A Framework for Mobile Interactions with the Physical World

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Outline

Motivation

- Physical Mobile Interactions
- Different HCI styles
- Problems & Experiences

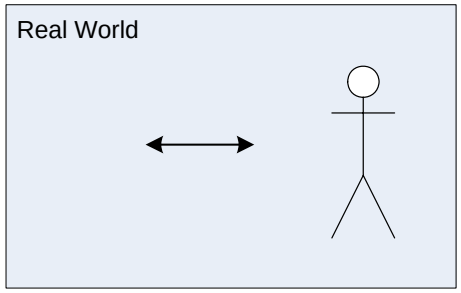
PMIF: Physical Mobile Interaction Framework

- Goals
- Generic Architecture
- Architecture
  - Mobile Device
  - Server
- Prototypes

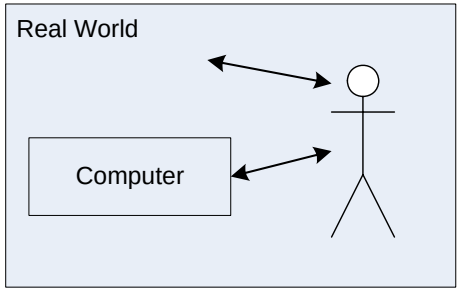
Summery & Outlook

Motivation: different HCI styles incl. physical mobile interactions

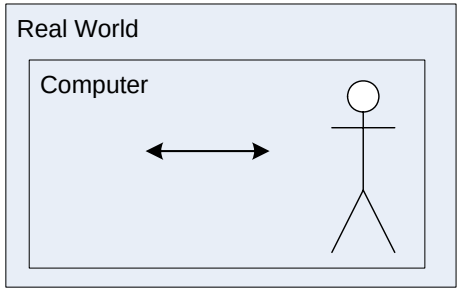
- *physical mobile interaction:* interaction between user, mobile device and physical objects; mobile device is used as a mediator for interactions with the real world
- Classification based on [19]



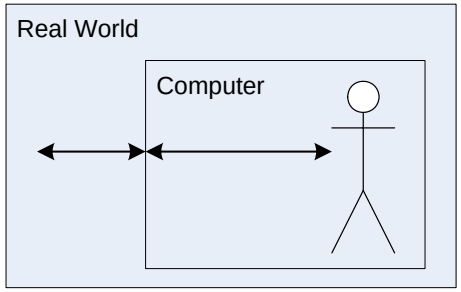
Before the computer



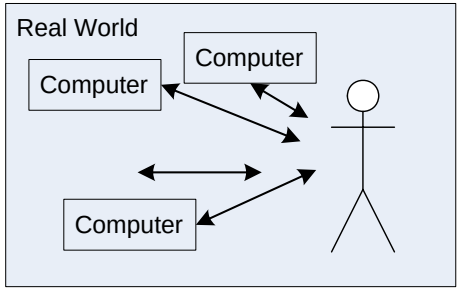
Usage of everyday computers (laptop, mobile phone)



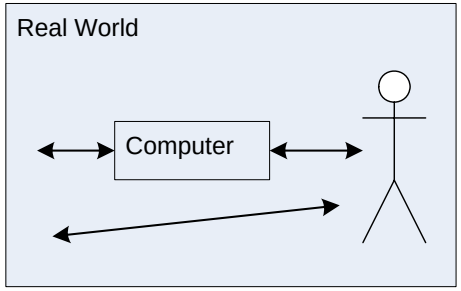
Virtual Reality



Augmented Reality (Head Mounted Display)



Ubiquitous Computing (Real World Computer)

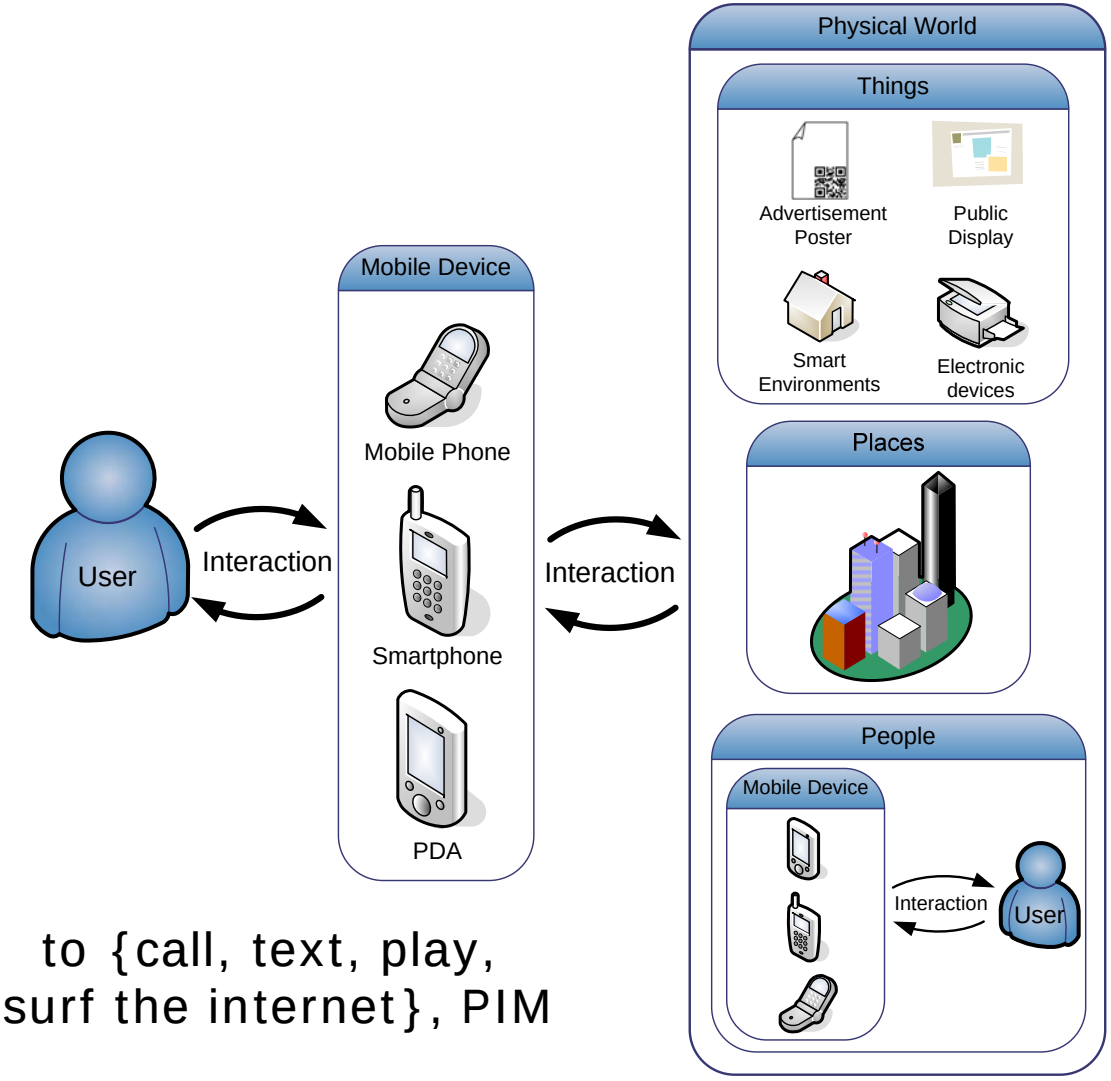


Physcial Mobile Interaction

- Advantages of these interactions: simplifies discovery and usage of (novel) services, new kinds of obvious interactions

Motivation: raising interest in physical mobile interactions

Motivation: physical mobile interactions



sensors of mobile device → interaction with augmented and not augmented “things”

Location based services (e.g. tour guide, city guide, mobile navigation)

Exchange (images, audio files, messages), Play (mobile gaming) → proximity of users

to {call, text, play, surf the internet}, PIM

Motivation: Problems & Experiences

- No comprehensive toolkit supporting the development of applications based on physical mobile interactions. Small authoring support.
- Development of several prototypes from scratch
  - Architectures were very similar
  - Addressed the same problems again and again


[2]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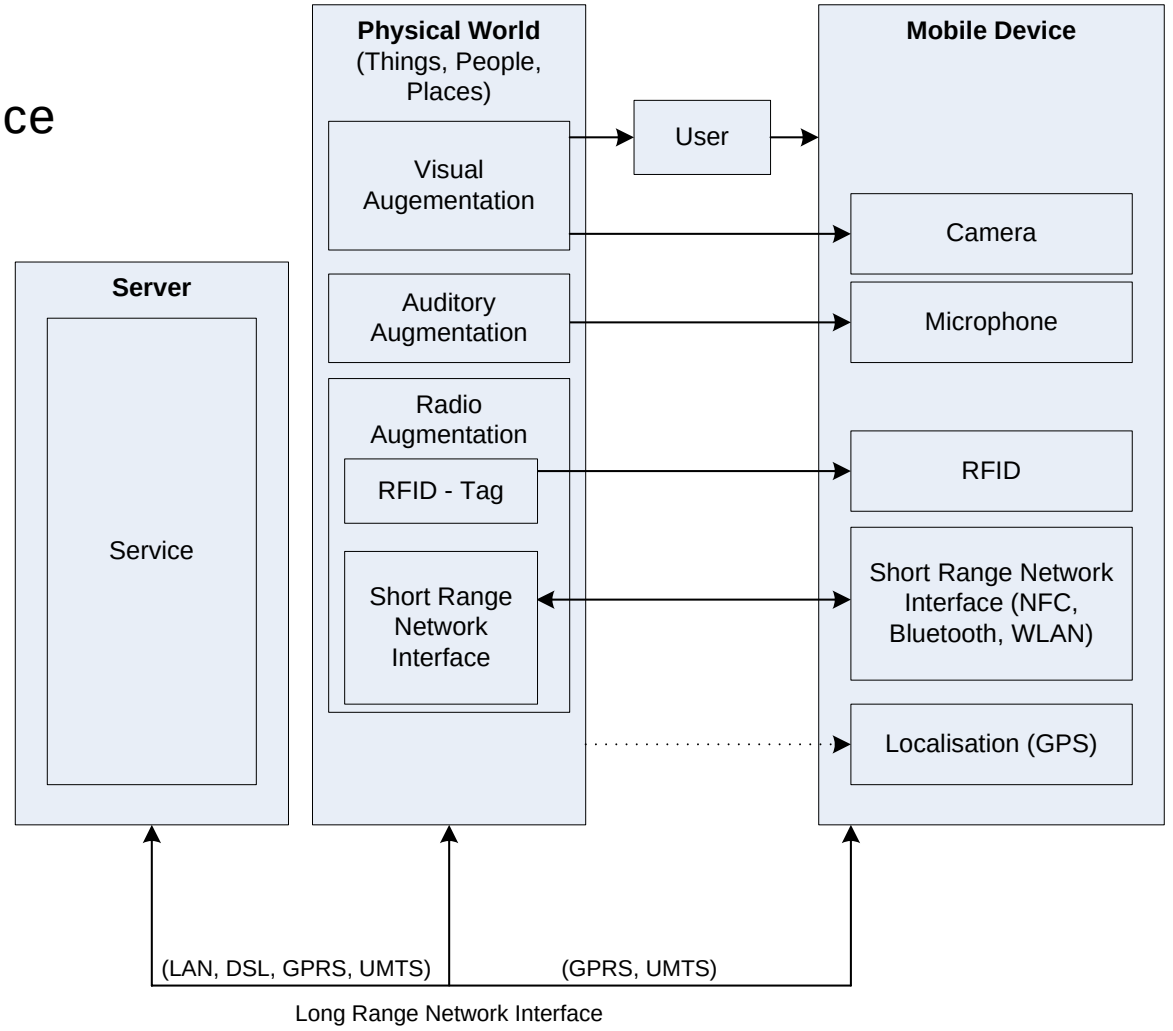
PMIF: Physical Mobile Interaction Framework

- Physical Mobile Interaction Framework (PMIF)
  - Focusing on marker-based interactions (Marker = Visual Code, Location, NFC / RFID, Bluetooth URL, Number)

- Goals:
  - Supporting the development and implementation
  - Supporting all important interaction techniques
  - Provision of abstractions for the programmer
  - Orientation on existing and evolving standards like the Java 2 Micro Edition (J2ME) and the Contactless Communication API (JSR 257) [22].
  - Provision of the interfaces for the integration of existing systems
  - Provision of lightweight components on the mobile device

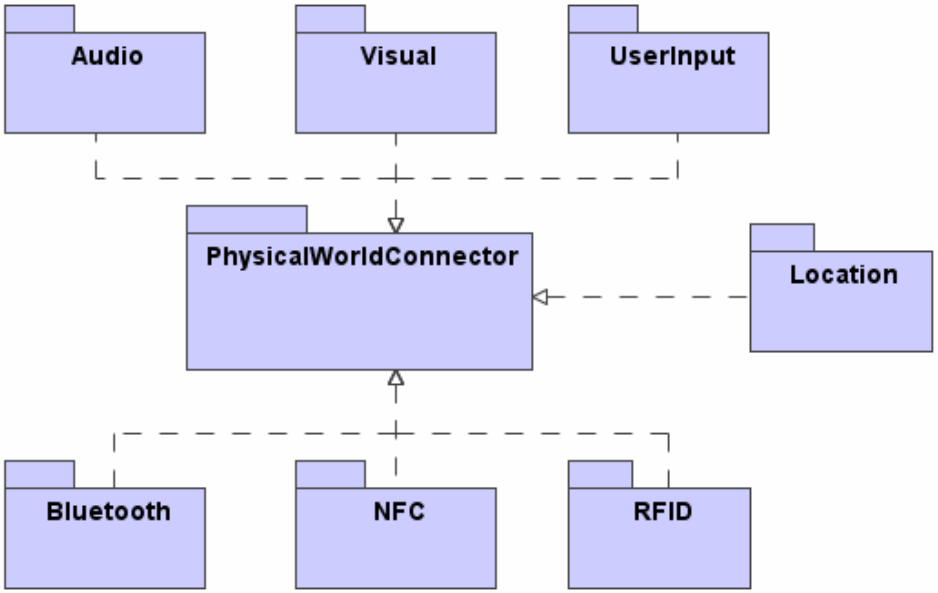
PMIF: Generic Architecture

- Link / Communication between augmented object and mobile device
- Direct / indirect interaction
- Unidirectional (read RFID tag) and bidirectional communication (Bluetooth)

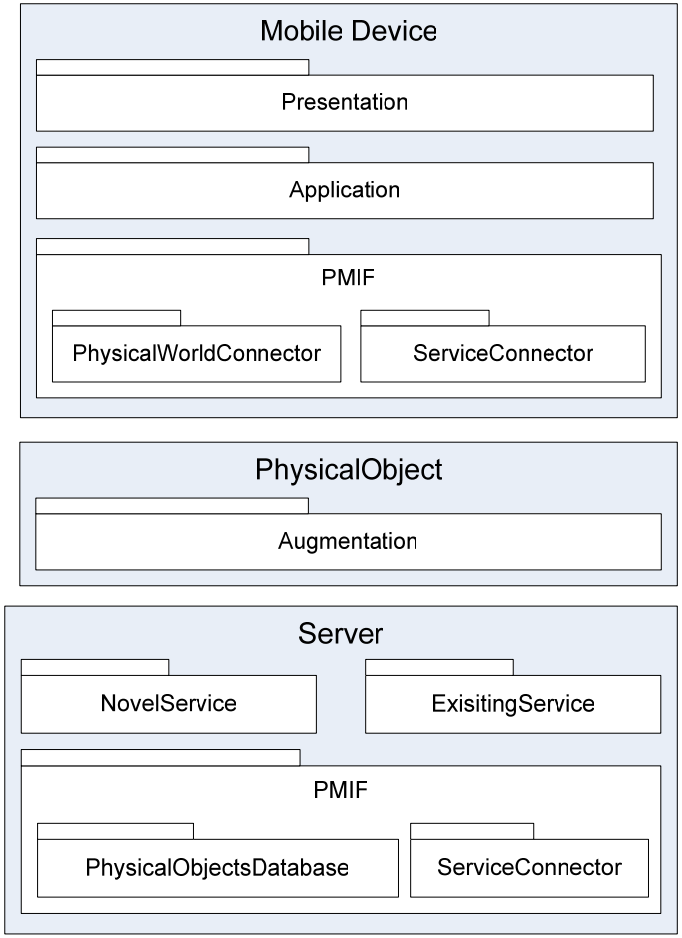


PMIF: Architecture / Mobile Device

- *PhysicalWorldConnector*: abstraction of the concrete connection technology (Stream metaphor)

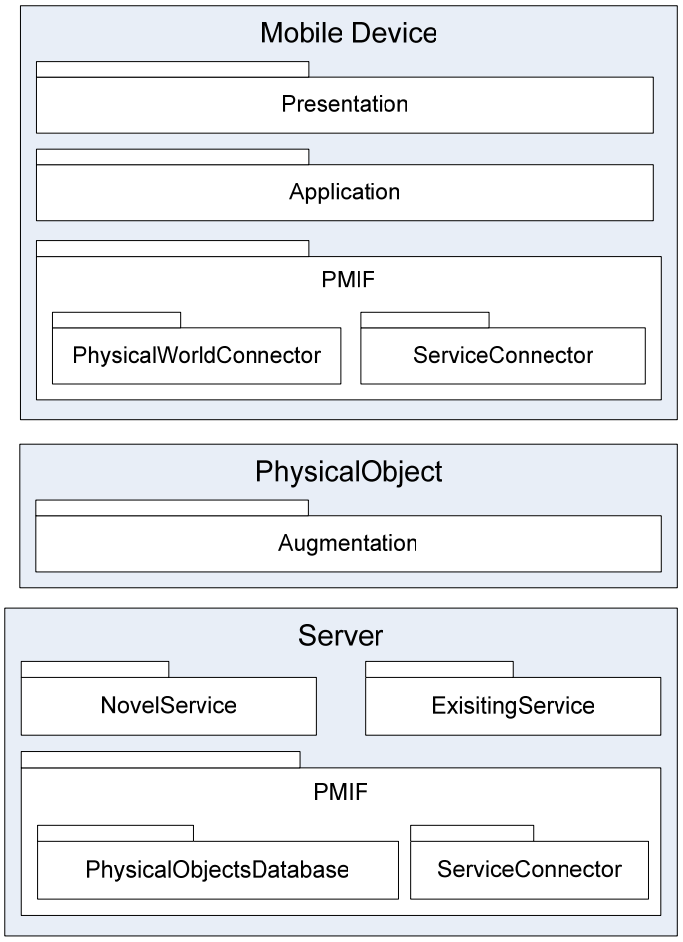


- ServiceConnector: Communication between PhysicalWorldConnector and ServiceConnector on the server



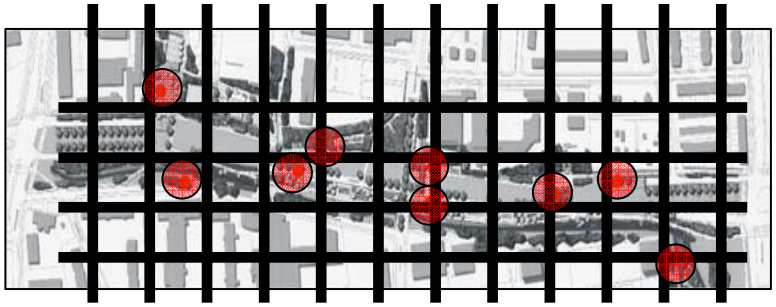
PMIF: Architecture / Server

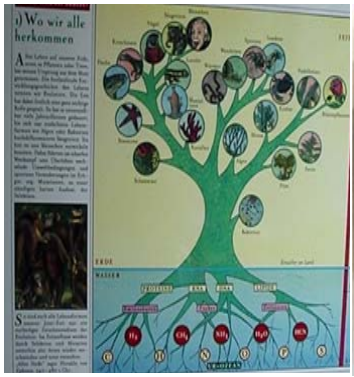
- *PhysicalObjectsDatabase*:
  - links the id (real world object) with the corresponding service (HTML, Web Service)
  - Database: identifier, position, properties and related services
- ServiceConnector: Communication between PhysicalObjectsDatabase and ServiceConnector on the mobile phone
- Server: remote server or part of the augmented real world object (public display)



PMIF: Implementation / Realized Prototypes

- Technology: J2ME (Mobile Phone) / J2SE (Server)
- Visual Physical Hyperlink (marker based)
- Mobile Guide (marker based, location based, user acts as a mediator)





- Mobile Learning application for children (user acts as a mediator)

- Situated Mobile Commerce (NFC / RFID)

Summery & Next Steps

- Motivation (Physical Mobile Interactions)
- Physical Mobile Interaction Framework (PMIF)
  - Goals
  - Architecture
  - Realized Prototypes
- Next Steps
  - Finishing / Improving the prototypes
  - Improving the integration of Near Field Communication (NFC) / RFID
  - Running a practical course (starting in October) based on PMIF
  - Supporting the authoring process (museum / tourist guide, mobile gaming, mobile learning)

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