Supporting Service Interaction in the Real World

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PERMID 2006: Pervasive Mobile Interaction Devices

Workshop at the Pervasive 2006

Sunday, May 7th 2006, Dublin, Ireland

- 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

Interface Generation
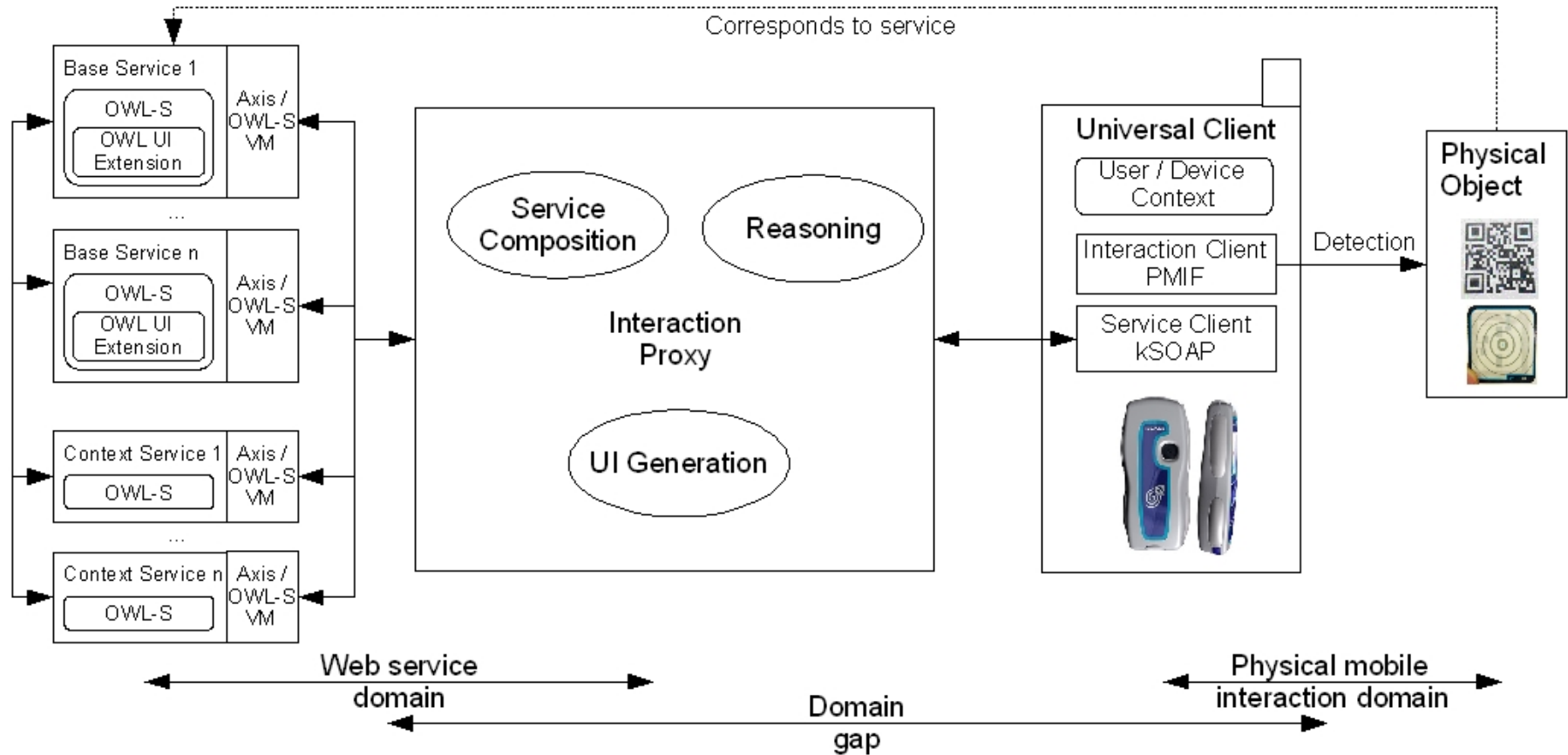
- Single Web Service description and UI extension used for interface generation

- 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

Cinema Ticketing Service

Choose a timeslot
14:00

Select movie title
Geisha

Select number of tickets
1

Submit   Reset

NFC Interaction ...
Perci Movie Tickets:
Please touch the tags on the poster
Cinema:
[ ]
Movie Title:
[...]
Timeslot:
[ ]
Edit

Low Fidelity Prototyping

- 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

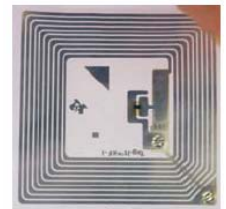- **Web Services:**

    - 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!

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.