

Future User Interfaces 2019

[7] Ambient Interfaces

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Who am I?

- Senior Researcher and Lecturer in Human-IST research centre, Unifr and EPFL's Dept of Computer Science
- PhD, Ubiquitous Computing, EPFL
- Masters, Telecommunication Systems, EPFL



Ubiquitous Computing

- A philosophical account on the role of technology in our lives

Ubiquitous Computing

- A philosophical account on the role of technology in our lives
- That became extremely popular

Ambient Interface

- Physical architectural space as new form of interface between human and digital information

Hiroshi Ishii, Media Lab



Human's "Background Processing"

Human’s “Background Processing”

Humans have highly sophisticated capacities for processing multiple information streams. While a particular source of information may occupy the “foreground” of our awareness, many additional sources may concurrently be monitored in the “background”.

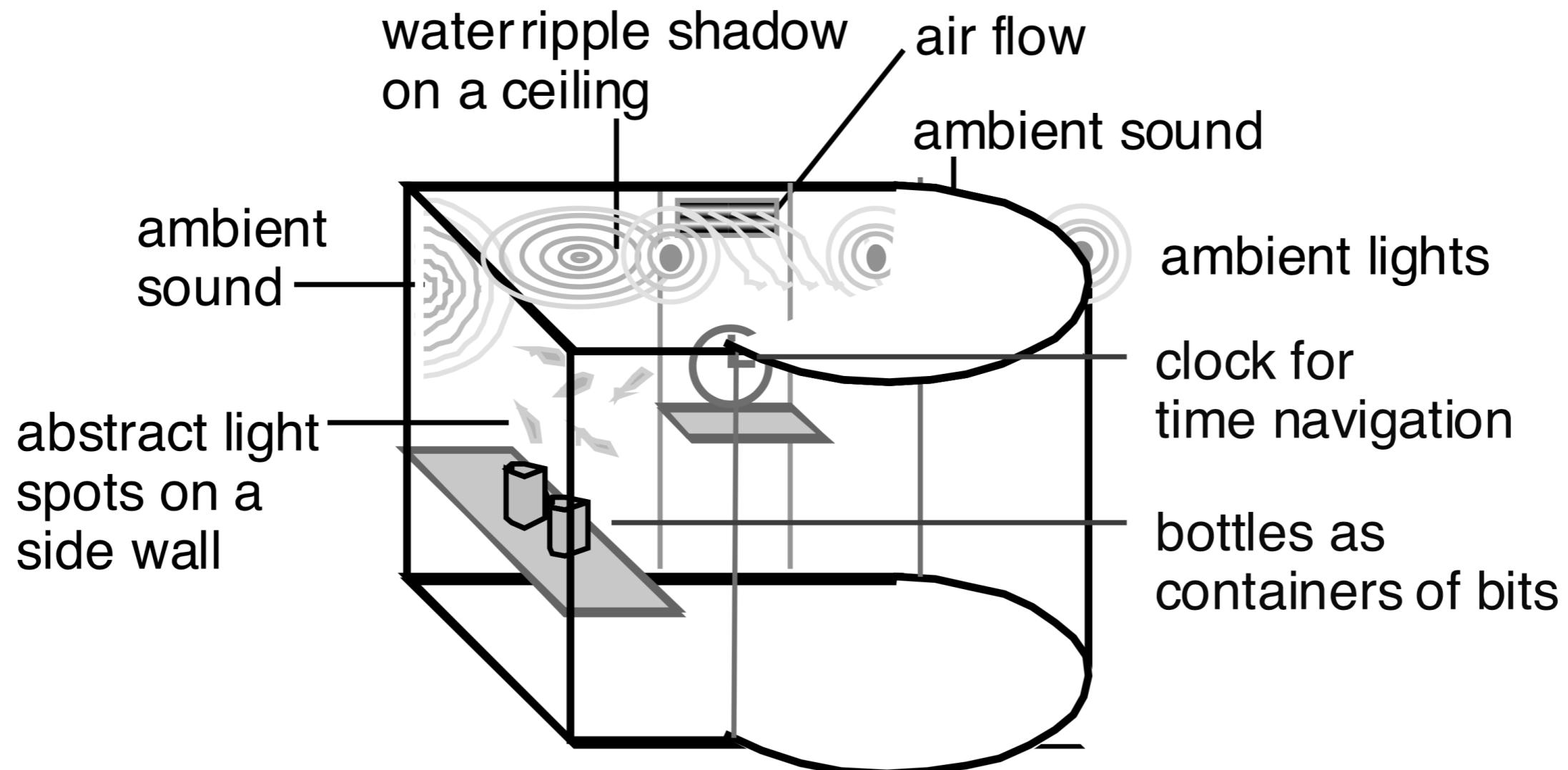
Example 1 (Dangling String)

- Network Traffic Information
- Through Vibration of a string
- Physical Space? Spatial Configuration?
- Use of Metaphor?



Weiser 96

AmbientROOM - Hiroshi Ishii (1998)



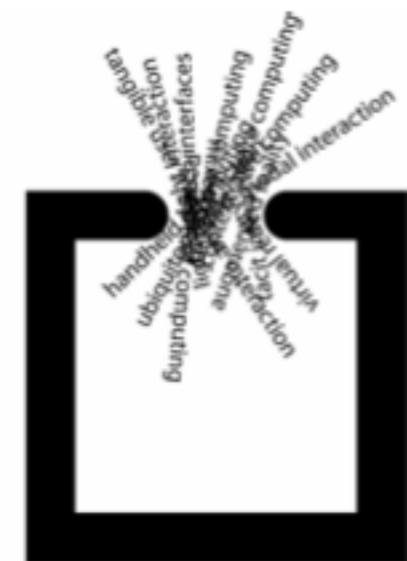
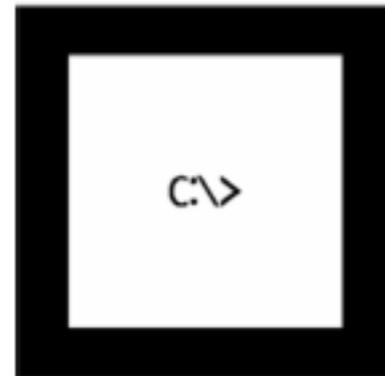
Ishii 98

The Elements of Ambient Interface

- **Physical Space**
 - existing architectural infrastructure
 - physical configuration
 - social and cultural significance
- **Medium**
 - metaphor, using prior real life experiences (RBI)
- **(digital) Information**
 - common sense - no clear cut border

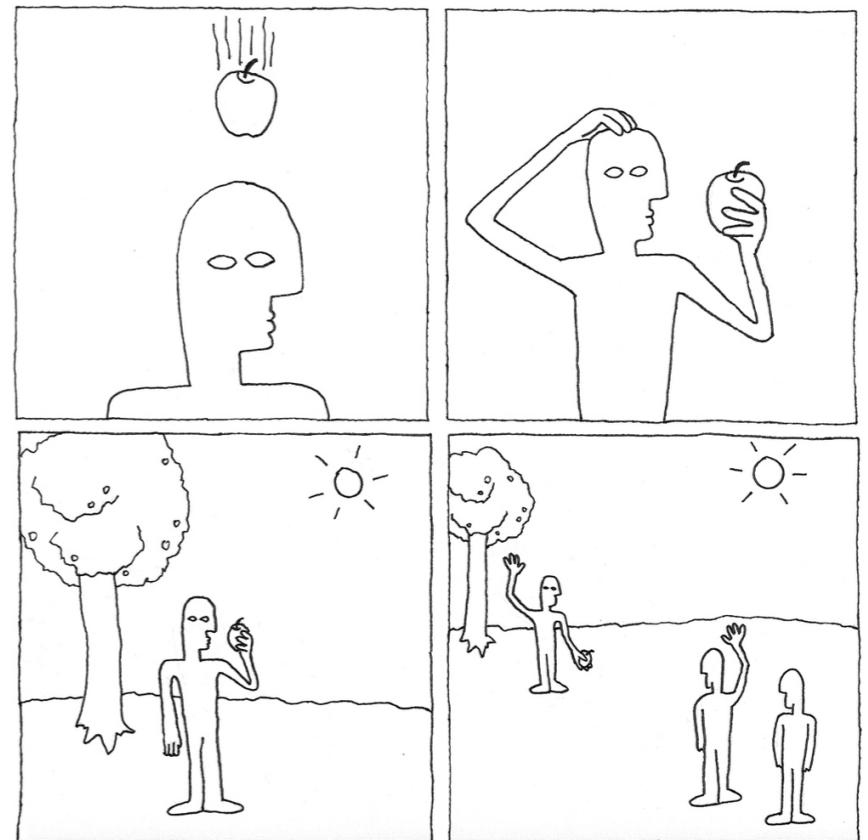
New Interaction Paradigms

- Reality-Based Interaction (RBI)



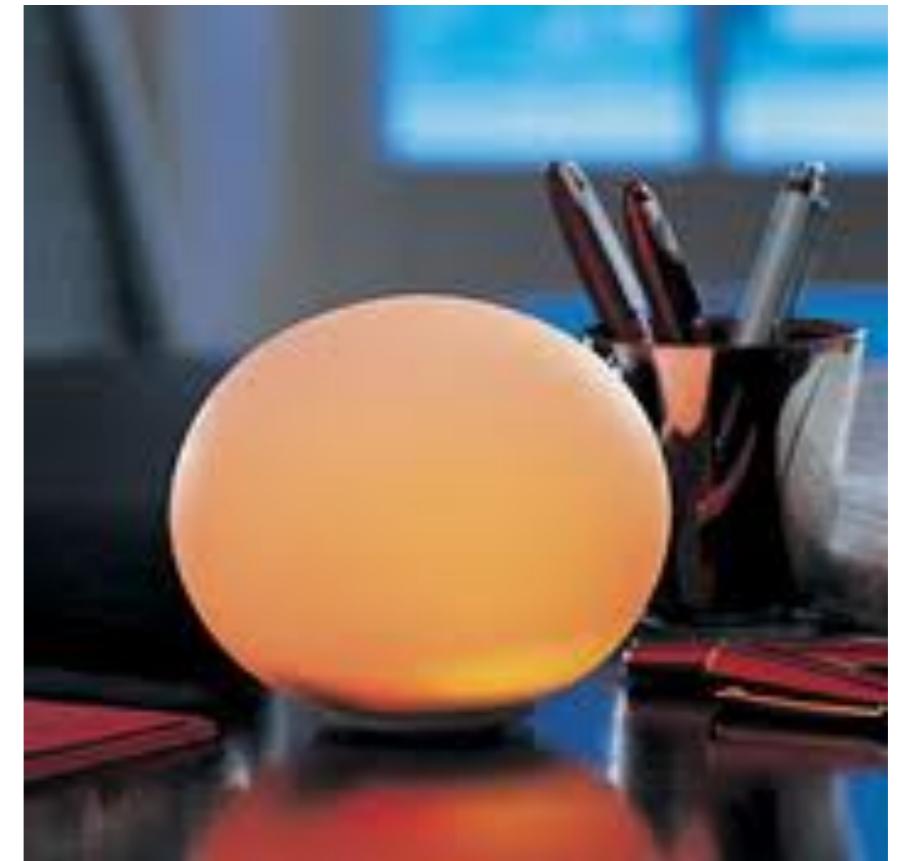
Reality-Based Interaction

- Reality Themes
 - Naïve Physics
 - Body Awareness and Skills
 - Environment Awareness and Skills
 - Social Awareness and Skills



Example 2 (Ambient Orb)

- stock market status, traffic congestion or weather forecast information
- on a glowing globe
- Physical Space? Spatial Configuration?
- Use of Metaphor?



Ambient Devices

Example 3 (Ambient Umbrella)

- if rain is forecast
- on umbrella's handle
- Physical Space? Spatial Configuration?
- Use of Metaphor?



Example 4 (Data Fountain)

- Currency data
- via height of water fountains
- Physical Space? Spatial Configuration?
- Use of Metaphor?



van Mensvoort 05

Example 5 (Ambient Wood)

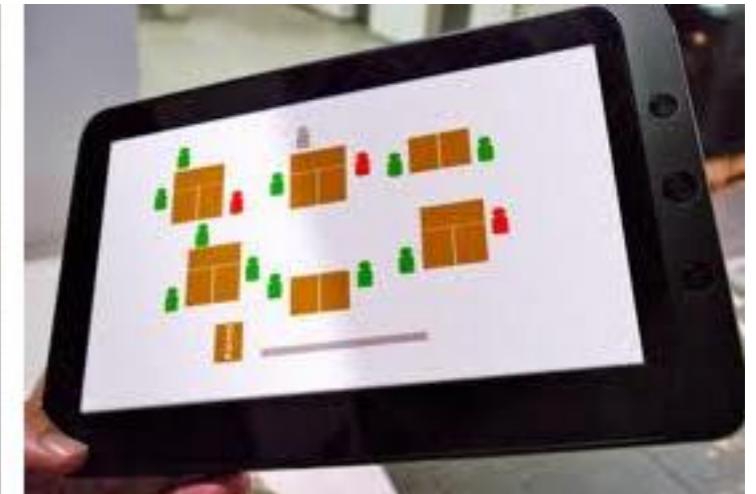
- Educational information about forest
- communicated through special devices
- Physical Space? Spatial Configuration?
- Use of Metaphor?



Yvonne Rogers 10

Example 6 (Subtle Stone)

- Color-coded Student's emotion
- Interactive ball
- Physical Space? Spatial Configuration?
- Use of Metaphor?



Madline Balaam 10

Example 7 (Power Aware Cord)

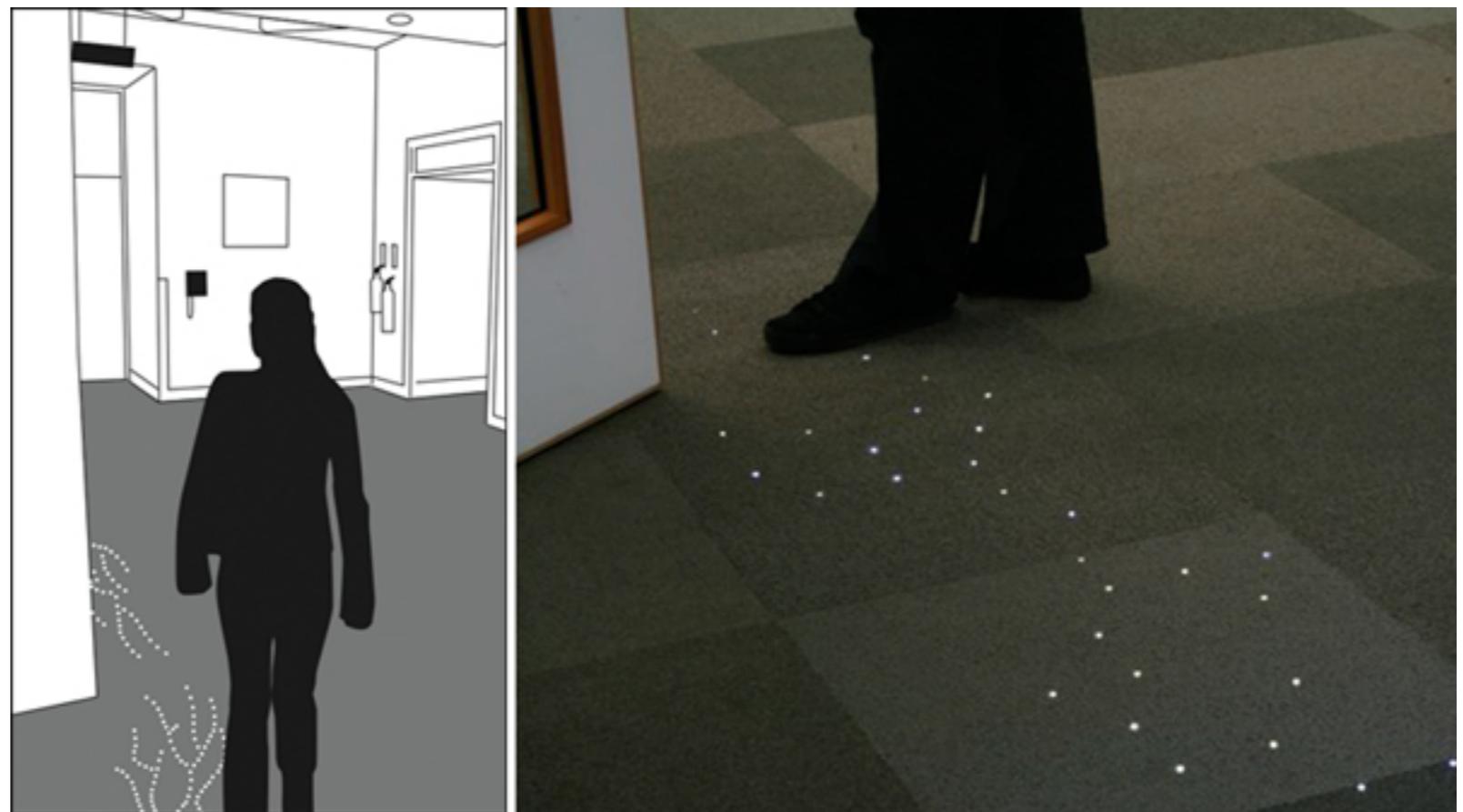
- Electricity energy data
- in glowing cord
- Physical Space? Spatial Configuration?
- Use of Metaphor?



Anton Gustafsson 05

Example 8 (Follow-the-Lights)

- information about possible paths
- into the flooring
- Physical Space? Spatial Configuration?
- Use of Metaphor?



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Group Activity (Part 1)

- Context: Future Urbanity
- Focus: The evolution of human experiences
- Task: Discuss the specific experience of being a pedestrian

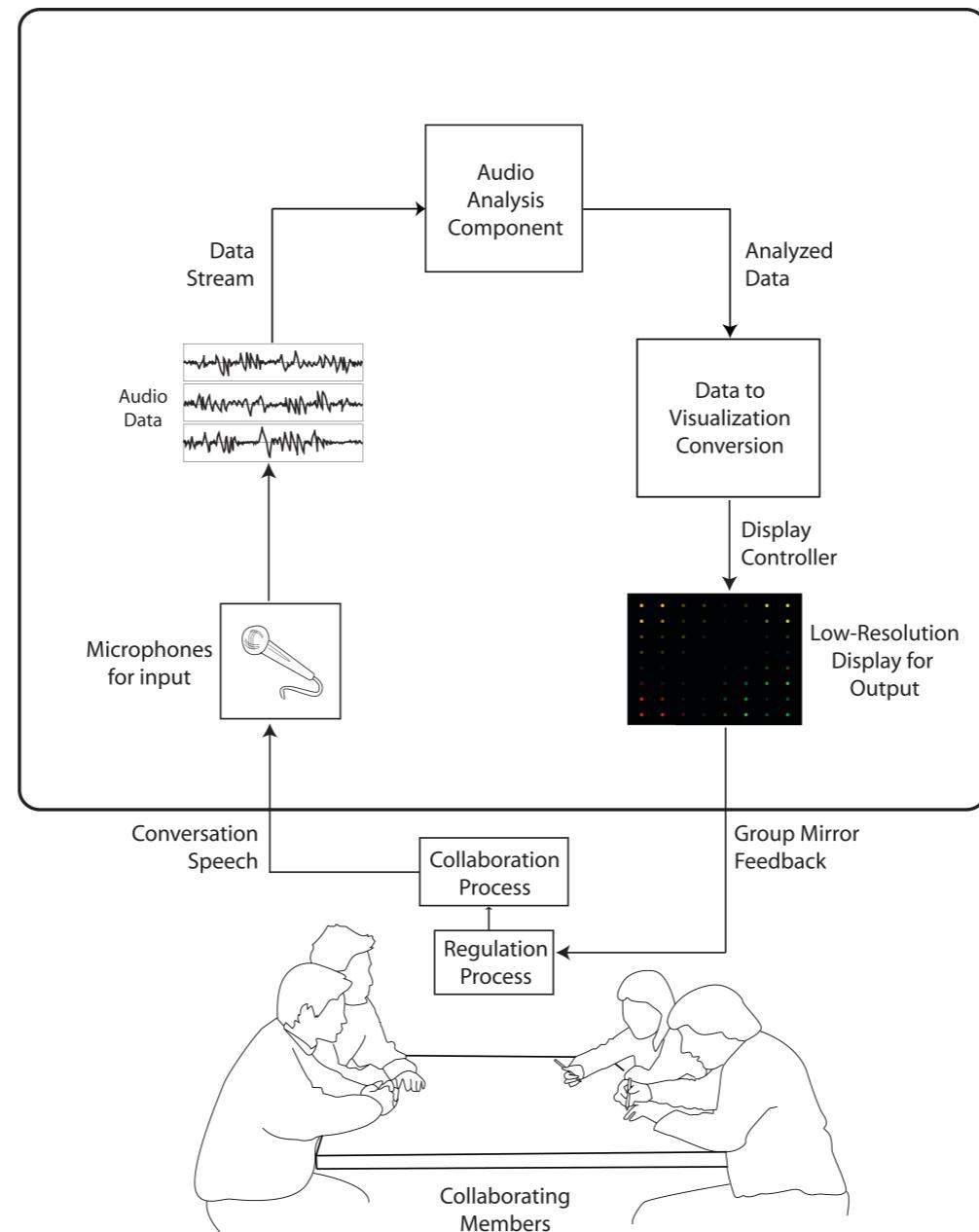
Example 9 (Reflect)

- Participation balance information
- on an array of LED on tabletop
- Physical Space? Spatial Configuration?
- Use of Metaphor?



Khaled Bashour 10

Reflect - Data Flow



Reflect - User Studies

Hypotheses

When showing participation levels:

1. *Reflect* is visible.
2. *Reflect* is unobtrusive.

3. *Reflect* can improve awareness.
4. *Reflect* can improve balance.

Reflect - User Studies

Study 1 – Experimental Setup

- ▶ Subjects
 - ▶ 72 paid subjects
 - ▶ Groups of four
 - ▶ University students
- ▶ Task
 - ▶ Murder mystery
 - ▶ Information pooling
- ▶ Procedure
 - ▶ 30-minute reading
 - ▶ 60-minute discussion

Reflect - User Studies

Experimental Conditions

Speaker condition



Topic condition



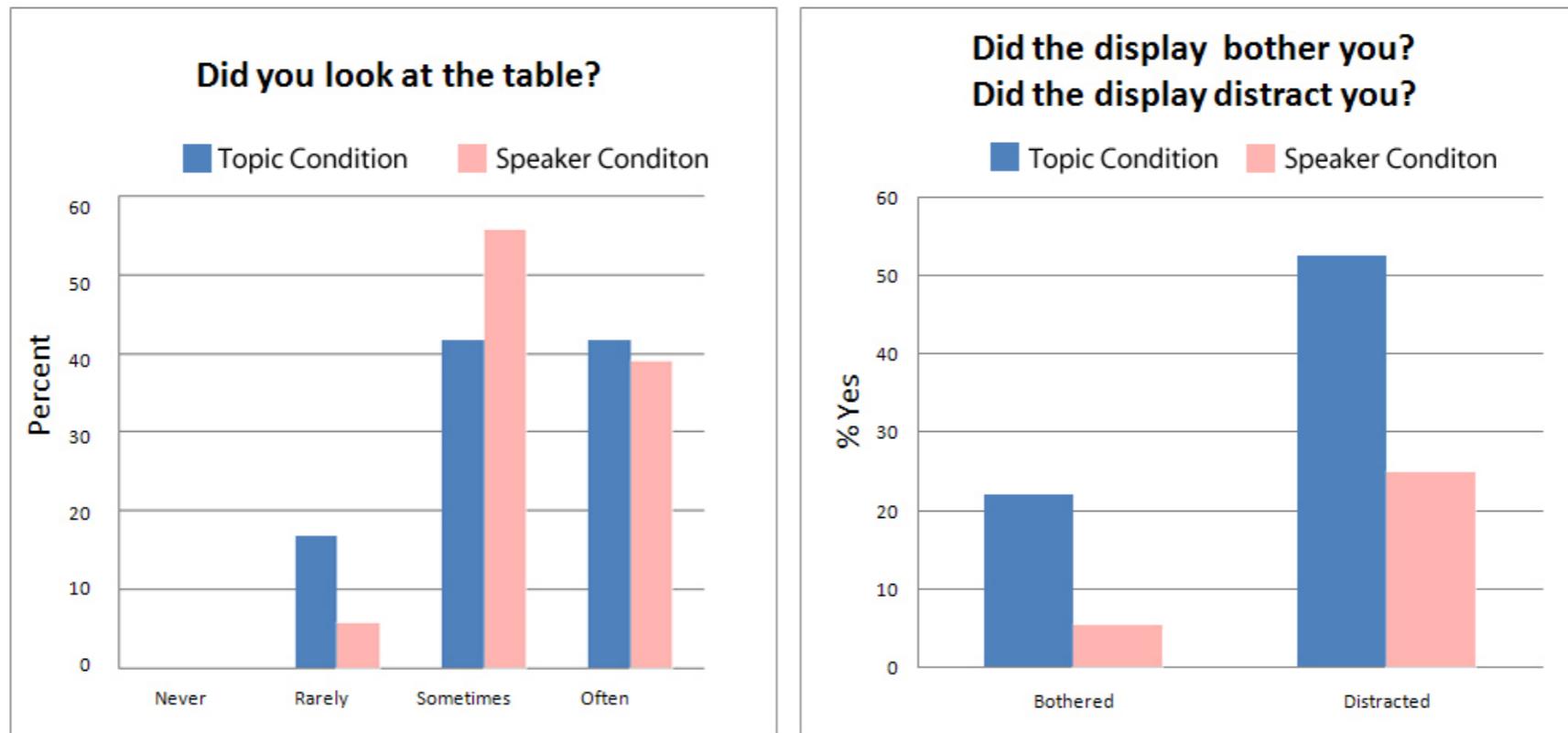
Reflect - User Studies

- ▶ Example



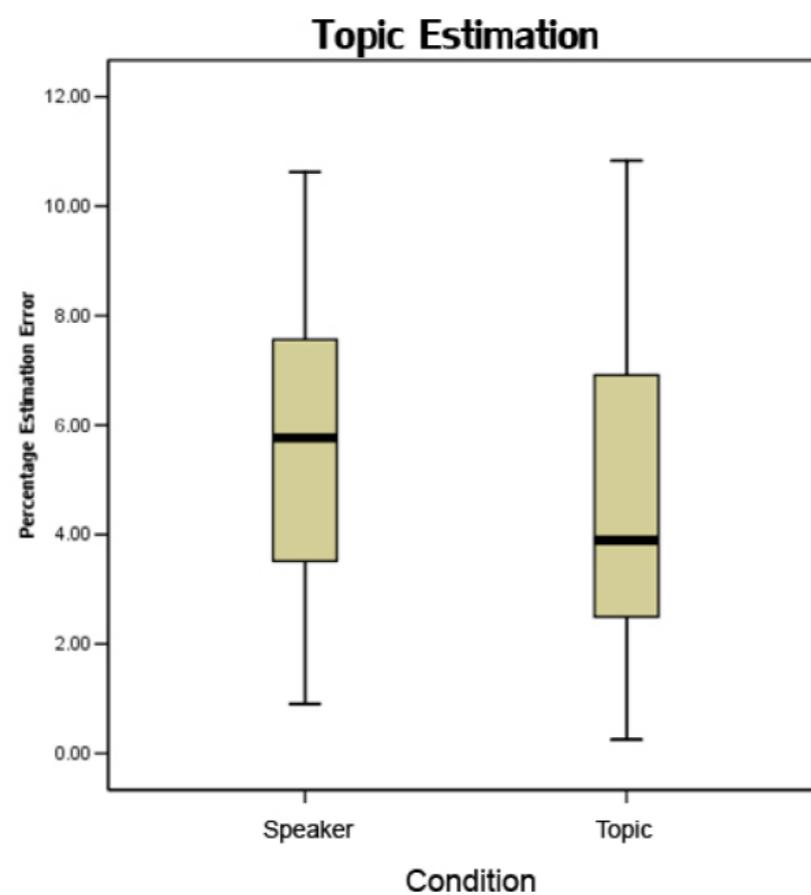
Reflect - User Studies

Results – Visibility and obtrusiveness

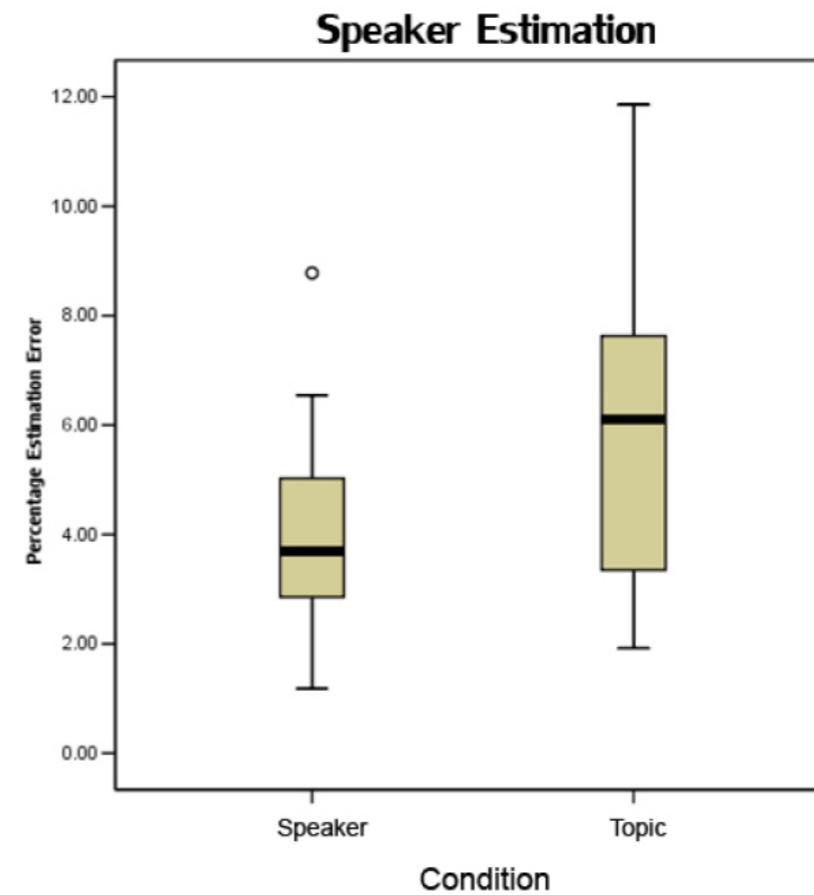


Reflect - User Studies

Result - Awareness



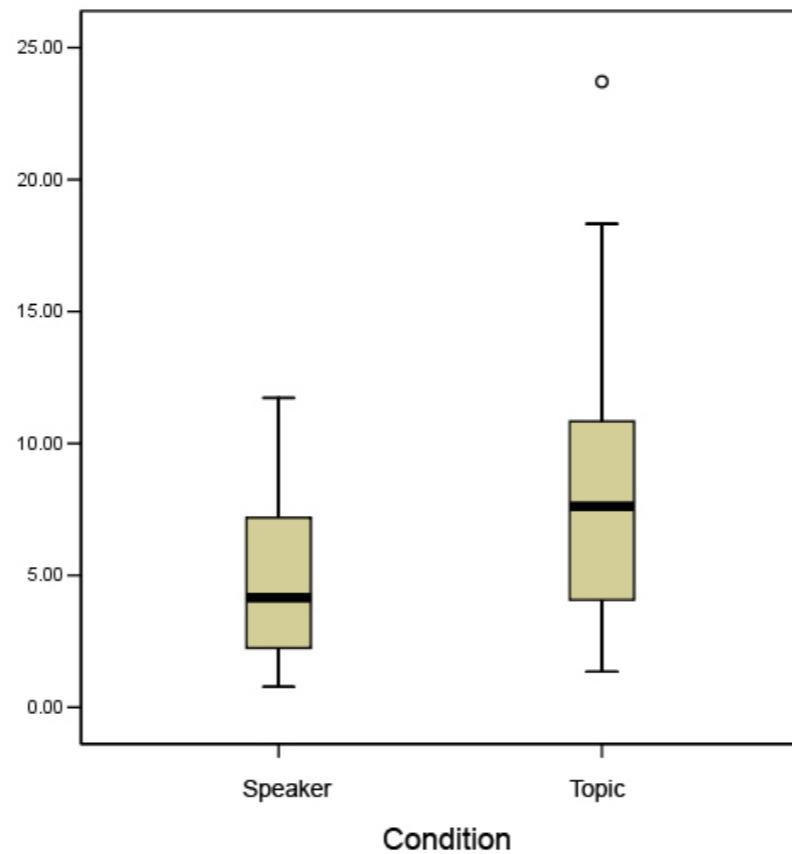
$$m_s = 4.0, m_t = 5.8, t[62] = -3.3, p < 0.01$$



$$m_s = 5.8, m_t = 4.3, t = 2.4, p < 0.05$$

Reflect - User Studies

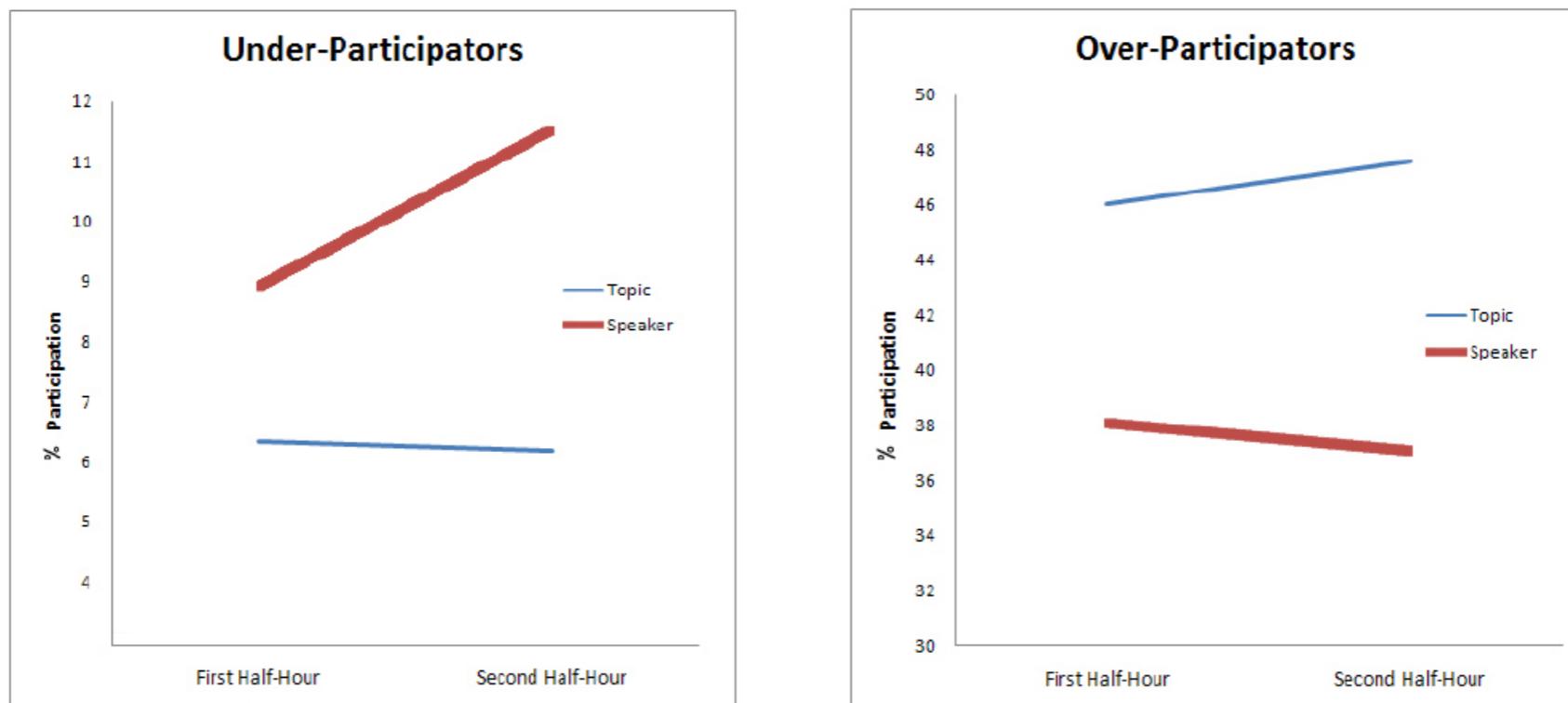
Results – Balance (1)



$$m_s = 5.0, m_t = 8.5, t[38] = 2.18, p < 0.05$$

Reflect - User Studies

Results – Balance (2)



$$m_s = 11.5, m_t = 6.1, t[8] = 1.304, p > 0.1$$

$$m_s = 37.1, m_t = 47.6, t[8] = -3.97, p < 0.01$$

Example 10 (Lantern)

- Learning Team's status
- Interactive device on study tables
- Physical Space? Spatial Configuration?
- Use of Metaphor?



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Lantern - Demo



Group Activity (Part 2)

- Context: Future Urbanity
- Focus: The evolution of human experiences
- Task: Discuss the specific experience of being a pedestrian
- Design an ambient interface that can improve pedestrians' interactive experience with the vehicles

HCI and Architecture

The emerging field of Human-Building Interaction

- Human-Building Interaction
 - Ambient Interfaces
 - Interactive Architectural Elements
 - “Collaborative Buildings”
 - (interactive) building automation