Supporting Service Interaction in the Real World

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Outline

- Physical Mobile Interaction
- System Architecture
- Interface Generation for Physical Mobile Interaction
- Early prototyping and user study
- Current status of the project
- Outlook

Mobile Interaction with Physical Objects

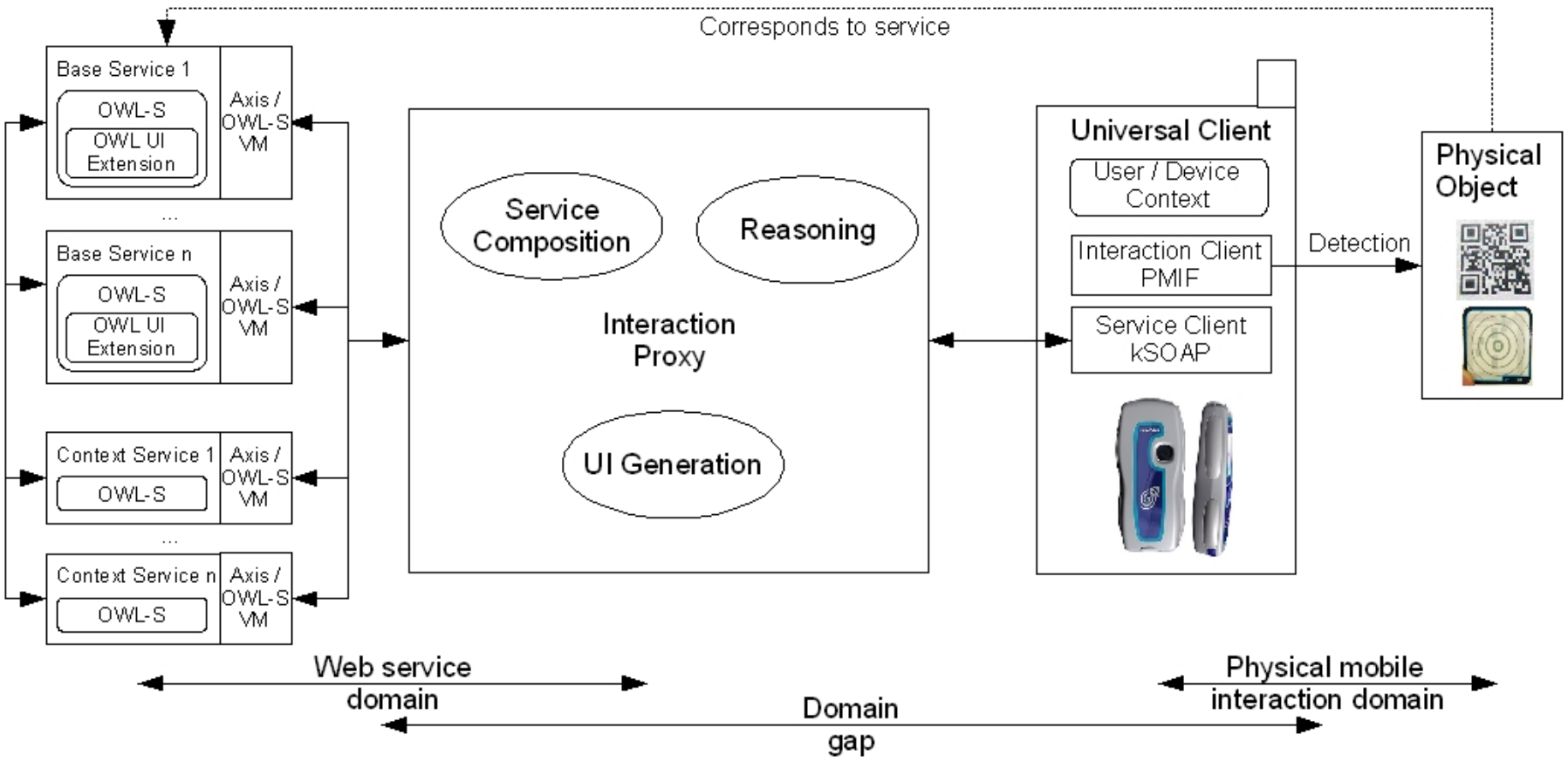
- Increasing interest in physical mobile interaction
- Facilitates mobile interaction with digital services through the interaction with physical objects
- Powerful mobile devices for information access, collection, processing and interaction
- (Augmented) physical objects become recognizable
- Technologies: visual marker and pattern recognition, wireless RFID / NFC tags, laser pointer, Bluetooth, GPS, ...
- Objects get digital identities (⇨ Internet of things) and can be associated with services

Problems and Motivation

- Current implementations of physical mobile interactions mostly simple and proprietary prototypes
- Little tool- and framework-support

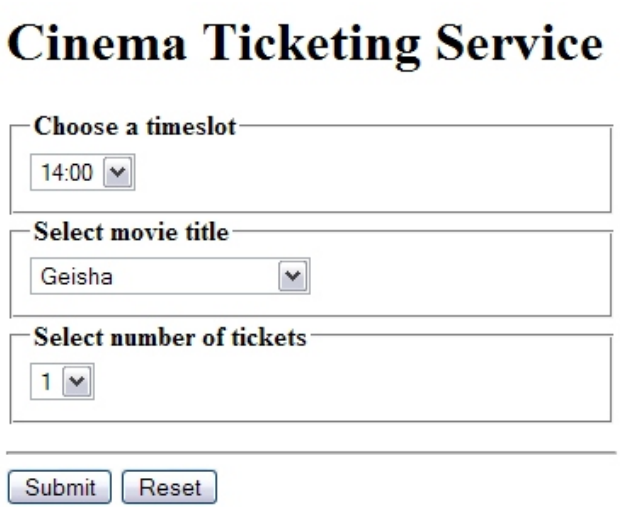
- Focus of the Perci project [1] (LMU Munich and DoCoMo Eurolabs)
- Support more complex physical mobile interactions
- Shift focus of interaction from mobile devices onto physical objects
- Transfer the familiarity of interacting with physical objects and exploit it for more intuitive interaction with associated services
- Framework to combine expressiveness and flexibility of Semantic Web Services with physical mobile interactions
- Exploit extended Web Service descriptions for the automatic generation of physical mobile interaction interfaces

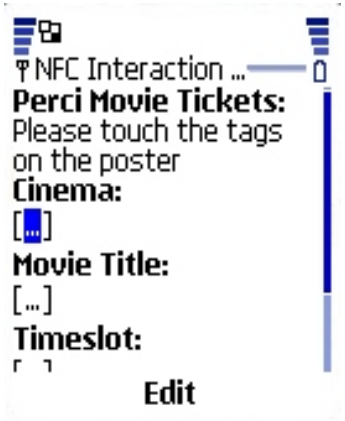
Architecture Overview



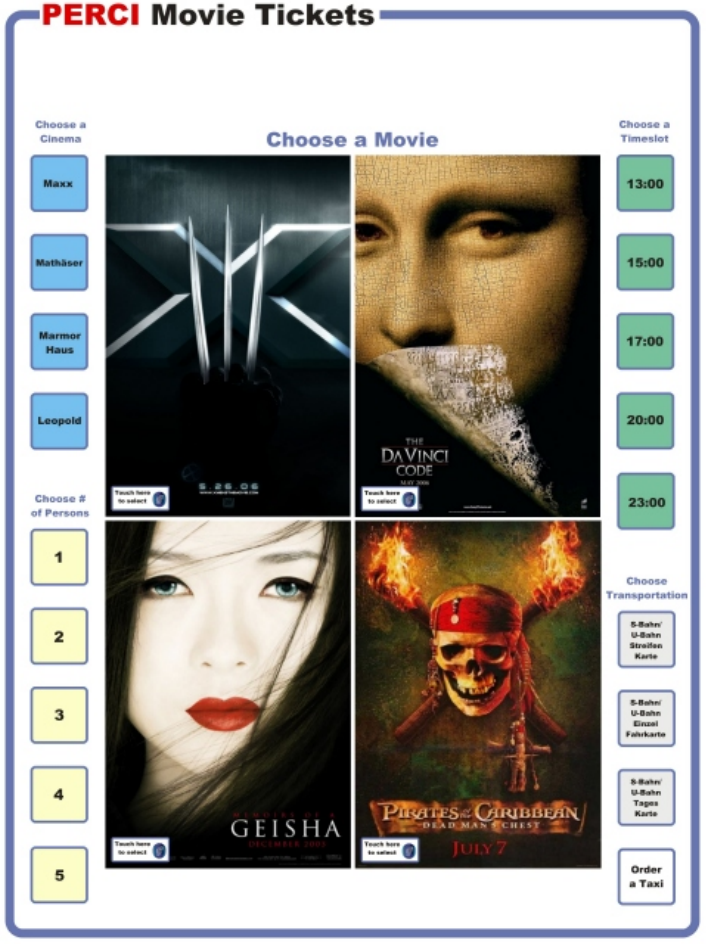
Interface Generation

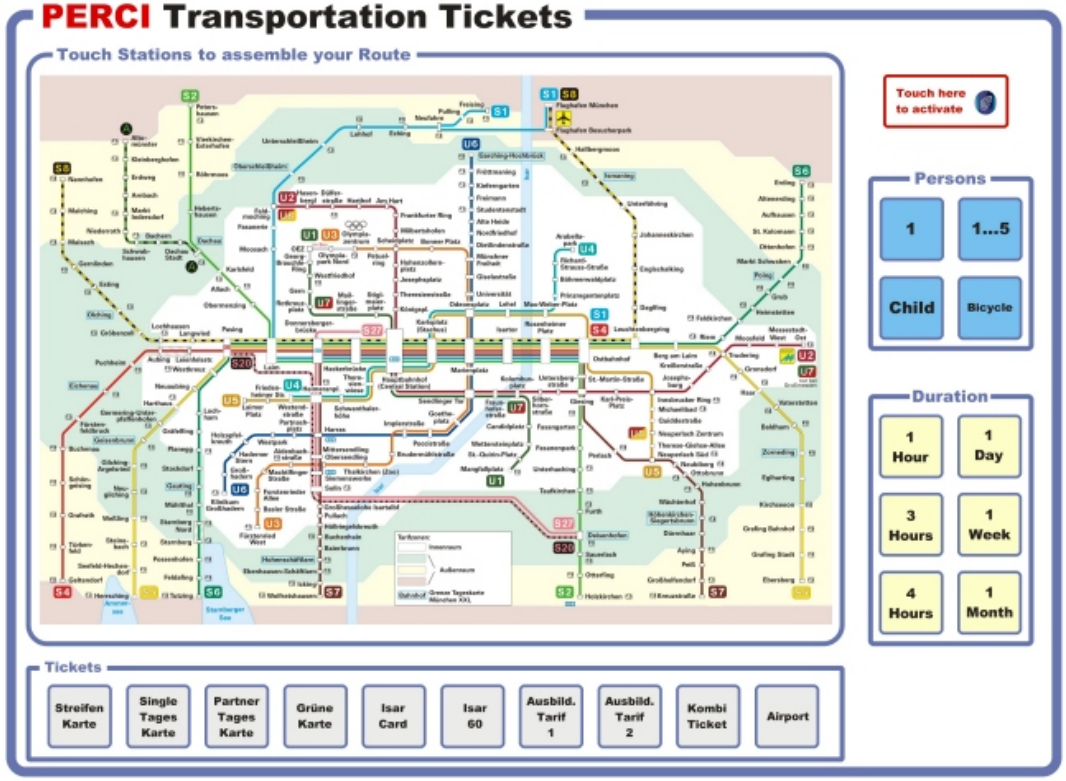
- Single Web Service description and UI extension used for interface generation
- Transformation from OWL-S into abstract interface description
- Basis for more concrete client- or server-side transformation
- Multi-channel publishing: Different transformation-rules for different target technologies and platforms
- Currently supported: XHTML and J2ME
- Currently supported interaction techniques: pointing (visual codes), touching (Near Field Communication), direct input





Low Fidelity Prototyping





Early User Study

- Simple user study with 10 participants (mostly students)
- Complete 2 scenarios with the posters and the paper prototypes (buying a movie ticket and a transportation ticket)
- Questions about the system before and after the scenarios




Early User Study - Results

- 70% of the users think that the proposed system is useful
- Initial effort to understand the system but then easy and intuitive to use, if users are already familiar with a mobile phone
- Useful where poster replaces another automat, but in some cases users could prefer a human contact for feedback (e. g. ticket counter)

\+ Fast, low-cost, can be used anywhere, easy to replace

\+ Less complicated menus, easy physical interaction, less faults

\+ Added value: payment could be included into mobile phone

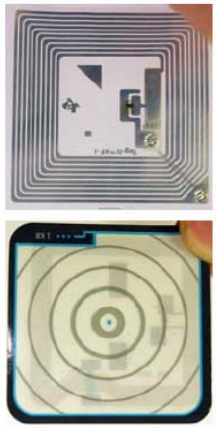
\- NFC widely unknown, needs to be established

\- Not enough feedback, only from mobile; actions not reversible

\- Posters need to be put up and actualized

Implementation

- **Web Services:**
  - OWL-S service descriptions and additional UI extensions
  - Using Apache Axis and Mindswap API
- **Interaction Proxy:**
  - Servlet that controls and arranges communication between the WSs and the mobile clients
  - Currently only http, SOAP-frontend planned
  - Uses Cocoon and XSLT for transformations
- **Mobile Client:**
  - Implemented with J2ME, kXML, PMIF (Physical Mobile Interaction Framework) [5]
  - Automatic interface generation from abstract UI description
  - Supports NFC, visual markers and direct input



Conclusion and Future Work

- Developing a framework that combines Web Services and physical mobile interaction
- Exploiting extended WS-descriptions for the automatic generation of adaptable interfaces
- Improving and facilitating more complex physical mobile interactions using different interaction techniques and technologies

- ➢ Finish prototype-implementation
- ➢ Add support for new interaction-techniques
- ➢ Conduct new, more representative user-study with prototype application
- ➢ Extend framework
- ➢ Support service authoring

Questions?

Thank you!

Related Work

- **Riekki, J., Salminen, T. and Alakärppa, I.** [2]
  - Framework for requesting services by touching RFID tags
  - Mobile phone as mediator between the user and local services
- **Khushraj, D. and Lassila, O.** [3]
  - Automatically generating personalized UIs for Web Services from OWL-S service descriptions with additional UI extensions
- **Internet of Things** [4]
  - Infrastructure for giving objects digital identities on the internet
  - Relies on RFID tags, Electronic Product Code (EPC), Object Naming Service (ONS) and the Physical Markup Language (PML)

Resources

[1]	http://www.hcilab.org/projects/perci/index.htm
[2]	Riekki, J., Salminen, T., and Alakarppa, I. 2006. Requesting Pervasive Services by Touching RFID Tags. IEEE Pervasive Computing 5, 1 (Jan. 2006)
[3]	Khushraj, D., Lassila, O.: Ontological Approach to Generating Personalized User Interfaces for Web Services, 4th International Semantic Web Conference (ISWC 2005), LNCS 3729, Springer-Verlag Berlin Heidelberg (2005). pp. 916–927
[4]	Meloan, S.: Toward a Global “Internet of Things”. November 2003. http://java.sun.com/developer/technicalArticles/Ecommerce/rfid/
[5]	Rukzio, E., Wetzstein, S., Schmidt, A.: A Framework for Mobile Interactions with the Physical World. Invited paper special session "Simplification of user access to ubiquitous ICT services" at the Wireless Personal Multimedia Communication (WPMC'05) conference, Sept 18-22, 205 - Aalborg, Denmark.