Towards an experimental infrastructure for Smart Wireless Sensors

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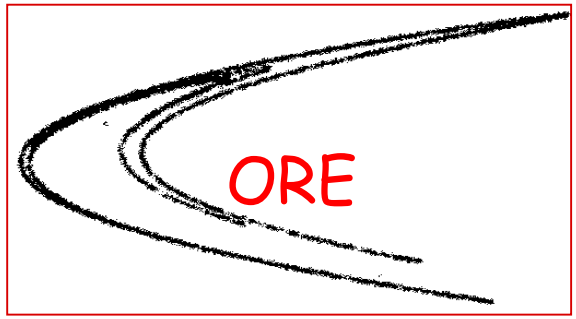
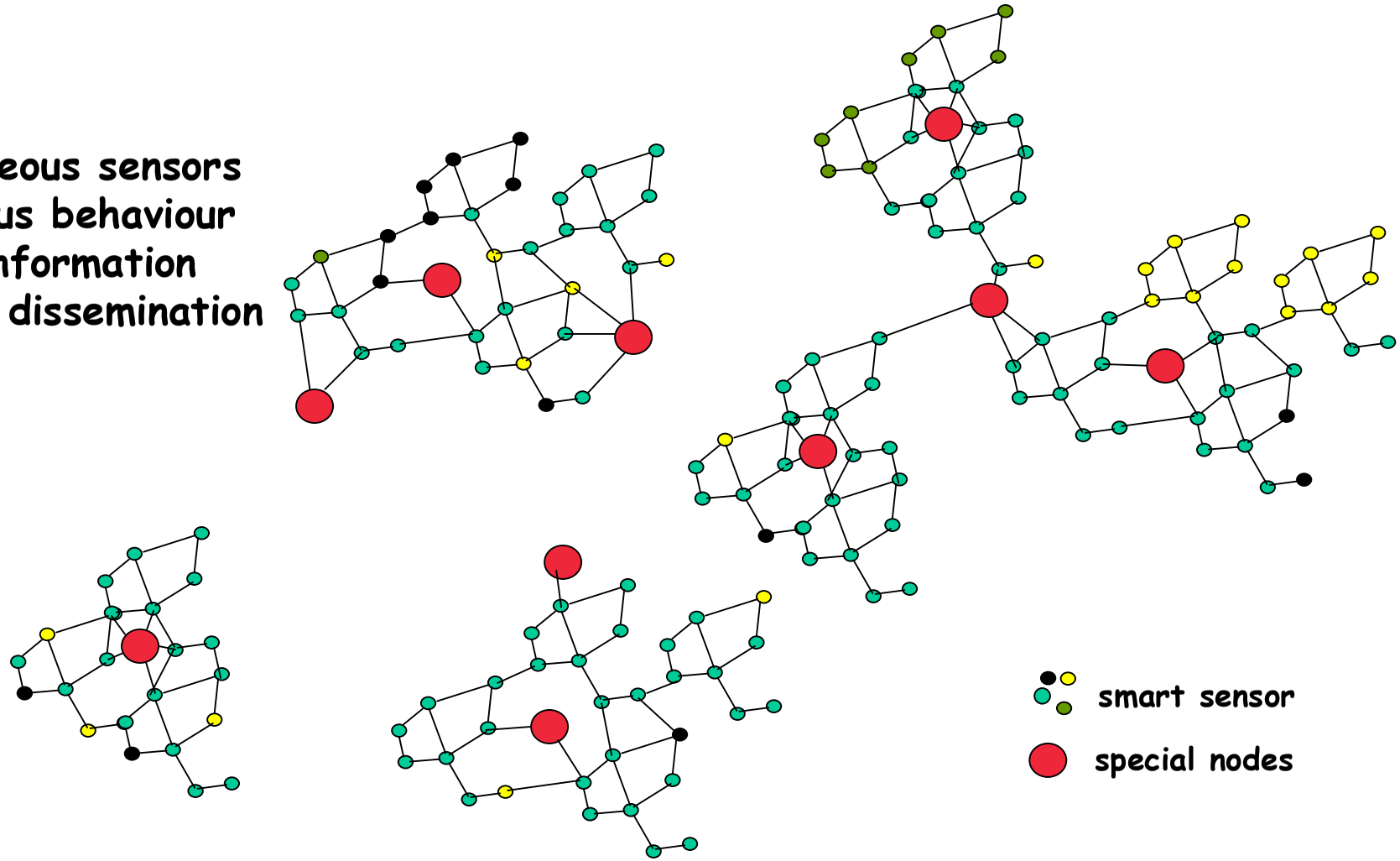


COoperative Real-timE systems

Cristiano Brudna, Changling Liu, Carlos Mitidieri, Hubert Piontek, Thomas Höhe, Matthias Seyffer, Holger Mönnich

A wired physical world

- heterogeneous sensors
- spontaneous behaviour
- aging of information
- quality of dissemination



Sensor/Actuator Networks:

Activities:

Middleware for smart sensors and actuators

Components for a wireless sensor network

Self-Describing Components

Middleware

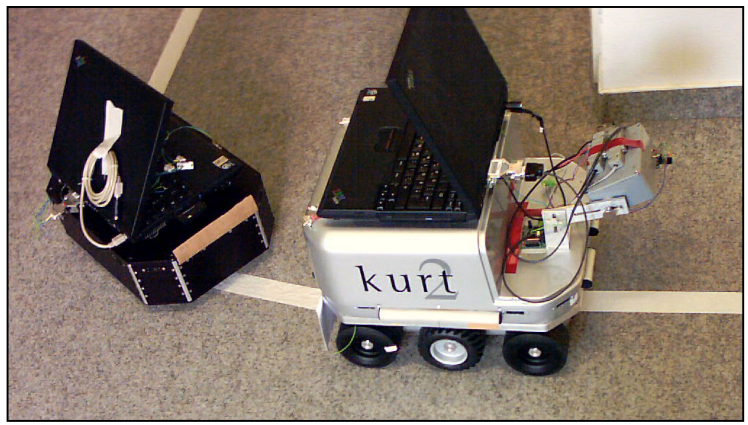
- COSMIC event-based publish/subscribe middleware

- dynamic configuration and interaction of autonomous smart components

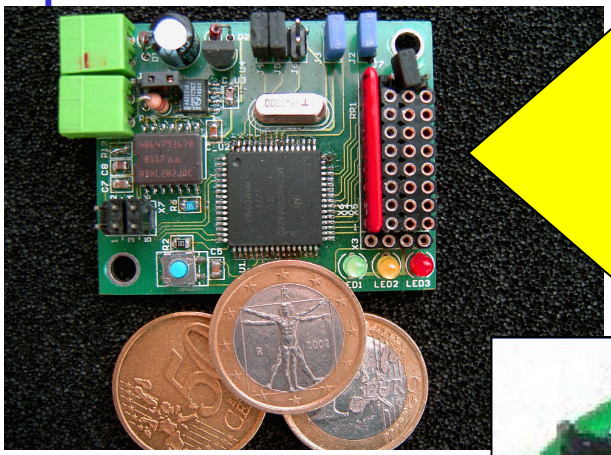
- events comprise context and dissemination quality

- basic version runs on small systems (~12kbytes ROM)

cooperating
„sensor nets"

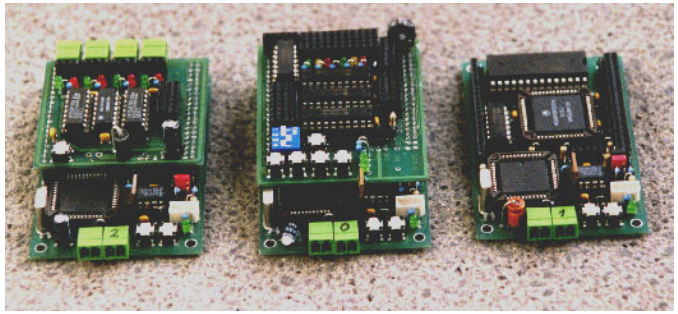


Hardware for Sensor Networks

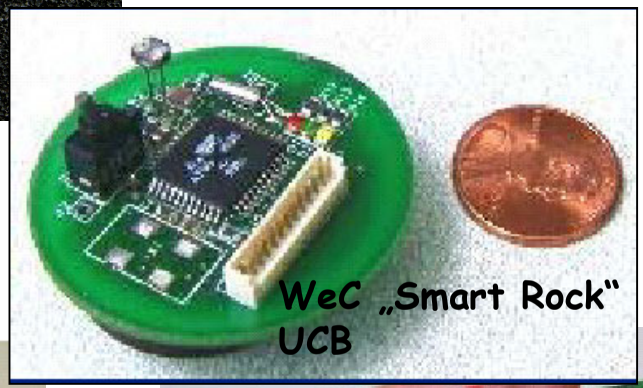


- infrared motion detector
- infrared distance sensor
- acceleration sensor
- weather station
- magnetic field detector
- in-house location system

a tiny-board, CORE, Ulm

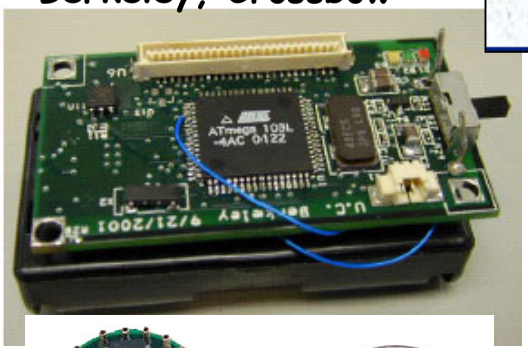


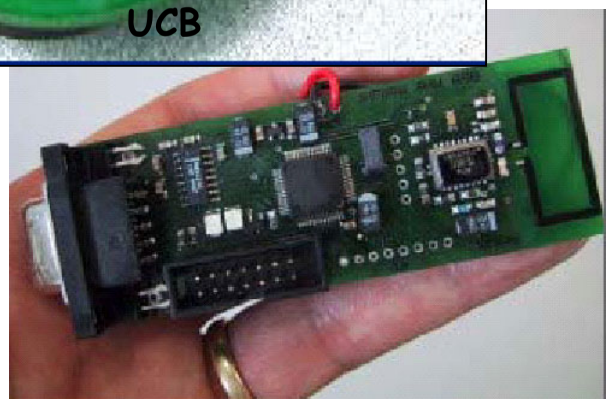
68HC11 CAN-Sensor Boards, CORE, Ulm



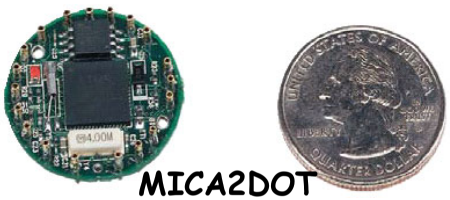
WeC „Smart Rock"
UCB

a mica mote,
Berkeley, Crossbow



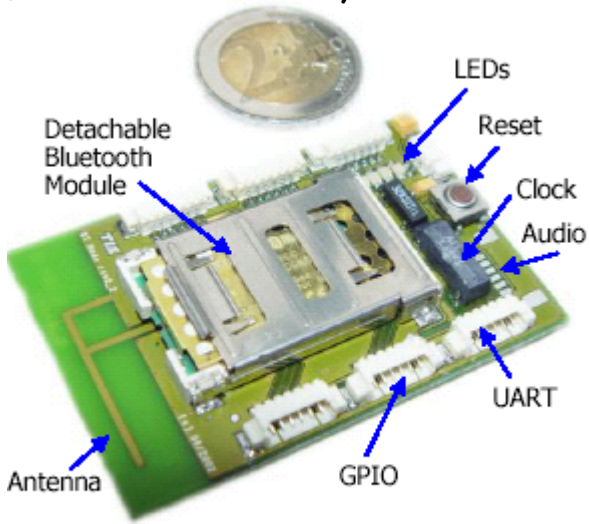


The EYES prototype



MICA2DOT

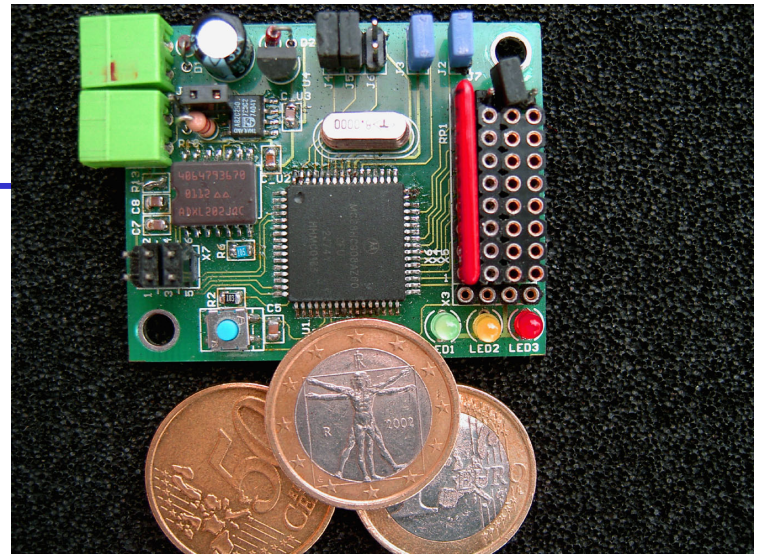
Smart-its: ETH Zurich,



cpu, memory
on back side

J.Kaiser

Tiny Properties



Designed for experimentation:
Basic Board + Piggyback extension

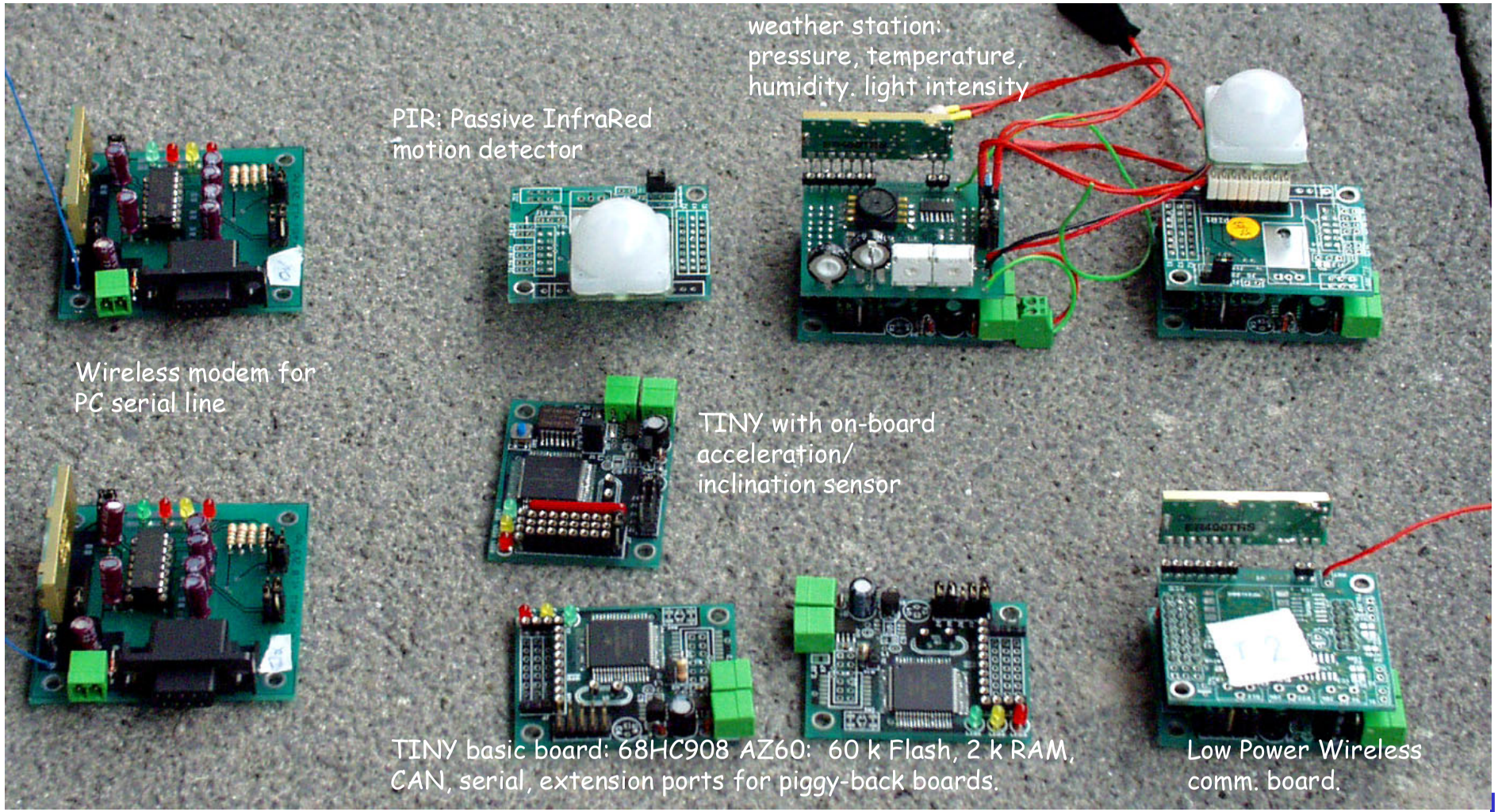
Basic board:

Processor 68HC908AZ60 (60k Flash, 2k RAM)
Power regulator (linear or switched) 6-14 V
LEDs for checks, configuration jumpers
CAN-Bus Network Interface
Sockets for AD, C&C, digital I/O
Sockets for asynch.and synch serial comms.

Power consumption:

Processor ~ 250 mW @ 16MHz
Radio link (Easy Radio, 19kbit/sec): ~150mW(transmit), ~75mW(idle)
9V Block (565 mAh): ~ 8h@continuous operation, ~30 days@10ms/sec

the TINY family



TINY Family: Motorola 68HC908AZ60A, CAN-Bus, Serial Line, Port for Extension Boards, phys. size: 50x40 mm, power consumption: approx. 55 mA @ 16MHz, Power input: 6-12 V, linear (< 100mA) or switched power regulator. Available sensor/actuator extension boards: PIR, weather, distance, acceleration, DC motor control, radio transceiver

Self-Describing Components

What?

- Event Data
- Context Data (location, time, ...)
- Device specific Data (type, precision,condition...)
- Temporal Properties (dissemination period,...)

How?

- Physical entities according to the International System of Units (SI) (IEEE 1451.2 TEDS Standard)
- XML representation for discovery
- WAP binary format for WSNs

Next Steps:

- MAC Protocol low power radio links
- Time and Synchronization
- Self Localization
- Information discovery