From Mobile to Wearable – Using Wearable Devices to Enrich Mobile Interaction

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Abstract
In the last decades, mobile phones have turned into sensor-rich devices that use different built-in sensors such as accelerometers or gyroscopes. The sensors have enriched the interaction possibilities, allowing, for example, gestural interaction. With the prevalence of wearable devices and peripherals, such as fitness bracelets and breast straps, the input and output possibilities can be further extended with both new sensors and actuators. Current applications could benefit from them, and entirely new applications could be designed. The design space for new applications needs to be identified, which will again drive advances in mobile and wearable computing. This workshop sets focus on wearable devices as means to enrich smartphones and their interaction capabilities. We will discuss the new design space and generate ideas of new applications. Furthermore, we will provide sensors and actuators allowing the participants to implement rapid prototypes of their novel application ideas.

Author Keywords
Workshop; Wearable Computing; Smart Garments; Interaction; Sensing; Actuating;

ACM Classification Keywords
H.5.m. [Information Interfaces and Presentation (e.g. HCI)]: Miscellaneous

Introduction

During the development of mobile phones, the input and output possibilities have dramatically changed. In the mid 90's, mobile phones used to have only physical buttons for input and a small display for output. Since the introduction of so called smartphones, touchscreens and sensors such as accelerometer and gyroscope became the de facto standard for additional input in mobile phones. Particularly the input possibilities broadened as new ways of exploiting sensor technology for increased interactivity were developed. In recent years, wearable devices and sensors, such as fitness bracelets, breast straps that measure the heart rate, or smart garments have arrived on the mass market. Wearable devices connect to a smart phone and provide their sensor data to be analyzed and utilized by various applications. For example, bracelets with accelerometers and gyroscopes are able to infer the user's activity (e.g., [2, 7]). Smart garments can analyze the users posture (e.g., [3]) and other physiological properties (e.g., [4]), or simply be used for input and output (e.g., [5]).

In the future, the number of available sensors and other wearable peripherals for smart devices are expected to continue growing. More physiological data will be available through, for example, pulse sensing wristbands or the integration of heart rate sensing chest straps into everyday life garments. In addition to enabling gathering new data, the data is envisioned to be open and accessible for other applications and context (e.g., in-car interfaces [6] or public spaces [1]). Overall, with the new wearable sensors, mobile technology can become more aware of the users, their activities and the physical and social elements of the context of use. Considering innovation and new applications, the issues are not anymore about lacking building blocks they are about how to utilize them in a meaningful way. What new kinds of services and mobile experiences could be built with them?

Objectives

In this workshop we invite contributions that address the question of how to utilize the emerging wearable enablers for richer mobile experiences. To give a few examples, we see the following areas as something that could benefit from new wearable sensors but we also invite position papers outside these topics.

- New Sensors and Actuators to enrich Mobile Devices
- Defining Interfaces between Wearable and Mobile Devices
- Privacy and Security of Wearable Devices
- Exploiting Wearable Devices in different Contexts
- Heads-up and Hands-free interaction with the Ubiquitous Information
- Interacting with Wearable Devices and Smart Garments
- Challenges and Opportunities of Wearable Devices for Life-logging and Quantified Self

Detailed Plan for Conducting the Workshop

The workshop is planned as a full-day workshop. The focus of the first session will be on short presentations of the participants and an ideation session. In the second session, the participants will split up in groups and create rapid prototypes of their ideas. First, the workshop starts with an introduction to the overall workshop topic as well

as very short introductory building familiarity among all the participants (9:00-9:20). Next, the accepted submissions will be presented in short talks (e.g., using pecha kucha style) (9:20-10:00). This is followed by an ideation session to create ideas how wearable devices can be utilized to enrich the interactivity of mobile devices and enable new services. Thereby, different breakout sessions are planned in different groups allowing the participants to engage with as many people as possible (10:00-12:00). In the afternoon session, participants receive a brief introduction to the sensors and actuators that are available (14:00 - 14:30). We will provide different types of sensors and actuators and introduce an easy way to use them within the Android system to build prototypical applications. Next, participants will create prototypes of the before generated ideas (14:30-16:30). We will assist the participant in the development process if necessary. As a wrap up, the participants will present their prototypes (16:30-17:00).

Expected Participants and Selection Process

We plan to bring together researchers, students, and practitioners that are interested in the workshop topic. We address a broad range of participants with different backgrounds including but not limited to design, computer science, and social science. Workshop candidates have to submit a position paper that fits the overall workshop topic. We will select participants based on the relevance as well as quality of their work. The number of participants will be limited to 20 participants to be able to provide enough sensors. All submitted papers will be reviewed by a group of experts in the field.

Outcomes

The intended outcomes of this workshop are the following:

- Bringing together researchers and practitioners to discuss the design space of wearable sensors and actuators with mobile devices.
- Identifying potential application areas where to invest research efforts in the future.
- Identifying challenges in designing and developing applications in this field

Organizers‘ Backgrounds

Stefan Schneegass is a Ph.D. student at the Human-Computer Interaction group at University of Stuttgart. Since he joined Albrecht Schmidt‘s group in 2012, he worked on several projects founded by the European Union such as pd-net, meSch, and SimpleSkin. He is interested in ubiquitous computing (UbiComp) and human-computer interaction (HCI). His particular interests are in wearable computing and smart garments.

Sven Mayer is a Ph.D. student at the University of Stuttgart. He is in the German research foundation (DFG) funded cluster of excellence for Simulation Technology. His research is about modeling of human behavior patterns for interactive system. Furthermore, he is interested in human-computer interaction (HCI).

Thomas Olsson is a post-doctoral researcher at Tampere University of Technology. He has been studying user experience of various mobile and ubiquitous systems and interaction technologies, and he has a broad experience in different design methodologies. Most recently, he has focused on designing for enhancing co-located social interactions with mobile and wearable technology in two Academy of Finland projects.

Kristof Van Laerhoven obtained his Ph.D. at Lancaster University (UK) and his M.Sc. degree at the University of Brussels (Belgium). He heads the Embedded Sensing Systems group at the University of Freiburg (Germany). His research combines sensing systems with pattern recognition and machine learning, to obtain adaptive and power-efficient systems. These are especially applied in the challenging scenarios of wearable systems and wirelessly connected networks. Kristof was the program chair of ISWC 2010 and general chair of ISWC 2013. He has published highly cited articles on wearable activity recognition.

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