

University "Politehnica" of Bucharest



Artificial Intelligence and Multi-Agent Systems Laboratory



Université Pierre et Marie Curie Paris



Laboratoire d'Informatique de Paris 6

# A CONTEXT-AWARE MULTI-AGENT SYSTEM FOR AMI ENVIRONMENTS

# Andrei Olaru

cs@andreiolaru.ro

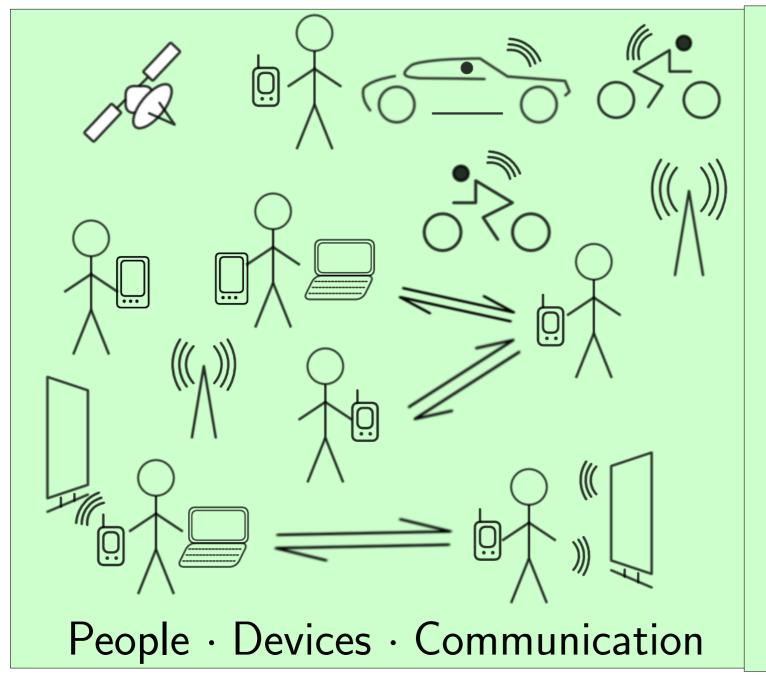
Supervisors:

Prof. Adina Magda Florea University "Politehnica" of Bucharest

Prof. Amal El Fallah Seghrouchni Université Pierre et Marie Curie, Paris

Ambient Intelligence – or AmI – is an ubiquitous electronic environment that supports people in their daily tasks, in a proactive, but "invisible" and non-intrusive manner. [Ramos et al., 2008, Weiser, 1993]

Our Goal: Develop a multi-agent system for the application layer of an Ambient Intelligence environment.



### Features of Ambient Intelligence:

- $\cdot$  pervasive
- $\cdot$  natural
- interactive
- $\cdot$  flexible
- · context-aware
- proactive
- $\cdot$  assistive
- transparent
- non-intrusive
- · privacy-aware

# A Layered Perspective of Aml

## Challenges

- How to make Aml reliable and dependable?
- How to manage the huge quantity of information generated by sensors and devices?
- How to provide only interesting information to the user in every situation?
- · How to make Aml privacy-aware and trustable?

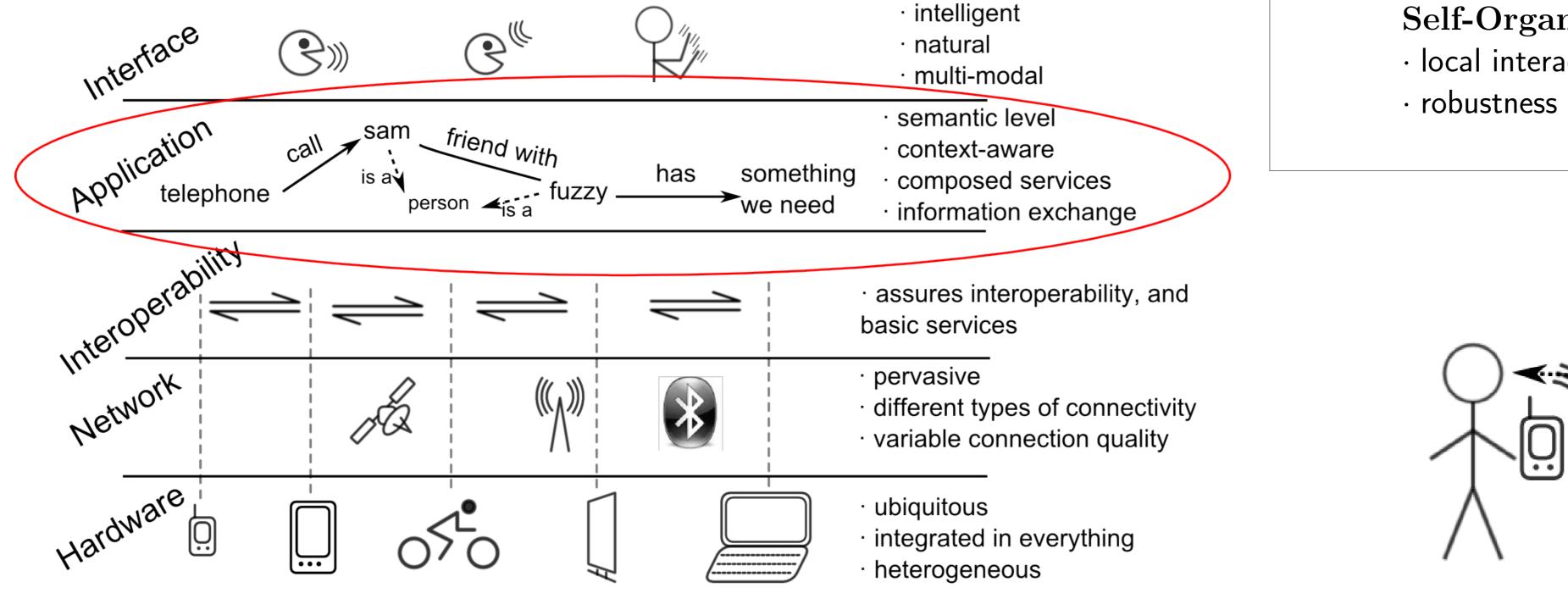
### Elements of the Approach

System Distribution

- $\cdot$  decentralization
- Multi-Agent Systems  $\cdot$  autonomy

 $\cdot$  no vital central components

 $\cdot$  reasoning



(layers based on [Seghrouchni, 2008])

### **Research Steps**

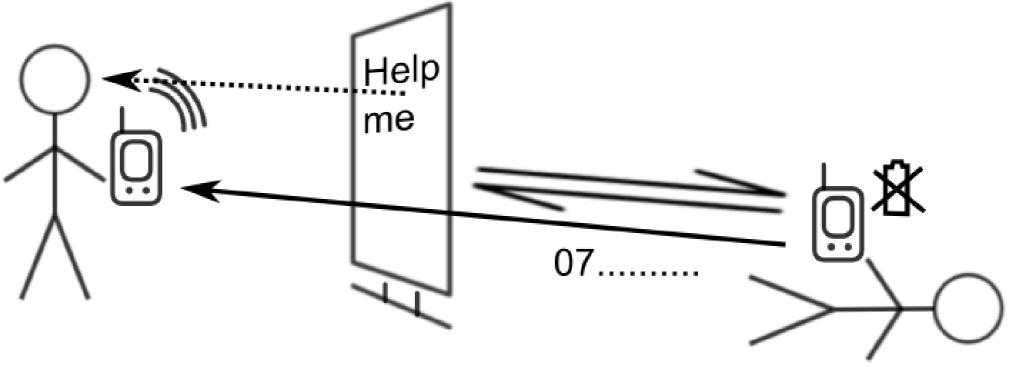
- Develop a multi-agent system based model for Aml's application layer.
- Propose scenarios that emphasize the requirements of real-scale Aml.
- Develop a simulation testbed that implements the scenarios.

- **Self-Organization**
- $\cdot$  local interaction
- robustness & flexibility

**Context-Awareness** 

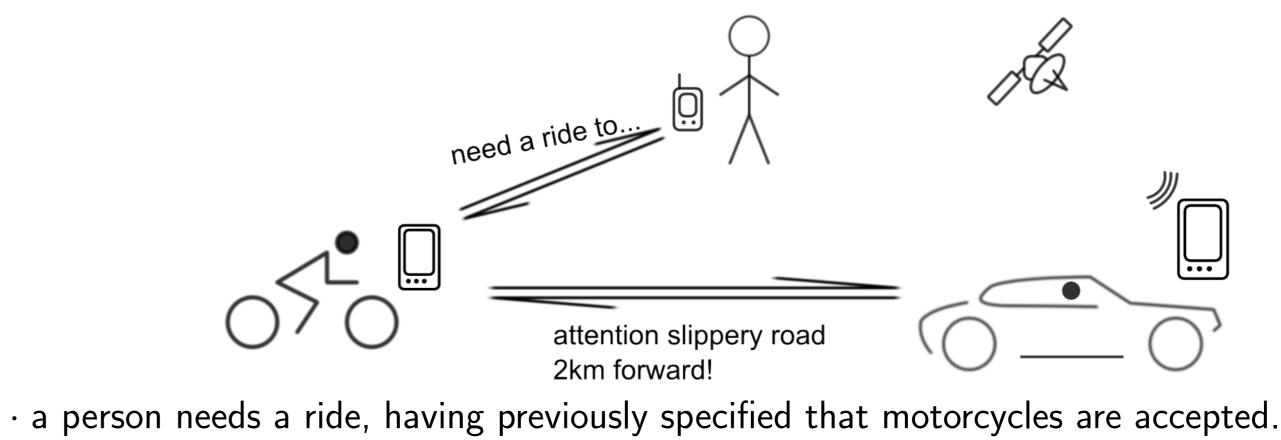
- · detection of compatible contexts
- $\cdot$  adaptivity and anticipation





 $\cdot$  a senior person falls on the street, in a less visible place.  $\cdot$  the smartphone detects the fall, but it cannot make a GSM call.

- $\cdot$  it sends a short message to a nearby intelligent advertising panel.
- $\cdot$  a person decides to help, receives the phone number and makes the call.



• Implement the developed model and experiment with the scenarios.

 $\cdot$  the system contacts a motorcycle driver nearby that accepts the ride.

 $\cdot$  the same system picks the information about slippery road up ahead.

 $\cdot$  the information is conveyed to the motorcycle driver and instructs him to be careful.

[Ducatel et al., 2001, Seghrouchni, 2008]

Г

[Ducatel et al., 2001] Ducatel, K., Bogdanowicz, M., Scapolo, F., Leijten, J., and Burgelman, J. (2001). Istag scenarios for ambient intelligence in 2010. Technical report, Office for Official Publications of the European Communities.

[Ramos et al., 2008] Ramos, C., Augusto, J., and Shapiro, D. (2008). Ambient intelligence - the next step for artificial intelligence. *IEEE Intelligent Systems*, pages 15–18.

[Seghrouchni, 2008] Seghrouchni, A. E. F. (2008). Intelligence ambiante, les defis scientifiques. presentation, Colloque Intelligence Ambiante, Forum Atena.

[Weiser, 1993] Weiser, M. (1993). Some computer science issues in ubiquitous computing. Communications - ACM, pages 74-87.

<sup>0</sup>This work is supported by University "Politehnica" of Bucharest, by Grant POSDRU 5159 and by Laboratoire d'Informatique de Paris 6.