Post it! Ways of content interaction between mobile devices and public displays

Julia Speckmeier

Abstract— The prices for developing and building large displays are decreasing. This could be one reason why also public displays positioned in areas like universities, schools or museums, are increasing. There are several mechanisms that allow users to interact and also post their own content to those displays only using a mobile device. Four different will be introduced in this paper: Twitter based boards, Bluetooth connection, using the phone's camera and scanning QR codes. It turns out that every technology has its pros and cons concerning usability, the range of contributors and available connection and applications. In the end it might be most reasonable to combine different mechanisms in one display.

Index Terms—public display, mobile phone, interaction, Bluetooth, Twitter

✦

1 INTRODUCTION

The prices for developing and building large displays are decreasing [1]. This could be one reason why public displays in areas like universities, schools or museums, are increasing. To stay interesting and create a benefit for their users, such displays are always in need of fresh content. As this content is expensive, one solution is to let the user himself create content and post it to the screen by using his mobile phone. This led to the deployment of message boards [10] or digital bulletin boards [1] [11] to which the user could post his own content. This paper will have a closer look at mobile phone interaction methods and especially technologies to post content from a mobile device right onto a public display.

Different means were developed to serve this cause, like Twitter based posting mechanisms [8] [10] and other technolgies that use an extra application[5] [1]. There are as well displays that interact via Bluetooth [6] [11] or QR codes [2]. First of all the paper will give a round-up of these different mechanisms, describing examples and relevant studies, advantages and drawbacks of each technology. Afterwards it will be interesting to compare and discuss the trade-offs between those mechanisms.

2 MOBILE PHONE INTERACTION VS DIRECT TOUCH

There are various forms of interaction with public displays: Direct manipulation over a touch screen, tracking gestures with an attached camera, or mobile phone based techniques that in some cases require to install special applications. Different papers [2] [7] showed that direct touch is the easiest and most usability-friendly method to interact with public displays. Nevertheless it has some restrictions, that could be the advantages of mobile phone interaction. Direct touch limits the range of users to work at the display at a time [11], with mobile phones it is no problem to use the display simultaneously. Also utilizing mobile devices allows the user to exchange sensitive data in privacy and create content spontaneously on-the-go [2]. Therefore many displays today „have become multi-modal, allowing interaction both by touch and using a mobile device" [11].

But what does that concretely mean? Which mechanisms were deployed to interact with large screens, and send as well as retrieve content from public displays? In the following four different techniques will be demonstrated.

- *Julia Speckmeier is studying Media Informatics at the University of Munich, Germany, E-mail: julia.speckmeier@campus.lmu.de*
- *This research paper was written for the Media Informatics Proseminar, 2015.*

3 OVERVIEW OF DIFFERENT MOBILE PHONE POSTING MECHANISMS

In the existing literature, many different approaches to post content from a mobile device to a public display are referred. Even more are only describing ways to simply interact with large screens without considering a user generated input. In the following these techniques will be shortly summed up and discussed regarding their benefits and barriers.

3.1 Twitter and Social Networks

In his thesis Buzeck [4] found out, that people are looking significantly longer at a display with content from microblogging services than at a display with other content. From this point it's no surprise, that in literature Twitter is often referred to as a posting mechanism to public displays.

One sucessful example for a Twitter posting board is the SI Display created by Munson et al. [10]. Every Twitter user could post his tweets to the display located in the university of Michigan by including @sidisplay in the 140-character message. A similar approach is the Twitterspace board [8], which displays tweets of a local community. The only requirement using Twitter based posting displays is, of course, having a Twitter account and using a Twitter client on a mobile device. This on one hand, limits not only the range of people who are able to contribute to the display, but maybe also those who are interested in reading Twitter messages. On the other hand it provides the opportunity to open tweets to a broad audience and people who normally don't use Twitter. [10]

Not only Twitter, but other social networks are getting in the focus of public displays. An example for supplying displays with user generated content from social media is Wiffiti, an abbreviation for wireless graffiti, which is used in bars or cafés to present images from Flickr and messages from Twitter. One could input his own content (only text) by sending a SMS with @WiffitiDisplayID. [4]

Briefly, Twitter and social networks are a big new technology when it comes to public displays. Although it limits the reach of contributors to people who are active Twitter users, it is a promising mechanism, due to the fact that already over 1 billion people in the world are using social networks.

3.2 Native applications

Using Twitter as a posting mechanism requires, as mentioned before, to have a Twitter mobile application installed on the phone. As research shows there are other techologies that use native applications as well, some of them via Bluetooth, others by wifi or internet connection. One of the first examples to use Bluetooth as a posting technology was the Hermes Photo Display, a system which was tested on office doors. Every user of a Bluetooth enabled mobile phone had to download an application beforehand and then could send pictures to

the display or download them [5]. Another example is Digifieds, a display which allows mobile phone users to interact through an Android app using an internet or wifi connection [1].

Working with native applications to post content to public displays has two main drawbacks: First, technologies that are using the internet to establish a connection to the display (i.e also Twitter boards) may charge the user extra fees. On the other hand, you can't use the service without downloading an application what may hold some users back, too.

3.3 Bluetooth

While Twitter and social media interaction with public displays is not necessarily limited to the use with mobile devices, the next technology is. Bluetooth is a service that is pervasive in new mobile phones, doesn't need a wi-fi or other internet connection and is free to use for everybody [11]. These are only two advantages over Twitter and SMS/MMS.

3.3.1 Interaction with Bluetooth device names

It is interesting how the interaction with Bluetooth works and which different approaches can be found in several studies. Davies et al. [6] had the idea to use the device names, every phone has, to manipulate the content on the display. By changing the preset name, which is usually the description of the phone, to different commands, the users could interact with the display. Their system called e-Campus could show an interactive map, view photos from Flickr or videos from Youtube, search in Google and even show websites with tiny-url. Although this is a very interesting technique to interact with Bluetooth enabled mobile phones, the user couldn't really post anything. So this might be a promising idea for future developments.

3.3.2 Posting content with Bluetooth

When it comes to posting content on a public display using a Bluetooth connection, Scheibe at al. [11] developed a digital notice board, where users could share information among a small community. As compared to displays like Digifieds or the Hermes Photo Display the Bluetooth Notice Board won't require to download any applications, which facilitates the whole process.

This shows that although Bluetooth may have technical restrictions, such as reliance [11] and small connection range, it is an easy to use and highly pervasive technology and therefore ideal for interacting with public displays. Special deployments also allow the user to post content like images or text notices and in most cases this is possible without downloading foreign applications to the phone.

3.4 QR codes

Next to Twitter, Bluetooth and native applications there are several other ways to interact with public displays using a mobile device. Visual codes, such as QR codes, are one of them and have been used in deployments for public displays. Alt et al. [2] developed a service which allows the user to easily create content on his phone and post it to a public display by a phone generated QR code. Every display has an attached camera which scans the code and uses it to display the injected content. The overall benefit of this technology is that it leaves the user time to create content, by also using third-party-apps on his phone, and lets him retrieve beforehand posted content by simply scanning another QR code provided by the display.

3.5 Comparing the presented technologies

After having a look at those different approaches to post content on public displays using mobile devices, it is quite interesting to compare the methods and summarize which one suits the needs of the user best.

As the table below shows *(see figure 1)*, each mechanism has its benefits and drawbacks, some won't work without internet or wi-fi connection, others require the user to download applications to their phone. Most of the technologies are free to use, except communication via SMS or MMS, which is in times of smartphones and nearly everywhere available wi-fi not that common anymore, though. Some technologies, like using the Bluetooth device names, have not been

advanced to posting content, but in the future maybe will - as against the Bluetooth Notice Board [11] or the SI Display [10] which already enable this feature.

	easy to use	free (no charges)	no application needed	no wi-fi/internet connection needed	posting mechanism
Twitter	✓	✗	✗	✗	✓
Bluetooth: Hermes Display	✓	✓	✗	✓	✓
Digifieds	✓	✗	✗	✗	✓
Bluetooth Device Names	✗	✓	✓	✓	✗
Bluetooth Notice Board	✓	✓	✓	✓	✓
QR Codes	✓	✓	✗	✓	✓
SMS/MMS	✓	✗	✓	✓	✓

Figure 1. Comparison of the different mechanisms showing benefits and problems of each technology. Which is the best solution for public displays depends on various factors such as the user's flexibility and context of the situation.

3.5.1 Trade-offs between Twitter and Bluetooth

Which one is the better, more intelligent solution when it comes to posting content to public displays? If one is for sure, than that there is no obvious answer to this question. It depends on what content you want to post, the user's flexibility and the context of the situation. Certainly, Bluetooth has the one key advantage: It doesn't need an internet connection, whereas Twitter can be only used with a client installed on the phone and a working wi-fi or internet connection.

In contrast, studies of the e-Campus network, which uses Bluetooth device names to communicate with a public display, showed that almost half of the interviewed test persons found it too complicated and were unlikely to use it again [6]. In this context, Twitter has the advantage that it is quite uncomplicated for people who are active Twitter users. Messages with a maximum of 140 characters can be sent, similar to Bluetooth or SMS only short texts, and also images and even videos. Even though the majority of people is active in social networks and shares content, not everybody may be agreeing with the idea of leaking his private account to a public display [10]. Communicating sensitive data, like email adresses, is therefore easier using Bluetooth based mechanisms.

3.5.2 Combining different mechanisms

This discussion shows that there is no overall perfect mechanism, that serves every kind of requirement when posting content to public displays. Each technology has its pros and cons, and therefore it may be intersting, combining different techniques to eiliminate their weak points. For example, connecting a display with both Twitter and Bluetooth to give the user the possibility to choose the mechanism, that suits him and his needs best. Also non Twitter users would have the chance to share content, and those persons who are not familiar with using Bluetooth on their phone. As seen in the table above, scanning QR codes to posting content, is a promising mechanism, too, and could be a further alternative, integrated into public display systems next to social networks or Bluetooth connection.

4 CONCLUSION

In conclusion, there are many different mechanisms that allow mobile phone users to interact with public displays and post their own content to the screen. This works by interacting with Twitter clients, which is an easy and direct approach, or Bluetooth enabled devices. QR codes are another promising technology for content interaction with large situated displays. Besides this, there are many other possibilites of content interaction with public displays. For example by combining

different of the here presented technologies. One approach of Maunder et al. [9] already uses phone-camera based interaction together with a Bluetooth connection to post user-generated content to public displays. Other combinations with Twitter and social networks or QR codes are possible. Overall, mobile phone interaction is a versatile form of interaction with public displays and as shown in the beginning, it has its advantages over conventional direct touch input.

REFERENCES

[1] F. Alt, T. Kubitza, D. Bial, F. Zaidan, M. Ortel, B. Zurmaar, T. Lewen, A. S. Shirazi, and A. Schmidt. Digifieds: Insights into deploying digital public notice areas in the wild. In *Proceedings of the 10th international conference on mobile and ubiquitous multimedia MUM'11*, pages 165–174, 2011.

[2] F. Alt, A. Shirazi, T. Kubitza, and A. Schmidt. Interaction techniques for creating and exchanging content with public displays. In *Proc. CHI '13*, pages 1709–1718, 2013.

[3] R. Ballagas, M. Rohs, and J. G. Sheridan. Sweep and point and shoot: Phonecam-based interactions for large public displays. In *CHI'05 Extended Abstracts*, pages 1200–1203. ACM, 2005.

[4] M. Buzeck. Micro-blogging services: An approach to supply situated public displays with user-generated content, 2009.

[5] K. Cheverst, A. Dix, D. Fitton, C. Kray, M. Rouncefield, G. Saslislagoudakis, and J. G. Sheridan. Exploring mobile phone interaction with situated displays. *PERMID Workshop, Pervasive*, 5, 2005.

[6] N. Davies, A. Friday, P. Newman, S. Rutlidge, and O. Storz. Using bluetooth device names to support interaction in smart environments. In *Proc. MobiSys 2009*, pages 151–164, 2009.

[7] D. Dearman and K. N. Truong. Bluetone: A framework for interacting with public displays using dual-tone multi-frequency through bluetooth. In *UbiComp '09: Proceedings of the 11th international conference on Ubiquitous computing*, pages 97–100, 2009.

[8] W. R. Hazlewood, K. Makice, and W. Ryan. Twitterspace: A co-developed display using twitter to enhance community awareness. In *PDC '08: Proceedings of the Participatory Design Conference*, 2008.

[9] A. Maunder, G. Marsden, and R. Harper. Creating and sharing multimedia packages using large situated public displays and mobile phones. In *MobileHCI '07 Proceedings of the 9th international conference on Human computer interaction with mobile devices and service*, pages 222–225, 2007.

[10] S. A. Munson, E. Rosengren, and P. Resnick. Thanks and tweets: comparing two public displays. In *Proc. CSCW '11*. ACM, 2011.

[11] M. Scheibe, F. Meissner, and I. Tunbridge. Investigating clientless mobile phone interaction with a bluetooth public display. Technical report, Department of Computer Science, University of Cape Town, 2006.