Physical Posters as Gateways to Context-aware Services for Mobile Devices

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Overview

- Why are mobile services so rarely used?
- Idea / Solution
- Related work
- Scenario
- Analysis
  - Categories of poster displays
  - Observing people at stops
  - Questionnaire
- Architecture
- Prototype
  - Architecture
  - Second iteration
- Conclusion / Outlook

Why are mobile services so rarely used?

■ **Technically it's already possible to use mobile services (WAP, i-mode)**

■ **Why are they so rarely used (in Germany/Europe)?**

■ Service Discovery
  – Does a mobile service of the local public transport organization exist?
  – What's the URL?
  – Solution: Google Wireless Search (not yet!)

■ Service Protocol Discovery
  – WAP, i-mode / cHTML, XHTML

■ Network Discovery
  – GPRS, UMTS, WLAN, Bluetooth

■ Cost / Speed

Idea / Solution?

- Use ubiquitously available artifacts in public as gateways to mobile services
- Pervasive advertising poster

  → Mobile services that are related to the shown info
- How to establish the connection?

  ▪ Marker on poster - represents service, service protocol, network

  ▪ Usage of built-in camera as sensor
- Network: Provided by the advertising company (integrated WLAN/Bluetooth-access point in an advertising column)
  → Cost aspect

Related Work

- **HPs Cooltown [1]**
  - Web presence for people, places, things
  - PDA + infrared beacons
- **505 series models of NTT DoCoMo have an integrated QR Code reader**
- **Rohs and Gfeller [2]**
  - Usage of camera-equipped mobile phones
- **Cybercode (Sony) [3]**
  - Visual tagging system for augmented reality
  - 2D-barcode
  - 3D position of the tagged object

→ Technically possible, Metaphor "Physical Browsing"
→ Usage of public posters: new application area
→ Analysis

Scenarios

- John recognizes movie poster on a advertising column → promotes a new film

- Interaction (focus the marker with the mobile phone)

- Usage of built-in Bluetooth access point

- Accessing the i-mode webpage

- Watches movie trailer + download

- Download further information (When & Where played)

- Shows all to his girlfriend in the evening → watch the movie

Categories of Poster Displays

Viewing time

Physical Accessibility

	User chosen	Determined by circumstance
Approachable		
Distance		

Observing People and Their Behaviour

- Observed people and their behaviour while they waited for public transport (nearby posters)
    - How long do they wait?
    - Activities during waiting
- Observed 230 passengers / 3 different locations
- 3 different observers – one form
    - For every passenger one row
    - Passenger = {description, arrival, departure, holds in hands, activities, part of a group}

Date/Time:		Place:				
Frequency of departures:						
	User (Description)	Arrival (min/s)	Departure (min/s)	Hands(l/r)	Activity	Group
1						

Observing People and Their Behaviour

Waiting time t (in seconds)	Spot check 1 (in percent)	Spot check 2 (in percent)
0 ≤ t ≤ 60	32	8
60 < t ≤ 120	12	14
120 < t ≤ 180	12	15
180 < t ≤ 240	11	9
240 < t ≤ 300	8	15
300 < t ≤ 360	5	4
360 < t ≤ 420	6	7
420 < t ≤ 480	3	11
480 < t ≤ 540	7	15
540 < t	4	2
Time between two busses / trams	5 minutes	10 minutes
Average waiting time	3 min 13 sec	4 min 37 sec

Observing People and Their Behaviour

- What did people do?
  - Mostly nothing
  - Talking - 20% in the afternoon
  - Calling - 8% in the afternoon
  - Waiting time < 4 minutes → people did not read
- "Killing time is a killer application" [4]
  - Usage of mobile services during waiting time
- → Requirements
  - Connection to mobile service established in a short time
  - User should be able to move afterwards (Bus arrives, driving with the bus)

Expectations in Mobile Services

- Usefulness of mobile services is often questioned
- Web based interview (May/June 2004)
  - Which mobile services potential users might connect with an advertisement poster?

- Steps
  - Introducing a mobile future
  - Example (motion picture ad – mobile services)
  - 1st form: 8 posters + big input area
  - 2nd form: 8 posters + rate proposed services
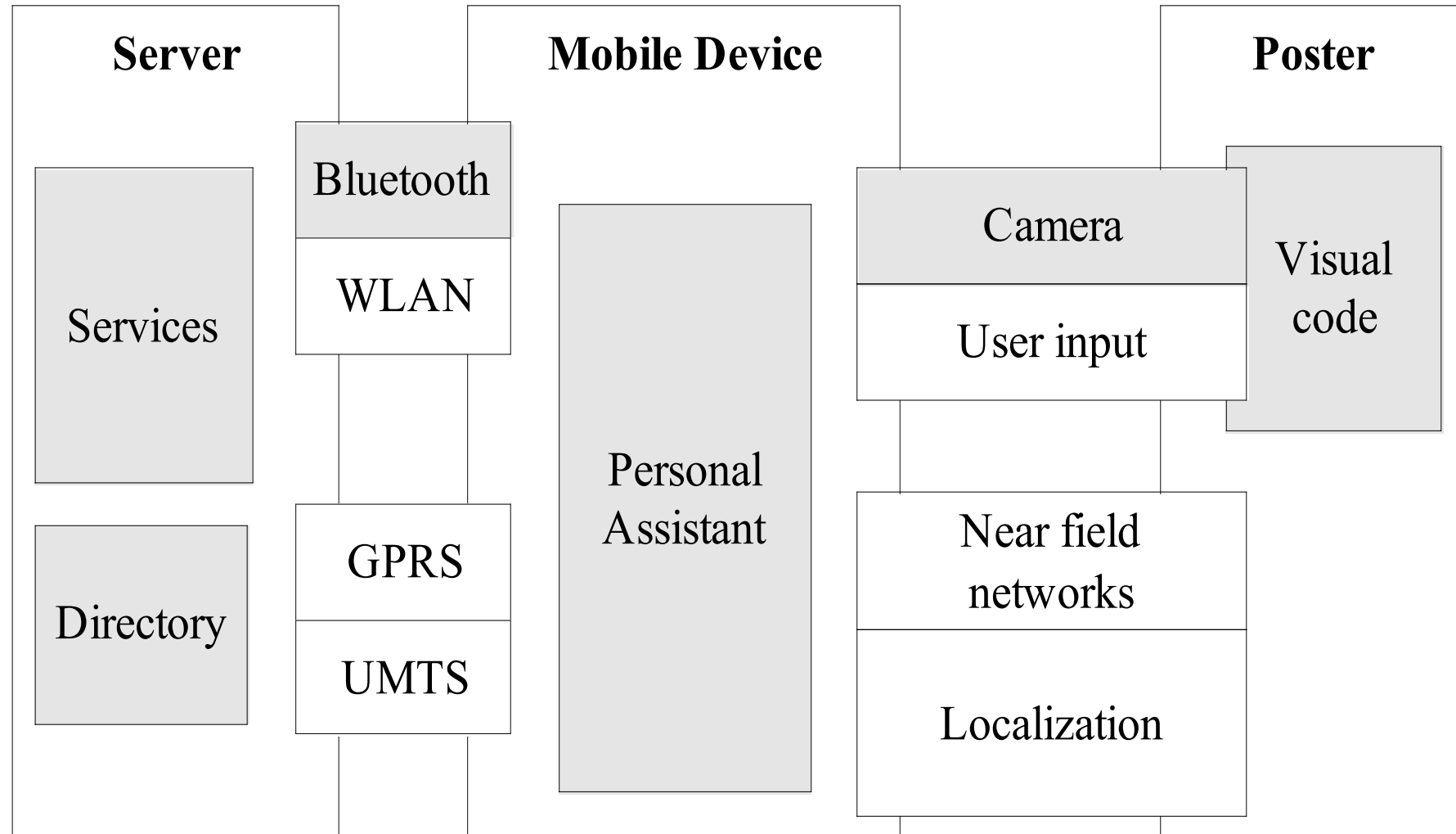 - 3rd form: statistical data (gender, age, etc,)
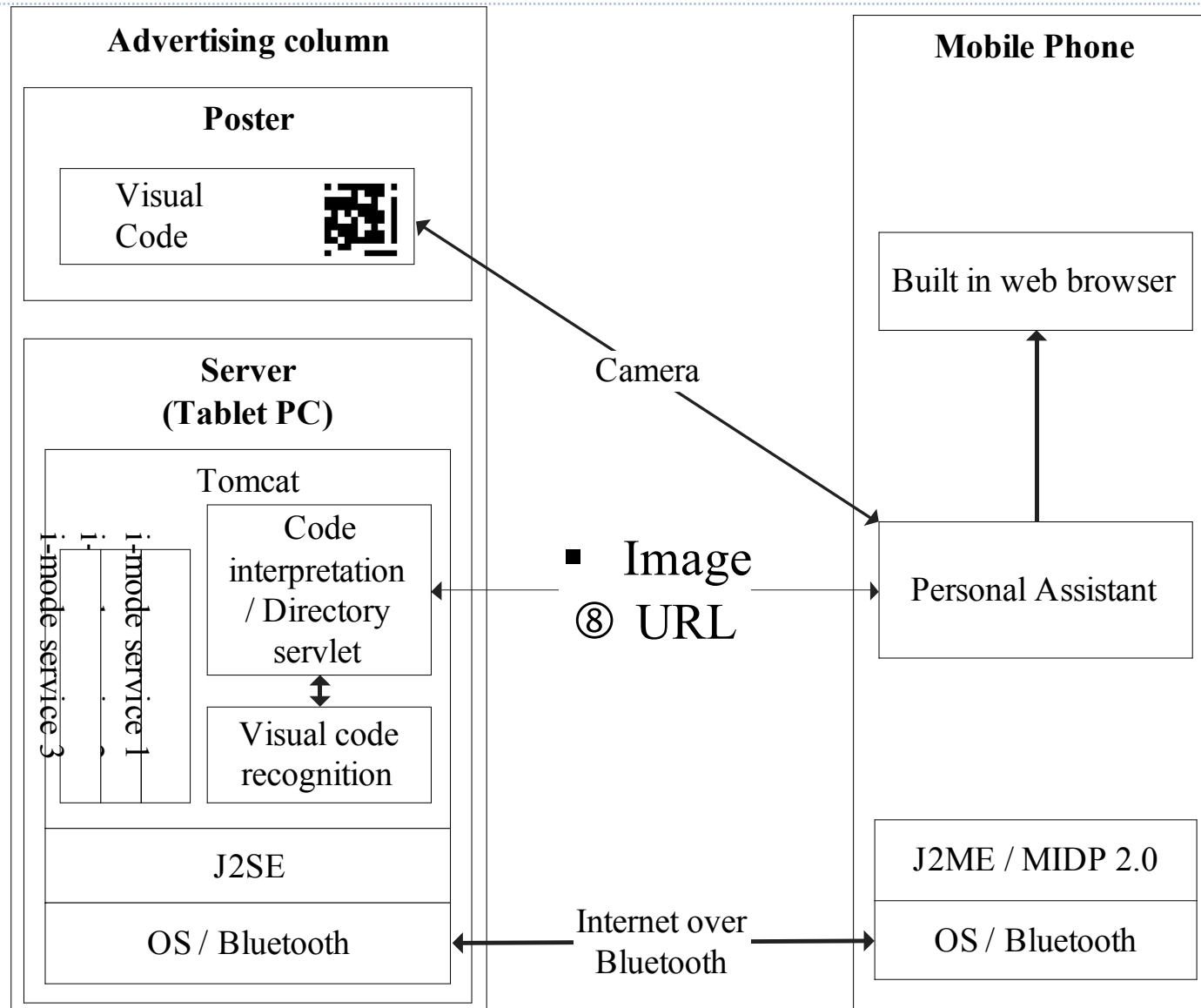
→ 39 participants

Expectations in Mobile Services

- People potentially very interested in the usage of mobile services
- Participants could imagine a large set of different services connected with different posters
- Mostly: Getting information / not buying
  - Car rental: special offers and prices (84%)
  - Home entertainment: technical information (55%)
- Interested in buying when offer limited
  - Reserving a ticket for a concert (68%)
  - Looking for and booking available flights (87%)
- Location based services
  - Where is the closest store (58%)
- → Convergence in expected services (2-5)

Overall Architecture

Server — Services, Directory, Bluetooth, WLAN, GPRS, UMTS

Mobile Device — Personal Assistant

Camera, User input, Near field networks, Localization

Poster — Visual code

Prototype: Architecture

Advertising column

Poster

Visual Code

Server (Tablet PC)

Tomcat

i-mode service 3 ⋮ i-mode service 1

Code interpretation / Directory servlet

Visual code recognition

J2SE

OS / Bluetooth

Camera

■ Image
⑧ URL

Internet over Bluetooth

Mobile Phone

Built in web browser

Personal Assistant

J2ME / MIDP 2.0

OS / Bluetooth

Prototype: Second iteration

- **Hardware:**
  - Two different phones (Nokia 6600, Siemens S65)
  - Tablet PC (Compaq TC 1000)
- **Mobile Phone**
  - APIs
    - MIDP 2.0 - CLDC 1.0/1.1
    - Mobile Media API (JSR-135), Bluetooth API (JSR-82)
  - Java J2ME code snippets can be found under www.hcilab.org (Documentation)
    - Camera performance
    - Image transfer to a servlet on a server
    - Bluetooth connection
- **Server**
  - Tomcat (Servlets)
  - Visual code recognition "visual codes" (ETH Zurich)

Prototype: Second iteration

- Practical course works on implementation
- Focus a marker → Webpage on the mobile phone
  - Less then 2 seconds
- First prototype of the advertising column
- 4 posters / 4 services (train, weather, bank, cinema)
- Display (Tablet PC) in the advertising column
- User passes by: advertising column starts interaction

Conclusion & Outlook

■ Conclusion

▪ Physical browsing well-known interaction metaphor

▪ Pervasive advertising posters + people spent time nearby doing mostly nothing

▪ People could associate mobile services with advertising posters, interested in

▪ Technically feasible

■ Next steps

▪ Deploying the prototype

▪ User studies with potential costumers (Do "normal" people understand physical browsing? How do they use the mobile services? What do they think about context awareness? Would they use it?)

Questions

- Acknowledgments
  - Our students doing the second iteration of implementation
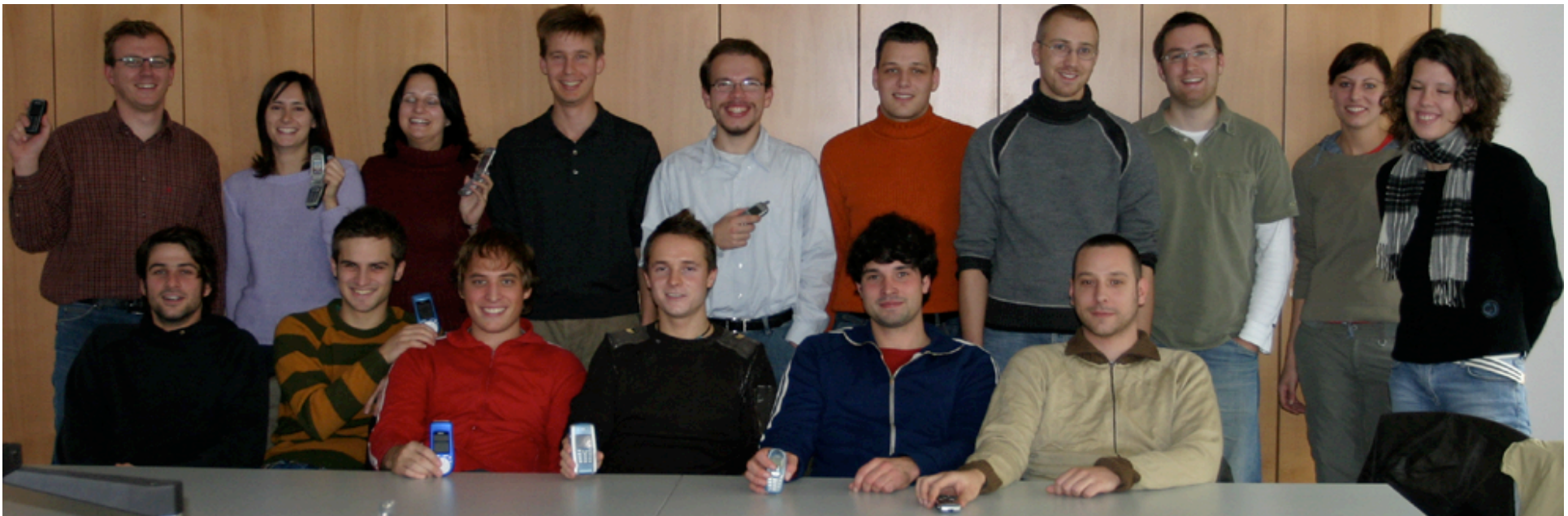
  - European Project Simplicity www.ist-simplicity.org
  - DFG Embedded Interaction www.hcilab.org
  - Nokia and Siemens for lending us mobile phones

References

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[2] Rohs, M.; Gfeller, B. 2004. Using Camera-Equipped Mobile Phones for Interacting with Real-World Objects. In: Alois Ferscha, Horst Hoertner, Gabriele Kotsis (Eds.): Advances in Pervasive Computing, Austrian Computer Society (OCG), ISBN 3-85403-176-9, pp. 265-271, Vienna, Austria, April 2004.

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