. The receiver module appears as a keyboard to the UMPC, and the three buttons send the keystrokes for up arrow, Enter, and down arrow respectively. We are working on an evaluation of the Magic Ring compared to other input devices for common navigation tasks. Figure 2 shows a picture of the device.

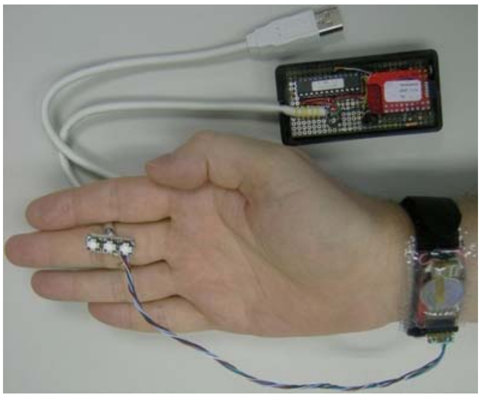

Figure 2: Magic Ring input device

Figure 3: SocialSense hardware being worn

FUTURE WORK

The SocialSense system is still in an early prototype phase, and although we have a working prototype, there are many ways in which it could be improved.

Unobtrusiveness

Significant work is still required before the system can be considered unobtrusive. The head-mounted display is probably the most difficult hurdle towards unobtrusiveness. Current displays are simply too bulky and obvious. While there are many companies working on technologies that they claim will be tiny and practically invisible, only time will tell if these displays live up to the manufacturers' claims.

It may be some time before we can develop a system that can be truly unobtrusive. An alternative approach would be to develop a version of SocialSense for a mobile device like the Apple iPhone. Such a device would be relatively unobtrusive, but it would require a way to make the user aware of nearby people. Given the near ubiquity of Bluetooth headsets, one option would be to have the mobile device "whisper" in the user's ear when someone entered their social space, at which point the user could browse profiles on their mobile device if they wished to.

Beyond Profiles

While profiles from social networking sites can be useful snapshots of a person's identity and interests, they can grow stale if the user does not update them. Updating one's profile does not provide any direct benefit to the user updating the profile; it only helps others. However, there are other sources of data that we can display such blog posts, or FaceBook updates. These information sources, like Twitter, could provide a more up to date indication of what is relevant to the person in question.

The system could even display email messages from the detected individuals that had been sent to the SocialSense user. Such a feature could be very helpful in making sure conversations with colleagues didn't require repetitive explanation of unread emails.

Privacy

With any social networking application, privacy issues are crucial and this is especially true in a mobile wireless environment. The SmokeScreen system [4] allows users to engage in presence-sharing using Bluetooth IDs or WiFi MAC addresses, but provides privacy management using cryptography. SmokeScreen provides a method for presence sharing between strangers using a centralized broker service. Privacy controls can also be on the server side where the user profiles are stored; allowing users to display only limited profile information to users not on their 'buddy list'. The server could also record who retrieved a profile, providing awareness to those being looked up. Critical for privacy is making sure that SocialSense is "opt-in", i.e. you decide if you want to share your profile and who you want to share it with.

Augmented Reality

Azuma and colleagues [1] define an augmented reality (AR) system as one that combines real and computer-generated information in a real environment, interactively and in real time, and registers virtual objects with physical ones. A future AR-enabled version of SocialSense could make the retrieved profiles appear to float above peoples' heads from the perspective of the user wearing the HMD. This would make it obvious who the profiles referred to, but such a feature would require significant advances in AR technology to be practical.

CONCLUSION

We have presented SocialSense, our application for providing context to social situations by sensing Bluetooth devices and displaying nearby user profile and status information. We have developed a prototype using a HMD and the custom Magic Ring input device. The prototype works, but is too cumbersome for routine use. We believe that in time it may be possible to develop an unobtrusive version that displays helpful information about nearby people and we have mapped out several areas for future research.

REFERENCES

1. Azuma, R., Baillot, Y., Behringer, R., Feiner, S., Julier, S., and MacIntyre, B. Recent advances in augmented reality. *IEEE Computer Graphics and Applications* 21, 6 (2001), 34–47.
2. Borovoy, R., Martin, F., Resnick, M., and Silverman, B. (1998) GroupWear: nametags that tell about relationships. In *CHI 98*, ACM (1998), 329-330.
3. Costanza E., Inverso S. A., Pavlov E., Allen R., Maes P., eye-q: Eyeglass Peripheral Display for Subtle Intimate Notifications. In *Proc. of MobileHCI 2006*, (2006), 211–218.
4. Cox, L. P., Dalton, A., and Marupadi, V. SmokeScreen: flexible privacy controls for presence-sharing. In Proc. MobiSys '07. ACM (2007), 233-245.
5. Eagle N. & Pentland. A. S. Reality mining: sensing complex social systems. *Personal Ubiquitous Computing* 10, 4, (2006), 255–268.
6. Fukumoto, M. and Tonomura, Y. Body coupled FingeRing: Wireless wearable keyboard, In *Proc. CHI 97*, ACM (1997), 147-154.
7. Holmquist L.E., Mattern F., Schiele B., Alahuhta P., Beigl M. & Gellersen H.-W. Smart-Its Friends: A Technique for Users to Easily Establish Connections between Smart Artefacts. Proc. *Ubicomp*, (2001), 116-122.
8. Iwatani, Y. Love: Japanese Style. Wired News, 11 Jun 1998.
9. Kanis M., Winters N., Agamanolis S., Gavin A., and Cullinan C. Toward Wearable Social Networking with iBand, In *CHI 2005*, ACM Press (2005), 2–7.
10. Kindberg, T., Jones, T. "Merolyn the Phone": A Study of Bluetooth Naming Practices. Ubicomp 2007 In Lecture Notes in Computer Science 4717 Springer Berlin (2007), 318-335.
11. Nicolai T., Yoneki E., Behrens N. & Kenn H. Exploring Social Context with the Wireless Rope. In *Int'l Workshop on MObile and NEtworking Technologies for social applications*, 2006.
12. Paulos, E. and Goodman, E. 2004. The familiar stranger: anxiety, comfort, and play in public places. In *Proc. CHI 2004*. ACM (2004), 223-230.
13. Perkio J., Tuulos V., Hermersdorf M., Nyholm H., Salminen J. and Tirri H. Utilizing Rich Bluetooth Environments for Identity Prediction and Exploring Social Networks as Techniques for Ubiquitous Computing. In Proc. *IEEE/WIC/ACM Int'l Conf. on Web Intelligence*, IEEE (2006), 137-144.
14. Pontin, J. From many tweets, one loud voice on the Internet. *The New York Times*, April 22, 2007.
15. Rekimoto, J. GestureWrist and GesturePad: Unobtrusive Wearable Interaction Devices, In *Proc. Int'l Symposium on Wearable Computers*, IEEE (2001), 21-27.
16. Rogers, A., David, E., Payne, T. R., and Jennings, N. R. 2007. An advanced bidding agent for advertisement selection on public displays. In *Proc Autonomous Agents and Multiagent Systems*, ACM (2007), 1-8.
17. Tsukada, K. and Yasumura, M. (2002) Ubi-Finger: Gesture Input Device for Mobile Use. In *Proc. APCHI 2002*, 388-400.
18. Zeleznik, R. C., LaViola, J. J. Jr., Feliz, D. A., and Keefe, D. F. Pop Through Button Devices for VE Navigation and Interaction. In *Proc IEEE Virtual Reality*, IEEE (2002), 127-134.