

Tool-support for Mobile and Pervasive Application Development - Issues and Challenges

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ABSTRACT

We are interested in all sorts of tool-support, which help the designer of a pervasive application in different stages of the development process, such as task and requirements analysis, conceptual design, prototyping and evaluation. We are looking for contributions that will help to address the following questions:

- *What are the past experiences and future expectations of designers and developers that use tools for support?*
- *What exactly are the benefits and the shortcomings of available tools?*
- *What are the open issues and challenges for the next few years?*

The workshop will feature presentations of research results, experiences of past and ongoing work, and a forum for participants to address a predefined set of focus questions.

Categories and Subject Descriptors

H.5.m Miscellaneous

General Terms

Algorithm, Design, Experimentation, Human Factors

Keywords

Tool-support, design process, mobile application, pervasive application,

1. OVERVIEWS

Applications for mobile phones are becoming more and more popular, and for 2010 Gartner research expects a market volume

of \$6,2 billion for mobile software that might even rise to \$30 billion in 2013. However, few of today's available applications consider the user's preferences, situational context, and other devices in their environment.

Developing such mobile applications requires a thorough understanding of the complex interplay of users, personal devices, and the environment. Designing for this interplay represents a very challenging endeavour. The context of use and the actual requirements are often difficult to describe, and for many use cases, impossible to foresee. Consequently, designing highly adaptive solutions that are centred on the needs of users and their activities in mobile settings is very demanding. Therefore designers and developers rely on multiple tools for support.

In order to effectively provide support for the development of a mobile and pervasive application, it is important for a tool to: (i) provide representations and concepts to describe the users and their needs in mobile settings; (ii) realize the design as a mobile application; and (iii) aid the designer in evaluating the developed applications with target users. Researchers all over the world have worked on applications that provide tool support by addressing the stages of the development process:

- requirements analysis / assessing users' needs
- interaction design
- prototyping, simulation
- implementation
- evaluation
- testing / debugging

These tools come in the form of authoring tools, automated usability settings, and rapid prototyping tools.

This workshop on tool-support for developing mobile and pervasive applications will be a forum of multi-disciplinary discussion on new tools and methods that support the different stages of the design process, but also experiences of using tools for developing mobile and pervasive applications.

1.1 Development Tools

In the past, software developers used scripting languages, such as Python for Symbian. Today, software developers of mobile applications are accustomed to using dedicated development environments with graphical user interfaces. For example, developers of Windows Mobile applications prefer Visual Studio; Blackberry, Android, Symbian and Palm developers use Eclipse with specific Eclipse plugins; and iPhone developers use XCode. Each of these development environments eases the provisioning of mobile applications on dedicated mobile devices for testing and debugging. Many designers are already accustomed to using software-based tools for prototyping UIs for mobile and pervasive applications. For example, the Adobe Device Central [2] is integrated with the tools for designing graphical UIs (e.g. Illustrator, Photoshop and Flash) and provides a set of tools for reviewing and testing Flash Lite content for mobile devices. Emulators for different device models help to test the content for a broad range of devices. The designer can even emulate environmental factors such as bright light in the environment, bad connectivity, etc. However, like most tools that are currently available in the market, the emulation of context and user interaction (e.g. multimodal interaction) is very restricted.

1.2 Mobile Web 2.0-based “mashup” applications

Many Web 2.0 services and applications provide APIs that can be further used by third party tools; for example, by mash-up tools that allow end-users to “mashup” information sources and services to meet their personal information needs [1]. Due to the improvements of the communication infrastructure and web standards, it is possible to easily create browser-based applications that target multiple mobile platforms. However, the browser-based applications have still only restricted access to context information and additional interaction modalities that are supported by mobile devices.

1.3 Pervasive Applications and Smart Environments

Furthermore, today’s mobile devices have better connectivity and as a result, are easier to integrate in smart environments. Companies operating in environments, such as airports, museums or even shopping malls, are aware of the potential benefits of novel interaction techniques, sensing technologies, and new ways of presenting personalized information to their users and customers. However, due to the large design space that ranges from wearable computing to public displays, the conceptual and technological choices pose new challenges to the designer. Designers of intelligent environments need support for the early stages of the development process, such as task and requirements analysis and conceptual design (e.g. modelling user activities).

1.4 Cooperative Design

Another challenge for the development of mobile and pervasive applications is the role of end-users and domain experts, and how to support their participation in the design process. Mobile and pervasive applications have very high requirements on personalization. Besides the obvious fact that end-users are the ones who best understand their own needs, end-users are already

accustomed to actively modifying their web profiles through the use of common web-based tools (e.g. front-ends of social software).

2. THEME AND TOPICS

We are interested in all sorts of tool-support, which help the designer of a mobile application in the stages of the development process, such as task and requirements analysis, conceptual design, prototyping and evaluation. We are looking for contributions that will help to address the following questions:

- Which tools are currently available to support the design and development of mobile and pervasive applications?
- What exactly are the benefits and the shortcomings of available tools?
- What are the past experiences of designers and developers concerning the available tools?
- How can the different stages of the iterative design process be methodically improved?
- Which new tools and methods are emerging?
- What are the expectations and challenges for the coming years?

Specific topics of interest for which we invite basic research and tool support include (but are not limited to):

- Tool-support for the early stages of the development process (e.g. modelling of the users’ needs and use cases for pervasive applications and conceptual design)
- Tool-support for rapid prototyping and automated usability (evaluation?)
- Tool-support for the general development processes (e.g. user-centred, activity-centred)
- Tool-support for cooperative-design between professionals and end users (user-centred design)
- Tool-support for pervasive (cross-device) user interfaces and smart environments
- Unified tool-support for the heterogenic landscape of mobile devices and settings

3. INTENDED AUDIENCE

The workshop addresses researchers and practitioners in the field of mobile computing, particularly interaction designers and software engineers.

It is also interesting for ethnographers which would also benefit from tool support for the modelling of users’ needs.

4. WORKSHOP FORMAT AND SCHEDULE

The workshop will feature presentations of research results, demonstrations of past and ongoing work, and a forum for participants to address a predefined set of focus questions. Every presentation will be followed by a short discussion. The number of participants will be limited to 20 people.

Prospective authors will be invited to submit their contribution electronically as a PDF conforming to the ACM SIGCHI proceedings format. Every submitted paper will be reviewed by members of the organizing and program committee, and based on this the organizers will select 10-12 papers for presentation at the workshop. Papers should have a length of about 2-6 pages. The suggested workshop will be a full day workshop consisting of 2 parts. In the first part, accepted papers will be presented. We will go through the papers and find common themes. Paper presentation will be grouped according to themes. Online copies of accepted papers will be made available before the workshop to registered attendees. The intention of the workshop is to share experiences and perspectives. In the first half of the workshop each participant will give a short presentation about their contribution. Presentations will be 15-20 minutes long, with a few additional minutes for questions. In the second half we will breakout into groups, each of which will address a question from a predefined set.

For the groups, we intend to prepare some application scenarios (e.g. a travel guide for public transport) and let the participants discuss how they would design and realize such a project with existing tools and methods, and which features would be helpful. The groups will try to make an actual design with tools, and maybe even create a working prototype/UI.

The workshop proceedings will be produced digitally following the publishing standards of the ACM and ready for the ACM Digital Library. The proceeding will be available online. The call for papers will be made available online and communication will take place via mailing lists and popular weblogs. Papers will be peer reviewed. Every submitted paper will be reviewed by two members of the organizing and program committee.

Table 1. Schedule

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| Opening (Arrival and welcome) |
| Session 1 (Paper presentation) |
| Morning Break |
| Session 2 (Paper presentation) |
| Lunch Break |
| Session 3 (Breakout session) |
| Afternoon Break |
| Session 4 (Breakout presentations and discussion) |

5. RELATED WORKSHOPS

In the past, there have been workshops that discussed similar topics as we plan to discuss in this workshop.

The workshop on co-design in 2008 [3] at the mobile HCI conference discussed all sorts of efforts of researchers and designers to interact and cooperate constructively with end-users. We intend to discuss tools and methods implemented in tools that support the co-design of mobile and pervasive applications.

The MIRW (Mobile Interaction with the Real World) workshop [4] has been a scheduled workshop at the mobile HCI for the last 4 years with focus on new mobile and wearable input and output interfaces. New input and output interfaces are also a topic of the workshop that we propose; however, only in terms of their integration into mobile applications; and with focus on the specific tools that provide support for the modelling of these new interfaces.

Compared to the MDDAUI (Model-Driven Development of Advanced User Interfaces) workshop [5], that is going to be held at CHI 2010, we intend to discuss which tools are available to model interfaces and how these tools could be combined with tools that support other steps in the iterative design process (e.g. tools for testing and evaluating); however, we will not discuss the details of different modelling languages for user interfaces. Furthermore, we also consider tool-support which is based on non-model driven approaches.

Similar to the MODIE (Modelling and Designing User Assistance in Intelligent Environments) workshop [6] we are interested in how to map an activity model into interactions with computing artifacts and how to unify the complementary concepts of public and personal devices in smart environments.

6. ORGANIZERS

- Ilhan Aslan is project manager and senior researcher at the Fraunhofer Institute for Communication Systems (ESK). ESK is part of the Fraunhofer-Gesellschaft that undertakes applied research of direct utility to private and public enterprise and of wide benefit to society. After receiving a Master's in computer science at Saarland University, Ilhan worked on mobile assistance for mega events in the COMPASS 2008 project at DFKI's Intelligent User Interfaces lab in Saarbrücken for 2½ years. Since March 2008, he has been working at the Fraunhofer ESK, where he is leading the ELEPHANT (Elements for Pervasive and Handheld Assistants, <http://www.esk.fraunhofer.de/elephant>) project, which aims to provide tool support for participative design of assistive technology.
- Karin Leichtenstern is a scientific assistant at the Augsburg University. She studied media informatics at the University of Munich (LMU). After a half-year stay at the University of Essex, she graduated with a Master in media informatics in 2006. Since May 2006 she is working at the laboratory Multimedia Concepts and their Applications. She worked for the EU-funded project eCIRCUS and developed pervasive interfaces for children. Currently, Karin is responsible for the EU-

funded network of excellence IRIS and the DFG-funded project OCTrust. In her PhD, Karin is mainly interested in the investigation of the tool-supported user-centred development process of pervasive interfaces for mobile devices.

- Dr. Paul Holleis is a researcher in the Smart and Secure Services Research Group at DOCOMO Euro-Labs since October 2008. His research is mostly concerned with simplifying the interface between humans and computers in general and concentrates on novel types of interactions as well as providing development support for tangible and pervasive computing. He received his PhD from the University of Munich (LMU) on the topic of integrating usability models into the development process for mobile applications
- Dr. Rainer Wasinger is a postdoctoral researcher in the Computer Human-Adapted Interaction (CHAI) group at the School of Information Technologies, Sydney University. He is currently working on the Multi-Channel Content Delivery and Mobile Personalisation project, as part of the Smart Services CRC. His current research interests are in mobile and pervasive computing, context aware applications, content re-purposing, and multimodal interaction. Prior to his current position, Rainer was working at the Centre for Language Technology in Sydney, and at the German Research Center for Artificial Intelligence in Germany during which time he was awarded his PhD by the University of Saarland and published the book "Multimodal Interaction with Mobile Devices: Fusing a Broad Spectrum of Modality Combinations".
- Dr. Christoph Stahl is a postdoctoral researcher working at the M²CI Cluster of Excellence for Multimodal

Computing and Interaction at Saarland University. In this context, Christoph is involved in the development of multimodal user interfaces for automotive in the DFKI project CARMINA. In his PhD thesis, Christoph has developed the GOAL method for the modeling and development of smart environments. The method's approach is based on Activity Theory to represent the users' needs and the YAMAMOTO toolkit to model environments and their instrumentation with sensors and actuators in 3D. Furthermore, Christoph is interested in supportive technologies for wayfinding and indoor navigation. In 2006, Christoph organized the MODIE workshop on the Modeling and Designing User Interfaces in Intelligent Environments [6].

7. REFERENCES

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- [3] Workshop on Co-design 2008 (<http://codesign.jottit.com>)
- [4] Workshop on Mobile Interaction with the Real World 2009(<https://mirw09.offis.de>)
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- [6] Workshop on Modelling and Designing User Assistance in Intelligent Environments(<http://w5.cs.uni-sb.de/workshops/modie06/>)