

# Sensing and Tagging

Ubiquitous Computing

Spring 2010

# Sensing:

- Making Sense of Sensing Systems: Five questions for designers and Researchers
- Distributed mediation of ambiguous context an aware environments

# Tags and other technologies:

- RFID: A key to Automating Everything
- Towards sustainable transport: wireless detection of passengers trips on public transport buses
- Brindging Physical and Virtual Worlds with Electronic Tags

...and design patterns

# Sensing

How to handle interaction between ubicomp systems and users?

- Sometimes the system will know what to do:

  - Glass under the tap

  - Opening the fridge door

  - Turning pages in a book

  - ...

- Carry ideas and principles from GUI's to ubicomp systems?

# Sensing

## Quotes:

“with sensing systems user may well be looking elsewhere than a display” → Remember the microsoft video!?

“mistakes and misunderstandings are repaired in communication”  
→ If I’m not looking at a display how can I communicate with the system?

# Sensing

- Gestures: many times they are not intentional
- Speech

→ Enable us to address and get the system attention, take action on it, be sure that it's doing what was suppose, and also enables efficient mediation when something goes wrong.

→ Both ambiguous!

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# Sensing

How to make natural language less ambiguous?

(1) Use of AI techniques:

- Probabilities (bayesian networks, HMM...)

- Machine learning

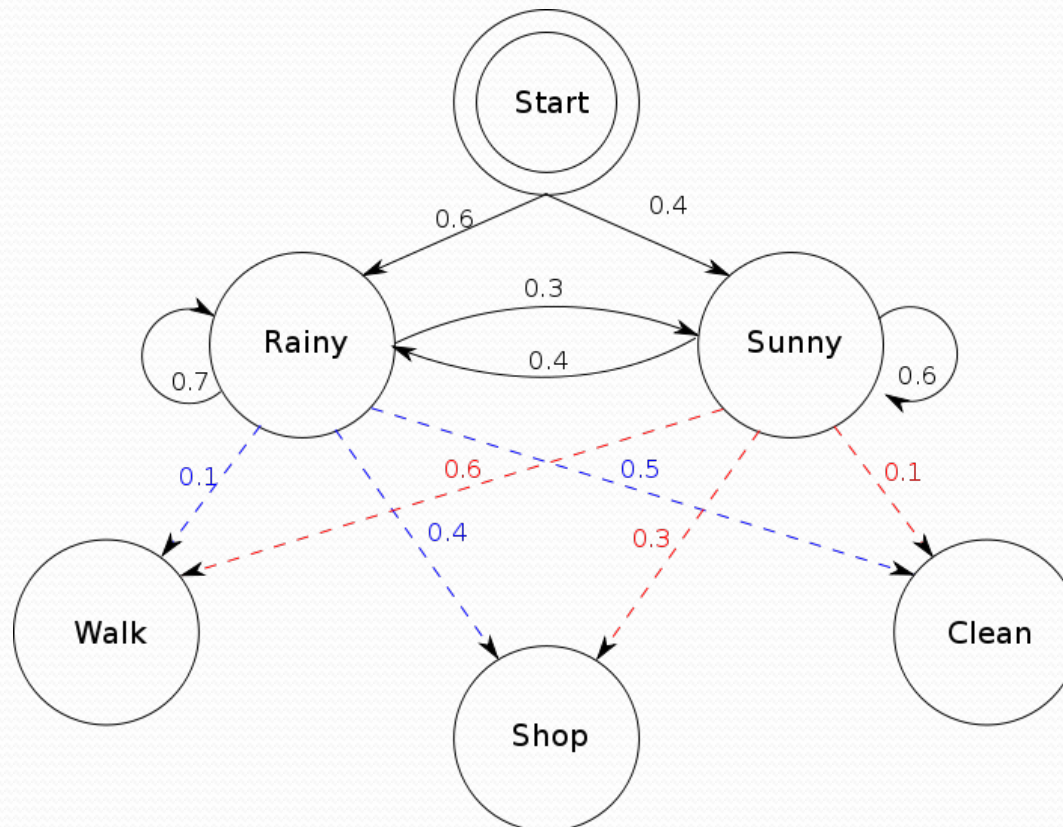
- Location and time info

- Other context info...

(2) Mediation: user is requested to disambiguate what was left from (1)

# Sensing

**Hidden Markov Model:** the emission\_probability represents how likely Bob is to perform a certain activity on each day. If it is rainy, there is a 50% chance that he is cleaning his apartment; if it is sunny, there is a 60% chance that he is outside for a walk.



Source: Wikipedia



# Conclusion & Discussion

- Users will not always be looking at screens or displays, so audio and gestures (ambiguous context) are important channels in system-user interaction
- In a Ubicomp world computers will disappear and we will only note the consequences of their actions
  - only possible by using natural language
  - requires some degree of user disambiguation
  - if users have to disambiguate, the system is not completely ubiquitous
- Truly umbicomp: No mouse, no keyboard and sometimes no screen or display?

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# Tags and other technologies:

[RFID technology](#) [\[link\]](#)

[IBM ad](#) [\[link\]](#)

# Tags and other technologies:

## Internet of things

RFID tags, will enable computers to automatically recognize and identify everyday objects, and then track, trace, monitor, trigger events, and perform actions on those objects. The technology will effectively create an “Internet of things”, of links between things and info about them. RFID will fundamentally impact the industries of manufacturing, retail, transportation, health care, life sciences, pharmaceuticals, and government, offering an unprecedented real-time view of assets and inventories throughout the global supply chain.

# Tags and other technologies:

## Security problems

- Physical access to the tag may represent an opportunity to tag exchange (big losses to retailers);
- Tag replication if there is no encryption;
- ...

# Tags and other technologies:

## Privacy principles

- Customer must be informed that RFID tags are present and in which products;
- RFID deactivation must be possible after purchase;
- Tags should be placed only in the packages allowing easy removal (but not that easy);
- ...

# Conclusion & Discussion

- Internet of things = links and doors?
- Internet of things = ubicomp?
- Differences between bluetooth devices and tags?

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# Patterns

- Helps novice more than experts

  - Anticipates problem detection saving time

- Much better than a checklist?

  - Examples (not much abstraction here)

  - Structure and interconnection

Why not using patterns in ubicomp?



Discussion...