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# Mobile Collocated Interactions With Wearables

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**Abstract**

Research on *mobile collocated interactions* has been looking at situations in which collocated users engage in collaborative activities using their mobile devices, thus going from *personal/individual* toward *shared/multiuser* experiences and interactions. However, computers are getting smaller, more powerful, and closer to our bodies. Therefore, *mobile collocated interactions* research, which originally looked at smartphones and tablets, will inevitably move towards fully integrated wearable technologies. The focus of this workshop is to bring together a community of researchers, designers and practitioners to explore the potential of extending *mobile collocated interactions* from, through and around the body using wearable technologies.

**Author Keywords**

Collaboration; embodied interaction; wearables; multi-user; jewelry

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.



**Figure 1.** *hipDisk* leverages social aspects of collocation to engender other kinds of collaboration.



**Figure 2.** *hipDisk* exploits changing relationships between torso and hip to actuate sound.



**Figure 3.** People making rhythmically and sonically complex sounds together.

## Introduction

### *Mobile Collocated Interactions*

Research on *mobile collocated interactions* [5][6][9] has been focused on situations in which collocated users engage in collaborative activities using their mobile devices, going from *personal/individual* toward *shared/multiuser* experiences and interactions.

A variety of means have been explored to encourage people to share devices, to create a collective experience or reach a common goal. Various physical and social contexts of use have been taken into account: at the office [5], at home [6], outdoors [2], in a theme park [3], in a pub [6], and in rural developing-world contexts [11]. Most of this research has been focused on smartphones and tablets.

### *From Device-Centric to Experience-Centric*

The resulting *mobile collocated interactions* seem *device-centric* rather than *experience-centric*. An exception is Blast theory's *Can You See Me Now?* (CYSMN?) [1] a multi-player pervasive game that combines online players with a group of collocated street-based runners. CYSMN? engages critically with the ubiquity of mobile devices, and engages people in the act of gaming and connection in unique ways, extending user and audience affect through visceral gameplay. As a mobile interaction framework, CYSMN? places devices at the service of enriched experiences.

At the other extreme, *hipDisk* [12] (Figures 1-3) leverages the powerful social possibilities of collocation and embodied engagement, yet overlooks the technological possibilities. Collocated users of *hipDisk* may play music together, and thereby enjoy a heightened experience of its use. Yet no change in the

functioning of the technology occurs to support or extend this shift. Similarly, Hug Shirt<sup>1</sup> captures temperature, heart rate, pressure and location of touch when capturing a hug, to recreate this 'hug' in the paired shirt. When used in demos, it collocates a pair of shirts to demonstrate the valence of 'sharing' hugs from a distance. What might be possible if Hug Shirt leveraged what can be afforded by technological collocation?

### *Mobile Collocated Interactions with Wearables*

Wearables are becoming increasingly prevalent. Computers are getting smaller, more powerful, and closer to our bodies, and clothing that incorporates interactive and responsive technologies is becoming commercially viable. Wearable gadgets (e.g., Glass<sup>2</sup>) provide extended capabilities for the wearer, yet tend to minimize the rich sensorial aesthetics of experience, of being in constantly intertwined experiential relationship with our surrounds and other people.

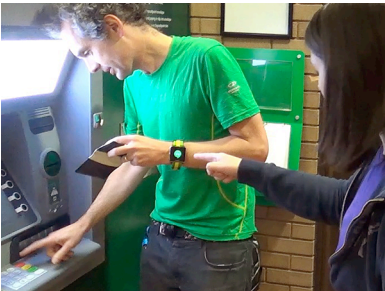
As more people wear technology, situations where there are multiple persons present with wearables will become commonplace. In those situations, wearables could support collaborative tasks and experiences through multi-user applications. One such example is *It's About Time* [10], which explores extending smartwatch interactions to turn personal wearables into public displays. Three technology probes were created that publicly show wearer's content (i.e., when their next meeting starts) (Figure 4), glancer's content (i.e., missed messages) (Figure 5), and public content (i.e., timely information such as news or weather) (Figure 6).

<sup>1</sup> Hug Shirt. <http://cutecircuit.com/collections/the-hug-shirt/>

<sup>2</sup> Google Glass. <https://www.google.com/glass/start/>



**Figure 4.** Displaying smartwatch wearer's content, indicating that they are late for their next meeting.



**Figure 5.** Presenting glancer's content on a smartwatch, with info about a new voicemail message.



**Figure 6.** Showing public content on a smartwatch, with information that it's going to be cold later.

#### *From Device-Binding to People-Binding*

Existing binding methods designed for computers, smartphones and tablets are not necessarily applicable to wearables, which may be far more personal and intimate. For example, while touching can be a natural way of selecting another user's phone or tablet, it might be inappropriate when the device is head-mounted, or centered on the torso.

Current methods for *mobile collocated interactions* do not take advantage of unique features of wearables that could enable more natural and innovative ways to form groups [4]. If we consider wearables as already attached to their owners, binding of multi-user wearables can form through people's social interactions. A handshake may indicate a level of acquaintance, prompting wearables to connect and share business contacts. A hug, on the other hand, is more intimate, and may prompt the transfer of more personal information. Pairing with the previously mentioned Hug Shirt could be achieved through similarly physical acts such as grasping or hugging. Possibilities such as these call for new research from various domains on group binding methods for connecting wearable devices.

This workshop asks what might it look like if the sophisticated knowledge of *mobile collocated interactions* was leveraged to generate powerful experiences such as CYSMN?, hipDisk and Hug Shirt. Might researchers be able to develop wearables that speak to the rich gamut of embodied experience, while bringing sophisticated advantages of technological collocation?

#### **Workshop Goals**

In previous workshops on *mobile collocated interactions* at MobileHCI '11 [9] and CHI '15 [7] (Figures 7 and 8), several challenges were identified as core to this research area: group size, physical distance, device-binding, operating systems, privacy, extending to public displays and tabletops, and in-the-wild evaluations. One question that remains unanswered is *how can we move beyond just designing (for) gadgets?*

As wearables gain popularity, we will need to consider situations where people want to use a rich ecosystem of wearables to engage in *mobile collocated interactions*. Such interactions may include clothing, accessories, prosthetics, and jewelry, as well as other wearables, not yet envisioned. It is imperative that this research area move beyond gadgets.

In this workshop we will continue exploration of *mobile collocated interactions* with a focus on fostering deeper understanding of designing and evaluating interactions with wearables. The goals of this workshop are:

- Identify key opportunities for *mobile collocated interactions* with wearable devices.
- Investigate how devices will be bound together.
- Consider more intimate or personal ways for interaction, as these devices get closer to our bodies.
- Explore interaction paradigms that can be (re-)appropriated for such interactions.
- Examine adequate ways of prototyping and evaluating such systems.

#### **Workshop Plan**

The aim is to bring together a mix of researchers and practitioners from interaction design, human factors,



**Figure 7.** CHI '15 workshop (morning session): individual presentations were followed by group discussions where relevant topics were identified for the afternoon.



**Figure 8.** CHI '15 workshop (afternoon 'hands on' session): we used LightBlue Beans ([punchthrough.com/bean/](http://punchthrough.com/bean/)) to create working prototypes. For this MobileHCI '15 workshop, the 'hands on' session will focus on the body and its capacity for movement and connection, rather than on technology.

computer science, art, and HCI, interested in exploring *mobile collocated interactions* with wearables.

The first half of the workshop (the morning) will be dedicated to introducing emerging forms of *mobile collocated interactions* with wearables, and presentations of attendees. Time will also be spent preparing a list of topics for the afternoon.

The second half of the workshop (the afternoon) will consist of a 'hands on' session, where we split into three teams and create technology scenarios based on a specific aspect of *mobile collocated interactions* with wearables (presented or identified during the morning session). We will scaffold this activity by introducing participants to Lundgren et al.'s design framework for mobile collocated interaction [8]. We will have on hand a range of technologies and strapping to attach ad hoc devices to different parts of the body. Instead of starting with a brief that takes its origin in technological potential, we will begin with the body and its capacity for movement and connection. This approach supports conceptualization of technology scenarios that are experientially rich. It fruitfully destabilizes assumptions, and affords the emergence of novel outcomes. The results of the workshop will be summarized and published on the workshop's website<sup>3</sup>.

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