Ambient Assisted Living
- Accessibility: Ambient awareness -
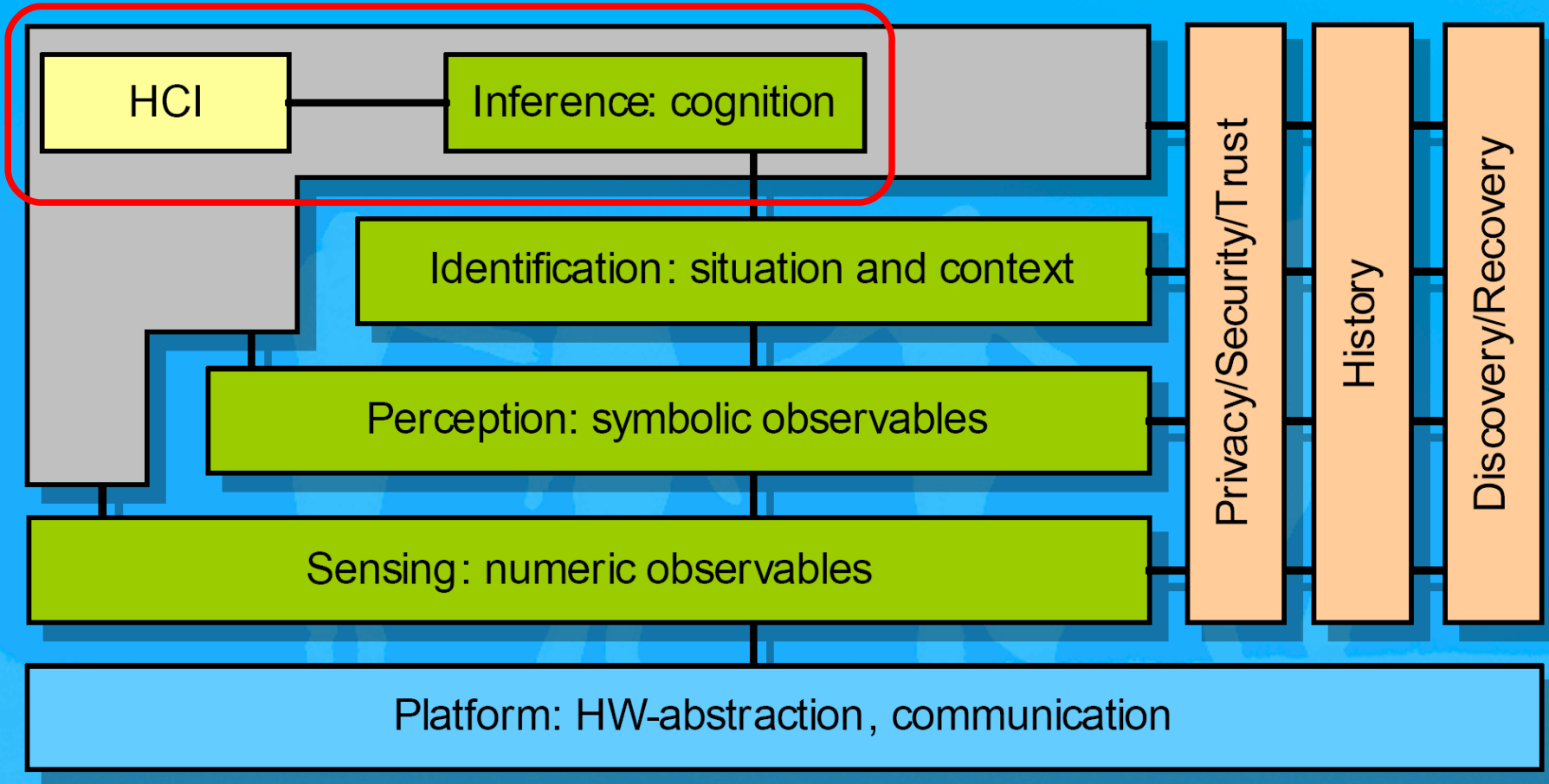
Seminar
Stefan Meißner
21.12.2007

- Motivation
- Feedback in AAL environments
- Ambient / Sound awareness
- Approaches
  - IC2Hear, CHIL (ITC-irst)
  - Nimio
  - IFeel2Hear, IFeel2Perceive?
- Summary
  - Next steps
  - Risks and opportunities

- People with certain disabilities
  - Impaired perception causes less feedback
  - Lack of some interpersonal interactions
    - hearing someone's shout
    - noticing if a person has entered the room
  - or no feedback at all
- People without disabilities
  - Even more feedback
  - Experiencing new ways of interaction
  - "Playing" with the ambience
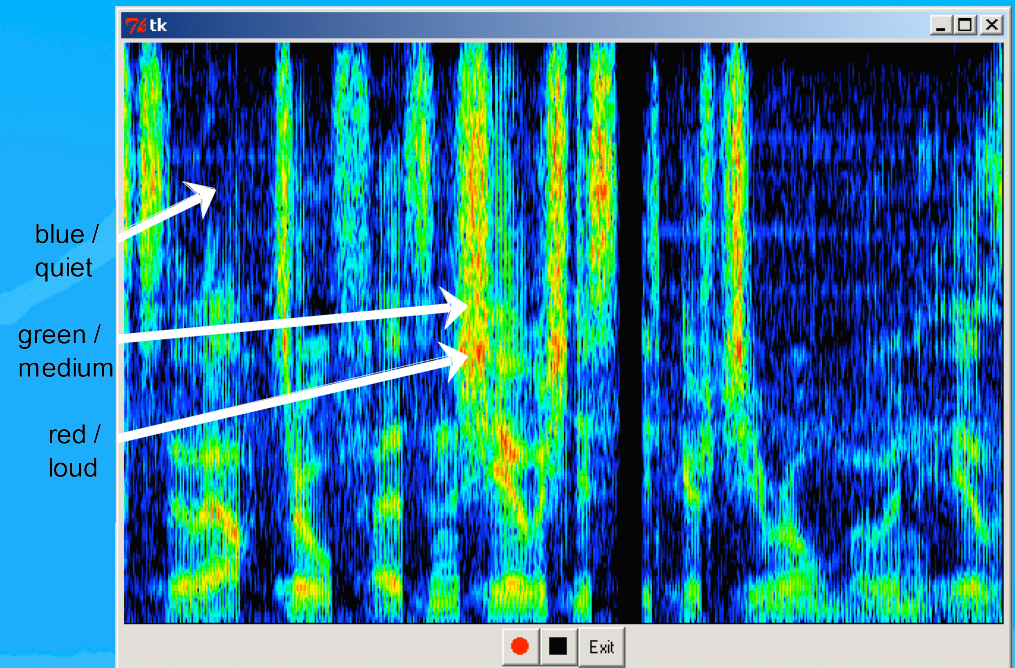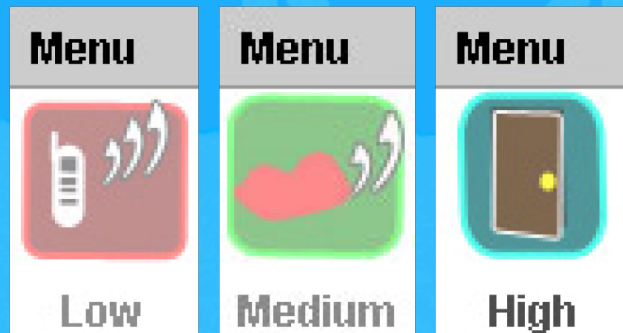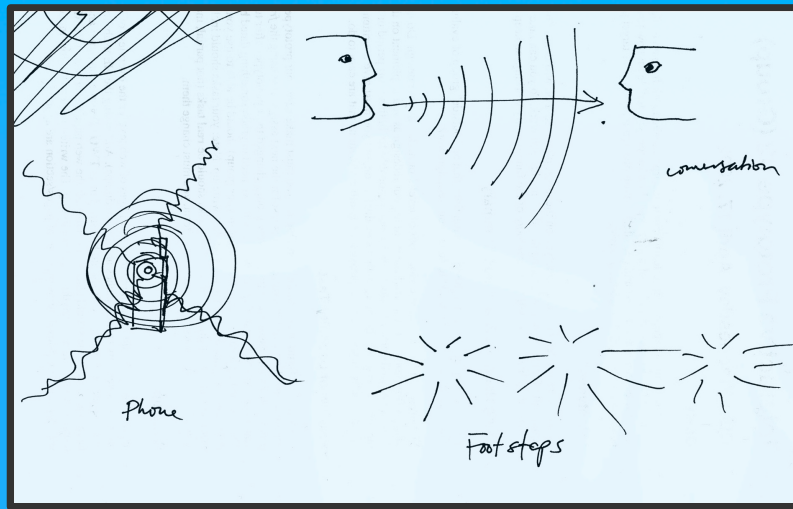
[Nehmer et al.:2006]

- Peripheral awareness
- Cognition or just awareness?
    - Low-key feedback
- Entropy and evaluation
    - Filtering / muting
    - Learning
    - Verbose mode?

Sound visualization
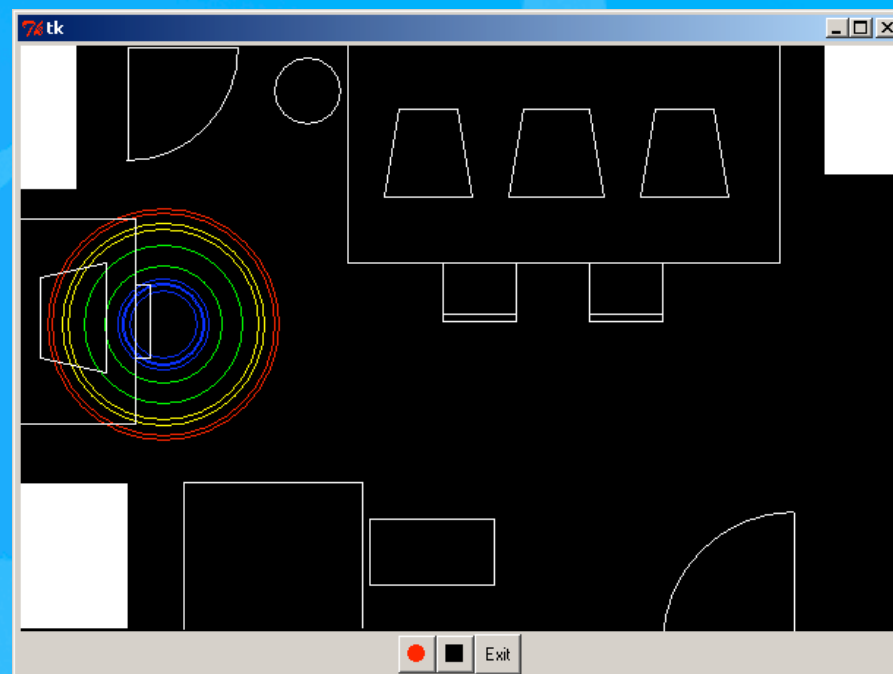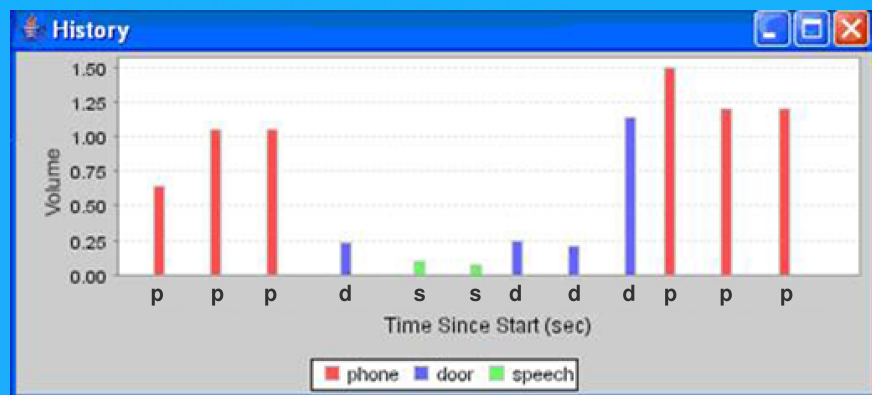
- ## Symbols / Icons
- ## Spectrograph

blue / quiet

green / medium

red / loud

Menu — Low
Menu — Medium
Menu — High

[Ho-Ching et al.:2003]

When? Where?

- History

- Map prototype

[Matthews et al.:2006]

Demo video of the CHIL Project

"In this demo, the classification is based on the input from a given microphone, while the location of the source is based on 14 microphones. The classification is based on Hidden Markov Models. Event accuracy is around 95%"

[shine.itc.it]

- event display within the user's field of vision
- attracting attention without distracting the user
- relative sound localization
- could display computer sounds as well, e.g. for
  - gaming
  - video clips
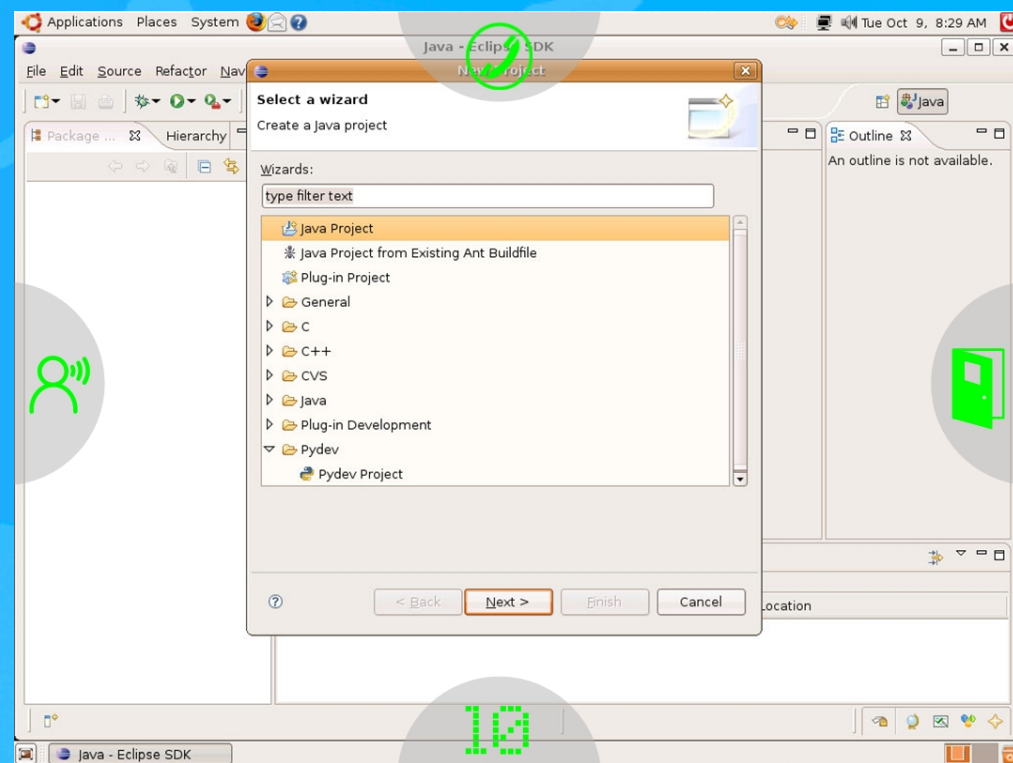
Motes (sensor networks)

- low-power wireless sensing devices

- small / tiny

- ad-hoc network formation capability

- Technology (tmote sky)
  - IEEE 802.15.4 WPAN (ZigBee)
  - TinyOS Support
  - Integrated sensors
    - Humidity
    - Temperature
    - Light

moteiv tmote sky mote

[Tmote sky datasheet:2006]
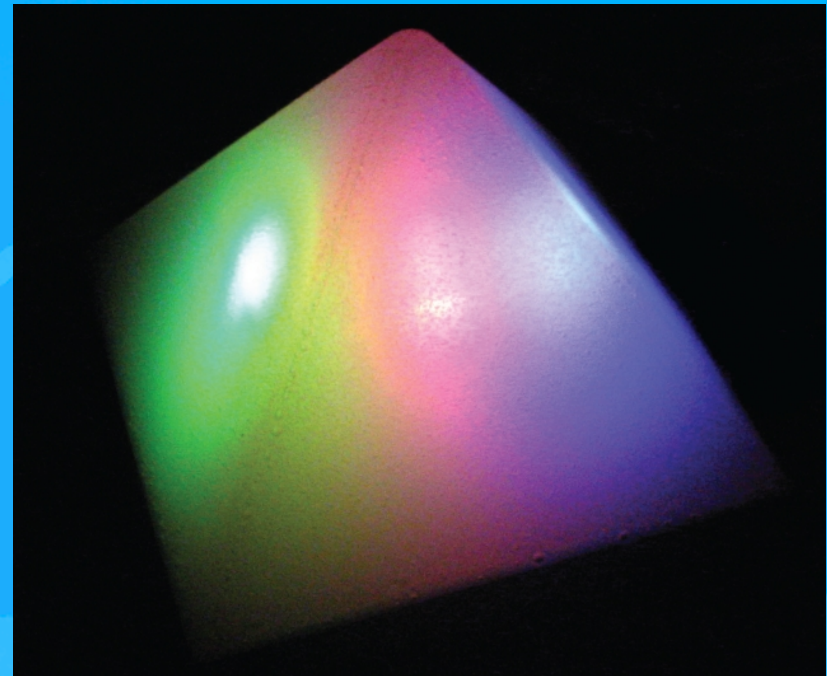
Nimio

- Context-specific ambient display
  - Microphone
  - Movement detection
  - Different reaction
    - "Family group"
    - Interaction type
- Tangible interface
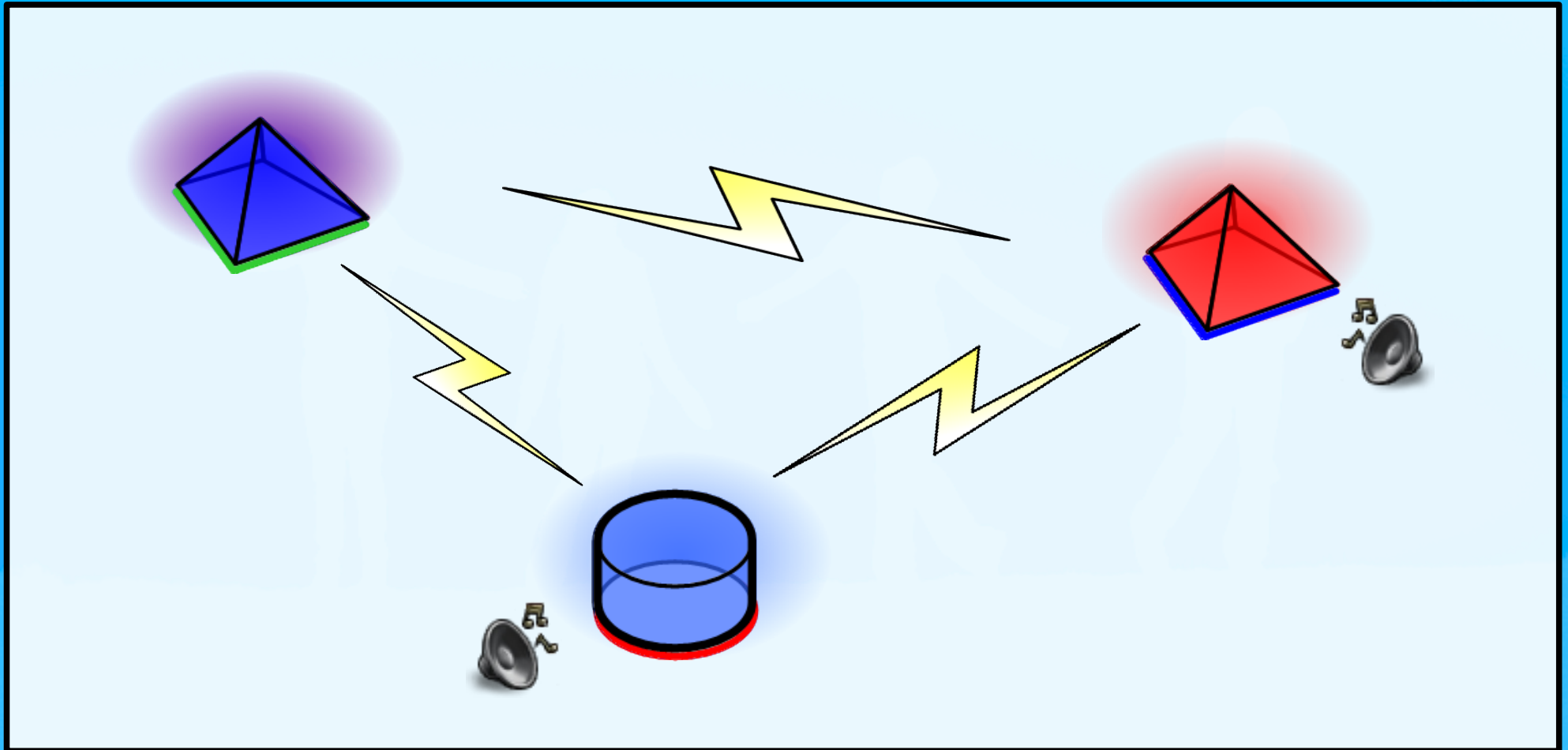- Desktop toy

[Brewer et al.:2005]

- Uses moteiv telos sky "berkeley" motes

- Benefits
    - easy to set up
    - open-ended
    - may be decorative

[Brewer et al.:2005]

Scenario with Nimio

Vibration

- Major perception improvement for
  - deaf-blind people
  - deaf people
- Wearable, unobtrusive
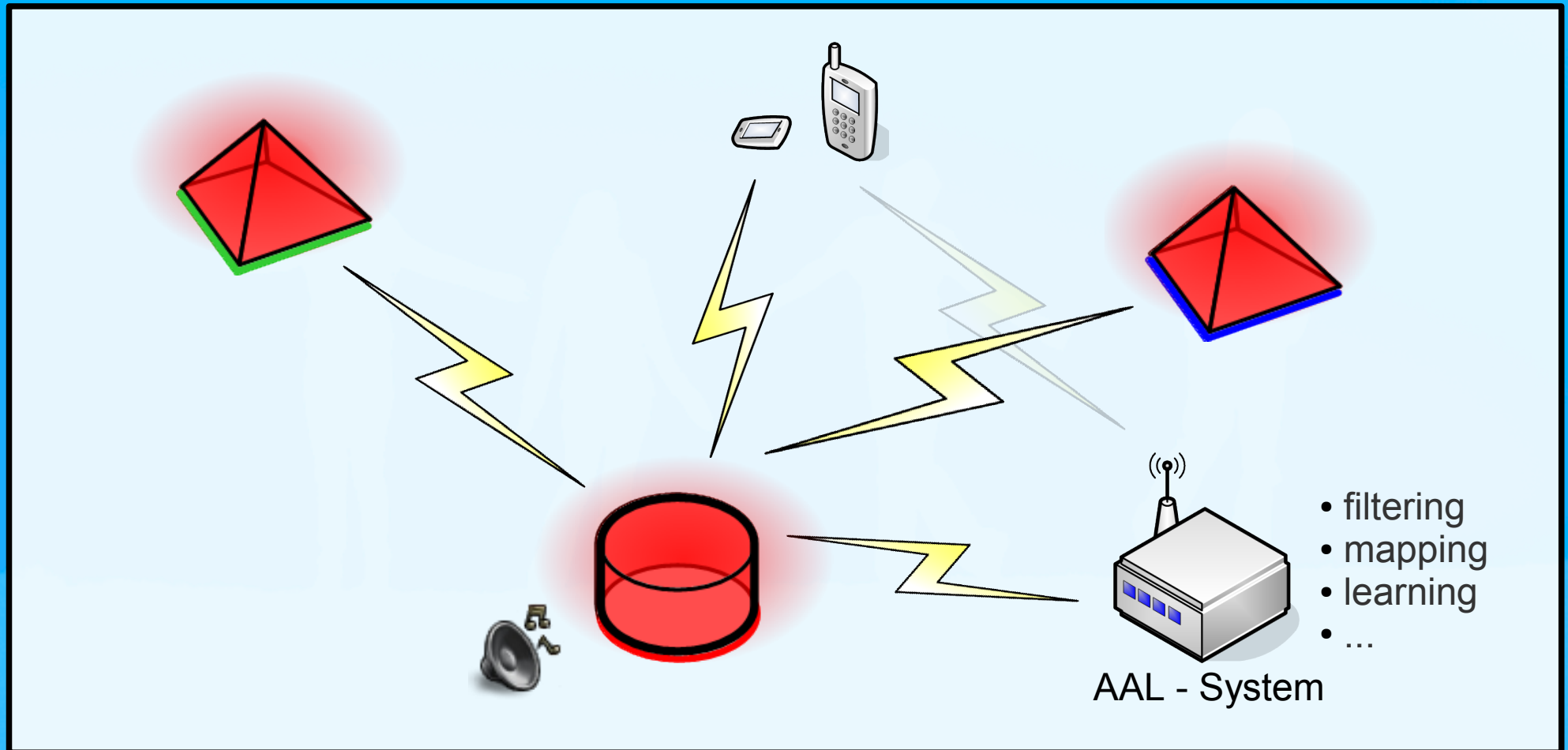 - cell phones
  - small gadgets

Bluetooth Vibrating Bracelet

[www.lm-technologies.com]

Scenario vision with an AAL-System

- filtering
- mapping
- learning
- ...

AAL - System
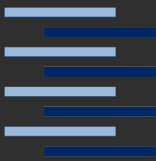
- Sound Visualization
  - Developing different prototypes
- Ambient Awareness
  - Determine requirements
    - hardware (motes, vibrating devices)
    - software (TinyOS, iROS)
- Evaluation with different audiences
  - Hearing impaired people
  - Deaf-blind people
  - People without disabilities

- Moteiv motes
  - TinyOS, nesC
  - new hardware platform: Java (www.sentilla.com)
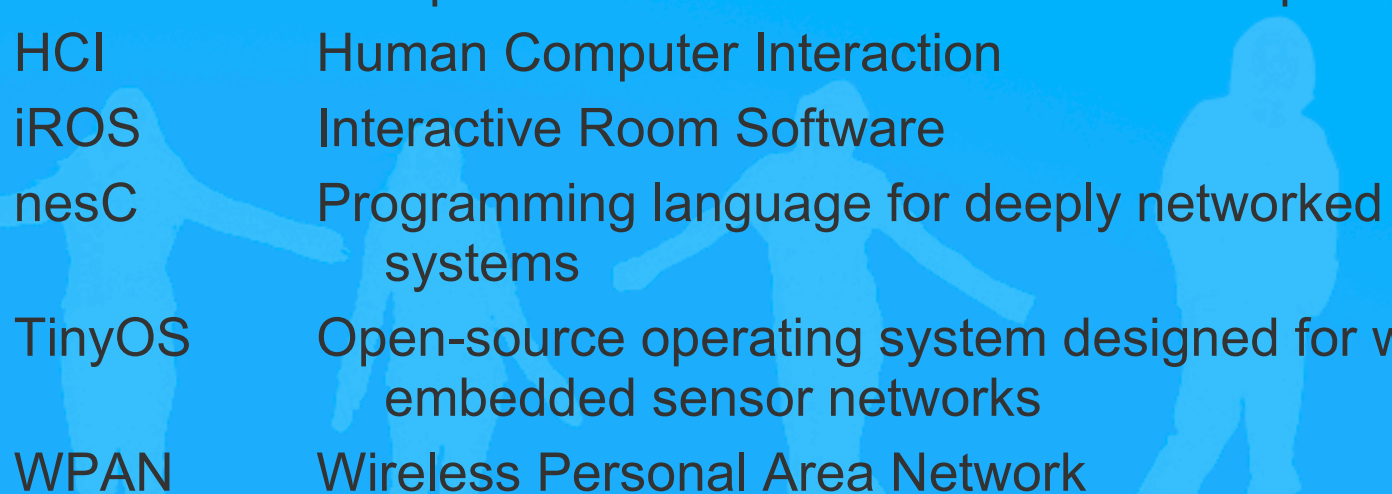- iROS event heap
- Feasibility
  - hardware costs
- Acceptance

» [Johanson and Fox:2002] B. Johanson and A. Fox: **The Event Heap: A Coordination Infrastructure for Interactive Workspaces**, 2002 - Proceedings of the 4th IEEE Workshop on Mobile Computer Systems and Applications (WMCSA-2002). 2002. Callicoon, New York, USA

» [Tmote sky datasheet:2006] Sentilla (Moteiv Tmote): **Tmote Sky Datasheet**, 2006 - http://www.sentilla.com/pdf/eol/tmote-sky-datasheet.pdf (last accessed 2007-12-20)

» [Ho-Ching et al.:2003] F. W. Ho-Ching, J. Mankoff and J. A. Landay: **From Data to Display: the Design and Evaluation of a Peripheral Sound Display for the Deaf**, 2003 - Proceedings of CHI 2003

» [Matthews et al.:2005] T. Matthews, J. Fong and J. Mankoff: **Visualizing Non-Speech Sounds for the Deaf**, 2005 - Proceedings of ACM SIGACCESS conference on Computers and Accessibility (ASSETS). Baltimore, MD, pp. 52-59, 2005

» [Matthews et al.:2006] T. Matthews, J. Fong, F. W. Ho-Ching and J. Mankoff: **Evaluating non-speech sound visualizations for the deaf**, 2006 - Behaviour & Information Technology, 25 (4). 333-351

» [Brewer et al.:2005] J. Brewer, A. Williams and P. Dourish: **Nimio: An Ambient Awareness Device**, 2005 - Demonstration at the European Conference on Computer-Supported Cooperative Work (ECSCW). 18-22 September 2005, Paris, France

» [Brewer et al.:2007] J. Brewer, A. Williams and P. Dourish: **A handle on what's going on: combining tangible interfaces and ambient displays for collaborative groups**, 2007 - Proceedings of the 1st International Conference on Tangible and Embedded Interaction 2007. pp. 3-10

» [Nehmer et al.:2006] J. Nehmer, A. Karshmer, M. Becker and R. Lamm: **Living Assistance Systems – An Ambient Intelligence Approach**, 2006 - Proceedings of the 28th International Conference on Software Engineering (ICSE 2006), Shanghai, China, 2006

[www.xkcd.com]

Questions?

[www.nabaztag.com]

AAL	Ambient Assisted Living
CHIL	Computers in the Human Interaction Loop
HCI	Human Computer Interaction
iROS	Interactive Room Software
nesC	Programming language for deeply networked systems
TinyOS	Open-source operating system designed for wireless embedded sensor networks
WPAN	Wireless Personal Area Network