Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences

Ambient Assisted Living
- Accessibility -

AW 2
Stefan Meißner
11.12.2007

Outline

- Retrospective
- Scenario revision – Object localization
- Digging deeper
- Object localization vs. Object recognition
  - NeXus
  - Orientation aid for blind people
- Scenario revision – Sound awareness
  - IC2Hear
- Summary

Main targets

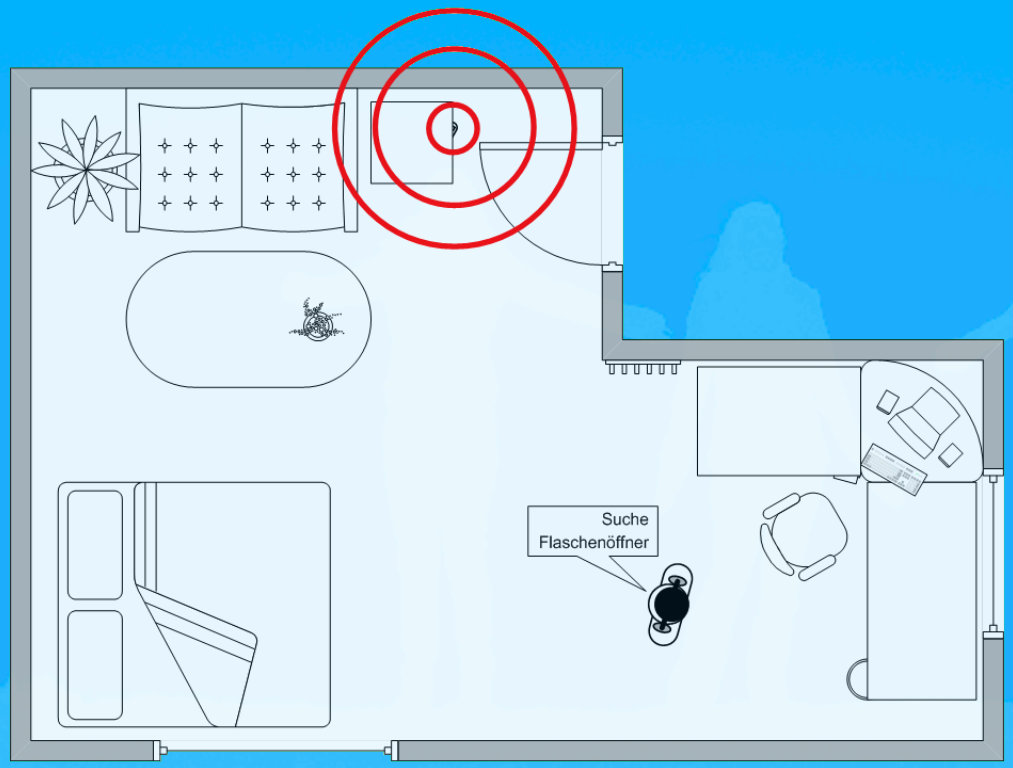
- Minimize dependencies
- Transparent and omnipresent assistance
- Improve user interfaces
- Make accessibility happen

Fraunhofer - Gesellschaft - InHaus1

[www.inhaus-zentrum.de]

Scenario revision – Object localization

“Lost bottle opener”



Issues

- Indoor positioning via RFID
- User interface
  - speech recognition
  - guidance by using (virtual) surround sound
- No map or 3D model available

Digging deeper

Insights gained from interviews with visual impaired persons

- Dealing with
  - unknown areas
  - obstacles
  - noise (e.g. construction site)
- Uncertainty when
  - changes occur
  - meeting unfamiliar people

[www.bsvh.org]

Object localization vs. Object recognition

Localization

- instant search result
- useful for sighted people as well
- searching “the machine's way”

General subject for AAL systems

Recognition

- object discovery
- orientation aid
- awareness improvement
  - information for recognized objects
- searching “the human's way”

NeXus

Visualization and Interactive Systems Group (University of Stuttgart)

- Spatial world models for mobile context-aware applications
- Global infrastructure for location independent applications
- Subproject “Orientation aid for blind people”

[www.nexus.uni-stuttgart.de]

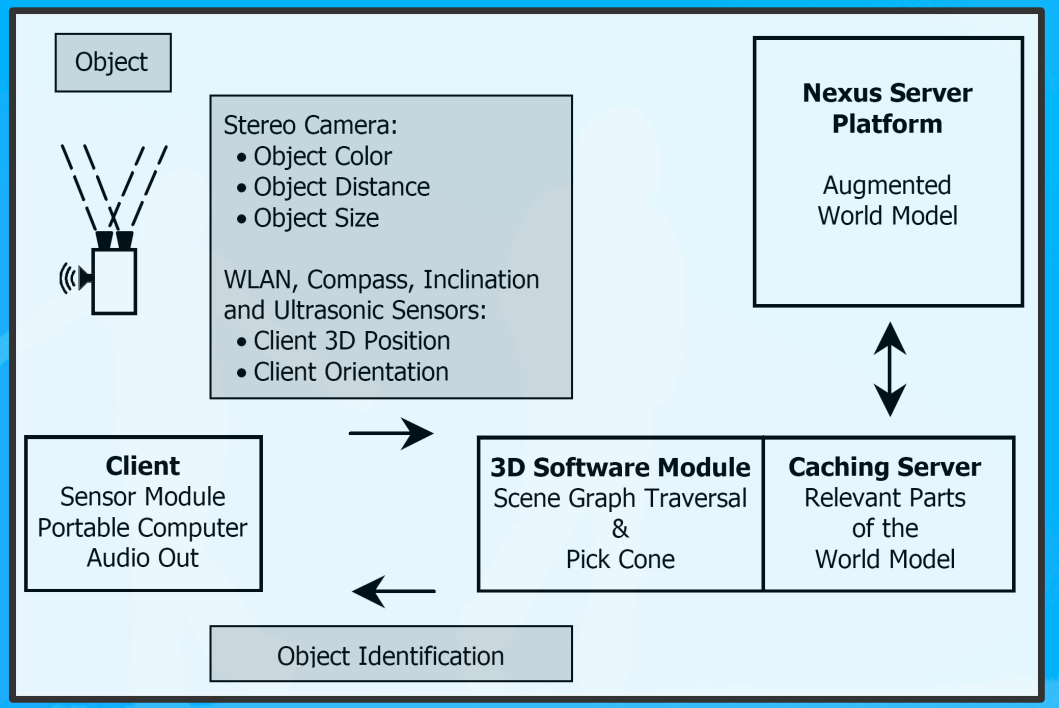
Orientation aid for blind people

- Interactive localization and recognition of objects using
  - stereo images
  - orientation (inertial sensors)
  - 3D model information
- Initial room localization using conventional W-LAN
- Precise “self-localization”
  - distance measurement
  - appropriate adjustment of the building model

[Hub et al.:2006]

Orientation aid for blind people

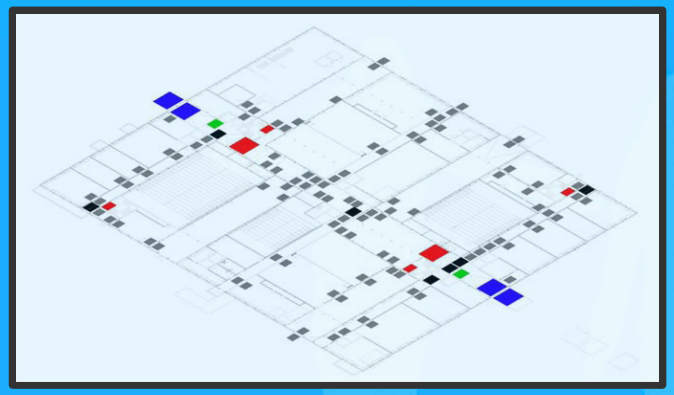
- Object identification
- Matching of known and recognized objects
- Transmission of corresponding information

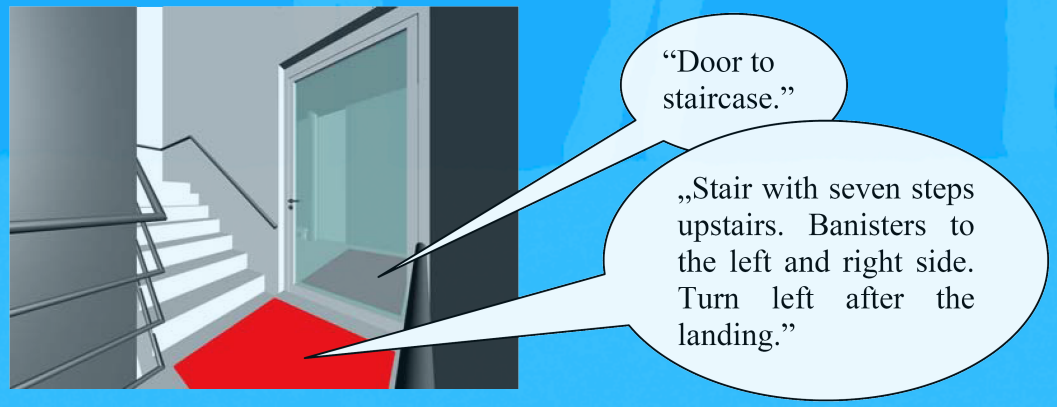


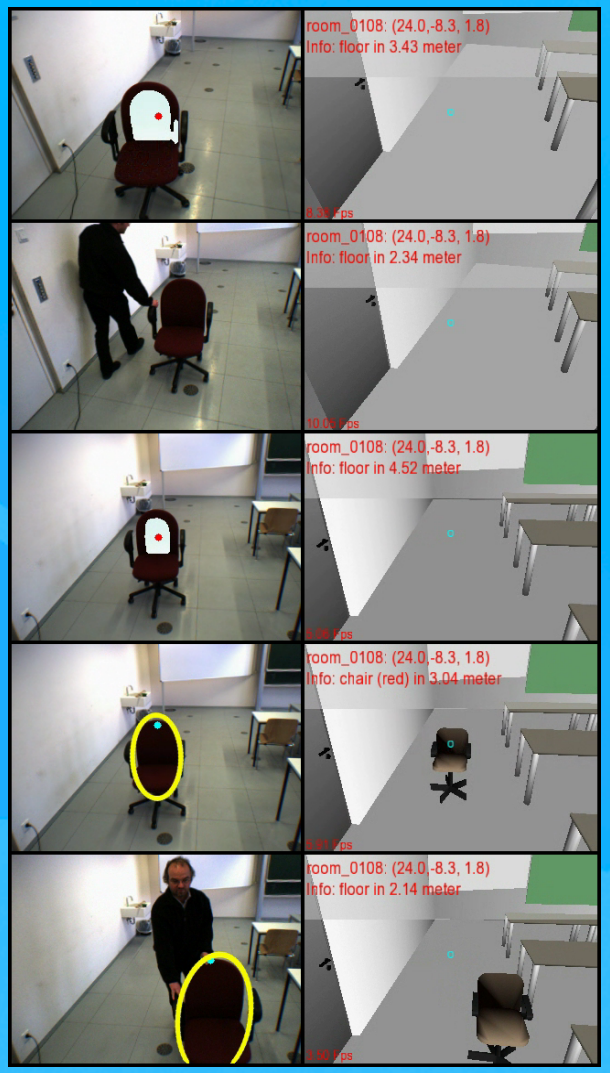
[Hub et al.:2004]

Further features

- Training, recognition and tracking of movable objects
- Virtual navigation areas







[Hub et al.:2005], [Hub et al.:2006]

Scenario revision – Sound awareness

“Child falls and cries”

Issues

- Event recognition
- Locating sound source
- Sound visualization
- Floor plan

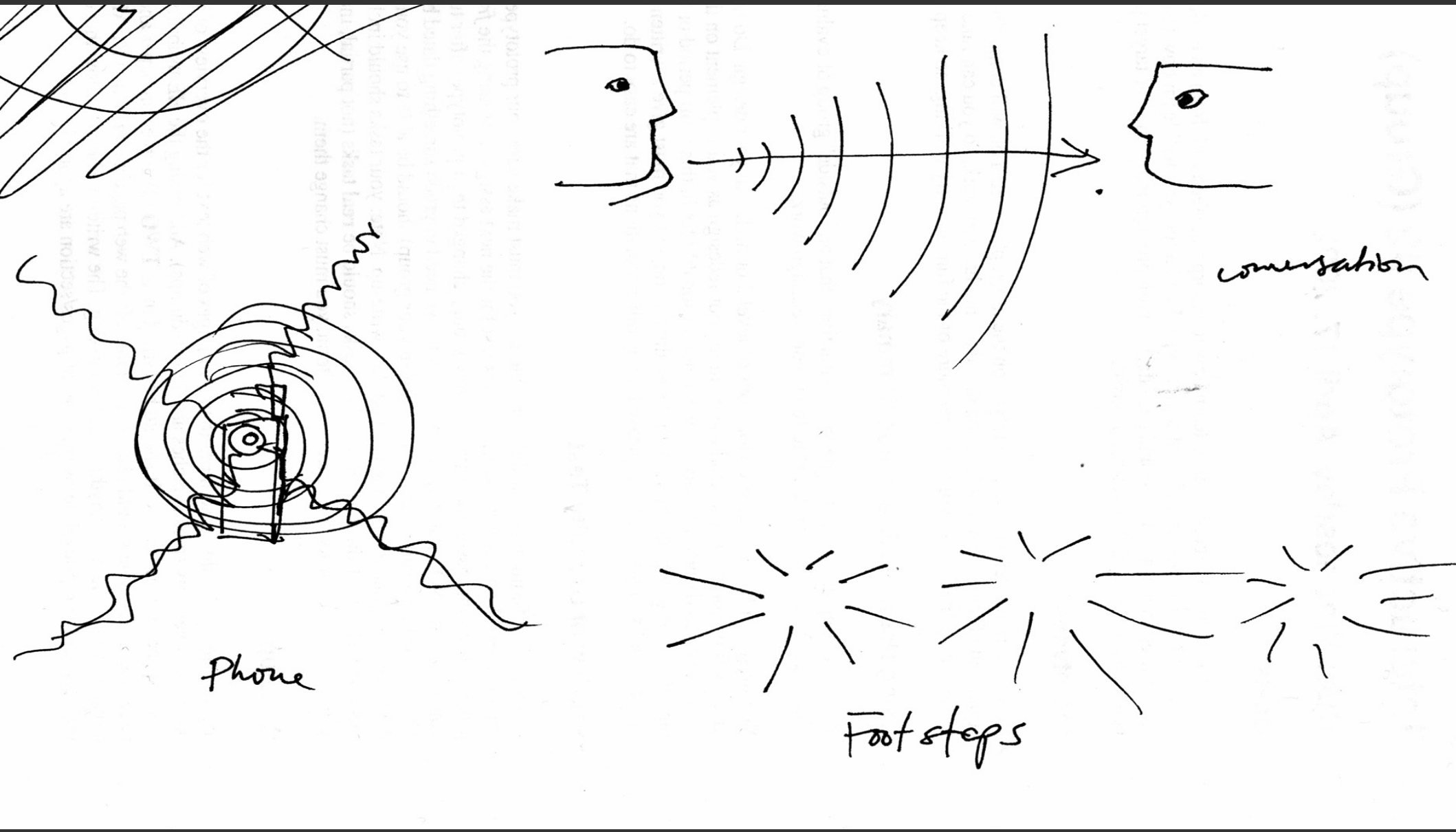
IC2Hear

Group for User Interface Research (University of California at Berkeley)

- Acoustic event classification system
  - CHIL Project Database
    - 25 noise classes (manually transcribed)
    - 2800 noise instances collected
  - SVM / GMM / HMM classifier
- Prototype
  - Trained with common office sounds
  - Background noises filtered out
  - High quality microphone mounted above desk

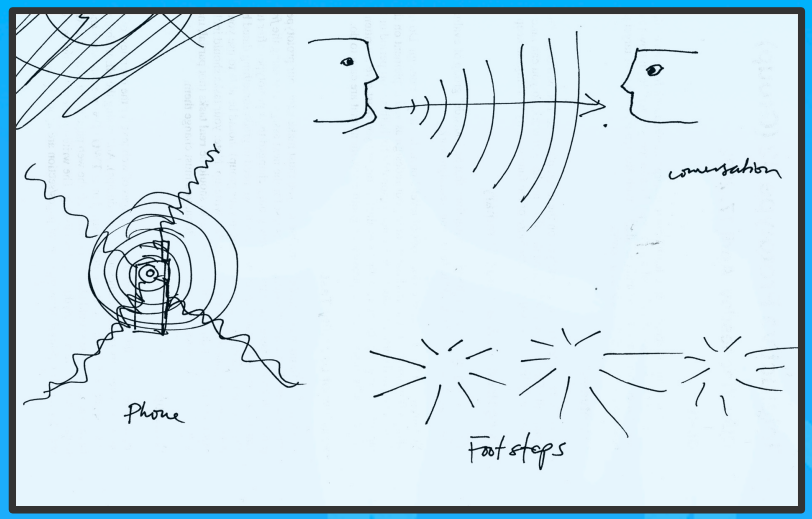
[Malkin et al.:2005], [Matthews et al.:2005]

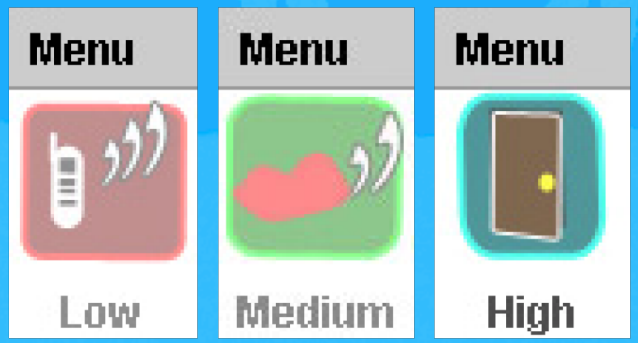
Sound visualization



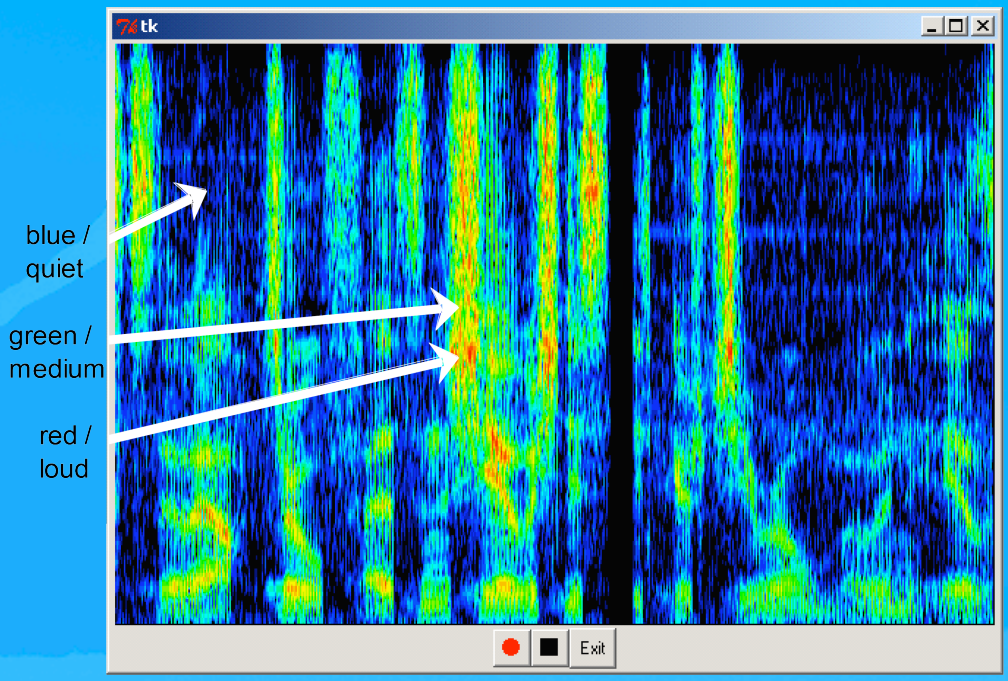
Sound visualization

- Symbols / Icons





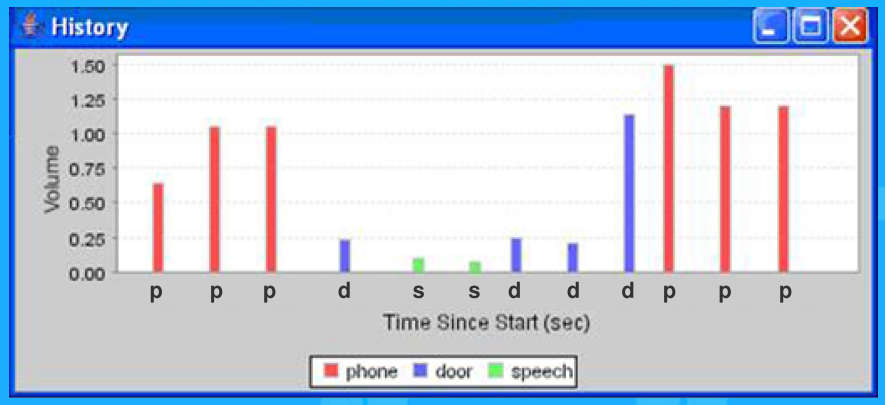
- Spectrograph



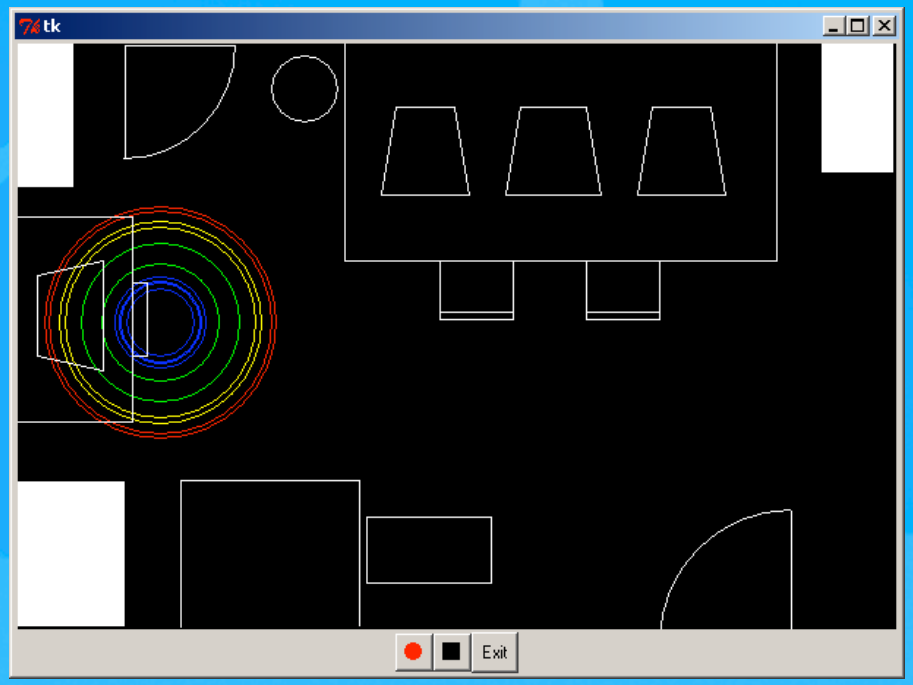
[Ho-Ching et al.:2003]

When? Where?

- History



- Map prototype



[Matthews et al.:2006]

Summary

- Awareness improvement
  - Sound
  - Vision
- Several approaches
- Integration required
- For disabled and non-disabled

References

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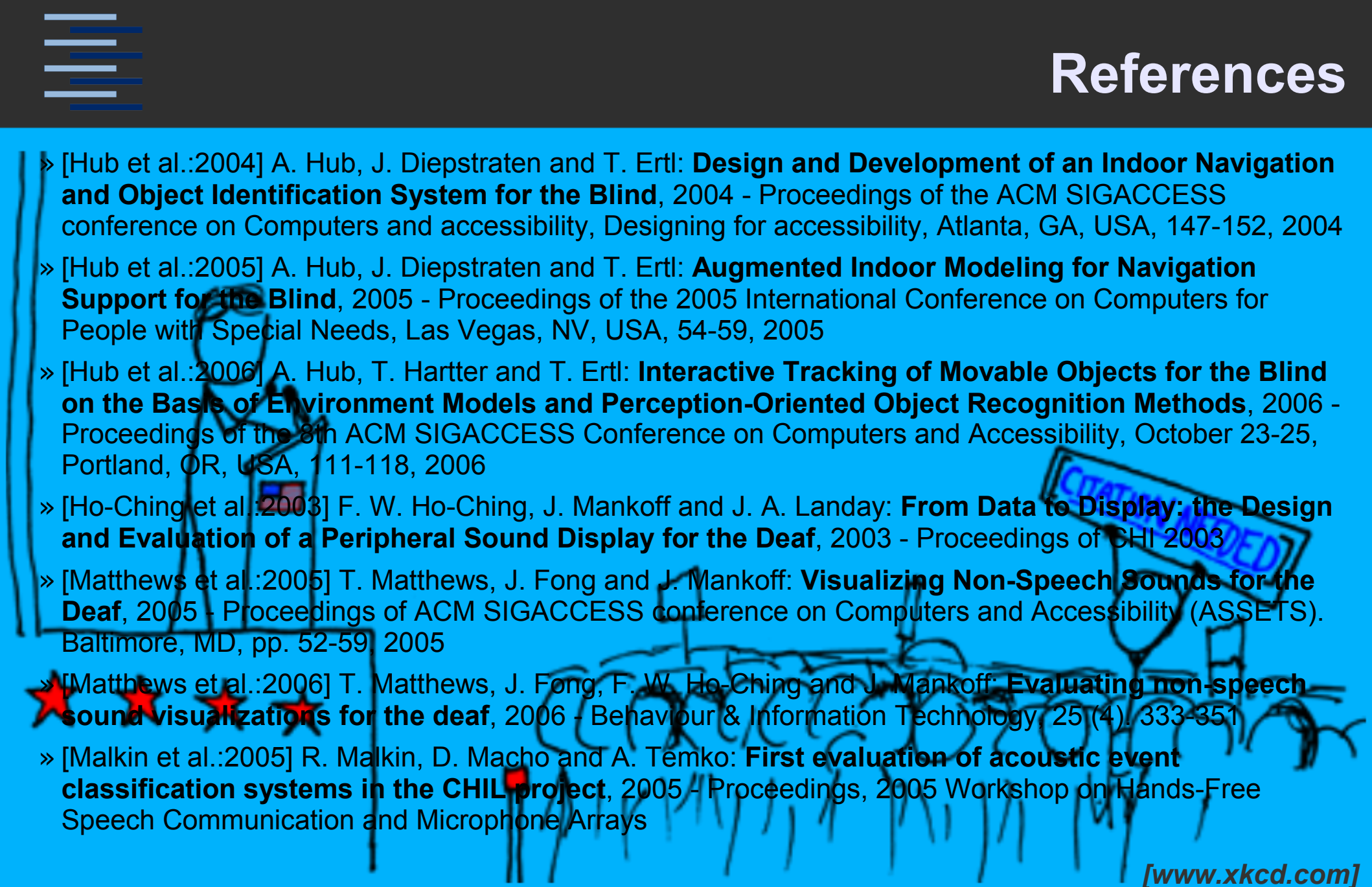
- [Malkin et al.:2005] R. Malkin, D. Macho and A. Temko: **First evaluation of acoustic event classification systems in the CHIL project**, 2005 - Proceedings, 2005 Workshop on Hands-Free Speech Communication and Microphone Arrays



[www.xkcd.com]

Make accessibility happen

Image taken from www.focus.de

On the Internet, no one knows you're not a dog!
Nor even if you're still the same dog!

[T.V. Raman]

Glossary

AAL	Ambient Assisted Living
CHIL	Computers in the Human Interaction Loop
GMM	Gaussian Mixture Model
HMM	Hidden Markov Model
RFID	Radio Frequency Identification
SVM	Support Vector Machine