Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences

Ambient Assisted Living
- Accessibility: Ambient awareness -

Seminar
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21.12.2007

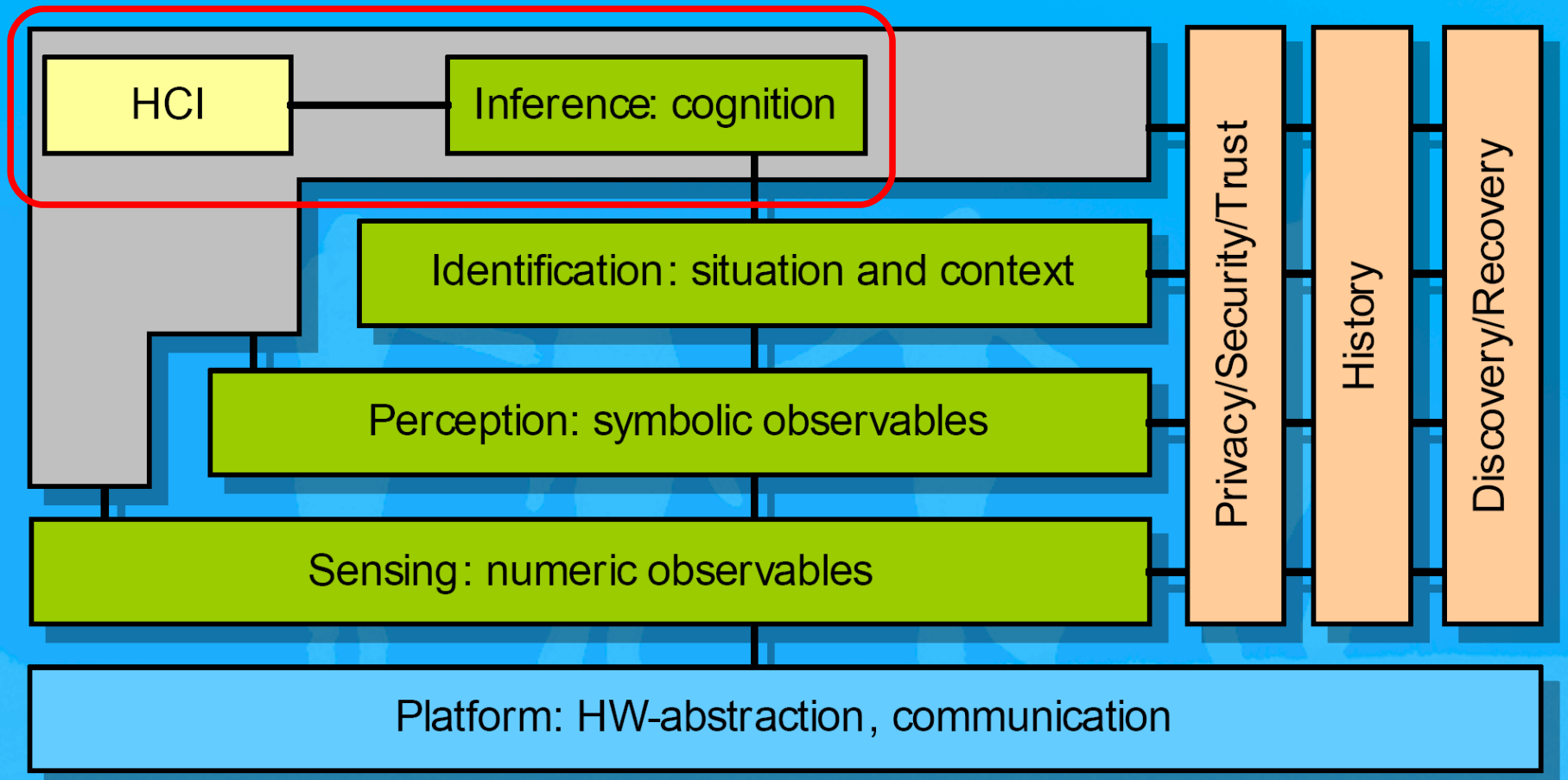
Outline

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

Motivation

- 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

Feedback in AAL environments



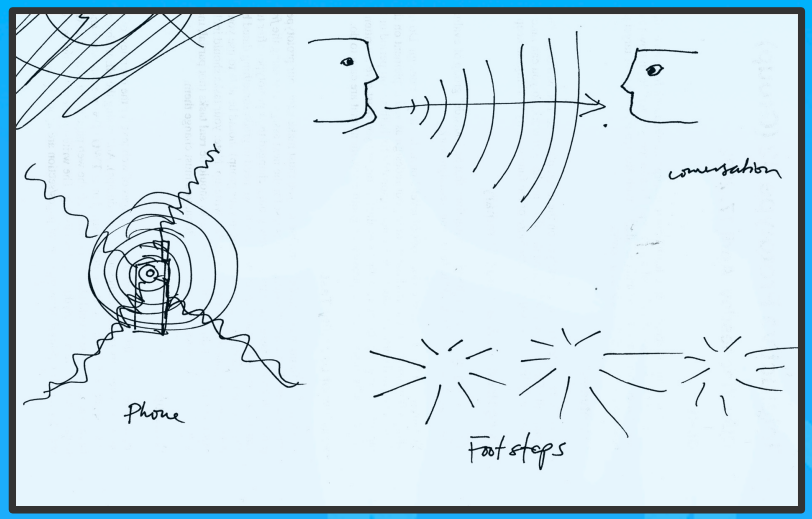
[Nehmer et al.:2006]

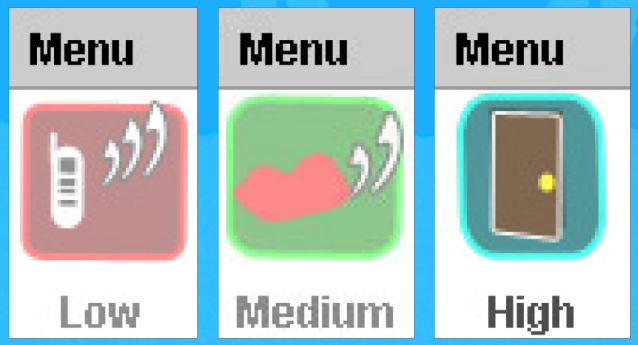
Ambient / Sound awareness

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

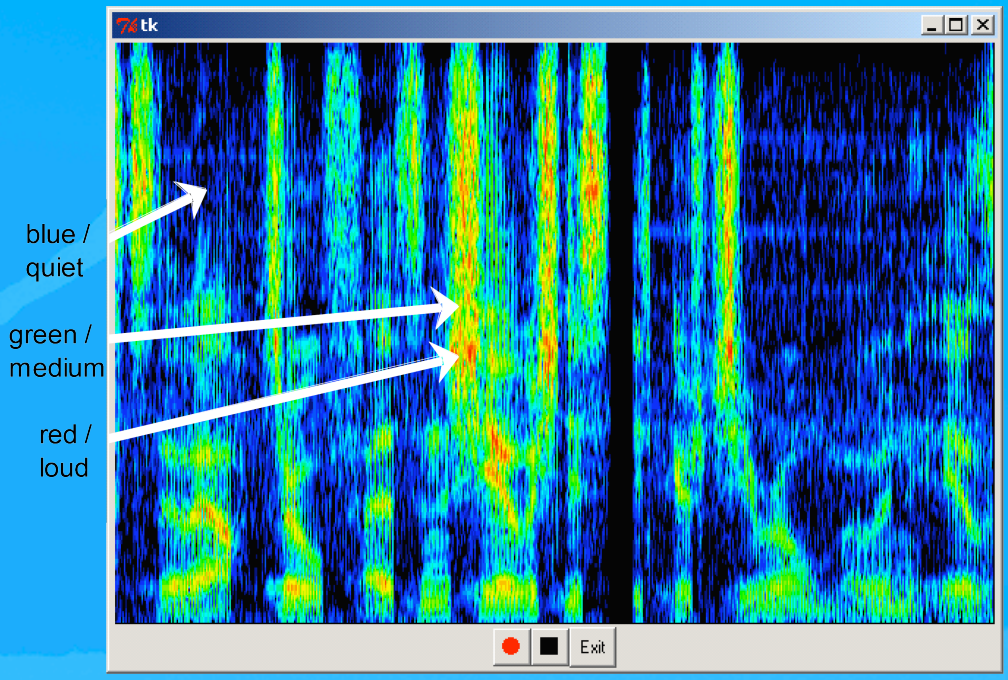
Sound visualization

- Symbols / Icons





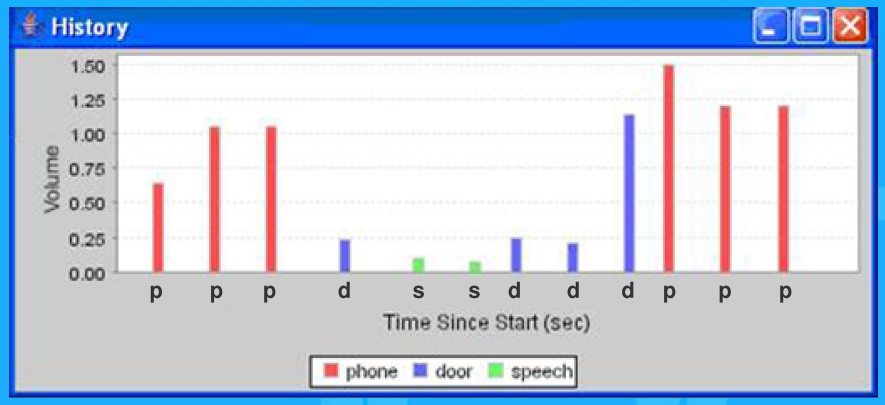
- Spectrograph



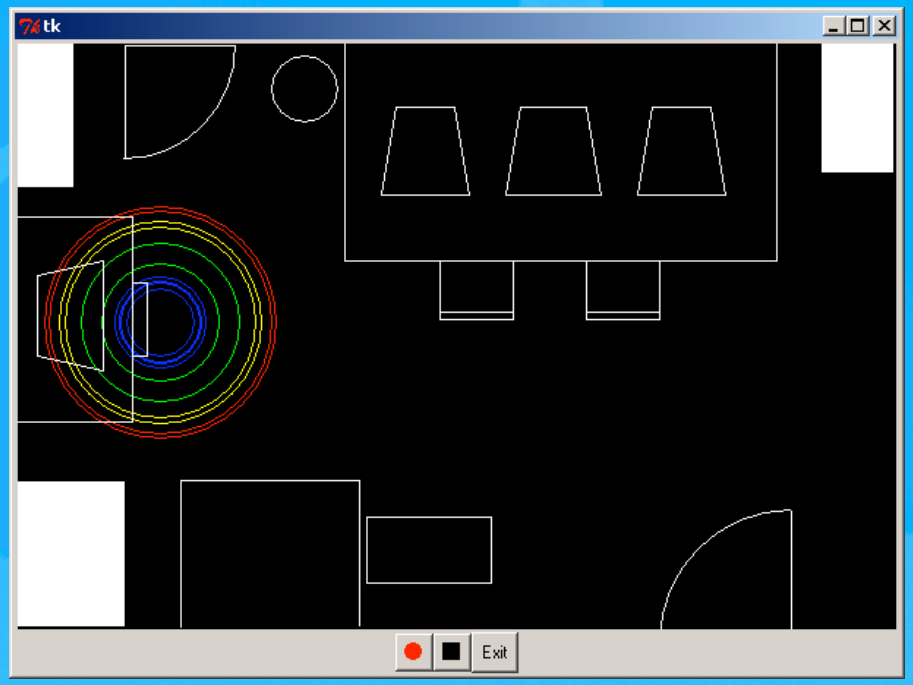
[Ho-Ching et al.:2003]

When? Where?

- History



- Map prototype



[Matthews et al.:2006]

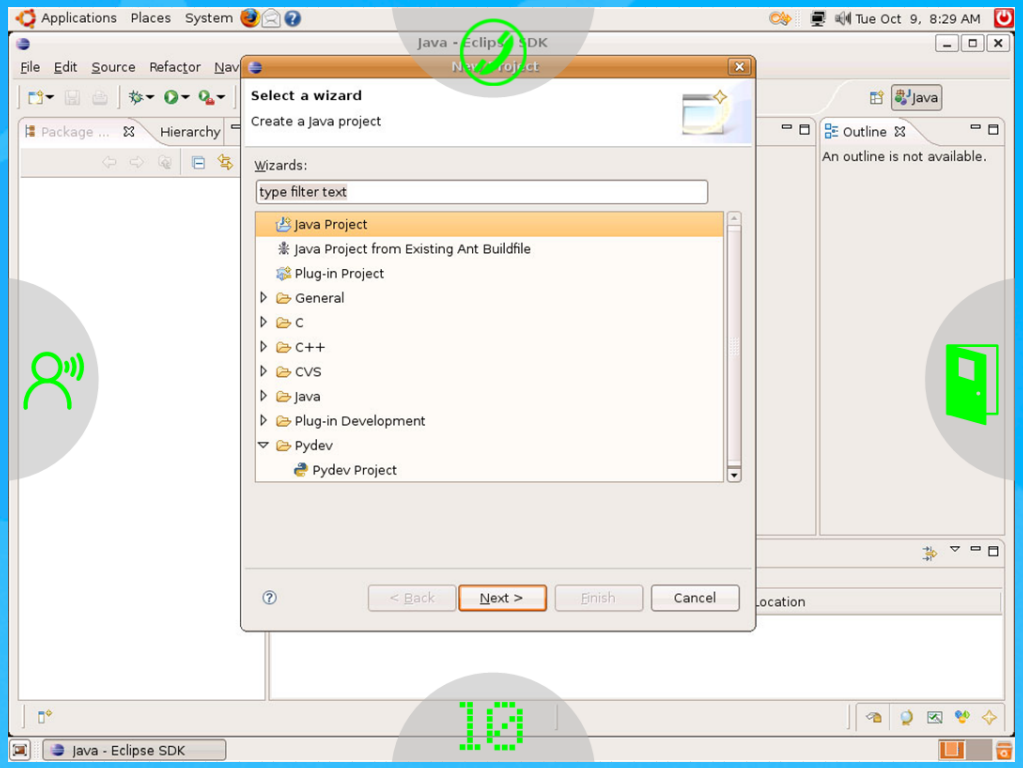
Demo video of the CHIL Project

“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]

Head-up display metaphor

- 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)

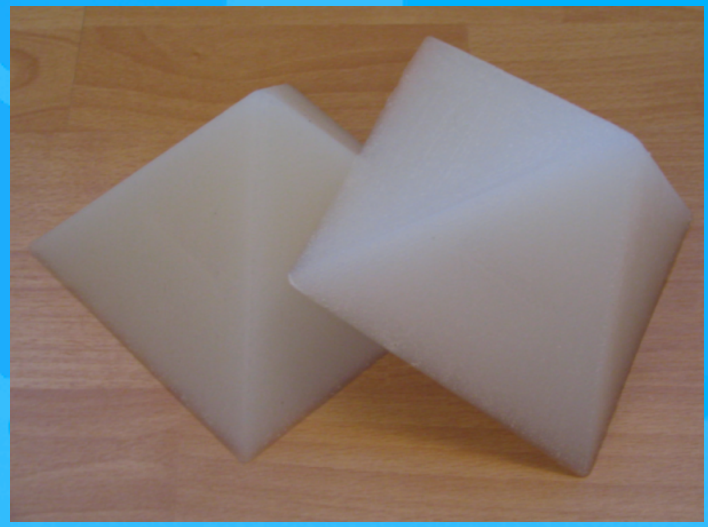
- low-power wireless sensing devices
- small / tiny
- ad-hoc network formation capability
- Technology (tmote sky)
  - IEEE 802.15.4 WPAN (ZigBee)
  - TinyOS Support
  - Integrated sensors
    - Humidity
    - Temperature
    - Light

moteiv tmote sky mote

[Tmote sky datasheet:2006]

Nimio

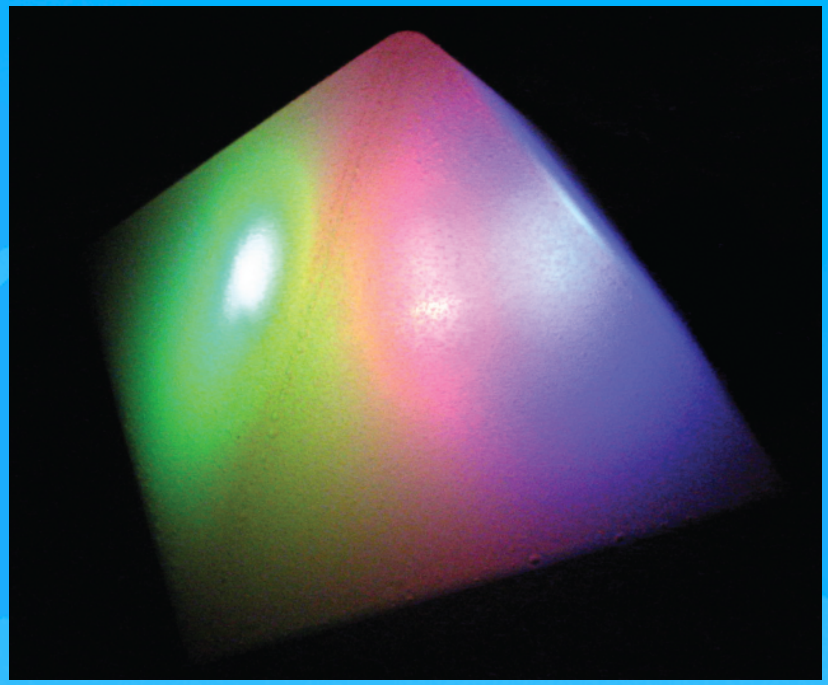
- Context-specific ambient display
  - Microphone
  - Movement detection
  - Different reaction
    - “Family group”
    - Interaction type
- Tangible interface
- Desktop toy



[Brewer et al.:2005]

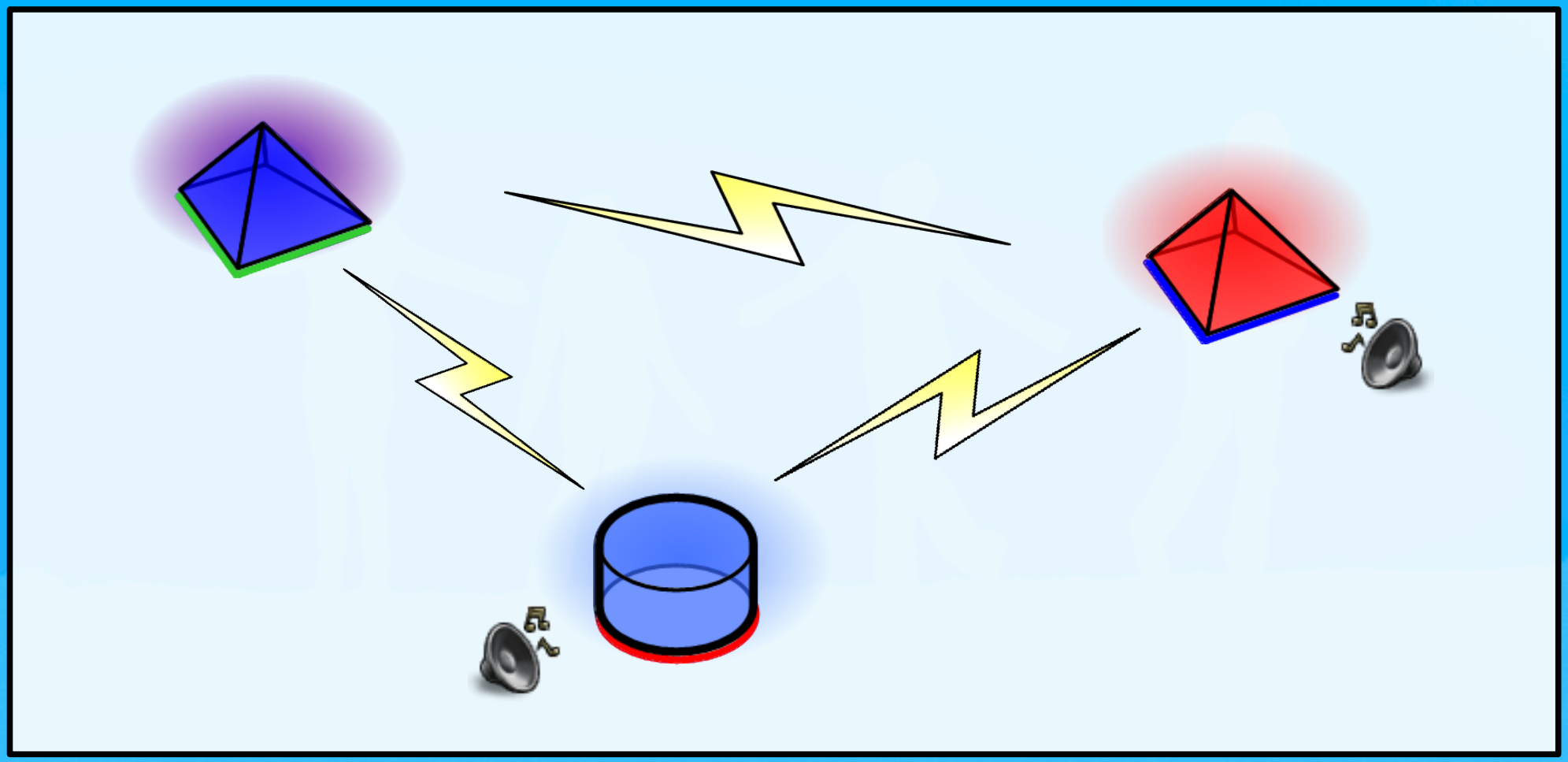
- Uses moteiv telos sky “berkeley” motes

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



[Brewer et al.:2005]

Scenario with Nimio



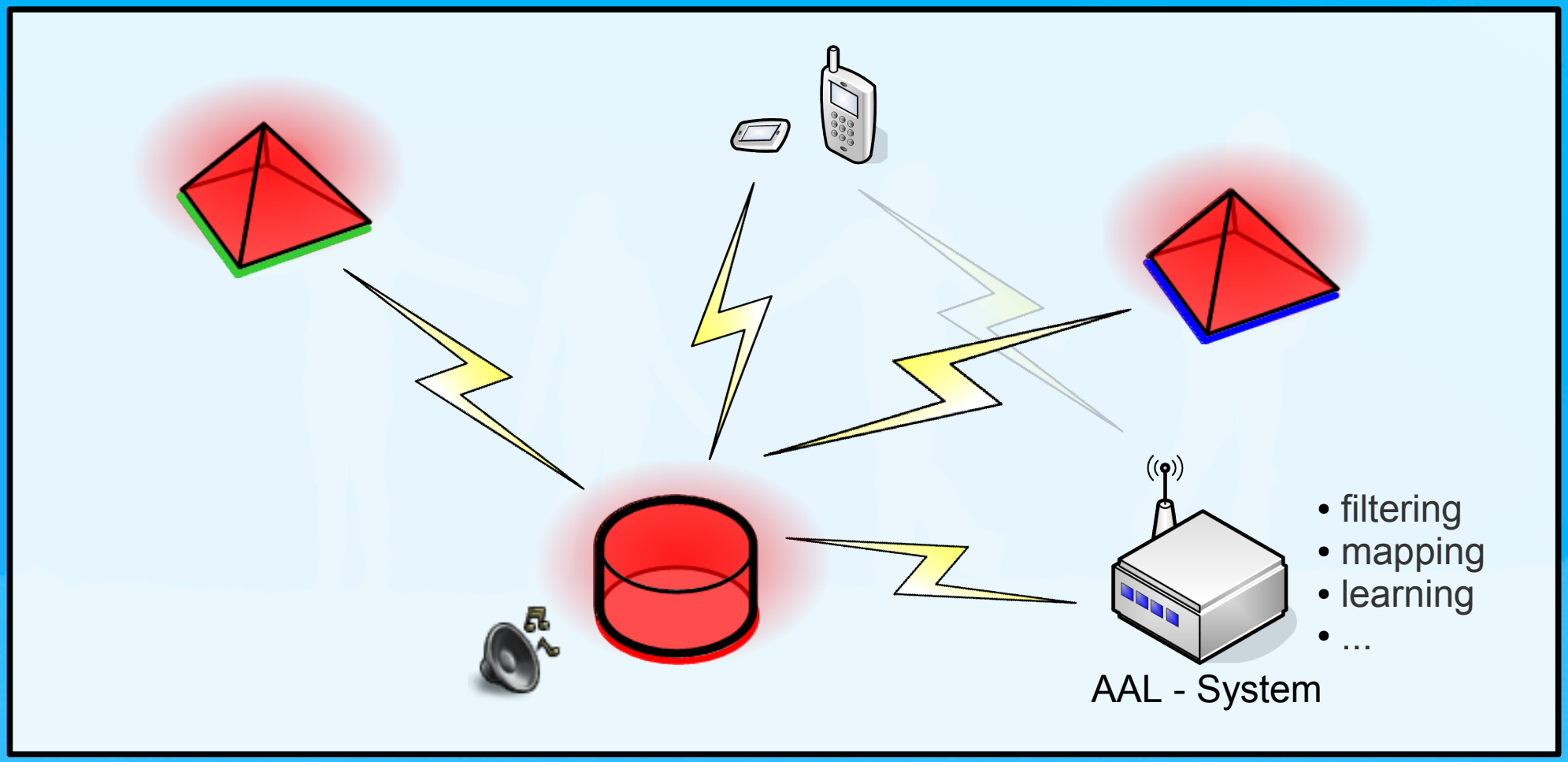
Vibration

- 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



Next steps

- 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

Risks and opportunities

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

References

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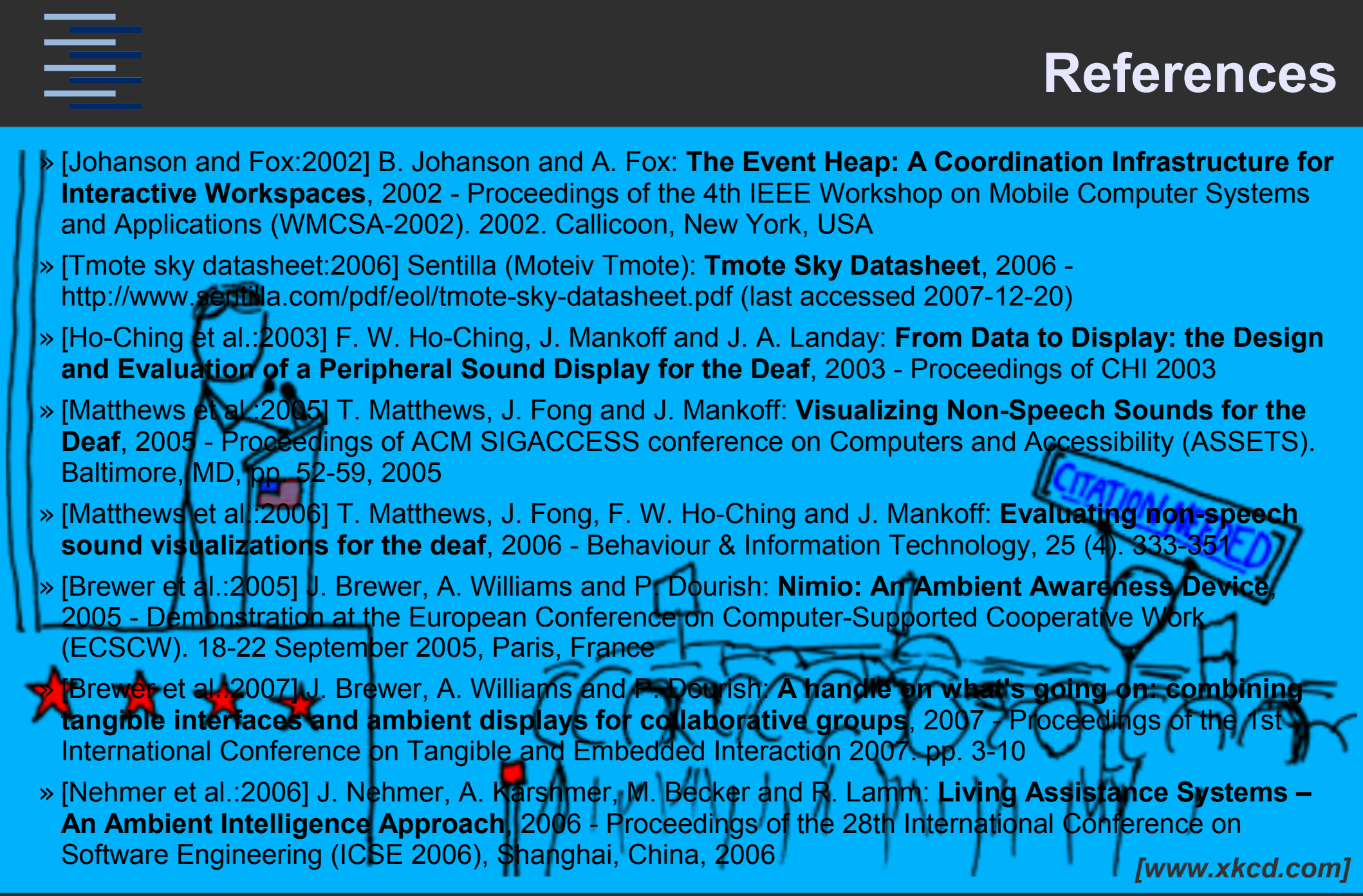

[www.xkcd.com]

Questions?

[www.nabaztag.com]

Glossary

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