A Context-Aware Multi-Agent System for Ambient Intelligence Environments

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- A & C
- AI-MAS
- PhD
- AmI
- Scenario
- Challenges
- Layers
- Approach
- Self-Organization
- Context
- Results
- Future

A Context-Aware Multi-Agent System for Ambient Intelligence Environments

overview

Faculty of Automatic Control And Computers (A&C)

http://acs.pub.ro/

Departments:

- Department of Automatic Control and Systems Engineering
  Head: prof. Ioan Dumitrache
- Department of Automatic Control and Industrial Informatics
  Head: prof. Radu Dobrescu
- Department of Computer Science and Engineering
  Head: prof. Valentin Cristea http://cs.pub.ro

Artificial Intelligence and Multi Agent Systems Laboratory

Head: prof. Adina Magda Florea

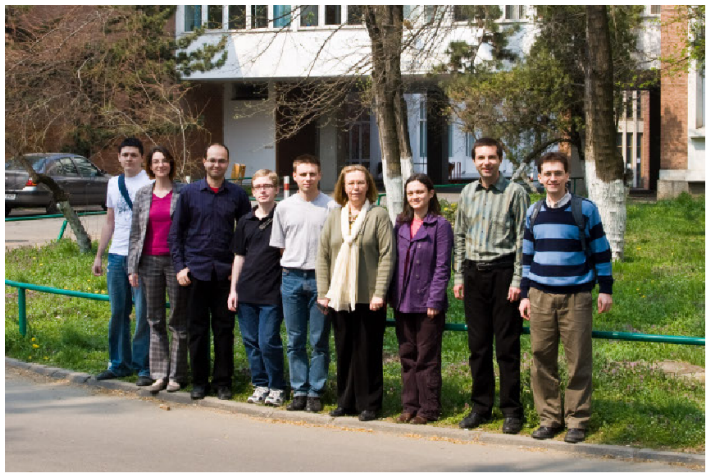
http://aimas.cs.pub.ro

· Research areas:

- Multi-agent systems
- Autonomous agents
- Coordination mechanisms, negotiation
- Emotional agents
- Self-organization

· Application areas:

- e-commerce
- e-learning
- SCM
- semantic web services for business processes
- Ambient Intelligence



A Context-Aware Multi-Agent System for Ambient Intelligence Environments

· develop a multi-agent system based model for Ambient Intelligence, considering various AmI scenarios and verifying it by means of simulation.

· advisor: prof. Adina Magda Florea

· in cotutelle with Laboratoire d'Informatique de Paris 6 (LIP6), UPMC, advised by prof. Amal El Fallah Seghrouchni

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]

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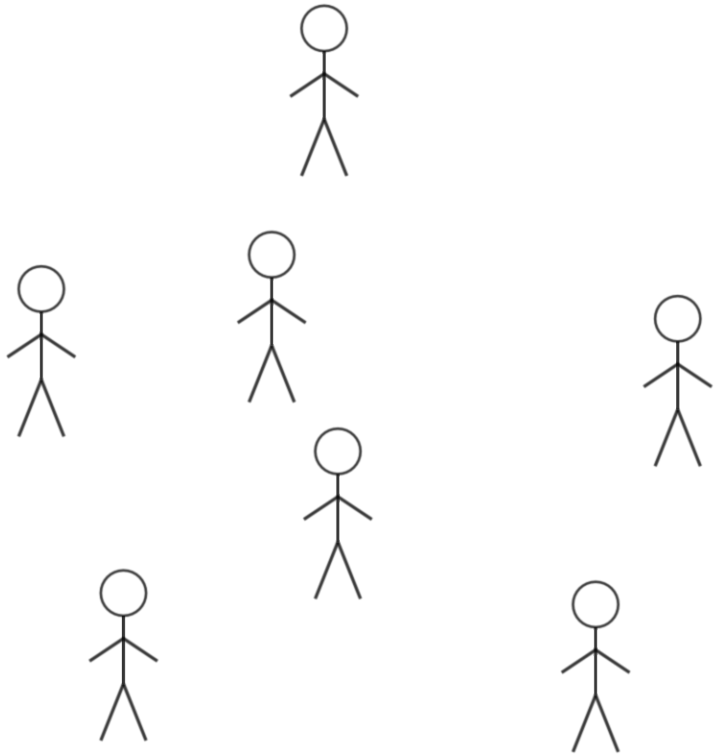

People

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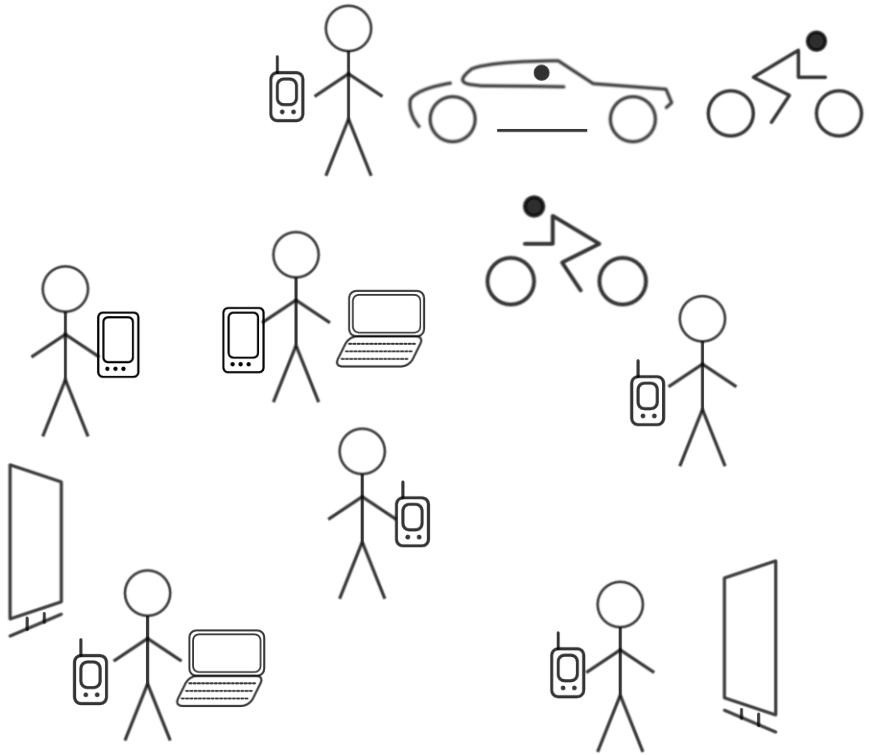

People · Devices

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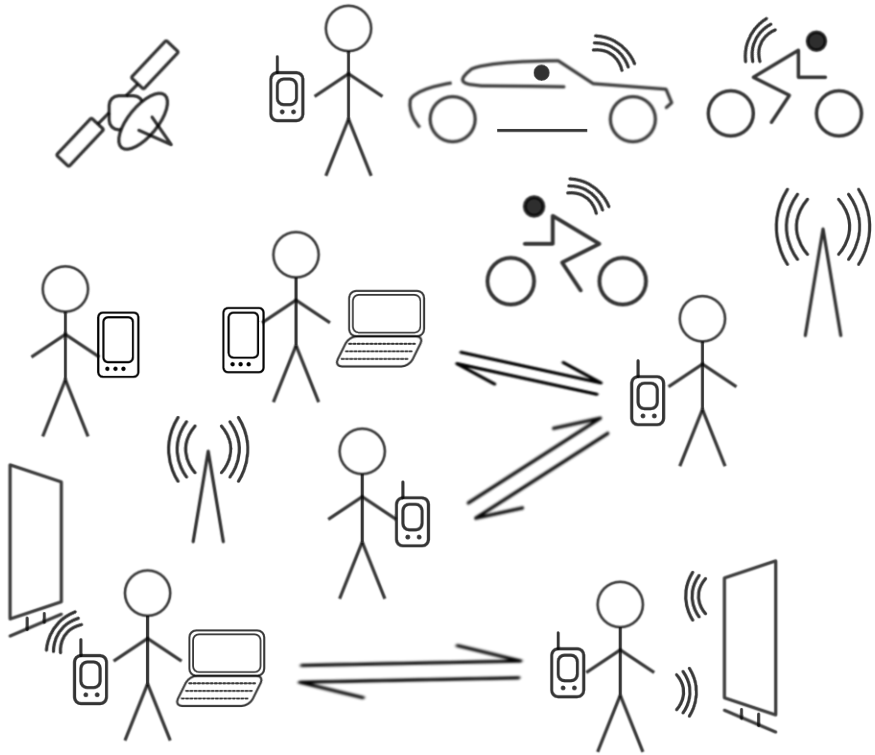
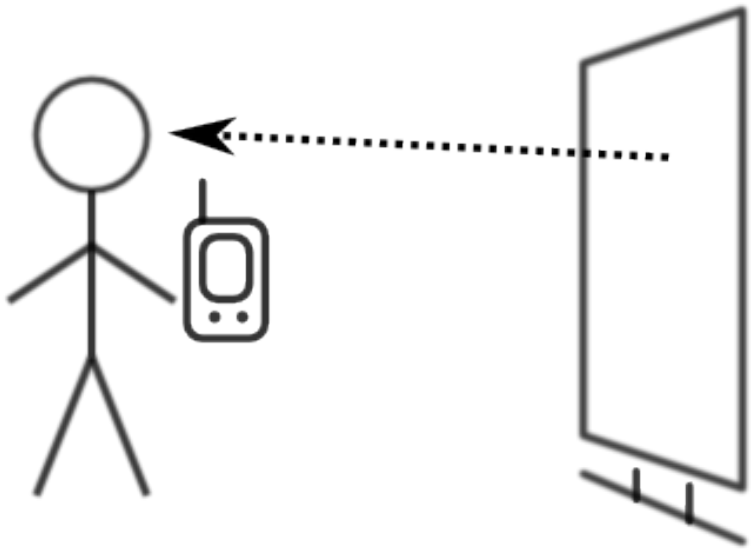
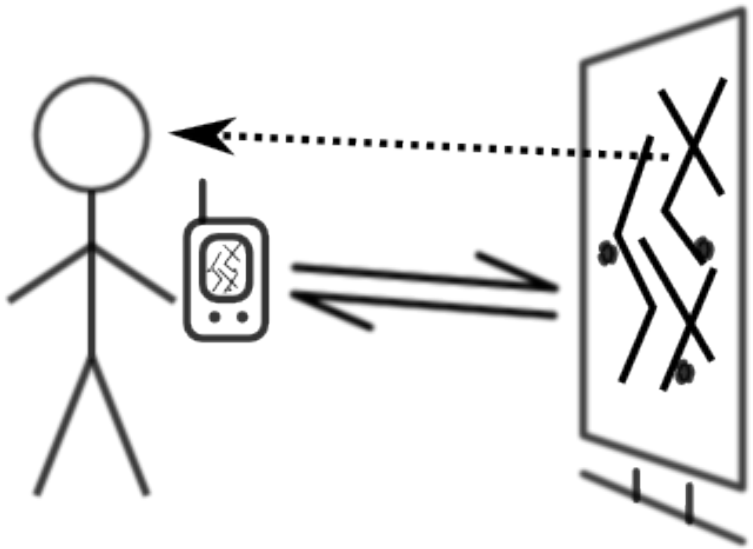


People · Devices · Communication

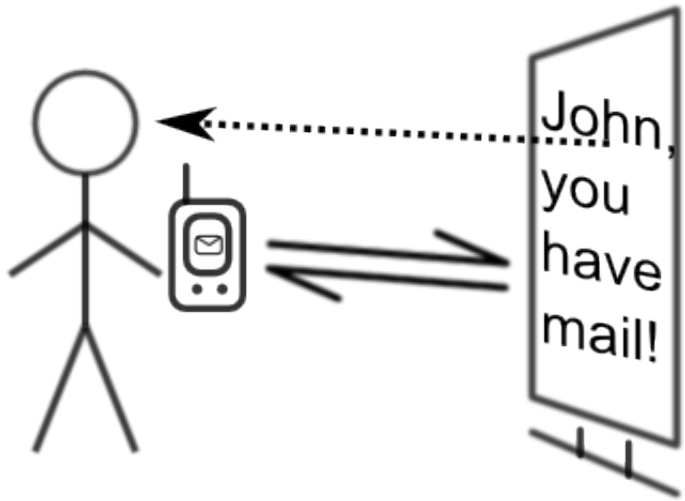
The large screen can be used to display context-aware advertisements...



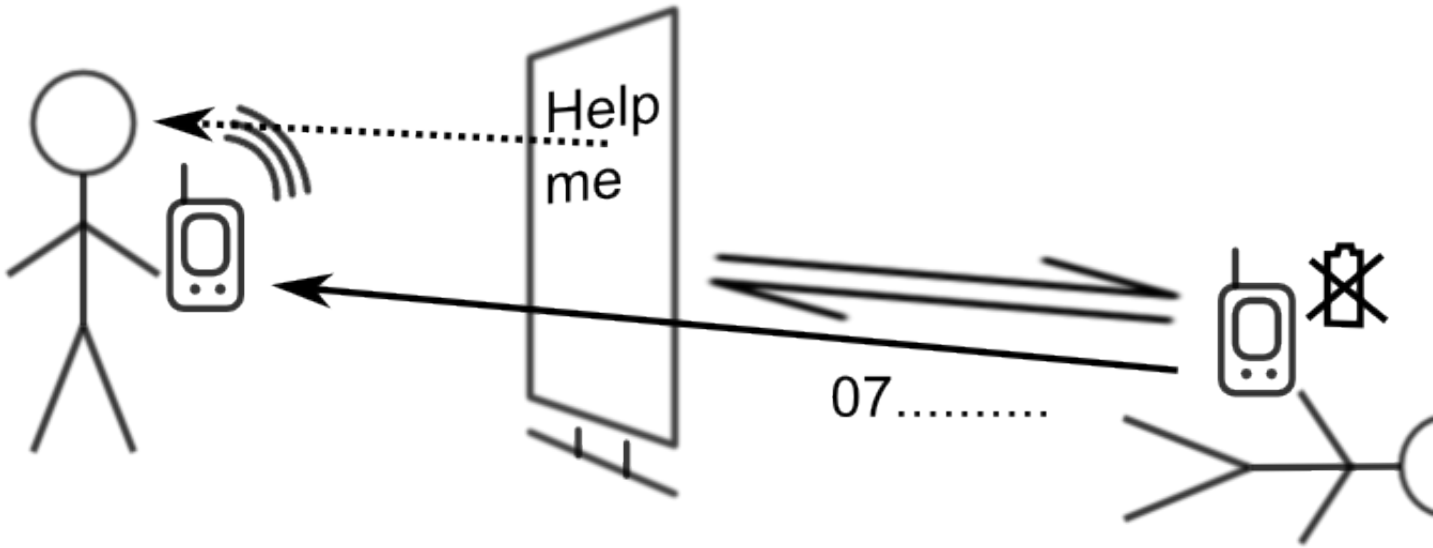
...or to draw attention of the user...



...to show an interactive map for which the mobile phone is too small [Canut et al., 2009]...



...to draw attention towards important events, if the phone cannot...



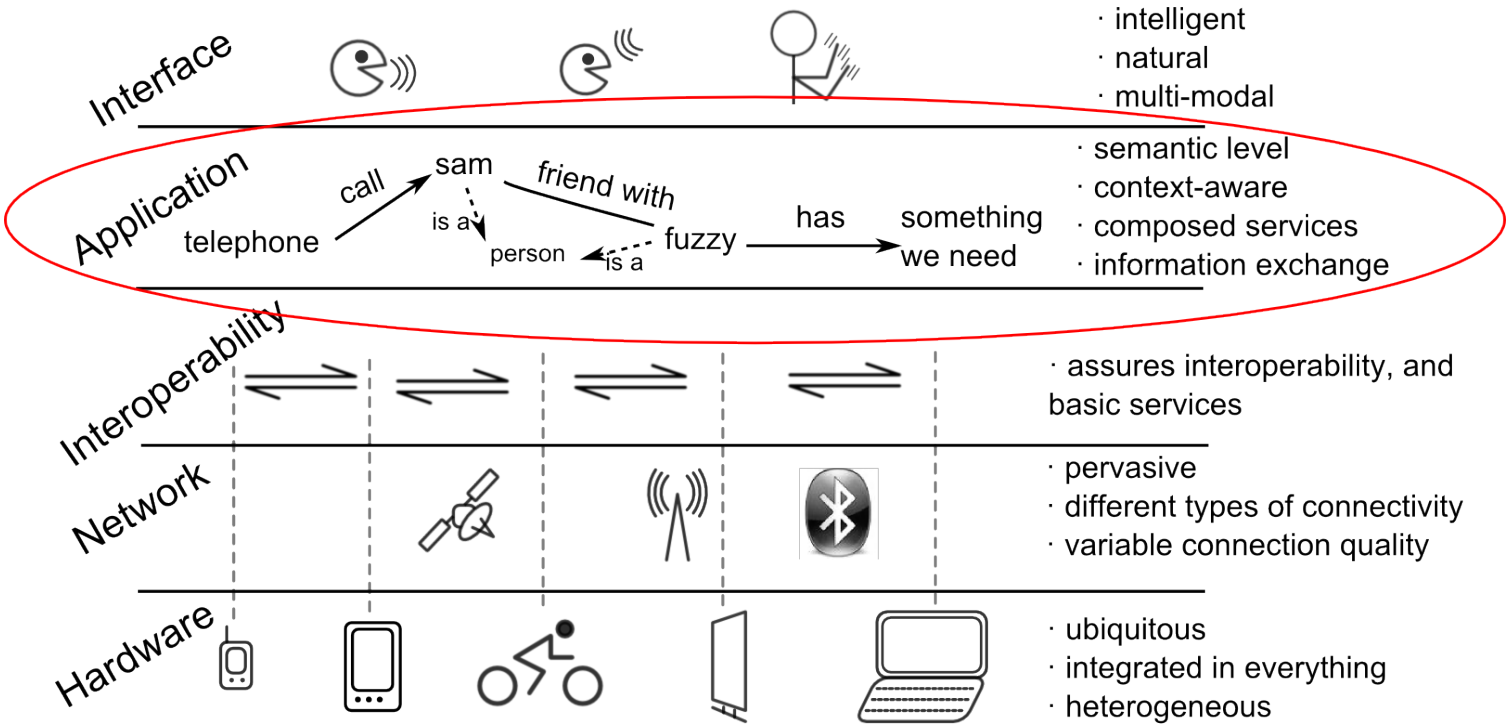
...or take part in a more complex scenario in which it facilitates the communication with another user in distress.

· How to make AmI reliable and dependable?

· How to manage the large quantity of information generated by sensors and devices?

· How to provide only interesting information to the user in every situation?

· How to make AmI privacy-aware and trustable?



· address the application layer – above hardware, network and interoperability, below intelligent user interfaces.

· this is where most of the challenges and most features that make AmI "intelligent".

· *answer some of these challenges, by providing a model for an AmI system's application layer.*

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· Approach

- multi-agent system

Agents provide proactivity, reasoning, have beliefs and goals represented semantically; one or more agents per device; flexible structure in function of device capabilities; coordination and collaboration.

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· Approach

- multi-agent system
- system distribution

Distribute the system, using centralized databases or ontologies as little as possible.

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· Approach

- multi-agent system
- system distribution
- self-organization

Provides organization without centralized control, leading to robustness and flexibility.

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· Approach

- multi-agent system
- system distribution
- self-organization
- context-awareness

Make behaviour, communication and information processing context-aware.

Both AmI and self-organizing systems characterized by:

- large number of individuals / devices
- distributed system
- heavy interaction
- unreliability of individual devices and connections

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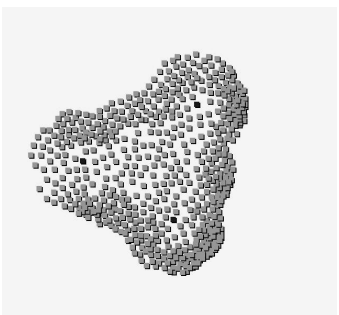
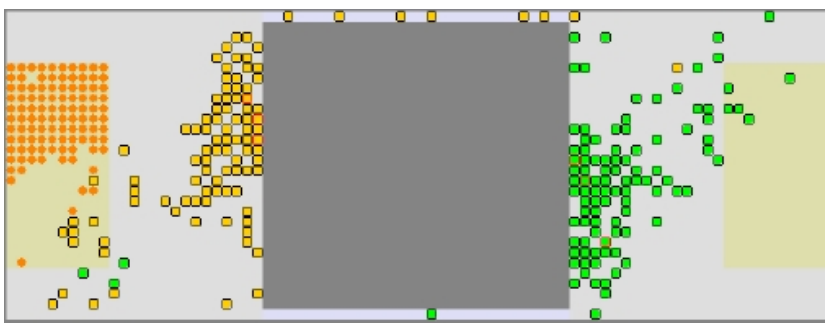


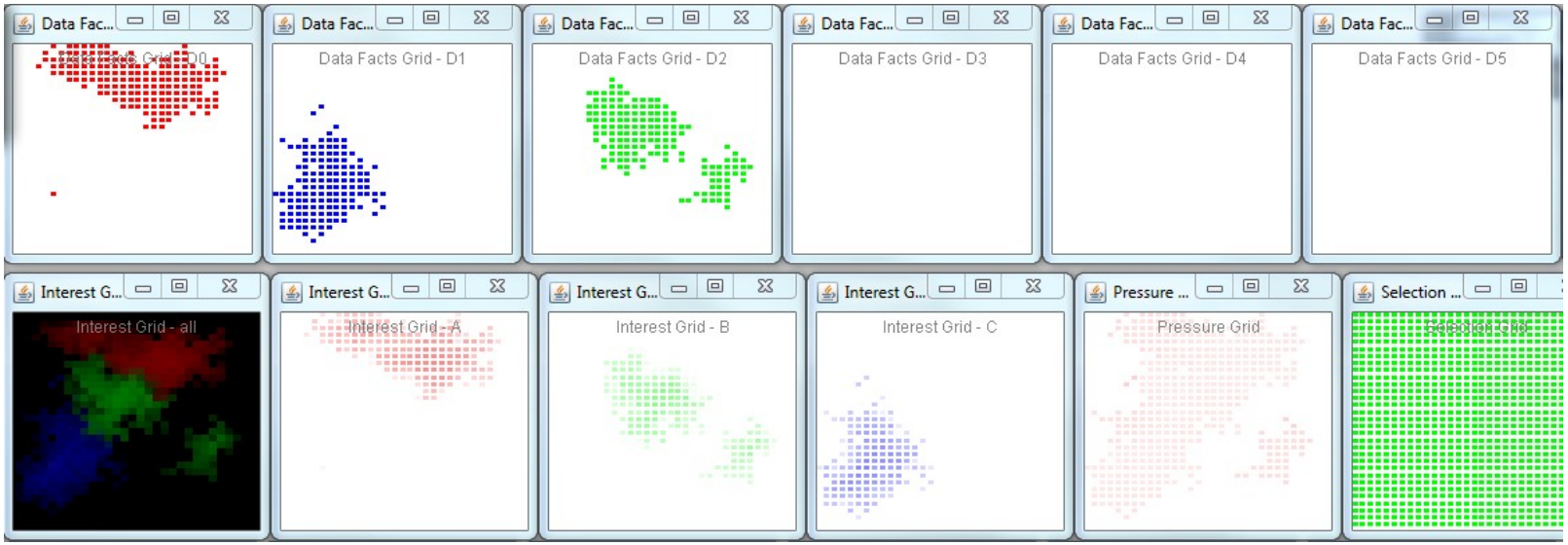


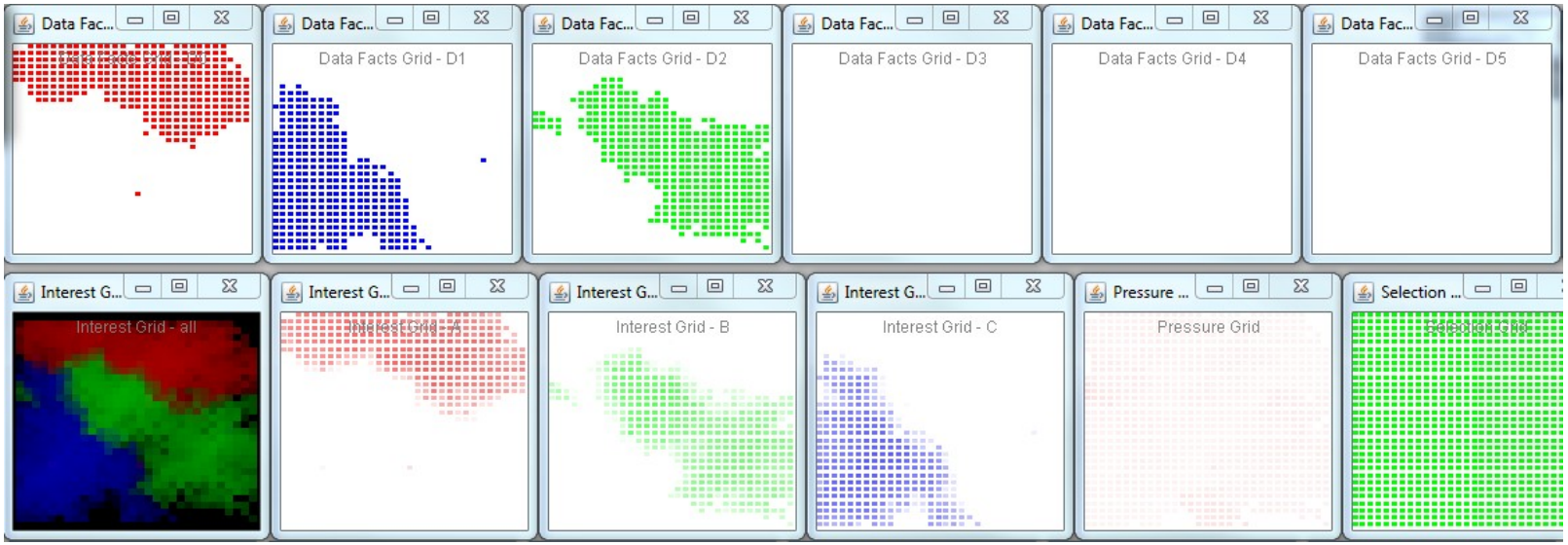
[Zambonelli et al., 2004, Picard, 2005]

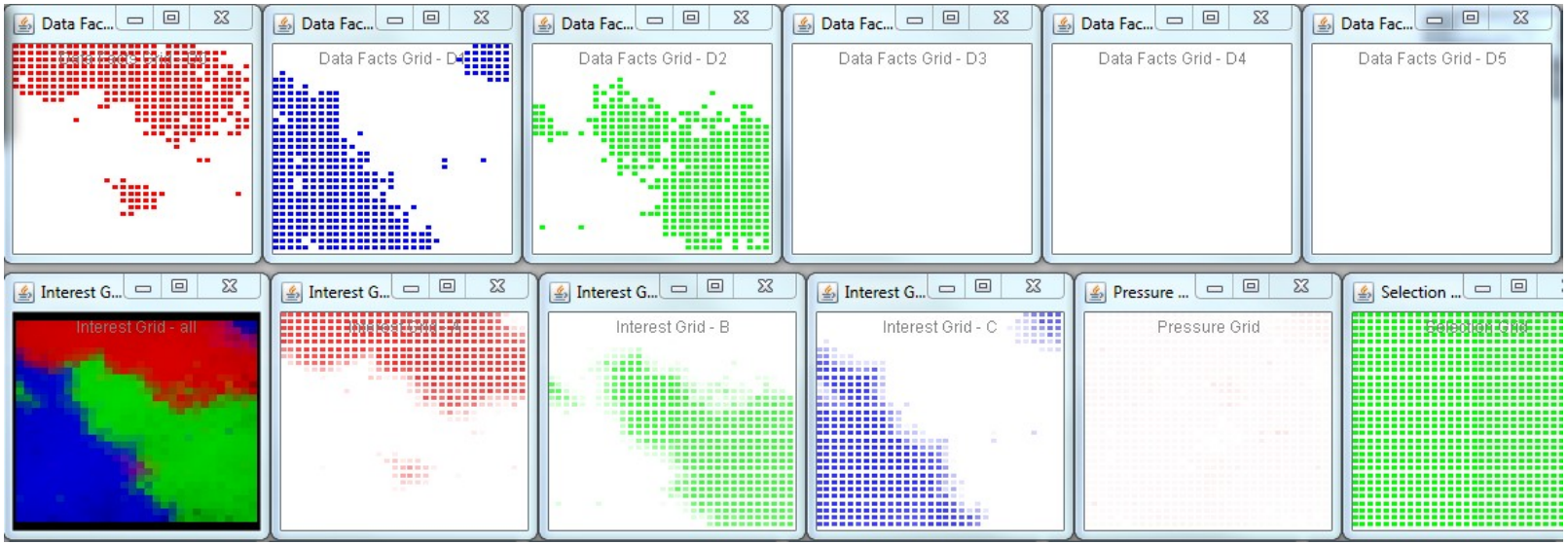
· We developed some simple, generic measures of context, for use by simple cognitive agents:

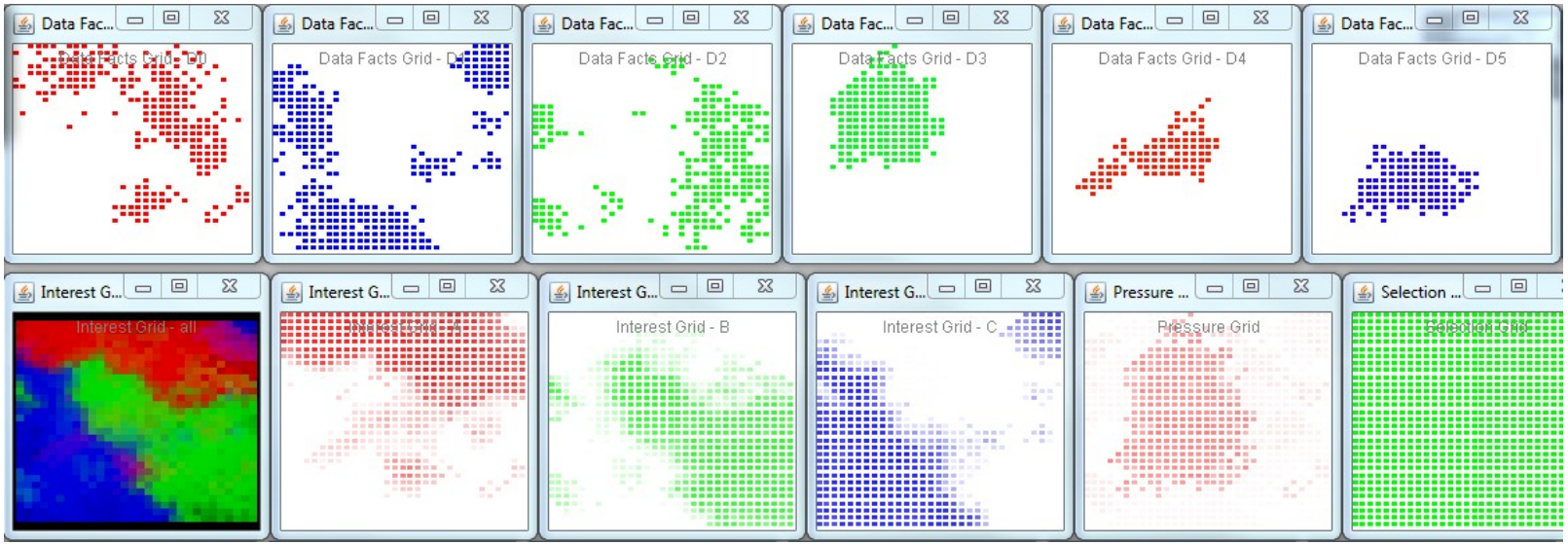
· Directed at information sharing based on importance, relatedness to domains of interest, and validity in time.

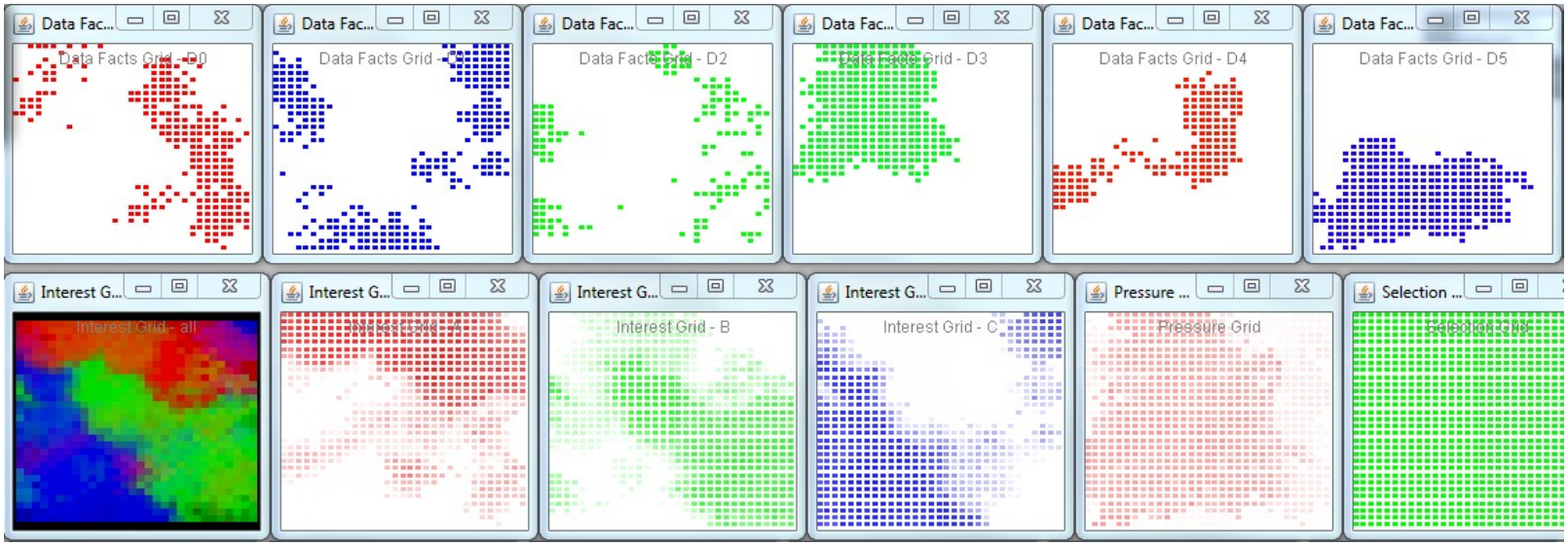
- pressure - translates directly into relevance of the information
- specialty - specifies to which domains of interest the information is related
- persistence - specifies for how long the information is valid
- space-locality - the information spreads around its source

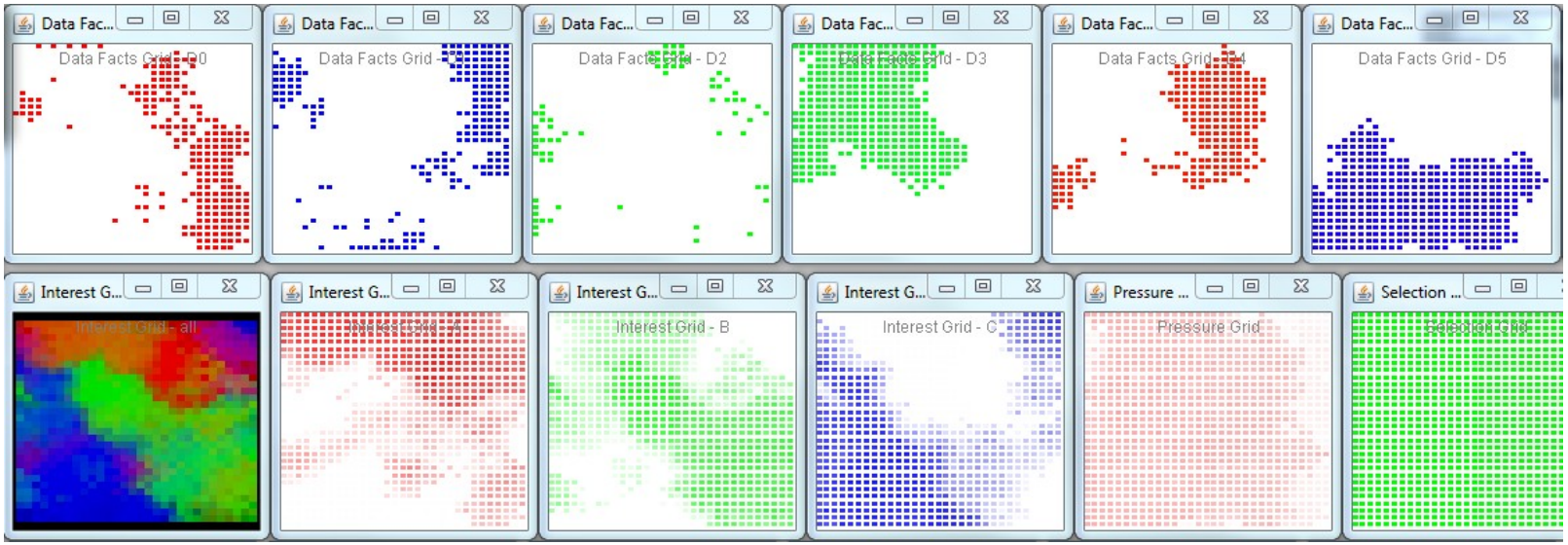


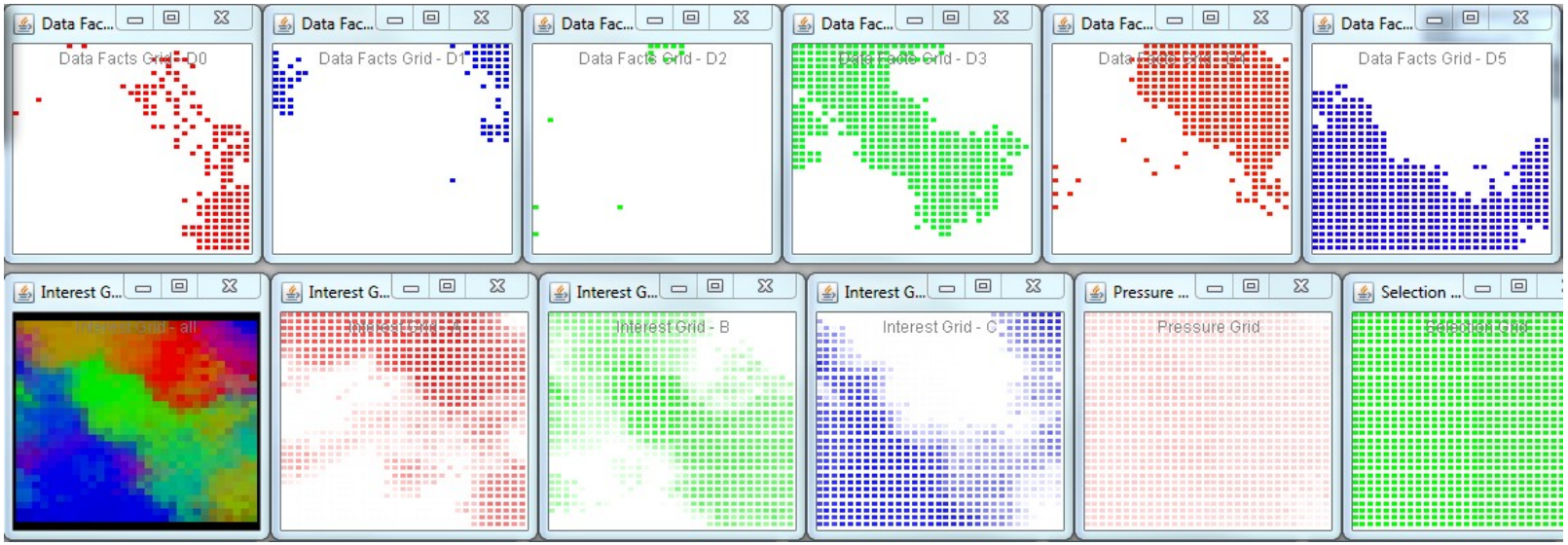


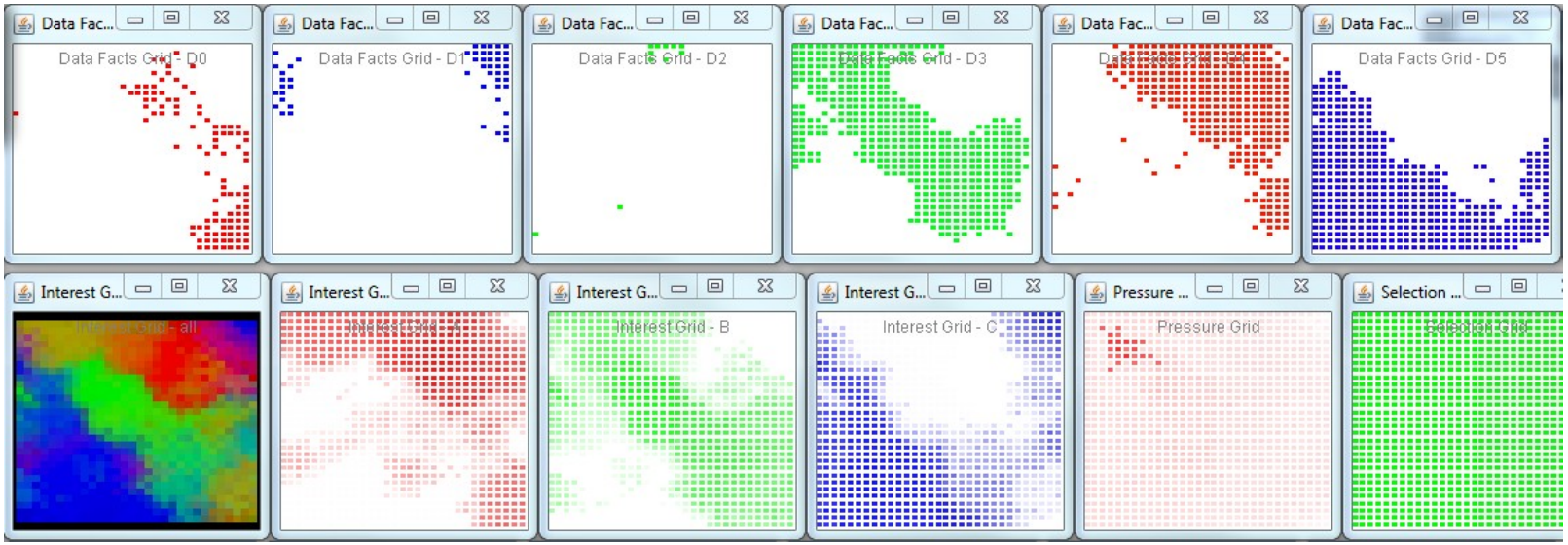


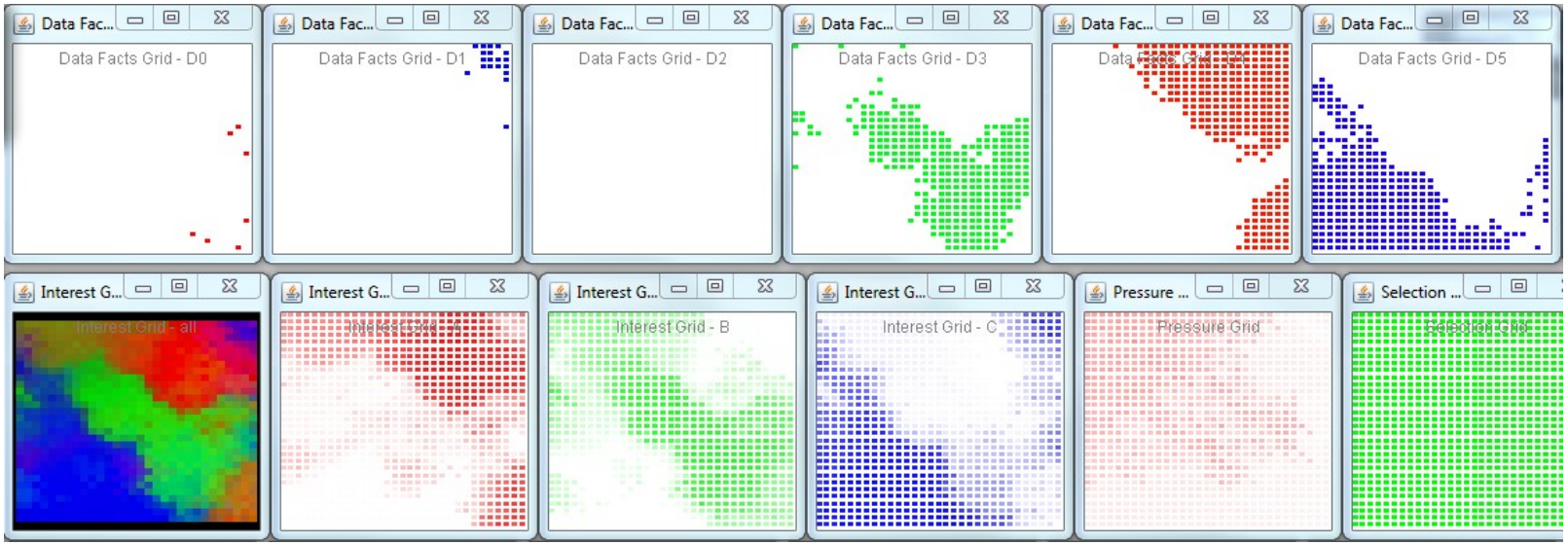


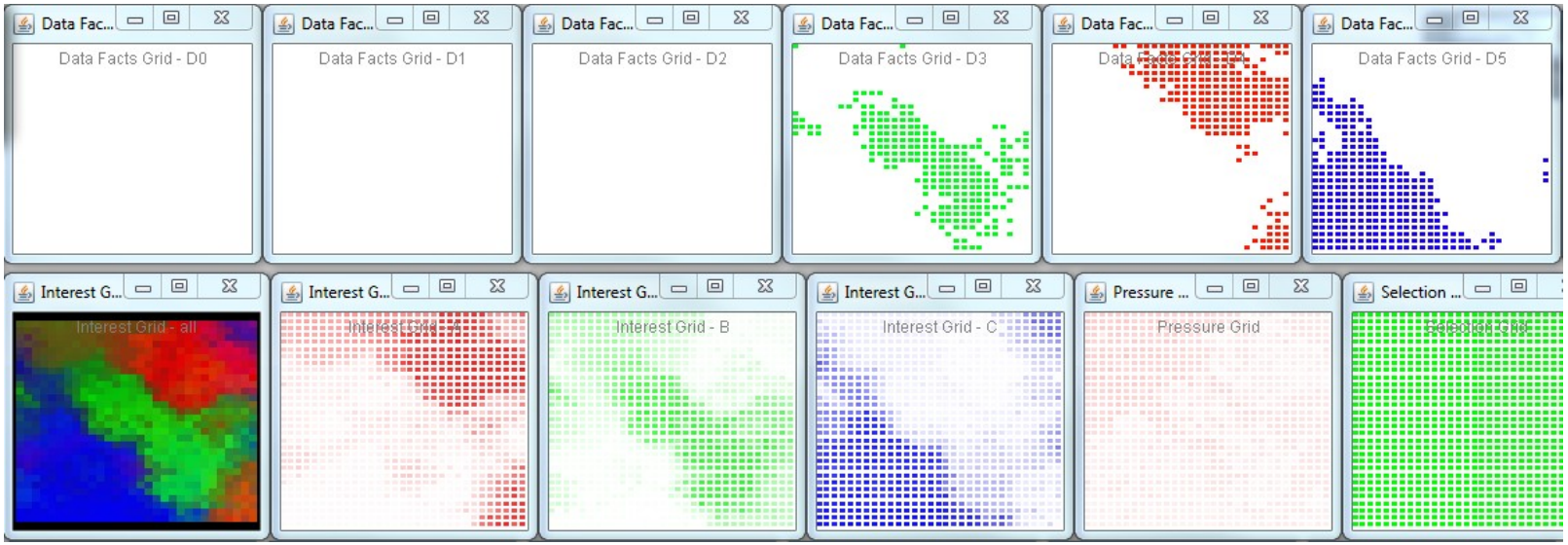












Future directions:

- Find an application and scenarios to connect current work with more real-life requirements
- Further develop context-awareness to include other types of context, namely social context and semantic relatedness between pieces of information
- Separate agents into different types, with different capabilities and interests.

AI-MAS Events

· SEE-MAS 2010 – the South-Eastern European Multi-Agent Systems Summer School

Bucharest, Romania, July 5-10, 2010

http://see-mas2010.cs.pub.ro/

· MASTS 2010 – the 2nd International Workshop on Multi-Agent Systems Technology and Semantics

(in conjunction with IDC'2010, Tangier, Morocco, September 16-18, 2010)

http://aimas.cs.pub.ro/masts2010/

· ACSys 2010 – the 7th Workshop on Agents for Complex Systems

(in conjunction with SYNASC-2010, Timisoara, Romania, September 23 - 26, 2010)

http://synasc10.info.uvt.ro/workshops/acsys

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Thank you!

Any Questions?