

# Context-Aware Communication

Seminar Ubiquitous Human-Machine Interaction

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# Outline

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## Introduction

- Motivation, definition and scope

## Selected fields of research

- Context-acquisition – diverse types of context
- Communication – different application areas

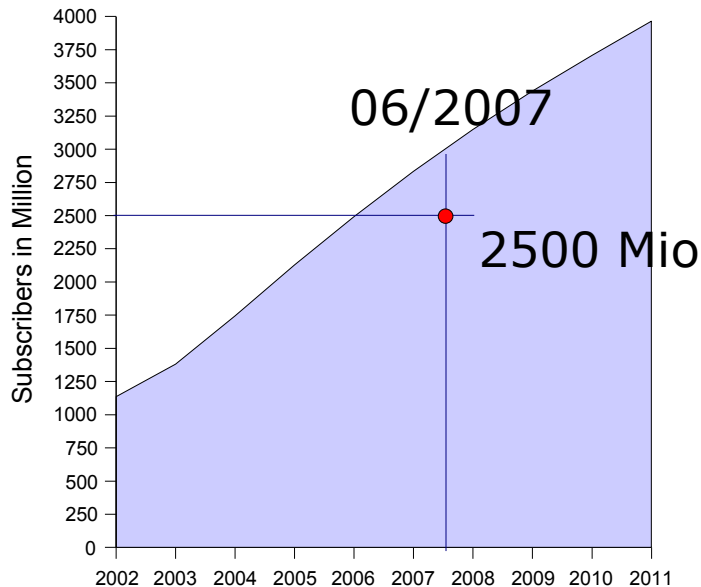
## Conclusion

- Recapitulation, trends, potential, challenges

## Reference

# Introduction (1/3)

## ▪ Motivation mobile phones



**Forecasted worldwide mobile subscriber numbers, 2002 – 2011**  
(Source: Portio Research 2006 and 3G Americas 2007)

## Types of communication

- Push-to-talk over Cellular (PoC)
- Short Message Service (SMS)
- Ordinary phone calls

## Disruption vs. information

- Ringing cell phones during meetings
- People are calling without knowledge of one's context

## Solutions?

- Manual profile selection

# Introduction (2/3)

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## ▪ Definition of context-aware communication

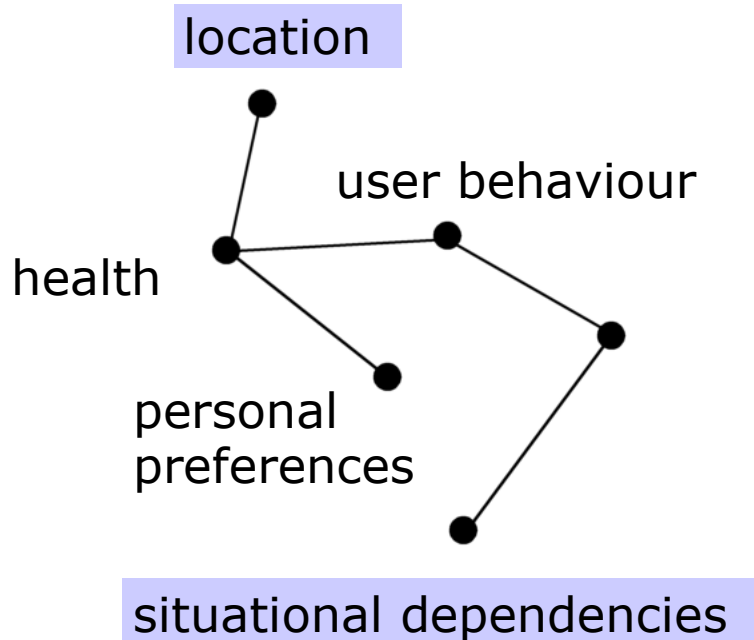
*Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves.\**

In general context-aware communication encompasses all fields of communication where context information creates a benefit and is acquired and processed to utilize it.

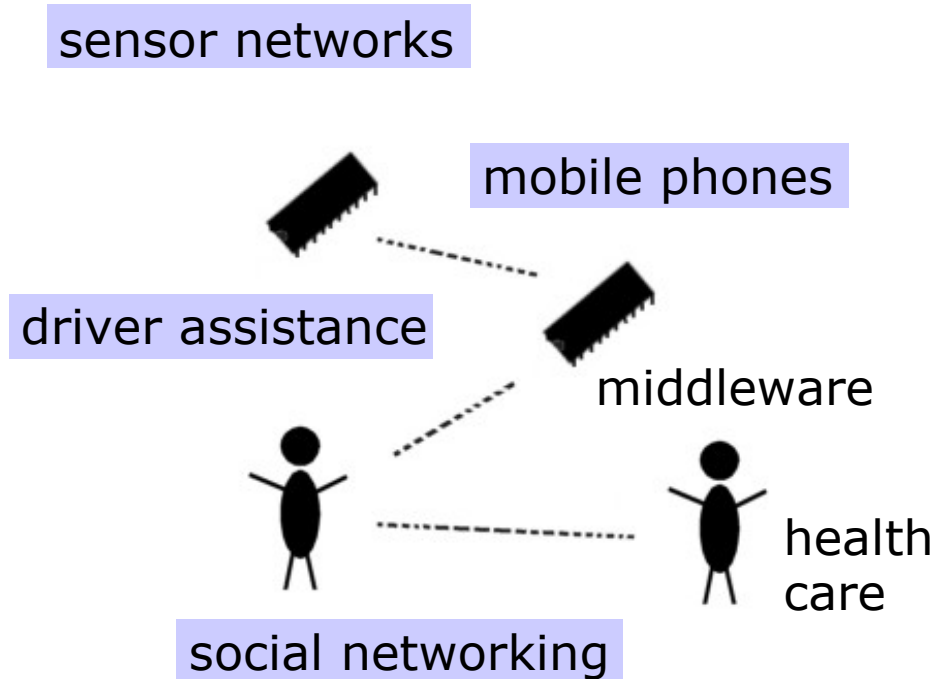
\*) Anind K. Dey and Gregory D. Abowd. "Towards a Better Understanding of context and context-awareness".

# Introduction (3/3)

## ▪ Scope of paper and presentation



### Context-acquisition



### Communication

# Selected fields of research (1/7)

Context-acquisition

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## ▪ Location-acquisition

### Outdoor

- Satellite communication (GPS) (*comMotion<sup>P</sup>*, *city guides<sup>P</sup>*)
- Mobile communication (cells, triangulation) (*Home Zone<sup>P</sup>*)
- A-GPS (combination GPS and mobile comm.) (*Emergency<sup>P</sup>*)

### Indoor

- Wireless LAN (*RADAR<sup>P</sup>*, *Nederlandse Spoorwegen<sup>P</sup>*)
- Bluetooth (<sup>1</sup>)
- InfraRed (*Active Badge<sup>P</sup>*)
- Radio frequency Identification (RFID) (*LANDMARC<sup>2</sup>*)

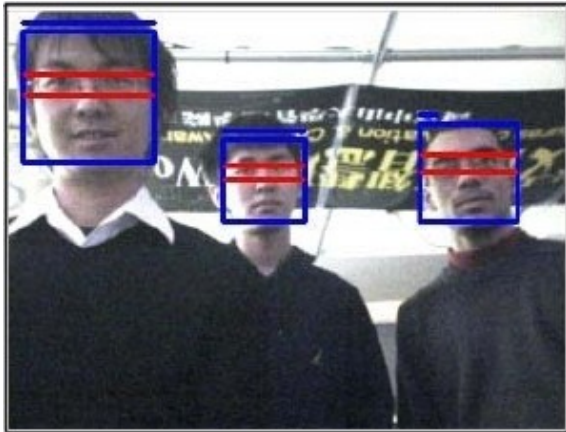
### Specific

- Calendar information (mobile and computer) (*CLUES<sup>3P</sup>*)
- Chirp technology (*RELATE<sup>4</sup>*)

# Selected fields of research (2/7)

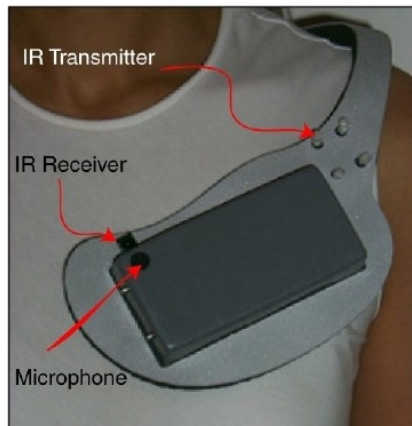
Context-acquisition

## ▪ Situational dependencies



### **Attention Meter<sup>P</sup>**

Facial expressions and head movements are captured with a single camera.



### **Sociometer<sup>P</sup>**

Wearable device with microphone, infrared transmitter and receiver to understand group interaction.

# Selected fields of research (3/7)

Communication

## ▪ Mobile phones



- A Bodymedia armband
- B Bluetooth headset
- C Laptop
- D Phone
- E GPS receiver.

### **SenSay<sup>P</sup>**

Uses calendar information and sensor data to gather context information (autonomous selection of sophisticated states).

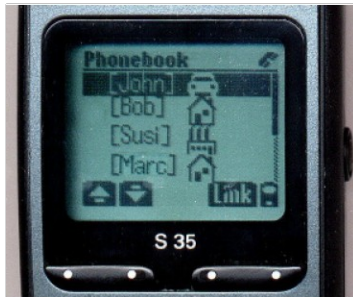
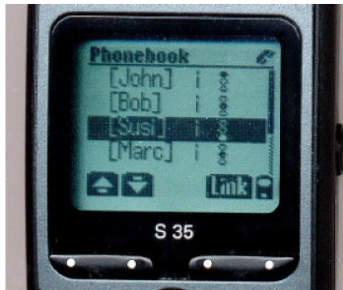
The underlying idea: a mobile phone should adapt to its user.



# Selected fields of research (4/7)

Communication

## ▪ Mobile phones



### Live Contacts Mobile<sup>P</sup>

The location, availability and calendar of persons are displayed in the contact list.

Combining for example *Outlook*, *MSN* and *Home Zone*.



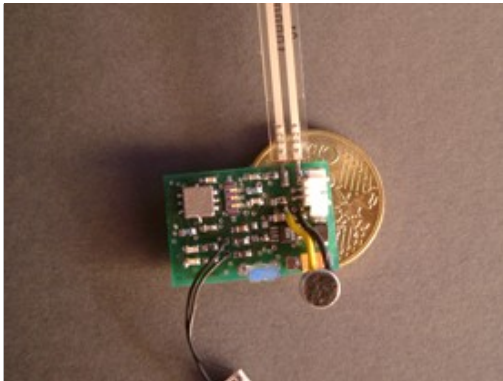
### Context-Phonebook<sup>P</sup>

Adding information as current location or availability to the phone's addressbook.

# Selected fields of research (5/7)

Communication

## ▪ Sensor networks



## Smart Its<sup>P</sup>

Small-scale devices adding sensor information and peer-to-peer communication to attached objects.

## Sensor Wall (Drawing)<sup>P</sup>

Drawing illustrating the idea of building tiny sensor nodes into an ordinary wall.



# Selected fields of research (6/7)

Communication

## ▪ Driver assistance (at DLR)



### **SADAS architecture<sup>P</sup>**

Measurement of distance to other cars, driver's attention and behavior. Notification about warnings depending on context.

### **The ViewCar records<sup>5</sup>**

- View of the driver, including gaze tracking
- View out of the window
- Position of the car and lane recognition
- Other objects via laser scanner
- Car data (use and drive dynamics)
- Physiologic data (pulse, electrical conductance of the skin)

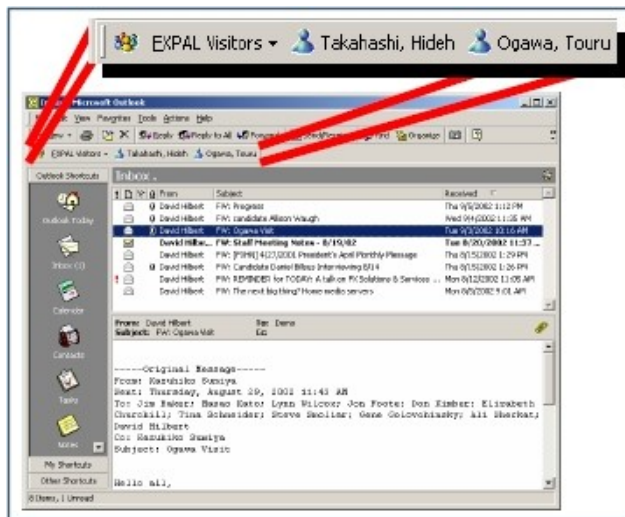
# Selected fields of research (7/7)

Communication

## ▪ Social networking

### Contextual Contact Bar<sup>P</sup>

Retrieving relevant contacts from website and email contents.



### WatchMe<sup>P</sup>

Displaying up-to-date context information for a specific person to enhance communication and awareness.

# Conclusion – recapitulation

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- Definition of context-aware communication
  - ♦ context and communication
- Examples of context-acquisition
  - ♦ Location – outdoor, indoor, specific
  - ♦ Situational dependencies (behavior and group context)
- Selected areas of context-aware communication
  - ♦ Mobile phones (wearable devices)
  - ♦ Sensor networks (machine-machine communication)
  - ♦ Driver assistance
  - ♦ Social networking (creating context-awareness, contacts)

# Conclusion

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## Trends

- Small and cheap devices, low-energy consumption
- Growing telecommunication market
- Human-Computer Interaction research
- Complex distributed systems

## Potential

- Improving communication
- Providing relevant Information
- Creating awareness

## Challenges

- Various (complex) interfaces
- Privacy issues

# Reference

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- P S. Maciejewski. „Context-Aware Communication“. Seminar Ubiquitous Human-Machine Interaction, July 2007. ([Basis of this presentation](#))
- 1 Bandara, U., Hasegawa, M., Inoue, M., Morikawa, H., Aoyama, T. “Design and implementation of a Bluetooth signal strength based location sensing system”. ISBN 0-7803-8451-2, September 2004
- 2 Lionel M. Ni<sup>1</sup>, Yunhao Liu<sup>1</sup>, Yiu Cho Lau<sup>1</sup> and Abhishek P. Patil<sup>1</sup>. “LANDMARC: Indoor Location Sensing Using Active RFID”. ISBN 1022-0038, January 2005
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- 4 RELATE: Assessment of relative positioning technologies for compositional tangible interfaces. [www.teco.edu/relate/](http://www.teco.edu/relate/) , July 2007
- 5 Deutsches Zentrum für Luft- und Raumfahrt (DLR), Institut für Verkehrsführung und Fahrzeugsteuerung, Automotive Systeme. [www.dlr.de/fs/desktopdefault.aspx/tabid-1236/](http://www.dlr.de/fs/desktopdefault.aspx/tabid-1236/) , July 2007