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
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
Low Fidelity Prototyping

PERCI Movie Tickets

Choose a Movie

Choose a Time:
13:00
15:00
17:00
20:00
23:00

Choose a Person:
1
2
3
4
5

PERCI Transportation Tickets

Touch Stations to assemble your Route

Persons
1
1...6
Child
Bicycle

Duration
1 Hour
1 Day
3 Hours
1 Week
4 Hours
1 Month

Tickets
Strassen Karte
Single Tages Karte
Pauschale Tages Karte
Grine Karte
Isar Card
Isar Karte
Ausflugs Tarif 1
Ausflugs Tarif 2
Kombi Ticket
Airport
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-fronted 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!
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