Touch-Based Access to Mobile Internet: User Experience Findings

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ABSTRACT

This article reports user experience findings from two field trials where Mobile Internet access was supported through Near Field Communication (NFC)-based tag infrastructure. The authors’ results show that touch-based interaction can provide enhancement to the Mobile Internet user experience in: (1) content and service discovery, (2) Mobile Internet access, and (3) integrated situated and embodied experience. The problems related to service discovery can be solved by providing location-based access, and by using visual cues embedded into the environment for discovering content and services. Mobile Internet access through touch solves the problem of memorizing complicated URLs and the challenge of typing with a mobile device keypad. As touch-based access builds a semantic bridge between the physical context of use and the Mobile Internet experience, the user experience converges seamlessly into one where both the physical and digital worlds play a role.

Keywords: Mobile Internet, Near Field Communication (NFC), Physical Interaction, Tags, Touch-Based Interaction, User Experience

INTRODUCTION

Internet content and services are becoming increasingly versatile and soon will integrate with practically all the imaginable and yet unimagined areas of our lives. It seems likely that internet use will not be limited to the boundaries set by desktop use, but rather will be needed and sought after also in mobile situations. The fast technological development of wireless networks and wireless communication devices seems to offer solutions that can make that happen. Modern urban environments are evolving towards Mark Weiser’s (Weiser, 1991) vision of Ubiquitous Computing, where all objects are computerized and networked.

The Mobile Internet has shown that technological advances and service availability alone do not result in widespread adoption and use (Constantiou et al., 2007). There are still challenges in the Mobile Internet hindering usage and slowing down adoption rates. An example of such a challenge is our limited understanding of how the Mobile Internet differs from the traditional internet experienced through a fixed desktop environment (Isomursu et al., 2007).
Research on mixed reality user interfaces (Milgram et al., 1994) has explored how our physical environment could be enhanced with digital content and services by mixing digital information and affordances with our physical world. NFC (Near Field Communication) technology provides one alternative for adding a link between an object in the physical world and digital content and services associated with that object. This link can be used by direct physical manipulation to provide digital services through a physical interface. These kinds of physical mobile interactions make it possible to bridge the gap between the physical and virtual world in an intuitive way (Falke et al., 2007).

**Touch to Access Mobile Internet**

Accessing internet content through objects in the physical world is called physical browsing (Ailisto et al., 2006). In physical browsing, the links are embedded in physical objects, and the user can select and use them to access internet content and services.

The technology used in the research presented in this article, NFC, is one technology for implementing physical browsing user interfaces. Other possible solutions include, for example, visual codes that are read through the camera of a mobile device (Rekimoto & Ayatsuka, 2000; Hansen & Grønbæk, 2008), infrared transceivers and tags (Swindells et al., 2002) or infrared beacons (Debaty et al., 2005; Want et al., 1999), and various other RFID variations (Want et al., 1999).

The user experience of NFC-supported service and content access has been studied in controlled settings. Touch-based service and content access have been found to be easy to learn and use, and users value the simplicity of the technology (Isomursu et al., 2008; Riekki et al., 2006; Välkkynen et al., 2006a). The research presented in this article contributes to the prevailing knowledge by exploring the user experience related especially to Mobile Internet access and providing results from the use of technology in field settings in various contexts.

**NFC Technology**

The field trials reported in this article have been implemented within the constraints of a research project that has evaluated applications and services based on Near Field Communication (NFC) technology. NFC is a short-range wireless technology that allows electronic devices to exchange data upon touching. NFC standards have been built over existing radio frequency communication standards (e.g. RFID and smart card standards), so it is a special case of RFID implementation technology.

The most common scenario for NFC use is to integrate the NFC reader into a mobile device, such as a mobile phone. This has already been done by some mobile phone manufacturers, and low quantities of NFC-enabled mobile phones have been available in the market for some years now. The mobile device can then be used to read NFC tags, or to communicate with other NFC-enabled devices upon touch. NFC tags are small and cheap, and they can be attached to virtually any object or surface. The tag can then act as a link between the physical and digital worlds.

Using an NFC tag as a Mobile Internet access point is very simple. The tag can directly store the URL to the web content. When the user touches the tag, the URL is transferred to the mobile phone using short-range radio frequency. No resolution services are needed, as the browser available in the mobile phone can directly access the URL transferred from the tag. In this article, we explore the usage scenario where a URL is transferred from the tag to the mobile phone. It is important to note, however, that the tag can store other formats of data too, such as phone numbers.

**Mobile Internet Access Challenges**

The expected main benefit of touch-based Mobile Internet access is that the user does not need to type or remember the URL needed to access the Mobile Internet content. Other solutions to this problem explored by previous studies include, for example, context-sensitive...
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