Social display...We can see what you are doing on your mobile device

Social Display…We Can See What You Are Doing On Your Mobile Device

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Abstract

Mobile devices have become powerful in terms of
computing and supporting various human activities.
People have moved some of their activities that earlier
have been done with dedicated artifacts to mobile
devices. However, due to the rather private and
personal interfaces of mobile devices, activities that
earlier were easily observable by surrounding others
have become private, decreasing the surroundings
people's awareness of a mobile user's activity and the
possibilities for serendipitous interactions. We
developed a prototype called *social display;* it provides
light-weight visual cues about mobile user's current
activity with the device. The cues are displayed on a
second display attached to the backside of the user's
mobile device. We present the concept, explain the
design decisions and briefly report key findings from,
first, a focus group study and, second, a field trial
study.

Author Keywords

Collocated interaction; activity awareness; social
interaction; face-to-face interaction; backside display;
social display; personal interface; user trial; field study.

ACM Classification Keywords

H.5.3. Information interfaces and presentation (e.g.,
HCI): Group and Organization Interfaces.

Introduction and Related Work

Mobile devices have enable people to be increasingly connected to remote others. Consequently, some people are very engaged in the activities with their mobile devices and tend to create a private mobile bubble around themselves [9], becoming absent-minded to surrounding people and joint activities [7]. This behavior is considered to be disturbing for those around mobile device users: a growing number of initiatives calling for actions to remind mobile device users to pay more attention to the surroundings. Some examples of these include "Not on app store[1]", "Stop Phubbing[2]", and "Look Up[3]".

Mobile devices are understood and used as personal devices [2]. Their design, especially the small screen size, is suitable for personal use. Sharing a mobile device with others – even though is possible – requires extra effort from co-users regarding both observing the output and providing input and maintaining their attentions to the activity performing with/on the device [8]. Furthermore, current mobile devices enable a broad range of activities that used to be carried out with dedicated physical artifacts. Many activities that used to be publicly observable have become private. The increased privacy has decreased approachability and thus the possibilities for serendipitous interactions. For example, reading a physical newspaper allows others to see what one is doing, or even guess which section s/he is reading. In a close relationship, the other could ask about the content one is reading. Similarly, browsing photos or watching videos on mobile devices have lost some of the social elements that physical photo and television used to provide, e.g. a joint focus or a shared interface. This creates a design space for technology itself to increase activity awareness and create more shared experiences in situations with collocated people.

Awareness of others has been defined as "*understanding of the activities of others, which provide a context for your own activity*" [1]. While most of awareness system focus on distributed contexts, we are interested in the awareness of people around a mobile device user about the user's activities with his/her device – we refer to this as surrounding people's *activity awareness*. We introduce *social display*, a second display on the backside of a mobile device, which provides visual cues to increase activity awareness.

Two-side display, in general, is not a totally new concept. These have been explored in, for example, face-to-face interaction between a customer and a service provider at a service counter with a desktop computer [3]. Kleinman et al. explore two-screen laptop with features similar to social network services aiming to invite and support social interaction between laptop users and surrounding people [6]. Commercial products from Yotaphone [10] and InkCase [11] also offer a second screen on the backside of a mobile phone as a supplementary information channel. These products, however, are intended for personal use. Differently from previous work, *social display* aims to

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[1] http://notonappstore.com/

[2] http://stopphubbing.com/

[3] http://bit.ly/1s2h19J

Figure 1. Top: A visual cue on social display about the activity a user is doing with the mobile device. Bottom: physical design of social display. A hinge enables the user to hold the phone without covering the display

use an additional display as a channel to increase activity awareness.

Design and Implementation of Social Display

Social display adopted an iterative design process. The concept was first introduced in a focus group through scenarios and paper-based mock-ups. We explored the perceived opportunities and challenges of the concept with both scenario-based interviewing and by co-designing the visual cues together with the participants. The focus group discussions and co-designing showed promising results in terms of the potential of social display in increasing activity awareness [5]. However, there were also concerns, particularly regarding self-presentation, privacy management, visibility of social display to others, and social norms constraining others not to look at any displays of personal devices.

After the focus group study, we built the Social Display application as a proof-of-concept, intending to explore the actual user experiences and see the effects on activity awareness. Social display application is an Android application utilizing an off-the-shelf 3.5-inch e-ink display from InkCase [11] as the secondary screen that is attached to the backside of a smartphone. The phone is connected to the second display through Bluetooth. The application manipulates the display via InkCase framework[4]. The main feature of social display is to automatically present a visual cue of what the mobile user is currently doing on their devices: it shows the name and icon of the currently used application on the smart phone. The application keeps track of the

activity by creating a service running in the background of the phone to identify the active application. Every time the active application changes, the service creates an image file that contains the icon and the name of the application and sends it to the second display. Figure 1 top illustrates a visual cue of a user's activity. A pre-defined image is shown when a user is not using any particular application (for example, in the case of home screen or the phone is locked). This picture can be changed by choosing an image from the phone gallery.

The second display is physically attached to the back of a phone slightly under the camera. There is a hinge connecting the phone and the display together. This hinge allows the users to hold the phone without covering their hands covering the second display (Figure 1 bottom). The detailed results of a field trial of this prototype are presented in [4].

In addition, we have also designed and developed a location-based feature. This allows the user to determine and control the visual cue according to the location (e.g. at work vs. in transit) and save as profiles. A profile is automatically activated based on the user's current location and user-defined geographical areas. The location is currently identified through the user's cellular or Wi-Fi connection (e.g. if the phone is connected to a school or workplace hotspot, home Wi-Fi, or using mobile data connection). This feature was not included in our field study but we are planning to evaluate it in the future as it was

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[4]
http://developer.inkcase.com/projects/inkcase/wiki/Build_your_first_application_for_InkCase

frequently mentioned and brought up during the focus group discussions.

Acknowledgements

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