Cast Together: Inclusive and Unobtrusive Mobile Interactions with a Situated Display

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ABSTRACT

We describe our Cast Together prototype that demonstrates inclusive and unobtrusive mobile interactions with a situated display. The prototype consists of a mobile and web application, and a Google Chromecast connected to a situated display. An inclusive and unobtrusive experience is encouraged for co-located persons by sharing notifications on the display, allowing users to decide at a glance if an alert requires further attention, and sharing app launches provides others with insight into private smartphone interactions. Music and photo collections generated from social media profiles can project personalities without active engagement with a personal device. Profiles can be linked to physical objects with NFC tags, and the act of exploring collections can become a visible performance by explicitly scanning objects with the smartphone. Shared information can also be managed implicitly by hiding details when a user steps out of the room, or by reacting to a change of place. A user study with two colleagues in an office setting leads to initial insights with our Cast Together probe.

Author Keywords

Notifications, Situated Display, Smartphone, User Experience.

ACM Classification Keywords

H.5.2. Information Interfaces and Presentation: User Interfaces

INTRODUCTION

Private smartphone interactions can negatively impact a social situation by making co-located persons feel excluded [1], and interruptions can draw multiple people away from a social situation to engage with a private display ('collateral disruption') [2]. Though exclusive and engaging mobile interactions can be suitable for personal tasks, there are opportunities to support co-located persons with inclusive and unobtrusive mobile interactions, by connecting smartphones to a shared display. We define 'inclusive' interaction to mean actions produce visible effects for spectators, and performers are granted equal opportunities to share. 'Unobtrusive' means manipulations are low attention, explicit gestures or implicit by passing control to an agent. Our Cast Together prototype was implemented as a probe to investigate the impact of inclusive and unobtrusive mobile interactions in a co-located environment. In the following sections, we relate the design of Cast Together to existing work, and share the results of a preliminary user study.

PROTOTYPE: CAST TOGETHER

Google Chromecast, displayed in Figure 1 (b), is a popular low-cost solution for connecting a smartphone to an external display. Cast Together is implemented as custom sender and receiver applications for Chromecast, with screenshots shown in Figure 1 (c) and (d). The Android sender communicates via Wi-Fi with the Chromecast connected to the situated display. This app contains the cast icon that controls the display to join, and stores the following optional preferences for sharing content and controlling privacy: an alias to be associated with, a photo and music collection, and the level of detail to share about app launches and notifications.

Identity

An alias identifies a device with events on the display beside its assigned colour. A clock in the center indicates the number of connected users in the co-located group.

App Launches and Notifications

The app name, title, and message of notifications can be shared at optional levels of detail to let users negotiate interruptions at a glance, and avoid an obtrusive visual attention switch [5] to a private screen when a notification is not important and can be ignored. If an app is launched on a personal device, a visual effect is created by sharing the alias and app name on the situated display. App launches and notifications display under the appropriate heading. If a user has chosen to exclude an app from the display, only the alias is revealed. The most recent event animates in from the top, and older events hide at the bottom. When a notification is dismissed or an app is closed on the smartphone, these events animate out entirely.

Photos and Music

Social media users maintain online identities by updating profiles of historical activity. Flickr and Last.fm are web services that let users upload photos or 'scrobble' music to profiles. Cast Together provides coarse-grained control over media collections by allowing users to present themselves through these public profiles. Photos display as the background by storing a Flickr user name, or a search term for a 'favourite thing'. A music playlist is generated by entering a Last.fm user name or 'favourite artist'. The active song and photo rotates between users, and the alias associated with the current selection is indicated on the display. This automated round-robin schedule is an alternative policy to [4], which requires users to explicitly interact with a device and actively vote for songs. Photo and music collections are chosen from recent history, providing a discussion point when personal profiles are chosen, as these reflect the latest music listened to and photos shared by the user. Collections are shuffled to ensure that sessions are varied when profiles are not regularly updated. As fine-grained

(a) 'Scanning the room' makes interactions explicitly visible to observers.

(b) Chromecast communicates between mobile devices and a situated display.

(c) A mobile application stores preferences on the device and connects to the display.

(d) A web application displays notifications and app launches sent by connected devices, and shares recent photos and music from social media profiles.

(e) 'Stepping out of the room' implicitly hides personal content on the display.

(f) 'Unobtrusive' mobile interactions let users have indirect control and glanceable awareness of their devices without taking them out of a bag or pocket.
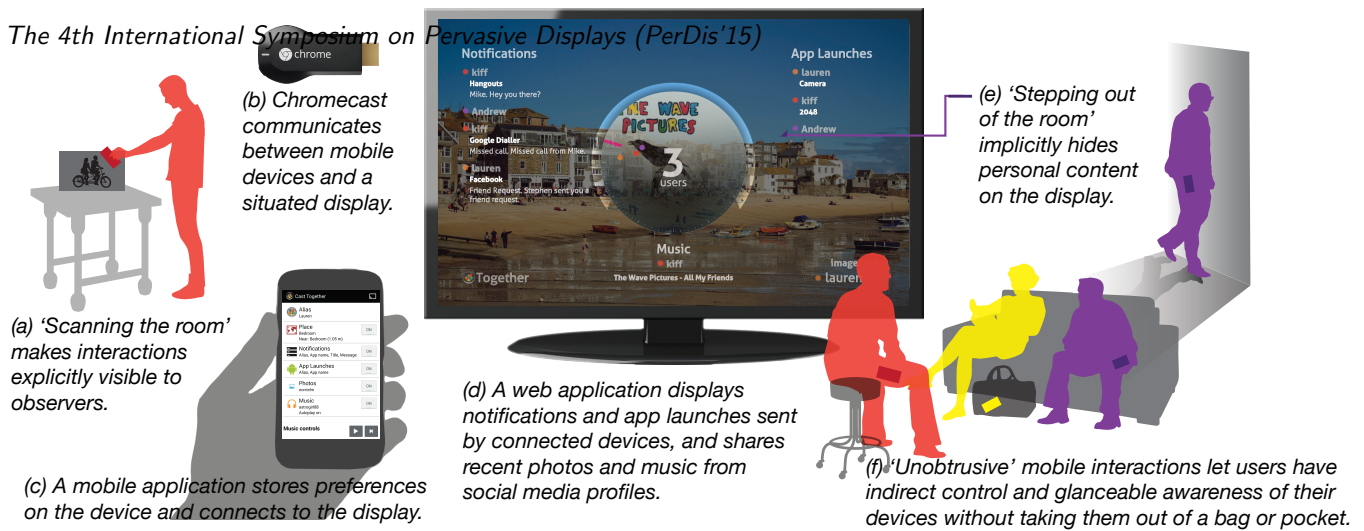
Figure 1: Cast Together is a probe for exploring inclusive and unobtrusive mobile interactions.

control is required for music playback, any connected device can change the volume, and play, pause or skip the music.

Explicit Interaction

Privacy levels and preferences of music and photo profiles can be recorded to an NFC tag, and retrieved by explicitly holding the device close to the NFC tagged object. 'Scanning the room', illustrated in Figure 1 (a), supports the idea of coupling bits and atoms [3] by relating physical objects to digital profiles. For example, a favourite artist can be linked to a band poster. NFC also allows users to 'beam' preferences to each other by holding the devices back-to-back when the app is open, making the act of sharing a visible performance.

Implicit Interaction

Sharing a full notification message is sometimes more appropriate in an intimate home environment than at work. To respect the user's privacy and reduce the need to explicitly update settings in different places, Cast Together adapts to the preferences shared with each display. Similar to proxemic interaction, events can be implicitly hidden when a user 'steps out of the room' with their device by detecting when a Low Energy Bluetooth beacon is out of range, as illustrated in Figure 1 (e). If a user 'steps out of the room', event details react to show only the alias, and animate back in when they return. Cast Together can also be instructed to automatically play music, or automatically connect to known displays when one is detected and idle, allowing the device to remain in a bag or pocket, as illustrated in Figure 1 (f).

EVALUATION AND DISCUSSION

We evaluated Cast Together for 4 weeks in an office shared by 2 motion graphics artists. App activity was monitored, and we found that Cast Together was launched in the office 119 times by P1 and 172 times by P2. Sharing notifications on the display was 'good for when we both have the same ringtone and it's ringing in one of our pockets and we don't know whose' [P1], and 'makes me more likely to get stuck in work when I'm on a streak' [P2]. This motivates the sharing of notifications to focus on a task, and to avoid collateral disruption when ringtones or notification alerts are similar to other co-located devices. P2 felt that sharing music 'was great as it stops you from listening to the same stuff' and 'the nice slideshow effect meant I could display a bunch of images for inspiration for

projects I am working on'. Connecting automatically 'was very useful as forgetting to turn it on was not an issue' [P2]. P1 positioned the NFC tags 'mainly around my desk or up on the wall to the left of me where all drawings/inspiration materials go' and were 'very handy which made it easier to change the music and images I wanted. This gave me more time to focus on my work instead of getting distracted and browsing the internet after I have picked some music'.

These initial results with Cast Together indicate several benefits of inclusive and unobtrusive mobile interaction in a co-located environment: (1) sharing notifications can avoid collateral disruption when alert tones are similar, and can support focus on a task, (2) including all users lets co-located persons appreciate the musical preferences of others, and sharing profiles can lead to serendipitous discovery of images, (3) implicit and explicit interactions can manage the sharing of content with little engagement with a personal device.

The next step will be to evaluate the impact of inclusive and unobtrusive interactions in a more dynamic social setting.

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