H. Reiterer & O. Deussen (Hrsg.): Workshopband Mensch & Computer 2012
München: Oldenbourg Verlag, 2012, S. 497-500
Ein Video zum Beitrag findet sich in der Digital Library: http://dl.mensch-und-computer.de/

eCOpenhagen: Smart Tangible City Map

Isabel Micheel

Department of Architecture, Design and Media Technology, Aalborg University Copenhagen

Summary

The present interactive demo was conceptualized as part of a project which set out to investigate whether novel technology can provide persuasive incentives to promote and implement strategies towards a more sustainable urban tourism. As a result, a physical mobile interaction prototype of a tangible, reusable city map embedded with NFC tags that allows communication with a mobile guidebook application was developed as a kind of climate persuasive service.

1 Introduction

Mitigating climate change and handling resources responsibly are two of today's world's most important responsibilities and key to reaching sustainability. To pursue this path towards a more sustainable future, it will not only be crucial to design products that last longer and in a way they can be reusable, recyclable or more energy efficient. It will also be necessary to aim at changing people's behavior throughout all sectors of their lives, e.g. when they are visiting a new city.

Following these considerations, the prototype presented here seeks to utilize technology as an enjoyable, novel way to explore strategies that aim at promoting and implementing a more sustainable urban tourism. It is designed as a compromise between digital, 'dematerialized' maps and guidebooks, which could possibly be the most eco-friendly approach, and today's practice of using paper maps and actual guidebooks, since especially physical maps still seem to be favored by many urban tourists.

2 Previous Work

While dematerialization (physical products are replaced by their digital, non-material equivalent) is often the key to the lightness and thus sustainability of products (Ryan 2004), it is not

ideal regarding city maps and guidebooks. Brown and Chalmers (2003) found that they are important collaborative artifacts for tourists and the small screen size of current mobile devices is neither sufficient to give a good overview, nor to display both the map and matching information from a digital guide in a way that suits the many urban tourists. Following the work of Reilly et al. (2005; Broll & Hausen 2010; Morrison et al. 2011), the present project tries to solve this dilemma of dematerialization on the one hand and physical artifacts on the other with the means of physical mobile interaction.

Physical Mobile Interaction refers to a relatively new paradigm for "mobile interaction that uses mobile devices for physical interaction with (tagged) everyday objects" (Broll & Hausen 2010). RFID based NFC (Near Field Communication), an emerging technology for the short-range, contactless exchange of data has great application potential for this type of interaction (Broll & Hausen 2010; Hang et al. 2010).

3 The Prototype

The developed prototype consists of a physical map UI depicting the city center of Copenhagen, Denmark, and a mobile guidebook application for Android (see Figure 1). Communication between the map and application is established using NFC technology. Adhesive NFC tags were placed on the back of the map allowing an NFC-enabled mobile device to read the encoded information stored on the tag and link it to additional information about particular locations. This augmentation of a physical map with digital content guarantees modularity, or upgradability, despite the map's material nature. Following the example of Crumpled City™[1], it was decided to produce the map using the textile-like material Tyvek®, which is 100% recyclable, liquid resistant and more durable than paper. This guarantees a longer life than that of common paper maps, opening up the possibility of map co-ownership, i.e. the map could be loaned at tourist offices.

Figure 1: Physical Map UI of the prototype (left) and mobile application GUI (right).

[1] Maps by Italian designer E. Pizzolorusso (http://www.palomarweb.com/web/tienda/products/view/5, viewed 5/2012).

The map UI design was based on the work of Hang et al. (2010) using three types of symbols that guide the user through the interaction (see Figure 2). An adhesive symbol aims at the user's awareness of the NFC capabilities. The explanatory symbol communicates the method of interaction, i.e. holding the NFC-enabled device close to a symbol to trigger the corresponding action in the mobile guidebook application. Action symbols represent the available functionalities. While the official NFC Forum N-Mark[2] was chosen as the adhesive symbol, the others are based on the Nokia 3220 NFC icon.

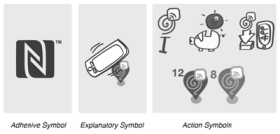

Figure 2: Three types of physical UI symbols

The main focus of the interface are the marked points of interests, which are either main tourist sights or different 'green activities'[3]. In addition, a menu provides links to general information about the concept, the download-url and the tourist's credit score, a playful, motivating feature that allows users to collect credits when participating in green activities and use them e.g. for discounts all over the city.

4 Conclusion

The present prototype was tested by a small sample of tourists in the city center of Copenhagen. The mostly qualitative study identified several indicators that tourists found the prototype easy to use, with the exception of problems caused by the "floppiness", and thus instability, of the map material, which calls for a better solution in further iterations. The overall willingness to adopt this new kind of city map if it was available was also high, whereas both the green activities as well as the additional digital content were named as motivating factors. The positive responses of the interviewed tourists towards the concept are encouraging, calling for a more elaborate user study and other projects of the like, i.e. investigating the advantages of physical objects and UIs combined or augmented with digital content, as well as ways for ICT to help promote and achieve various sustainable goals across all kinds of application areas.

---

2 Since the NFC Forum is probably the largest forum of influential companies joining forces to promote and advance NFC technology, it is believed that their trademark will eventually be the strongest symbol associated with NFC (http://www.nfc-forum.org/home/, viewed 05/2012).

3 Green activities are taken from the official 'Visit Copenhagen' website, which offers the "Climate Tourist" a range of "ways to go green while in Copenhagen" (http://www.visitcopenhagen.com/ecopenhagen, viewed 05/2012).

References

Broll, G. & Hausen, D. (2010). Mobile and physical user interfaces for NFC-based mobile interaction with multiple tags. In: *MobileHCI'10*. Lisbon: ACM.

Brown, B. & Chalmers, M. (2003). Tourism and mobile technology. In Kuutti, K. & Karsten, E. H. (Hrsg.): *Proceedings of the Eighth European Conference on Computer Supported Cooperative Work*. Helsinki: Kluver Academic Press.

Hang, A., Broll, G. & Wiethoff, A. (2010). *Visual design of physical user interfaces for NFC-based mobile interaction*. In: DIS 2010. Aarhus: ACM.

Morrison, A., Mulloni, A., Lemmelä, S., Oulasvirta, A., Jacucc, G., Peltonen, P., Schmalstieg, D., & Regenbrecht, H. (2011). Collaborative use of mobile augmented reality with paper maps. *Computers & Graphics*, 35, 789–799.

Reilly, D., Welsman-Dinelle, M., Bate, C. & Inkpen, K. (2005). Just point and click?: using handhelds to interact with paper maps. In: *MobileHCI '05*. Volume 111, ACM. S. 239–242.

Ryan, C. (2004). *Digital Eco-Sense: Sustainability and ICT – A New Terrain for Innovation.* Lab Report 03. Carlton: lab.3000 – innovation in digital design.

Contact

Isabel Micheel, Department of Architecture, Design and Media Technology, Aalborg University Copenhagen, Denmark.

Lautrupvang 15, DK-2750 Ballerup. E-Mail: isabelmicheel@gmail.com