Mobile Device-complemented Advanced Driver and Mobility Assistance Systems

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Motivation

- Mobility is a key factor for self-determined participation in society

- Mobility constantly changes with advancing technology and people's needs

Examples:
- Sharing economy

- Sustainability and comfort

- Always connected

http://www.dlr.de/vf/Portaldata/12/Resources/images/projekte/mid/mid2008_c1_l.gif

Problem Statement

Mobility processes have increasing complexity

- creation of seamless intermodal door-to-door trips
- control of various different digital services and interfaces

Many factors influence mobility processes, for example:

- User groups
- Means of mobility
- Trip purpose and context

http://www.mobiel.de/uploads/pics/Vortrag_pro_Nahverkehr_Wertewandel.jpg

Goal and Approach

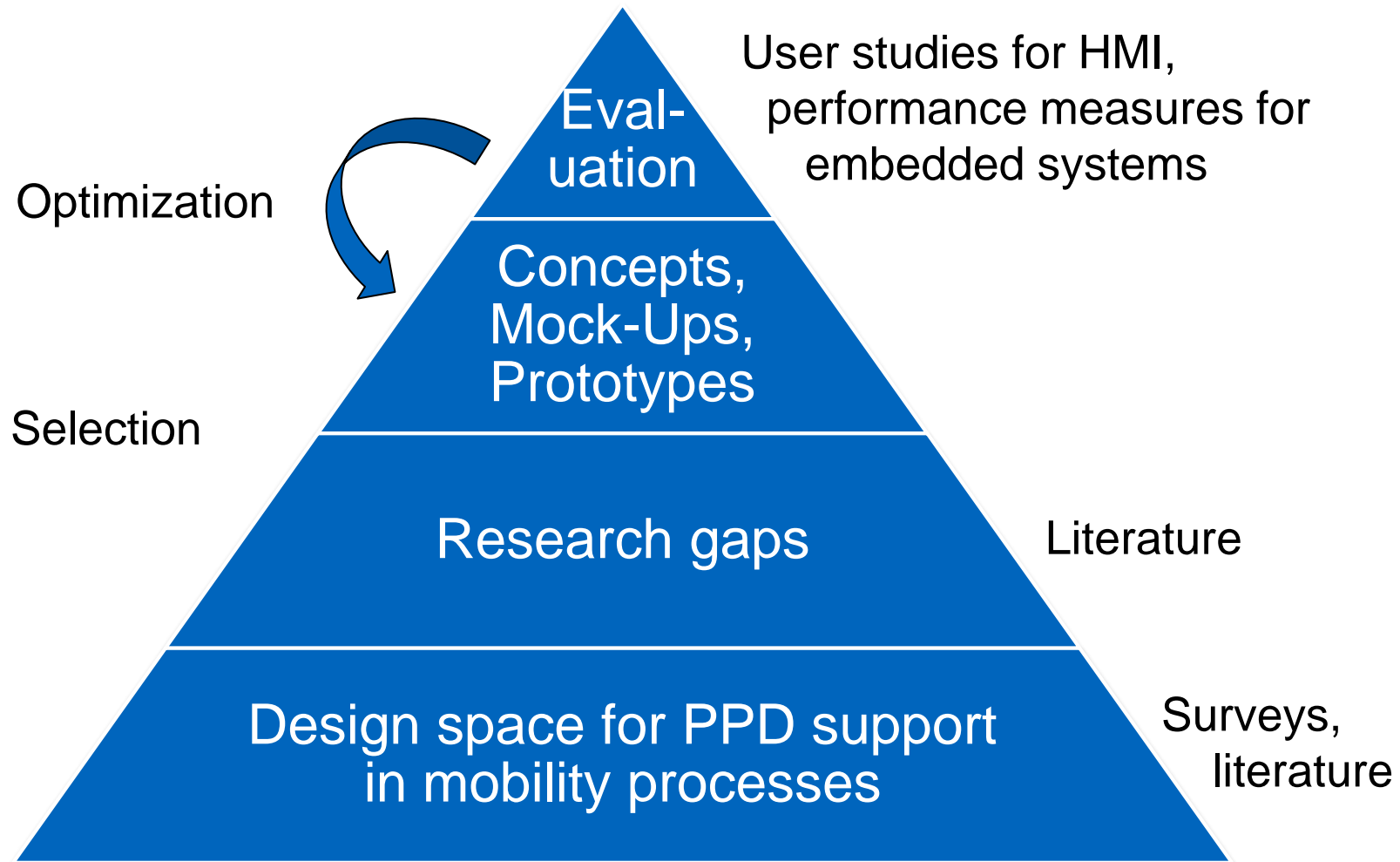Context-aware support of users' mobility processes through personal portable devices

Personal portable device (PPD): smartphone, tablet PC, wearables

- ubiquitous travel companions
- context information (calendar, social data, location history, …)
- sensors for gathering further context information
- users are acquainted to human-machine interfaces
- high processing power
- multiple (wireless) communication systems

Research Questions

1. What are the main mobility requirements of potential users?

2. What are the steps typical intermodal mobility scenarios are composed of?

3. What steps in intermodal mobility scenarios can benefit from digital assistance by users' PPDs?

4. What data sources and application programming interfaces (APIs) are necessary for providing mobility-related assistance functions?

5. How can the complexity of operating new mobility services be reduced for the users?

6. How can users be supported in controlling different mobility-related HMIs?

7. What are potential problems and challenges of mobile device-complemented mobility assistance functions?

Methodology

Eval-
uation

User studies for HMI,
performance measures for
embedded systems

Optimization

Concepts,
Mock-Ups,
Prototypes

Selection

Research gaps

Literature

Design space for PPD support
in mobility processes

Surveys,
literature

Selected Concepts

- Mobility training
  - Physical training with mobility aid
  - Automotive user interface training
- Route planning
  - Physical fitness-based route suggestions
  - Trust-enhanced route presentation
- PPD integration in the automotive domain
  - Extensible architecture for offloading driver assistance functions in vehicle-to-x communication scenarios
  - PPD as HMI for advanced driver assistance system

Aspects: Motivation (gamification), engineering, user evaluation

Example: Mobility Training with PPD

Goal: enhance physical mobility and mobility aid handling

Ongoing user study:

- 24 participants (70+ years)
- Group training vs. printed instructions vs. interactive app

# Example: Automotive User Interface Training on PPDs

- 30 participants
- Significant effect only for uncommon functions
- Ongoing: in-vehicle training

Example: Route Planning
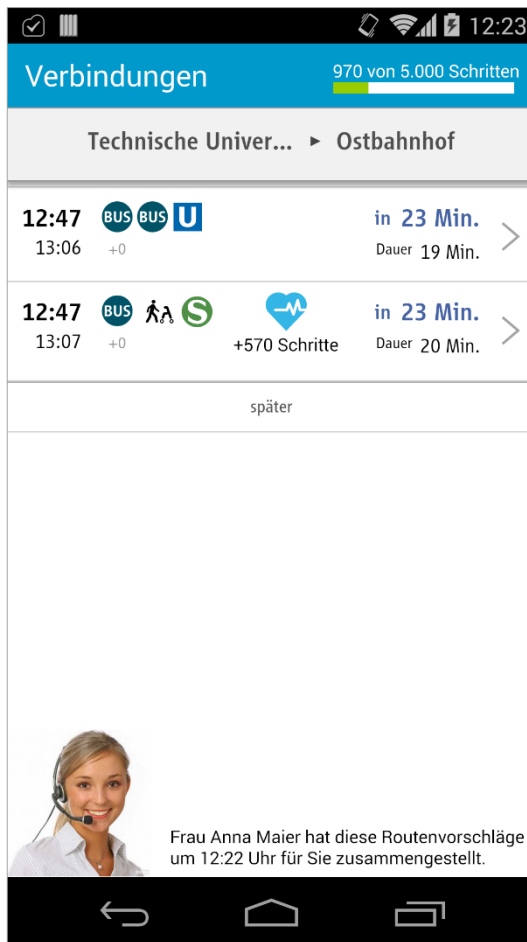
Planned user study:

- 15 participants (70+ years)
- Mock-ups for different scenarios
  - o Fitness route based on requirements and preferences (park, culture, shops)
  - o Different approaches for enhancing trustworthiness of route suggestions
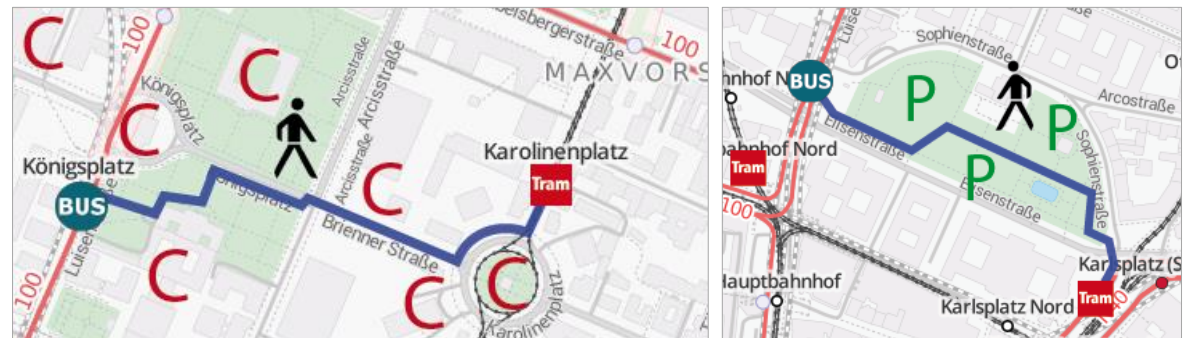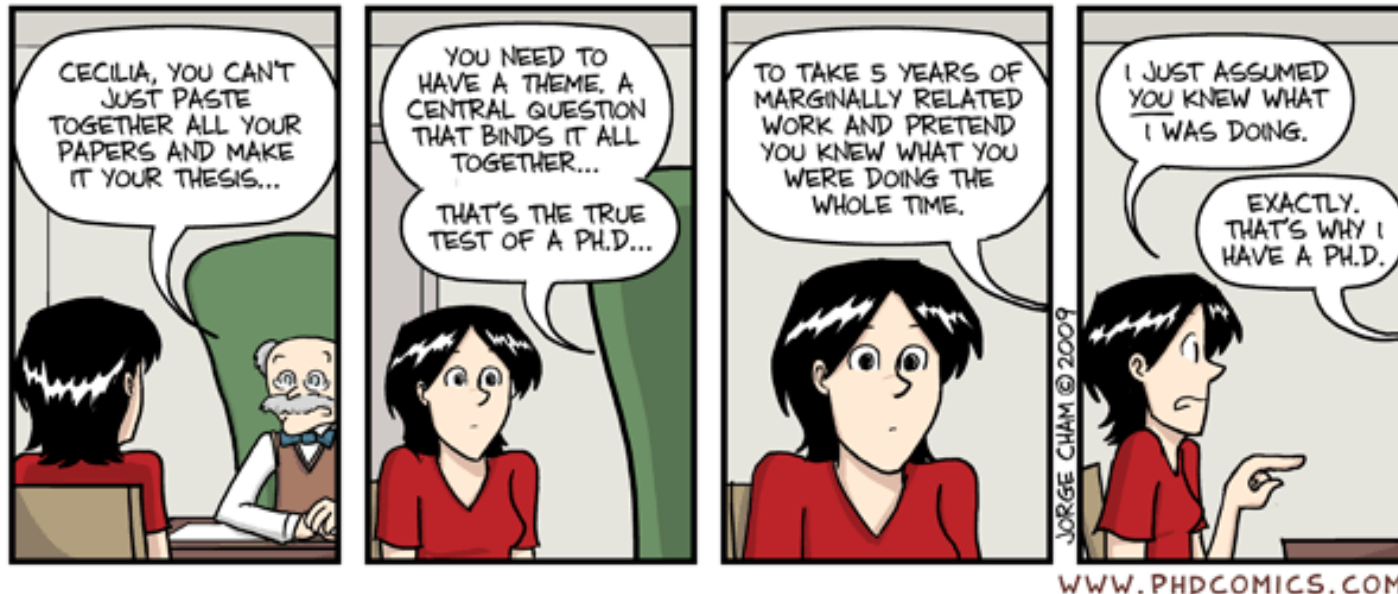
Example: PPD as HMI for Advanced Driver Assistance Systems

Addition of route context

Next Steps

- Finish user study for "enhanced mobility through physical exercising"

- Perform user studies for "fitness route", "in-vehicle UI training"

- Create a first complete draft of dissertation until July 2015

Discussion

- Are the story and the approach comprehensible? What remains open or is missing?

- How to account for the change of user groups between the conducted user studies?

- How can the combination of system engineering concepts and human-computer interaction results be sold best?

References

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