**GUEST EDITORIAL PREFACE**

Mobile Interaction with the Real World: Introduction to the Special Issue

*Enrico Rukzio, University of Duisburg-Essen, Germany & Lancaster University, UK*

*Andreas Zimmermann, Fraunhofer FIT, Germany*

*Niels Henze, University of Oldenburg, Germany*

*Xavier Righetti, EPFL, Switzerland*

**INTRODUCTION**

Mobile phones have become an integral part of our everyday lifestyle and for many it is intolerable to be without it. The usage of these devices is nowadays not just about calling and texting but more and more about browsing the web, writing emails, playing games, consuming media, receiving location-dependent information and participating in social networks. An upcoming, very important aspect is that the mobile device is conceptually not just used for the interaction with digital information but also for the interaction with the real world we are actually living in. Kindberg et al. (2002) did pioneering work in this area through their research on mobile interaction with people, places and things in the real world. When considering the developments towards location-based mobile services in the last years than one could assume that this area is now very well understood and intensively applied in practice. The indirect mobile interaction with other users who are not co-located is also very much explored already through application areas like voice communication, text messaging, social networking applications and instant messengers.

The direct mobile interaction with co-located users and the interaction with objects in the surrounding environment is still a field with many open research questions and issues. It is still very problematic to start an interaction via a mobile device with the mobile device of another person close by or with several co-located persons. Although it is technically possible via technologies like Bluetooth, WiFi or Near Field Communication (NFC) most people do not use it because of complicate technical device discovery and selection processes. The main issue is the technology available does not support those interactions on a level we are used to, such as moving objects or changing their orientation with our hands, pointing onto objects or gestures towards an object. Once a connection between co-located users is established it is still questionable how they can or should interact with each other whereby important aspects such as privacy issues, social protocols or collaborative aspects have to be considered.
Mobile interaction with smart objects, displays and surfaces in the environment were the focus of many research projects in the last decade leading to new interaction metaphors, services and applications (Ballagas, Rohs, Sheridan, & Borchers, 2006; Rukzio, 2007). But we are far from arguing that aspects such as the selection of one or several objects and the interaction with them are solved. One field that gathered quite some interest is the usage of pointing-based interactions in which the user can point onto something with the built-in camera to receive additional information. Examples for this are the QR codes used in Japan or more recently Nokia Point & Find. When it comes to such emerging technologies like Near Field Communication (NFC) or built-in pico projectors then there are still many open questions, e.g. regarding how the interaction flow should look like when touching a smart object with an NFC phone or which interactions could be used when using camera-projector-phone.

The Mobile Interaction with the Real World (MIRW) workshops running from 2006-2009, always in conjunction with the Mobile HCI conference, addressed many of the previously mentioned aspects and provided a platform for future research in this area.

**CONTENTS OF THIS ISSUE**

The five contributions to this special issue are significantly extended versions of papers being presented at the MIRW 2009 workshop. The workshop received 22 submissions which were reviewed by three reviewers and of which 10 papers were accepted for presentation. The articles of this special issue focus on novel interactions and applications for personal projectors, gesture-based mobile interaction with other mobile and fixed devices, a context-aware mobile shopping trolley and a framework supporting the flexible interaction with remote displays.

The first paper by Schöning et al. focuses on the emerging trend of having both pico-projectors and cameras built into mobile devices and their potential for new interaction techniques, applications and services. The authors discuss different spatial layouts of camera and projection leading to settings where the camera view does not focus on the projection, partly overlaps with it or where the field of the camera is completely overlapping with the field of projection. All of the three options have their advantages and disadvantages and offer the potential for new interaction techniques. Furthermore, the paper discusses two prototypes showing concrete examples for the previously introduced concepts. Map Torchlight is a mobile augmented reality application which tracks the orientation of a camera-projection unit in relationship to a paper map in order to project additional information onto the map. A system called “LittleProjectedPlanet” bases on the idea of using information from the real world (e.g., track sketched on a whiteboard) and uses them as an integral part in a mobile augmented reality application (e.g., using the sketched track as part of a game).

The second paper presents “View & Share”, an application supporting co-present viewing and sharing of pictures using personal projection. The paper focuses on the vision that many people will have projector phones in the future and that friends will be able to view and share media in a convenient and ad hoc way. The presented framework supports the forming of ad hoc groups in which users can have one of two different roles: viewer and presenter. The viewer is able to request a picture currently shown by the projection of the presenter and the presenter is able to send a photo to all viewers. Further features such as borrowing the projection and a private viewing mode which does not use the projection are supported. A user study is reported which shows the advantages and disadvantages of the interaction concepts and their implementation. The study results provide interesting insights into the user’s point of view to viewing and sharing based on personal projection, social aspects as well as privacy issues.

The third paper by Yoo at al. reports novel gesture-based interactions supporting
the interaction with another mobile device or an interactive surface. A sprinkling interaction is introduced with which the user can transfer files or information from one mobile device to another by using a pouring respective sprinkling interaction. The user has to hold one device over the other one and has to change the orientation in such a way as she would pour the data onto the other device. Furthermore, the authors present a shaking interaction which can be used to trigger a combination of information on a mobile device. In the presented example, pictures and music are mixed together by shaking the mobile phone. The third interaction concept being introduced supports the interaction between a smart table and devices, such as a mobile phone, in the environment. The table shows where which devices are in the room and files can be sent to them by dragging and dropping files onto the representation of those devices on the table.

The fourth paper reports CAST, a Context-Aware Shopping Trolley for pervasive computing in a supermarket. The authors address the problem that many people have problems to locate and find products in a supermarket, to find optimal routes considering e.g., a certain shopping list and to receive appropriate product related information. The interactive trolley addresses those issues by guiding and directing shoppers in the handling and finding of groceries via a display installed at the trolley which is facing towards the user. The paper discusses the design aspect being considered when developing CAST, its architecture and implementation as well as the user interfaces design. An empirical evaluation is reported that showed that shoppers using CAST adapted in different shopping behavior than traditional trolley shoppers by exhibiting a more uniform behavior in terms of product sequence collection and ease of finding products and thus, CAST supported the shopping experience.

The usage of mobile and handheld devices for interactions with remote services is seen as a promising interaction paradigm allowing the user to use her mobile phone as a remote control. The authors of the fifth paper present a framework which allows the user to select the desired mobile device of their choice for the interaction with a remote service. Because of the heterogeneity of available devices and interaction styles, the interoperability needs particular attention by the developer. This paper describes the design of a general solution to enable mobile devices to have control over services at remote hosts. The applied approach enhances the idea of separating the user interface from the application logic, leading to the definition of virtual or logical input devices physically separated from the controlled services.

**FUTURE VISION**

This special issue presents research focusing on the future use of personal projectors, usage of gestures for device to device interaction, context aware shopping trolleys and mobile interaction with remote services. When considering the overall vision of mobile interaction with the real world than one could argue that most of the principles towards interactions with locations and persons are now reasonably well understood. Research on mobile interaction with pervasive user interfaces such as interactive horizontal or vertical displays, person projections and other devices offers still many questions. It’s assumed that we will see many new interactions, services and application in the upcoming years which focus on this aspect of mobile interaction with the real world.

**ACKNOWLEDGMENT**

The MIRW workshop from which the papers of this special issue have been selected was organized in the context of the European Network of Excellence “Intermedia” (project No. 038419) and all the guest editors, who all are taking part in this project, would like to thank for the support received from the Intermedia project when working on this special issue. We want to thank all participants in the
previous Mobile Interaction with the Real World (MIRW) workshops and the authors of the manuscripts for this special issue. We also thank the Editorial Review board of IJMHCI and the reviewers who collectively ensured the high quality of the articles in this issue: Susanne Boll, Jonna Häkkilä, Paul Holleis, Martin Pielot, Benjamin Poppinga, Derek Reilly, and Michael Rohs.

Enrico Rukzio
Andreas Zimmermann
Niels Henze
Xavier Righetti
Guest Editors
IJMHCI

REFERENCES


Xavier Righetti is working as a research assistant and PhD student in the Virtual Reality Lab (VRlab) at the Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland. He is currently involved in the European Network of Excellence Intermedia in which he focuses on the design and development of modular wearable components for enhancing user interaction through contextual awareness. His vision is the plug-and-play usage of wearable modules and their ad-hoc reconfiguration once worn by a user.