

# Situation Management and Computing Agents

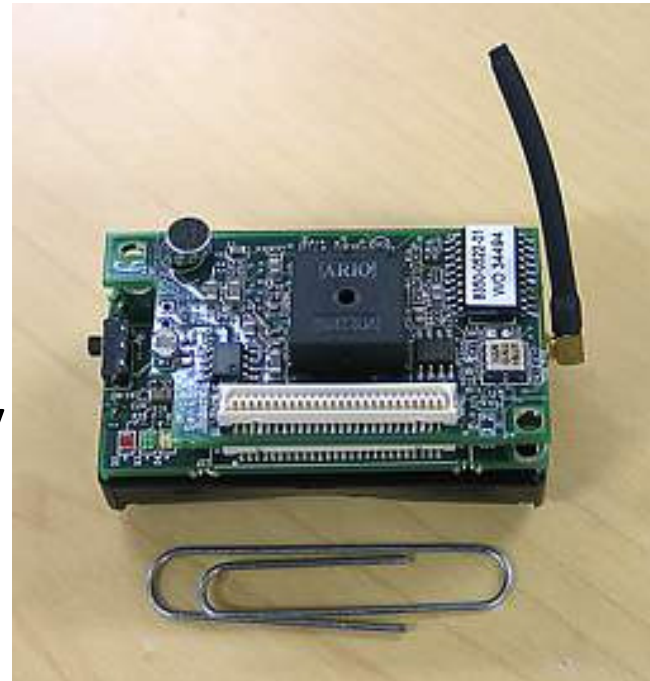
Jürgo-Sören Preden  
Laboratory for Proactive Technologies  
Tallinn University of Technology

Jürgo Preden 2009



# Smart Dust Motes

- Autonomous computing devices
  - Microcontroller
  - Wireless communication interface
  - Sensors
  - Autonomous power supply
  - Autonomous operation



# Ad-hoc networks

- Every node is a router
- Allows to extend the network without increasing the communication range of a single device
- Open network architecture
- Interaction patterns, configuration of devices not known beforehand

# Current WSN architectures

- Each node has a fixed role
- Application is designed and configured offline
- Mainly centralized approaches
  - One or several sink nodes
  - Data collected and processed at sink node

**Not suitable for teamwork!**

# Distributed applications

- No central coordination, no fixed roles
- Application is formed dynamically at runtime
- Agents present application components as services
- Application is assembled as a collection of services at runtime
- Many to many data flow with dynamic interactions

# Situation awareness

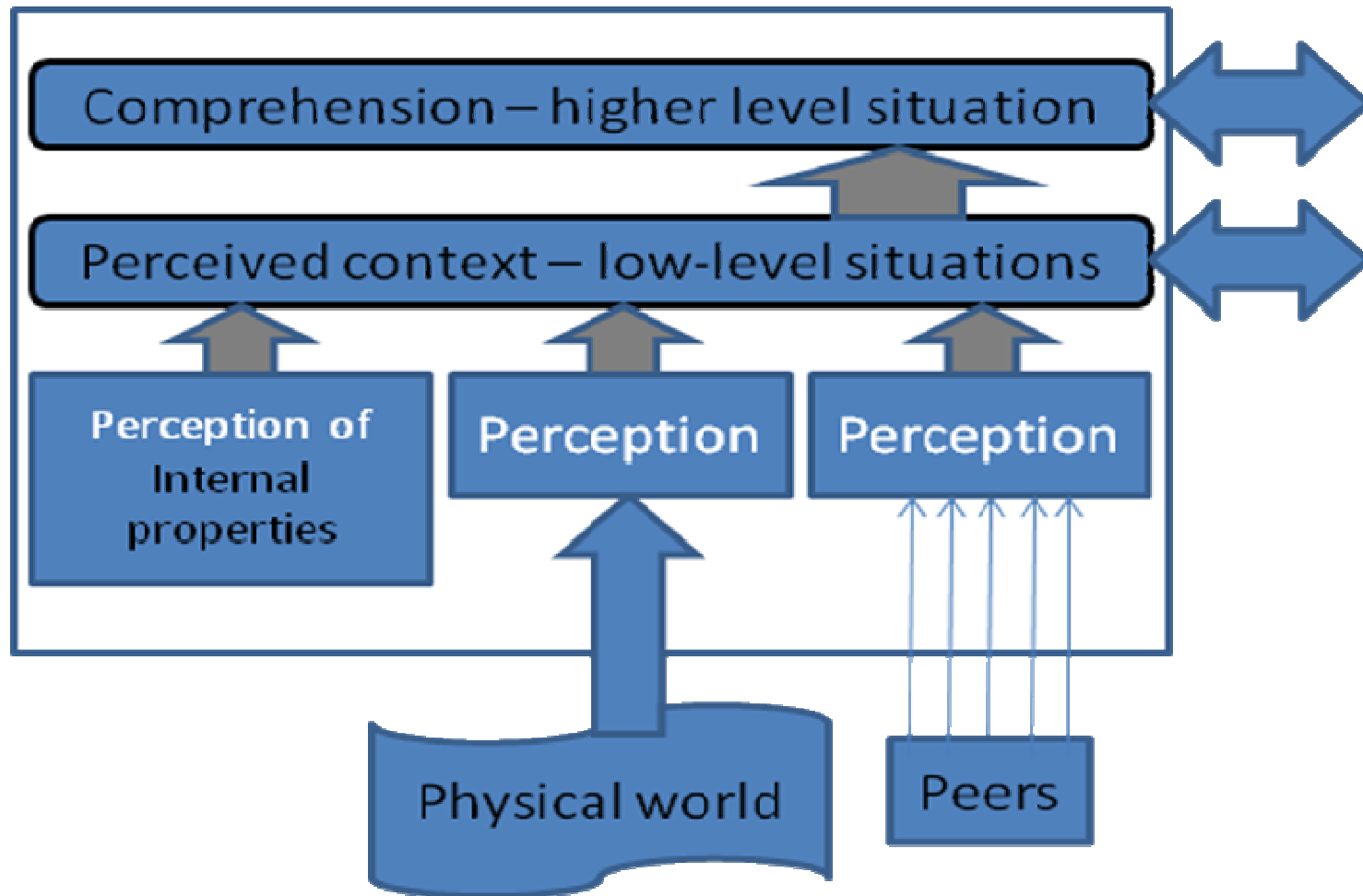
- Three level SA model (introduced by Endsley in 1988)
  - Level 1 – perception
  - Level 2 – comprehension
  - Level 3 – projection

“the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future” (Endsley, 1988)

## Situation awareness & computing agents

- Situation awareness principles are applicable to computing agents
- Same situational concepts can be used by many agents resulting in a more capable agent system
- The design and behaviour of agents is more transparent

# Situation assessment





# Unmanned vehicles

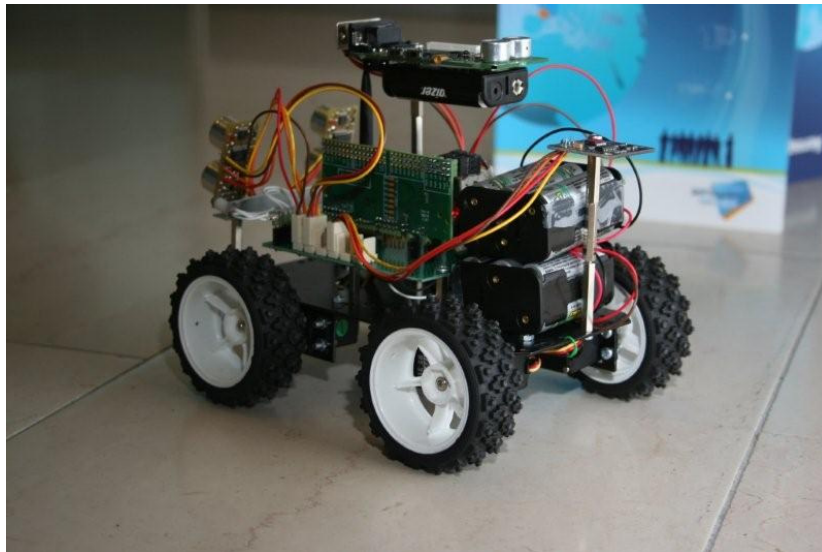
- can benefit from the situation management concepts
- Information sources are discovered at runtime
- Vehicles act as service providers
  - Sensor data originating from the vehicle
  - Positioning
  - Situational information propagation

# Vehicle situational information

- Types
  - Terrain type – speed of movement,
  - Obstacles – obstacle avoidance
  - Peers
  - Adversaries
- Sources
  - Other vehicles (air & ground)
  - Stationary field agents
  - Remote sources

# Experiments with vehicles

- Simulations with basic concepts in Matlab
- Code generated from Matlab
- Code is run on a real mobile platform



## Smart smart dust motes?

- Situation awareness principles can be used in 8 bit devices
- Situation parameter values can be generated and utilized by these devices
- Situation parameter values with validity intervals can be exchanged using tiny packets (100 bytes)

## Smart smart dust motes?

- Motes act as a distributed store of situational information
- Situation parameter values can be queried with constraints for
  - Situation parameter type
  - Temporal validity interval
  - Spatial validity interval
- Subscriptions for situation parameters can be made

## Consistent representation of situations

- All collaborating agents use the same representation
- More powerful agents (computing power, communication, algorithms) can compute higher-level situation parameter values

Thank you