iBand: a wearable device for handshake-augmented interpersonal information exchange

Marije Kanis[1], Niall Winters[2], Stefan Agamanolis[1], Cian Cullinan[1], Anna Gavin[1]

[1]Human Connectedness group
Media Lab Europe
Sugar House Lane, Bellevue, Dublin 8, Ireland
{marije, stefan, cian, anna}@medialabeurope.org

[2]London Knowledge Lab
Institute of Education, University of London
23-29 Emerald Street, London WC1N 3QS, UK
n.winters@ioe.ac.uk

ABSTRACT
iBand is a technology-enhanced bracelet that can store, display, and exchange information about you and your relationships. This exchange occurs during a common user-initiated one-to-one gestural interaction between two people: a handshake. iBand aims to leverage the familiar nature of the handshake, coupled with the qualities of jewelry to act as tangible keepsakes and reminders of relationships, to explore potential applications at the intersection of social networking and ubiquitous computing.

Keywords
Human relationships, wearable computing, social networking, context awareness, ubiquitous computing

INTRODUCTION
Initial meetings and introductions mark the first moments of building new relationships. Yet, these important moments are often awkward or forgotten, sometimes because of the natural failings of human memory (not being able to remember someone's name) or because there is a lack of a catalyst for a richer interaction. In many everyday contexts, people may not have the time to fully engage with one another at a first meeting. Perhaps email addresses or business cards are exchanged, but sometimes contacts are not reviewed or followed up on.

iBand is a wearable, context-aware bracelet that aims to address some of these issues. The device stores and exchanges information about you and your relationships. Information exchange occurs peer-to-peer and only during a one-to-one focused interaction: when two people shake hands. Information gathered and processed is reflected on the bracelet itself and can serve as a reminder or as an ice breaker for further conversation.

From among many possible gestures of greeting (kissing, hugging, bowing, etc.), we chose the handshake as the focus of the project since in many cultures it is an intuitive and natural practice that accompanies a variety of specific social events: a first meeting, a subsequent reunion, a goodbye, etc. The overall goal of the project is to augment this gesture - and the interaction scenarios that involve it - through the application of ubiquitous computing technologies, thus exploring ways to enhance the process of building relationships.

RELATED WORK
A number of earlier efforts share similar themes with that of iBand. Systems such as the Lovegety, GroupWear [1], nTag [2], and the SpotMe conference navigator [3], determine when there is a match between interests or other characteristics of both parties and notify the parties accordingly. These devices are "always on" in that users do not explicitly control the transfer of information.

Unlike the iBand, Portable Digital Proxies (PDPs) [4] are devices/applications representing users in physical space by *broadcasting* their profile, usually without explicit user action or intervention. They are characterized by being *portable*, *peer-to-peer* and *always-on*. Similarly, the concept of an Inter-Personal Awareness Device (IPAD), instantiated in the Hummingbird [5], augments a person's awareness of others by providing a continuous sense of when other members of a community are in the vicinity.

An important characteristic of the iBand is that it seeks to augment *gestural language* and leverage the social behavior of touch. Unlike the devices described above, it is not triggered by people's location, distance from, or proximity to each other. Zimmerman [6] uses touch to transmit information via a weak electrical current running between two people's bodies, but this exchange happens in the absence of any specific gesture.

SURVEY
Before building a first prototype of iBand, we distributed a questionnaire to help us gain some insight into people's feelings about personal details and contact management in general, followed by more specific thoughts about an iBand-like device. We received completed questionnaires from 30 people from a variety of cultures, with an even split between men and women.

The results of the survey were largely not surprising. Several respondents expressed frustration with the complexity and time consumption of current means of contact management. Other answers revealed that there were certain pieces of information the respondents felt comfortable having broadcast and others over which they wished to have more control, although the threshold was not the same for everyone. However, on the whole, the respondents claimed they were comfortable sharing their name, email address, time and place met, photograph, and biography with people that they shake hands with. Several

respondents envisaged using an iBand to keep track of people met in business contexts (conferences, meetings) but some also imagined social scenarios (concerts, parties).

USAGE SCENARIO

Karen and Rob are meeting each other for the first time. Both are wearing iBands. Karen has decorated hers with sparkles, whereas Rob, being a successful businessman, wears a sleek gold-plated version. They introduce themselves to each other as they shake hands. Small lights flash on their iBands, indicating that an information exchange has occurred. Certain fibers on Karen's bracelet start to glow, indicating that Rob is interested in business networking and that she has never met him before. After some initial small talk, a lull in the conversation occurs. Rob glances discretely at his iBand display, which indicates that he earlier met a friend of Karen's named Catherine. Catherine's photo is also displayed. He remembers the conversation he had with her and mentions it to Karen who is interested to hear about it. After the meeting, Karen forgets Rob's name, but gets a quick reminder when she looks down at the display on her iBand that recalls the names of the last ten people she shook hands with. She can now tell her friend David that he should go over and talk to Rob without feeling embarrassed that she has forgotten his name. Rob, meanwhile, uploads the contacts he has collected on his iBand and emails them to his business development team.

FIRST PROTOTYPE

Our first prototype is an initial step toward the device envisioned in the above scenario that includes more basic components and functionality. We wish to incrementally build toward a more complex device through an iterative process of evaluation and refinement.

The prototype is a wearable bracelet, adjustable in design for different kinds of users (male, female). When worn, the circuit board and battery lay flat under the wrist and an infrared (IR) transceiver is positioned near the back of the thumb pointing toward the hand such that it is visible to an IR transceiver on another device when shaking hands.

The user first enters contact/biographical information into a kiosk, which stores it in a database and assigns a unique ID number to their iBand. When the user shakes hands with another iBand user, ID numbers are exchanged and stored. Illumination patterns on LEDs woven into the fabric of the bracelet change incrementally to indicate the number of contacts collected and other information. When the user returns to the kiosk, it displays a list of new contacts by looking up the collected ID numbers in the database.

Handshake Detection

There are many ways to imagine detecting a handshake via a device based on the hand or wrist: Accelerometers could be used to detect an up-and-down shaking motion synchronized on two devices (a technique similar to that used in Smart-Its Friends [7]); muscle tension in the wrist or palm could indicate the user is gripping another hand; light or pressure sensors on or near the palm of the hand could detect when a hand is in contact with or pressing against an object; carefully-positioned directional IR transceivers could detect when two hands are in alignment with each other… An ideal detection system would take advantage of all of these simultaneously, and maybe others.

For this first experiment, we wanted to avoid the potential awkwardness of having sensors placed directly on the hand. Our technique uses IR transceiver alignment combined with a detected up-and-down motion synchronized on the two devices in IR contact. IR transmission is only activated when the hand/wrist orientation are within a certain range defined by a calibration phase in which the user holds their hand in "shaking position" and presses a small button on the bracelet. This, combined with the fact that an up-and-down motion must be detected at the same time via accelerometers on both devices, helps to reduce the number of unintended contacts (for example, if by chance two devices become aligned randomly while gesturing in conversation or handing an object to someone). Because it does not incorporate muscle tension or pressure, this technique also runs the risk of missing some handshakes that do not have a strong up-and-down motion characteristic (sometimes people just grip each others' hands instead of shaking). It is possible that, if told about this limitation in advance, users may be able to adapt their handshake practice to enable proper detections.

FUTURE DIRECTIONS

We are currently working toward mass production in order to undertake meaningful evaluations of iBand use in real-world situations. We are also exploring scenarios and iBand-like devices that involve other types of greeting gestures used in different cultures. We are also interested in studying how the iBand might change the meaning of the handshake and nature of social interactions involving it.

ACKNOWLEDGMENTS

This research has been supported by partners of Media Lab Europe and London Knowledge Lab. Additional thanks to Matt Karau, James Auger, and Richard Noss.

REFERENCES

1. Borovoy, R., Martin, F., Resnick, M., & Silverman, B., "GroupWear: nametags that tell about relationships", *CHI 98 Conference Summary*.
2. nTag, http://www.ntag.com
3. SpotMe Conference Navigator, http://www.spotme.ch
4. Terry, M., Mynatt, E.D., Ryall, K., & Leigh, D., "Towards Design Guidelines for Portable Digital Proxies: A Case Study with Social Net and Social Proximity", unpublished, 2001, available at: http://www.cc.gatech.edu/grads/t/Michael.Terry/papers
5. Holmquist, L.E., Falk, J. & Wigström, J., "Supporting Group Collaboration with Inter-Personal Awareness Devices", *Personal Technologies*, vol. 3, no. 1-2, 1999, pp. 13-21.
6. Zimmerman, T.G., "Personal Area Networks: Near-field Intrabody Communication", *IBM Systems Journal* vol. 35, no. 3-4, 1996, pp. 609-617.
7. Holmquist, L.E., et.al., "Smart-Its Friends: A Technique for Users to Easily Establish Connections between Smart Artefacts", technical note, *Proceedings of UbiComp 2001*.