Mobile Collocated Interactions: Taking an Offline Break Together

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According to Cisco, in 2012 we surpassed the point where there are now more mobile phones than people on earth (there are also more people with access to a mobile device than a toothbrush). What used to be mostly a device for professional use is now permeating every aspect of our lives. Today's mobile devices allow us to stay in touch, document our lives, buy our groceries, find our way to our next appointment, and read a good old book. People often say they feel "naked" or that they are missing something when they forget their mobile phone back at home or at the office. We are also getting our first mobile phones at an ever-younger age. In Finland, where part of this work took place, children get their first mobile phone at age seven (together with the keys to their family's home). As we can see from these examples, mobile phones have become our companions, witnesses to our lives. However, this has all come at a cost, a social cost, perhaps.

Sherry Turkle discusses some of the anti-social consequences that mobile phone use has had among teenagers in the US, critiquing *networked life*. A life where we become inseparable from our smartphones, where our social lives are happening online, where devices become substitutes for connecting with each other face-to-face, and where we would rather text than talk [1]. Indeed, we do see some of these symptoms popping up too in other places such as Finland, Wales or Chile. The truth is, we are spending an awful amount of time emailing, texting, facebooking, and twittering in our western world [2]. Our relationships with each other are mediated through a screen as opposed to happening directly in a park, café, pub, or living room.

But there is hope. The very devices that have partly taken away the human touch from interpersonal communications could be the key to re-establishing and enriching face-to-face, physical interactions.

Towards Shared and Collocated Use of Mobile Devices

Mobile phones were originally conceived and have traditionally been utilized for personal use. In western culture, we are not supposed to ask for a family member or a friend's mobile phone and freely start browsing through their list of contacts, collection of photos, or the websites they have visited. Perhaps, on occasions, people may pass their phone around and let others manipulate their device to show a photo to others. In other cultures, sharing comes naturally either due to economic pragmatics or because community rather than individual outlooks are prioritized. By and large, though, in western contexts, it will take a major change in people's current use of mobile phones to open up to the opportunities that shared use of mobile phones have to offer.

For the past three years, we have been looking precisely at this issue. Are people willing to share their mobile devices and engage in collaborative interactions? Using new display, sensor, and short-range communication technologies, we envision situations where collocated users engage in collaborative activities using their devices, thus going from *personal-individual* towards *shared-multiuser* experiences and interactions. We have explored mobile collocated interactions, encouraging people to share their devices to create a collective experience or reach a common goal. Various physical and social contexts of use have been taken into account, such as teamwork at the office, sharing media content at home, and public expression in a pub (Figure 1), and for sharing educative stories in rural "developing world" contexts. In this article, we will reflect on some of the issues and challenges people will face once mobile collocated interactions become commonplace.

Figure 1. Participants collaboratively creating comic strip panels during the *MobiComics* evaluation. Mobile Collocated Interactions provide a way to disconnect from the network for a while and engage in face-to-face social interactions.

Taking an Offline Break

Consider the amount of time you spend managing your life on your social networks. All this online activity must come at the expense of face-to-face communications. We are spending less time physically with each other and more time with our mobile devices. And when we actually do get together, people seem to be glued to their screens often ignoring those around them; avoiding eye contact [1]. Inspired by Turkle's arguments, we think it is time to lift our heads up away from the screen and start noticing others who surround us.

Figure 2. Participants sharing photos using their mobile devices with *pass-them-around*. The two people on the left look at the presenter as he tells the story behind his pictures.

Mobile collocated interactions offer a way to disconnect from the network for a while and take a break. This downtime supported by mobile phones could provide the necessary space to nurture our human relationships and make room for reflection [1]. To achieve this, we have been looking into human activities that are currently supported by digital technology, and we have decided to provide a humanistic alternative [3], especially for those interactions that benefit from face-to-face communication.

One such example is photo sharing. Online photo sharing services such as Flickr or Photobucket offer many benefits, however, they lack the richness of social interaction when compared to sharing paper prints between collocated users [4]. In Figure 2, we see four persons discussing photos face-to-face using *pass-them-around*. This app uses the metaphor of passing paper prints around whereby each mobile phone becomes a physical container of individual photos.

What we see here is the type of mobile collocated interactions where attention naturally shifts between the artifact (the photo) and the presenter. In this case, while the presenter is telling the story behind this particular picture, the two people on the left are looking directly at him, while the presenter and the person on the right are looking at the photo. This type of interaction, mediated by mobile phones, fully supports the richness of social interactions, while at the same time taking full advantage of digital technology. For

example, the app also contained a way to easily duplicate images, an automatic slideshow, and ways to tile devices together to create a larger joint display.

Creating Joint Attention

When using their mobile phones, people have a tendency to hold their devices with one or two hands with the screen facing towards them. People will usually adopt a particular device position, combined even with a second hand to cover the screen up, either to browse private content such as a confidential email, or to avoid glare on the screen. We are accustomed to manipulating our mobile devices this way and, as we all know, old habits are hard to break.
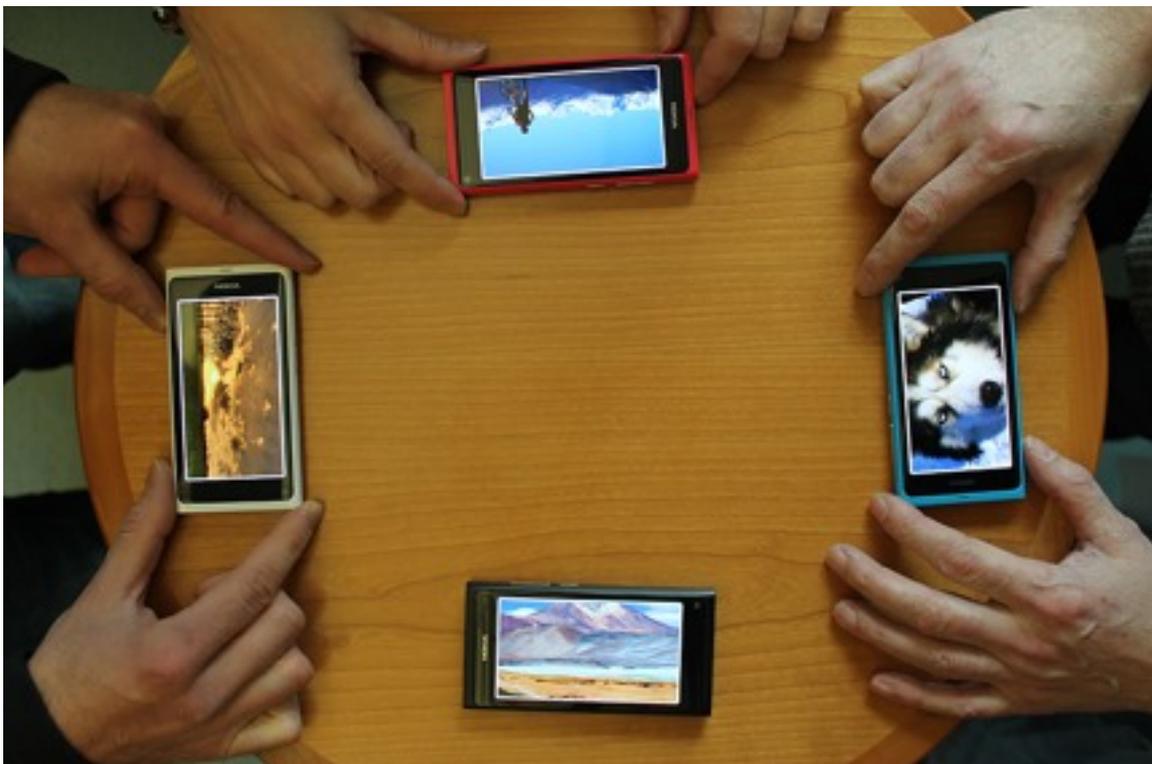

Figure 3. Participants keeping their mobile devices on the table to create a common workspace. This configuration allows those involved in the interaction to extract information about the current state of the interaction.

For people to fully benefit from mobile collocated interactions, they must open up and start seeing their personal devices as shared public devices. In mobile collocated interactions, phones are at the intersection between fully personal and fully shared use. This basic principle is exploited by board games that combine the individual use of tokens, money and cards, with the shared use of the dice and board. The mobile phone will sometimes behave as a token, and will sometimes be part of a larger board. In mobile collocated interactions, people should ideally be able to make both individual moves, such as for browsing private content, as well as playing together. The shared uses will usually entail keeping the device flat out on a table or projecting information on a wall so that all people, or at least more than one person, can comfortably see the shared

content and get information about the current state of the interaction. People should be able to perceive the interactive space created by these shared devices as one entity. Siftables [5] are a good example of small mobile devices that show this type of behavior.

Figure 4. One participant points to the photo shown on the next device to his right, thus refocusing the group's attention to that particular device during the *pass-them-around* evaluation.

In Figure 3, we see how four devices create a common workspace. In this example, people are passing photos around a table, one by one, in sequence. When the owner of the photo collection passes on to the next photo on their device, the remaining three devices also respond by automatically passing on to the next photo. What this creates in practice is that each person is free to decide whether to look at the photo on their device, across the table, or right next to them. Any change in the photo sequence will be automatically reflected on all devices simultaneously and so everybody will be aware of how the state of the interaction has been changed. If some participants were to be holding devices in their hands, the illusion of creating a shared space would be broken. In Figure 4, we see how the participant on the bottom left is pointing to an interesting photo (or part of it) shown on the next device to his right, thus drawing the attention of the group and the discussion to that particular device. The app also allows people to create group huddles and discuss photos together by tiling devices to create larger displays (Figure 5).

Figure 5. Different group huddles are created by combining a) two devices b), three devices, c) four devices into two separate tiles, and d) into one large tile that includes all four devices.

What we have observed in our evaluations is that people do see the benefits in creating such shared interactive spaces and are genuinely positive about the possibilities these device ecosystems can open up. For instance, when tiling devices to display a composite larger version of a photo we were surprised to see that people did not complain much about how bezels (the screen borders) sometimes partition the photos. As mentioned earlier, however, people have the tendency to see the mobile phones as personal devices and so it will take some time for people to see the benefits of such interactions and massively adopt them.

To effectively create joint attention between groups of collocated people, the number of participants involved in the interaction should fall in the range between two and ten participants. Beyond that, not all users will be able to comfortably perceive the displays of the mobile devices as part of a common interaction space. Larger public displays such as LCD screens and projections can then be added to create broader ecosystems of interaction [6,7,8].
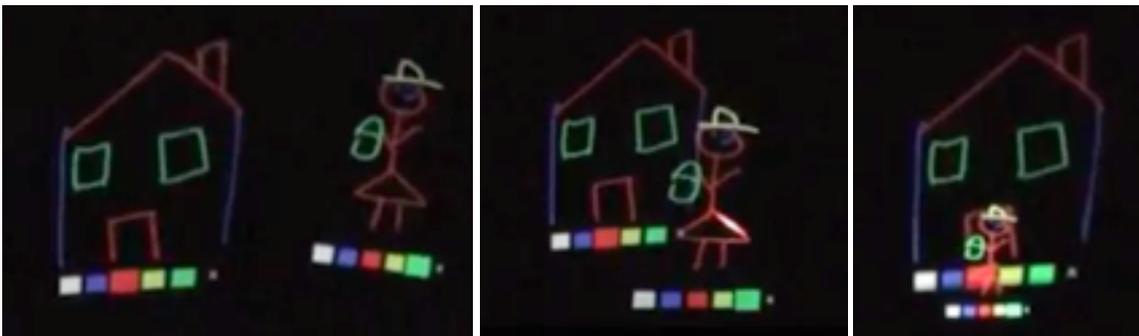
Figure 6. Sketching and projecting to create a shared story. Bottom: two users collaborating to animate the PicoTale.

Large-Scale Sharing

In the PicoTales prototype we explored the feasibility and value of creating a much larger shared storytelling surface by combining projected output from interlinked mobiles [9]. Each user sketches on the touch screen display of their device, and this image is projected via an attached small projector.

The images can be animated by the user, whose arm movements are recorded by the device's onboard sensors, with no additional infrastructure – such as depth camera – needing to be deployed in the environment. Figure 6 illustrates the collaboration between two users, who are creating a story together. When they have finished, the system uses the sensor data and sketch content to create a video representing the users' joint efforts; this video can be replayed later on each person's mobile, emailed, or shared via a social

network. The current prototype allows up to four people to use their mobiles together but in principle the approach is only limited by the physical projection space available.

Initially we imagined PicoTales being used in range of "developed world" scenarios – in classrooms as part of a lesson; and, at home perhaps as part of a "draw something" style game. In our work, though, we've been increasingly involved in considering rural, "developing world" contexts and these present interesting possibilities for shared interactions. One storytelling project found that technology that forced individual and restricted collaboration was ill received by the community [10]. In contrast, PicoTales could lead to more appropriate, effective group sharing.

Getting Started

People have been thinking about connecting several devices into one ecosystem for some time now. One recurring issue with multi-device ecosystems is how to get the mobile devices to "talk" to one another, in other words, how to set up the connections in an *ad hoc* way so that the devices can start exchanging information. Setting up connections between different devices is a widely documented problem for these types of collaborative interactions [6,7].
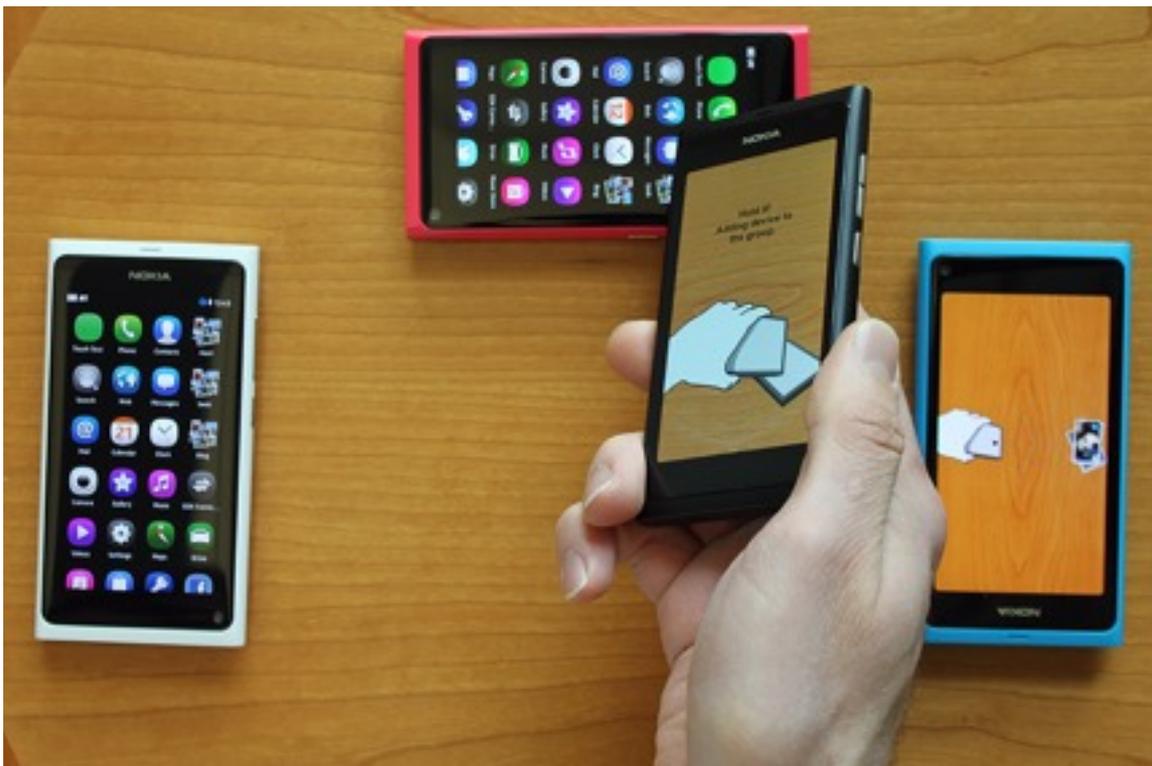

Figure 7. Using device proximity and touch interactions to connect devices together.

Unless people are able to spontaneously join a group and start interacting with others in a fast and easy way, they might lose the interest in participating in mobile collocated interactions in the first place. The technical obstacles that must be overcome are: detecting devices, identifying the correct nearby devices that will participate as part of

the group, and connecting those devices. Wireless connections do not provide the physical cues that allow us to determine which devices are connected. We build upon that lack of physical cues by using device proximity and touch interactions (together with audio-tactile feedback) to ensure that the right devices are connected. Figure 7 shows how a person holding the black device can pick which other phone to connect by bringing their device within close distance. In this example, this person has already connected the cyan phone and is about to add the magenta device. We also combine the process of opening the app together with the different device connectivity steps mentioned earlier so that they become a single seamless process as opposed to several fragmented steps.

Once people are participating in mobile collocated interactions, they should be able to just as easily leave the group, for example to go to the washroom, and then rejoin it once they are back. Participants in our studies have also requested to be able to break up a group and join it once again a day or a week later. These comments point towards the fact that people are not thinking about the hassles of setting up a group, but about the potential joys of repeatedly sharing and interacting with others in mobile collocated interactions.

Sharing Personal Phones

Going back to our initial question of whether people are willing to share their mobile devices and engage in collaborative interactions, in our studies we have found that people are concerned about letting other people handle their personal phones. Often mentioned reasons for those concerns were that they may spill drinks over the phone when using it in the context of a bar or café, or unintentionally damage it (i.e., scratch the back side when moving the phone on a surface), beyond the normal wear and tear that happens from daily use. People seemed to be more comfortable with sharing their devices with people they know and trust, such as with close friends and family members, as opposed to with complete strangers. In such cases, the owners of the phones can more safely judge whether someone will be careful with their phone or not. On the positive side, most participants felt the benefit of engaging in *ad hoc* collocated social interactions using the phones outweighed the potential risk of damaging the device. But first, we must be able to deliver useful and sensible mobile collocated experiences to people. This can then be the first step towards better balancing our *networked* life and our intimate personal life.

ENDNOTES

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