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Utilizing Projector Phones for Social Media

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ABSTRACT

Mobile phones are great for keeping in touch with friends, family, and coworkers, but they may also cause us to become more isolated from the outside world by focusing our attention on our own little digital world. Public displays, on the other hand, can spark discussions with those in the vicinity. A personal, portable, public display might be made possible by mobile phones with built-in pico projectors, which would combine the phone's computational and communication powers with the convenience of sharing the projected image. Making the content on the phone visible to co-present individuals may aid in bridging the gap between the digital and physical worlds and maybe improve in-person communication. We investigate projector phone applications for social computing in this study. We describe the functional characteristics and societal effects of projector phones, investigate the design realm through situations that are represented by low-fidelity prototypes, and talk about the opportunities and problems that come with design.

1. INTRODUCTION

We may maintain relationships with friends, family, and coworkers by using mobile phones. However, on occasion, they can also cause us to become detached from the outside world and focus instead on a comparatively private, intimate digital realm consisting of emails, texts, and phone conversations. Furthermore, sharing displayed information with co-present individuals is challenging due to the tiny screen size and narrow viewing angle of mobile phones. Although one can pass a phone around or hold it up for others to view, neither tactic effectively supports light-hearted, opportunistic contact or simultaneous group-based communication. In contrast, public displays have been demonstrated to stimulate discourse and interaction by presenting information to a large number of individuals at once [10, 12].

A personal, portable, public display may be possible with mobile phones that have built-in pico projectors, combining the computing and communication power of a phone with the sharing simplicity of a huge projected display. Projector phones have the potential to blur the lines between the digital and physical worlds, improve face-to-face communication, lower social barriers, and create rich visual communication because they allow users to project content from their phones onto other people and make digital information visible.

In this work, we offer scenarios that start to draw boundaries around the design space of potential projector phone uses in social computing [3]. The potential are demonstrated with lowfidelity prototypes running on the LG Expo (Figure 1), one of the first low-cost projector phones. We first discuss the technological characteristics of projector phones and the resulting design considerations, after which we evaluate relevant work. We then present a number of scenarios and low-fidelity prototypes and discuss specific opportunities and challenges in the design of these systems.





2. RELATED WORK

The usage of mobile phones and associated social practices have been the subject of several sociological and ethnographic studies [7, 14]. Social interaction with placed and public displays, including mobile peripheral displays [4], is the subject of additional research [10, 12]. Applications of projection, particularly camera projector systems, to augmented reality, tangible computing, and ubiquitous computing are the subject of additional literature [13, 16].

Applications and interaction strategies for compact, portable projectors have been studied recently. The Hotaru system introduced methods of engagement to facilitate teamwork when using projected displays [15]. Using handheld projectors and passively monitored pens, Cao et al. have demonstrated methods for interacting with virtual information spaces integrated in the real world. A range of application examples for both single-user and multi-user interaction are presented [1–2]. With WUW, also known as 6th sense, a wearable camera projector system, Mistry et al. investigated physical and gestural interaction [11].

Researchers are now able to examine mobile phones that have attached pico projectors thanks to recent advancements in hardware. The whereabouts of friends are projected onto paper maps by the Maurauders Light system [9]. Greaves and Rukzio have built a framework for collaborative media viewing and sharing with projector phones [6], and they have compared the performance of mobile phone screens and projectors for photo browsing tasks [5].



The usage of projector phones for social computing is the main topic of this study. We describe the features and societal implications of an early mass-market projector phone and offer a series of hypothetical situations meant to spark more investigation, debate, and thought.

3. CHARACTERIZATION

In addition to discussing certain design concerns, we outline the technical features of projector phones using the LG Expo projector phone's specifications as an example. Technical

specifications

The LG Expo is a smart phone running Windows Mobile that features a QWERTY keyboard, touch screen, and pen. It features a detachable, built-in projector that is directed and operated via physical sliders. The brightness of the DLP pico projector with HVGA resolution (480x320) is not specified; nevertheless, comparable versions have an output of 6-12 lumens. In strong light, the projection from the Expo is invisible. Figure 2 shows the brightness of the Expo in indoor daylighting with window curtains closed or open and an on/off incandescent overhead light. An approximately 6-foot projected image can be clearly seen from a 10-foot throw in these kinds of moderate lighting circumstances; in darker situations, Size and throw distance are both capable of more than quadrupling. Our testing show that with the projector turned on, the phone's 1500mAh battery lasts for about two hours. The camera and projector of the Expo are positioned in opposite planes and cannot be used simultaneously.



Figure 2. Indoor lighting, clockwise from top left: window and incandescent, window only, neither, and incandescent only

3.1 Design considerations

In many parts of the world, mobile phones have become commonplace, and inbuilt pico projectors allow them to be displayed in public, privately, and everywhere. Applications for projector phones can take advantage of the hardware and software found in modern mobile phones, such as those for positioning and sensing (accelerometer, GPS, Wi-Fi), multimedia capture and display (picture, video, audio), and networked communication (voice, SMS, MMS, Internet). Projector phones are relatively small, light, portable, handheld devices. By overcoming the size limitations of today's relatively small mobile phone screens, projector phones enable vision-assistive technologies and facilitate the sharing of information with multiple people at once. They also offer some of the affordances of huge displays. Additionally, projector phones allow users to mix the features of many surfaces for ad hoc displays of the projection surface, the projected content, and the motion of the projector to create meaning.

A projector phone's low brightness currently prevents it from being used in strong lighting, such as direct sunshine or a well-lit area of a conventional office; however, an application might dynamically alter letters and colors to maximize visibility based on lighting

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circumstances. The power requirements of a projector are also considerable; at the moment, continuous projection is not possible without the phone plugged in due to battery life issues. We anticipate that these restrictions will decrease as hardware improves.

The content on the projected display and the LCD display at the LG Expo are the same. Differentiating the views on each monitor could open up new applications and ways to interact with the system. Because the camera and projector cannot be used simultaneously, the LG Expo as sold does not directly enable the class of computer vision-based interaction techniques that are generally supported by camera/projector systems. Given the hardware setup of the Expo, it would be possible to lessen the requirement to look away from the projected display in order to interact with the phone (through the keyboard and touch screen) by either enabling voice activation or providing a visible indication of the user's interactions on the touch screen in the projected display.

A projected display creates an additional layer of indirection between the user of their phone and the content they are viewing; it allows information to be displayed without requiring the user to pay attention to it. As will be covered in more detail later, this indirection may let people communicate with people they might not otherwise interact with and provide information that they might not otherwise be able to convey.

When projecting from a phone, content privacy is compromised and may be viewed by uninvited parties. Users of projector phones can select from a variety of display modes (such as projector and LCD) according to factors including the quantity of viewers, security of the physical location, and privacy of shared content. Access controls, like the ones illustrated by Cao et al. [2], might be beneficial. Projection also has the potential of being intrusive; adjacent individuals may view one's display without consent, which is similar to forcibly listening in on private phone calls, and certain projection formats may not be appropriate or desired. It is conceivable that as individuals get used to this new technology, new social norms will emerge.

4. SCENARIOS

In addition to the corporate uses for which they have been advertised, we also see social uses for commodity projector phones. We examine multiple possible societal uses using a series of scenarios, accompanied by low-fidelity prototypes, to emphasize advantages and disadvantages. We analyze what is feasible with the LG Expo as a foundation for our exploration of potential applications.

4.1 Opportunistic sharing

Scenario. Bob is a PhD student who is walking down a hallway to an academic conference. As he approaches the elevator with Sally, a reputable researcher, he strikes up a conversation and provides her with a synopsis of the work he'll be presenting at the conference. When Sally requests for further information, Bob pulls out his phone and uses it to project his study poster onto the wall next to them. He zooms in on that portion of the display when Sally points to an image and asks about some of his findings (image 3). They talk about the figure for a little while longer after entering the elevator. To save a link, Sally takes a picture of the 2-D code in the corner of the projected banner using her phone to Bob's website for future reference. As the elevator arrives at Sally's floor, Bob thanks Sally for the chat and she steps off the elevator.



Figure 3. Opportunistic sharing, catalyzing conversation, humor and play, and collaborative coordination

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Discussion. Here, a mobile projector screen offers a shared visual aid that enhances a spontaneous conversation while on the road. This artifact is shared by those close to the discussion's active participants, therefore it goes without saying that public projection is inappropriate when privacy is at stake. At this point, further visual information would probably not be helpful in such an opportunistic conversation. In another example, a virtual business card is created from a displayed 2-D visual code, as explained by Kray and Rohs [8]. The projector phone is probably being held in the hand in this kind of mobile situation, which prevents the hand from making gestures or using it for other purposes. Additionally, the projector needs to be held steady for the best viewing experience; this is especially crucial when there is more throw distance or movement—or maybe both hands or rested against the body.

4.2 Catalyzing conversation and interaction

Scenario. Tim and his friend John are chatting at a party. Tim wants to talk to Jane, the girl he sees standing close, but he's a little bashful. When John inquires about Tim's recent snowboarding excursion, Tim projected a few images from the shoot onto the wall. A small number of individuals gathered around Tim and John are drawn to the photographs and start to show interest in them. Curious, Jane approaches the group to find out what they are looking at, and she strikes up a conversation with Tim about his trip (Figure 3). Tim is glad and relieved that he didn't have to gather the courage to approach her.

Discussion. This illustrates how social contact and discussion can be facilitated by a projected display. Nowadays, you can approach strangers at a party immediately and strike up a conversation; nevertheless, this direct approach requires confidence and runs the risk of being rejected. By offering a topical resource and an indirect approach, the projected photographs in the scenario lessen the social strain of making a personal introduction and "breaking the ice." Additionally, a situation could arise where an unwelcome amount of attention is drawn to a projected show due to its public nature.

4.3 Laughter and recreation

Scenario. Friendly coworkers Rick and Sue enjoy a good joke. Sue is sitting at her desk in the middle of the afternoon, beginning to feel peckish. After taking out her phone, she looks for a photo of her favorite donut from a local bakery that she and Rick go to often. She projects the donut onto the wall and begins to move it toward Rick's desk. Laughing uncontrollably, he glances up from his job and finds the projected donut floating on the wall next to him. She says, "Yes," in response to his question, "Are you trying to tell me something?" before projecting the donut onto her stomach. He smiled and considered whether to go for a snack when she projected the donut onto him little break to get some donuts onto his stomach (Figure 3), which makes him laugh and convinces him to go.

Discussion. Here, a projector phone enhances visual communication and allows for playful interaction. It allows users to infer meaning from the combination of virtual and real-world components (a donut projected onto one's tummy, for example). devouring it), making use of the projected image's size, motion, position, and content. Furthermore, we observe that projecting onto a surface is a type of virtual, visual touch that occurs at a distance. This kind of interaction has the potential to escalate into mischief (e.g., projecting a sign saying "kick me" onto someone's back) or to cross social boundaries (e.g., projecting onto parts of

the body that are socially taboo or onto an unknown individual).

4.4 Cooperative Supervision

Scenario. It is proposed that Lynne and Frank get pizza while hanging out with friends. Taking out her phone, Lynne searches the menu of her favorite pizza joint. As she projections it onto a wall, she asks the group, "What kind of pizza should we get?" "I like [another pizza place] better," comments Frank, while the others ruminate over and discuss the menu. Guys, what are your thoughts? and next to Lynne's menu, he projects the menu of another restaurant onto the wall. Frank projects his menu somewhat higher than Lynne's when a friend of theirs points out a pizza that looks good (Figure 3). Lynne grabs her phone and places an order for a pizza from a different acquaintance down off the wall to slightly magnify her projection, then starts to cover Frank's menu with hers. Frank and Lynne are still fighting it out for projection supremacy as they try to get everyone to decide which pizza joint they like most, until someone makes a choice.

Discussion. In this instance, several projected displays facilitate group decision-making. A huge group could not share such a display simultaneously, as they do in this scenario. Currently, a small number of individuals can share a physical or digital menu (e.g., on a phone or laptop). Additionally, a number of screens can increase the display space and allow other people to contribute their own viewpoints. We also see how people may suggest or compete for priority based on the spatial placement (size, location, organization, etc.) of projections.

4.5 Situated display

Scenario. When Kyle awakens, he looks at his surfboard next to his bed. When his alarm goes off, he has set his phone to project a display onto the surfboard (Figure 4). He notes that his friend Anne wants to go surfing and that the wave forecast seems nice. Before work, he gives her a call and they get together for a quick surf. Kyle places his phone on his desk in the office later, and it displays an ambient display onto the wall next to his monitor. It displays the responsibilities and availability of his coworkers, project status updates, and a few of his favorite private images. His coworkers can see it with a quick glance in his direction, and he can see it out of the corner of his eye. He decides on a task from his list of things to accomplish and makes it clear he doesn't want to be bothered. Every now and again he glances up and finds a picture of himself, which makes him happy. He signals that he is available and gets to work on something else. After one of his colleagues approaches him to talk about a project, they strike up a conversation about some projected pictures of each other that they both find interesting. This allows them get to know one another better.



Figure 4. Situated display, personal Expression,

Discussion. This example shows how a projector phone can be used as a stationary, public, or personal display. Without becoming overly distracting, a display like this might promote social awareness and offer ambient information. Because of its mobility and sensing capabilities, the projector phone eliminates the need for



various specialized peripheral display devices (like Chumby) and allows the contents of the display to be customized to the specific situation (such as the projection surface, location, activity, and persons nearby). However, for this use case, the phone must be hooked in (to a USB port or electrical outlet, for example) and the display must be pre-configured in order for it to be viewed.

4.6 Advertising and self-expression

Scenario. Jerry projects vibrant colors into the ground as he makes his way to the train, matching his wardrobe and cheery music to brighten the gloomy day. You can see his virtual business card at the edge of the screen that is projected. He is sitting next to a girl on the train who is frowning at him. She is dressed in black and there is a projection of dark red flames dancing around her favorite singers (Figure 4). When her flames hit his leg through his jeans, he steps over. Upon arriving at work, his coworker Lauren remarks that he must be in a good mood based on his upbeat demeanor.

Discussion. Here, a projector phone produces a dynamic, one-of-akind backdrop that conveys a person's personality and sense of style. It can promote commercial interests like business cards or fliers, or it can promote personal interests like bumper stickers and t-shirts. On the other hand, there are several reasons why one's personal projection could bother other people. There are a few possible reasons why someone would not want to witness the projection: it could be offensive, the projection surface could be limited (such as a public building or an unfamiliar individual), or both. As explained here, sustained projection would necessitate a longer battery life than those offered by existing devices.

5. Conclusion

Through a variety of situations, we have started to map out the design space of possible projector phone apps for social computing. using low-fidelity prototypes. A few factors that can be utilized to classify this design environment are the projected usage, participant roles and relationships, the impromptu nature, length, and movement of conversation, and the requirement for privacy. We've examined situations where projector phones can encourage playful engagement, chance-based sharing, and dialogue. group collaboration, placed presentation, and individual communication. We've talked about how personal projection on-the-go could improve awareness, reduce social barriers, and improve communication. Furthermore, it might breach the confidentiality of the information that is displayed and encroach on the privacy of those who are not directly involved.

Our scenario-based design exploration aims to spark debate and highlight areas that warrant further investigation. Future research should, of course, focus on the observational investigation of people's projector phone behaviors and experiences. Particularly intriguing prospects arise from the creation of projector phone applications that specifically facilitate in-person social engagement, and developers ought to keep looking for answers to the technological and societal problems raised here. As phone cameras and processing power increase, interaction techniques like computer-vision based gestural engagement will probably change as well.

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