Cracking the Black Box

Ned Burns and Stephen Intille
MIT House_n

(Thanks to Intel and the NSF for funding House_n home sensor work)

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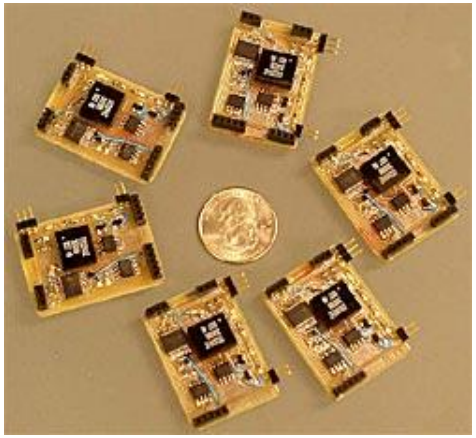
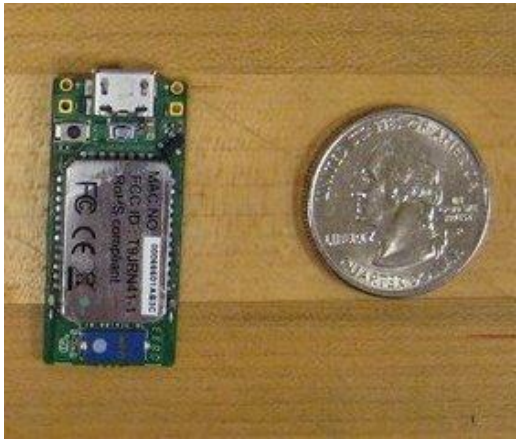
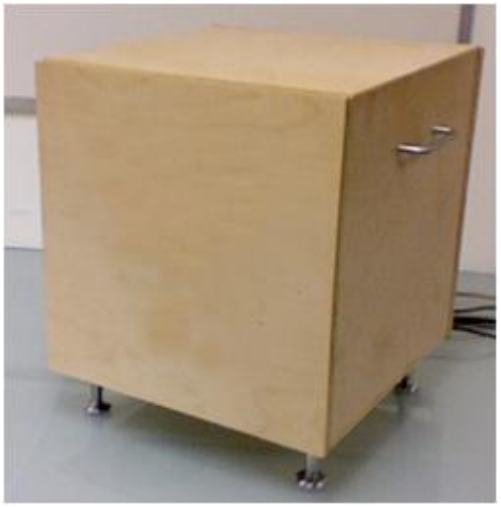


MITes



Wockets

PlaceLab



BoxLab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XBOX 360


FULL BODY
MOTION CAPTURE


Prestige


Prestige

Activity recognition

Context recognition

Context awareness

Barriers

- Diverse home environments
- Heterogeneous sensors/technology
- Missing sensors
- Unique human behavior

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PlaceLab data

Taking out the garbage

Rank	Object
1	Window blinds
2	Recycling bin
3	Computer keyboard
4	Cabinet
5	Closet

Getting ready to sleep

Rank	Object
1	Pillow
2	Cabinet
3	Faucet
4	Eyeglasses
5	Towel holder

Eating a meal

Rank	Object
1	Remote control
2	Cabinet
3	Television
4	Window blinds
5	Closet

In order to modify the system, the user has to provide it with some kind of information.

Information

- Perceived
- Acted
- Annotated

Information

- Perceived
  - What the user *thinks* they do and interact with when they perform a specific task.
    - Surveys, games, common-sense reasoning
- Acted
- Annotated

Information

- Perceived
- Acted
  - The user demos or performs a particular task
  - Conceptually attractive, easy for users to understand
  - Possible confounding factors: observer effect, ignores multitasking, interleaving
- Annotated

Information

- Perceived
- Acted
- Annotated
  - Hand-annotation of naturalistic activities (past or present), including start/stop times
  - Most time consuming, requires some kind of exterior motivation (game, etc.)

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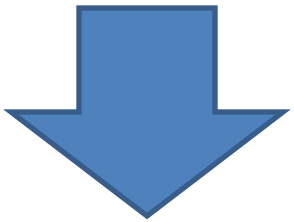

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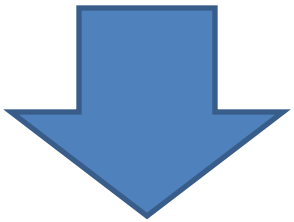

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Mental model

Plan

Pilot study[1]

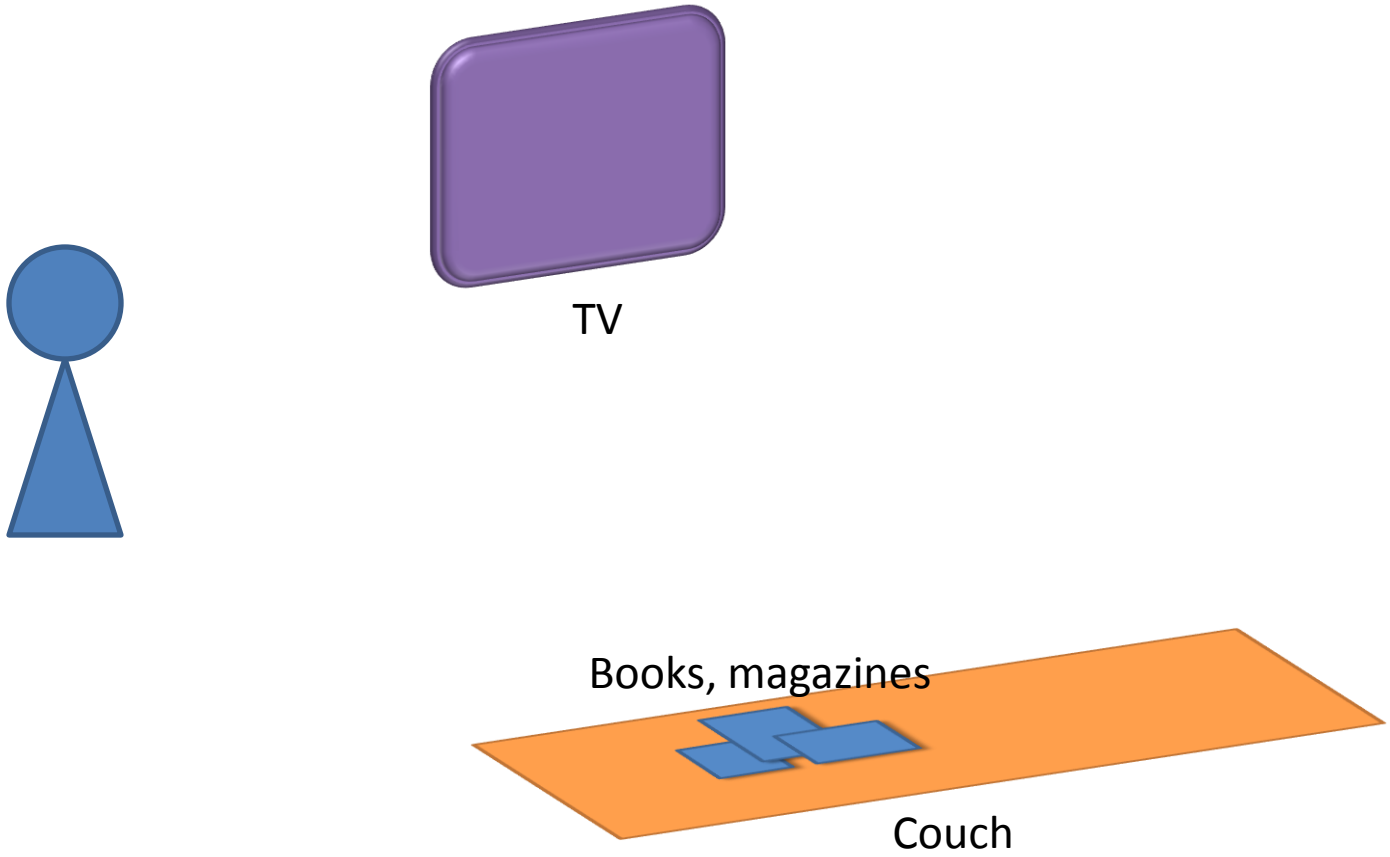
- Audible reminder system
- Assumption that system was "context sensitive"
  - Annoyed by "absurd" behavior
  - Expected context to include time of day, location, activity currently taking place
- Cheat sheet
  - "Lights & (turning down) shades"
  - "Take J's call"
- Modified behavior
- Wanted ability to link reminders to specific activations/activities

[1]Intille, Kaushik, and Rockinson (in press)

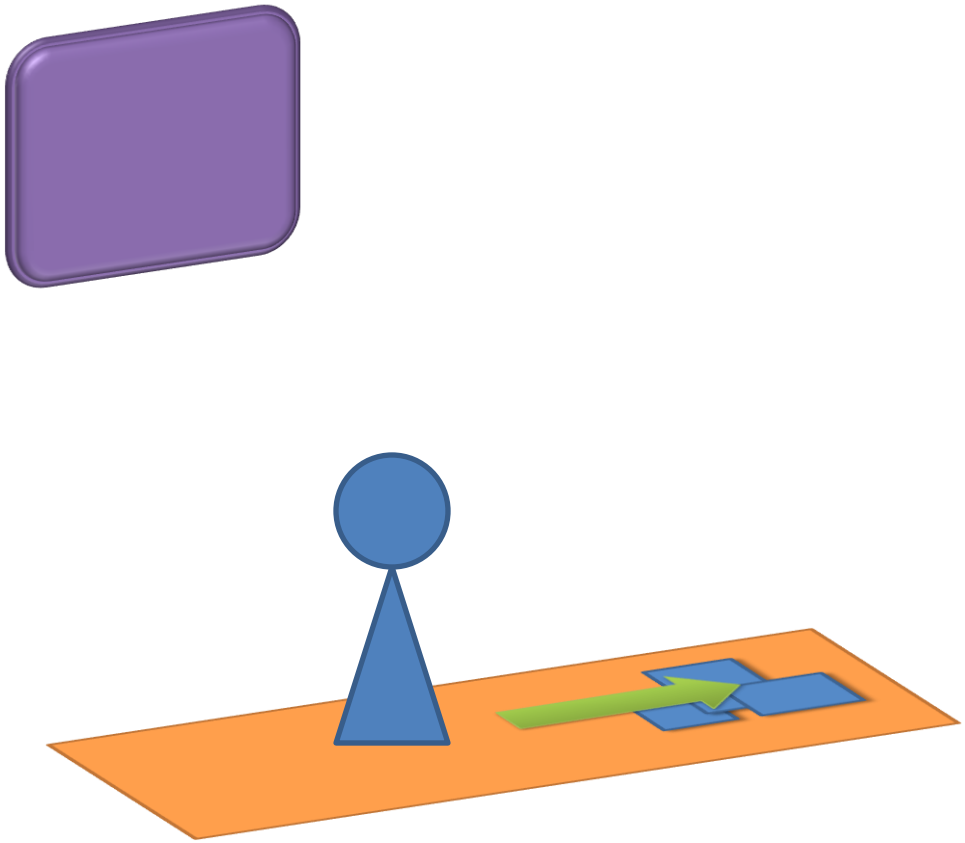
Example

User

Example



Example



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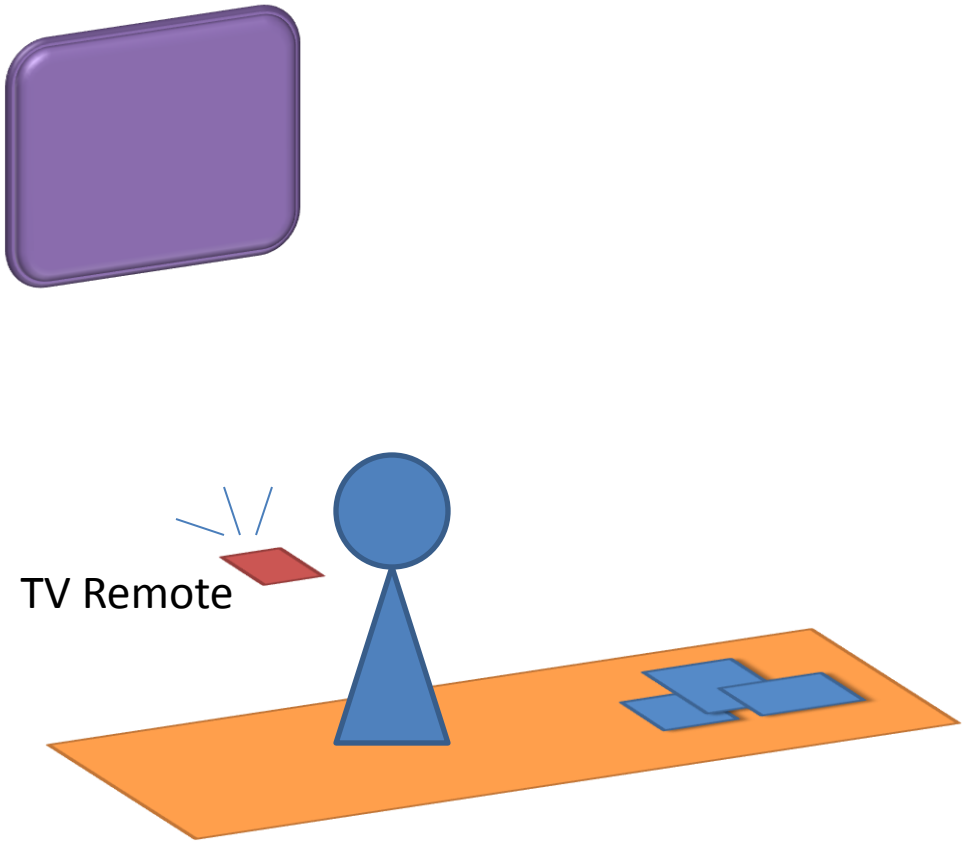
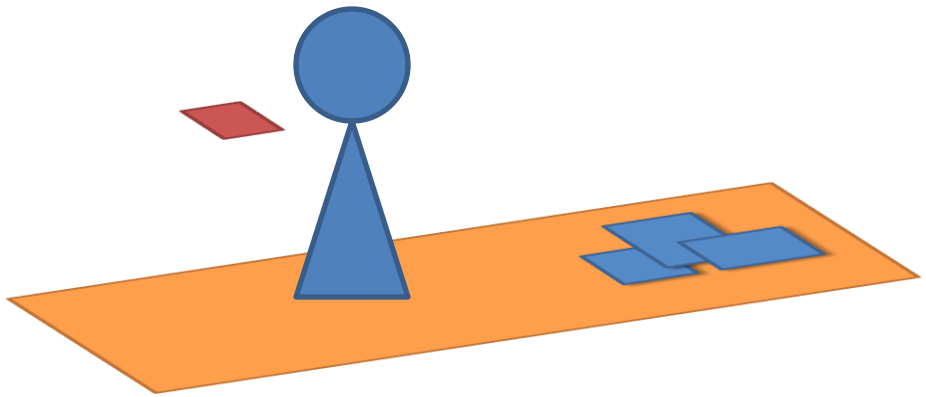


Example

System thinks:

READING



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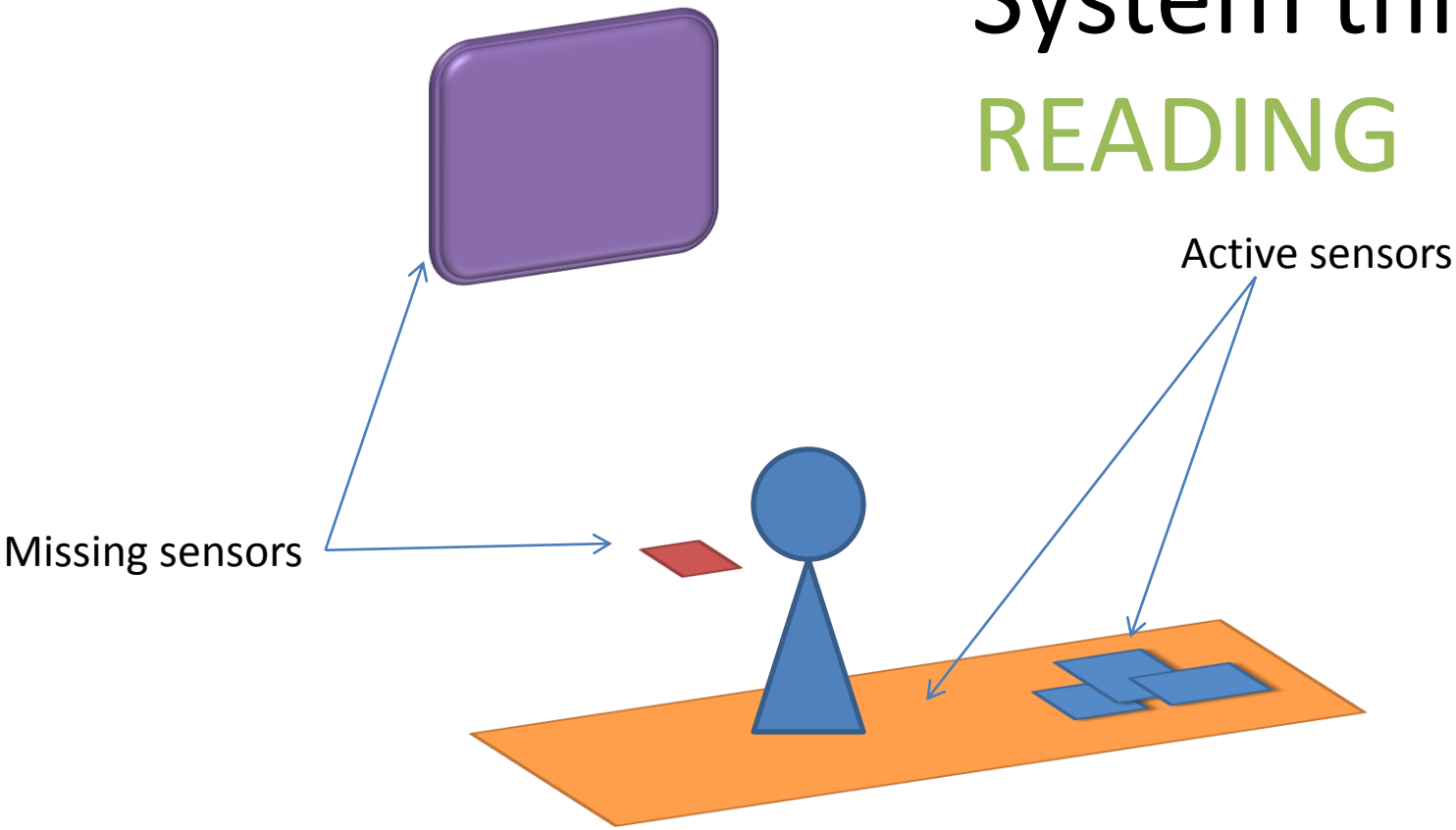

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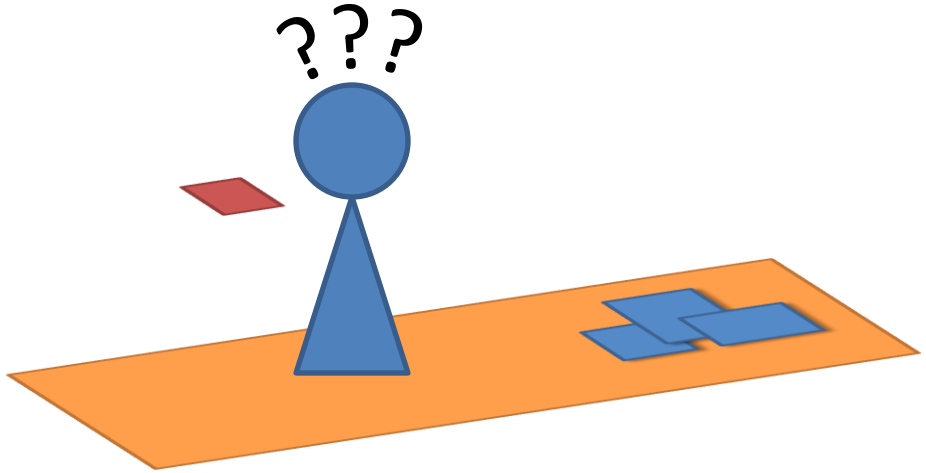

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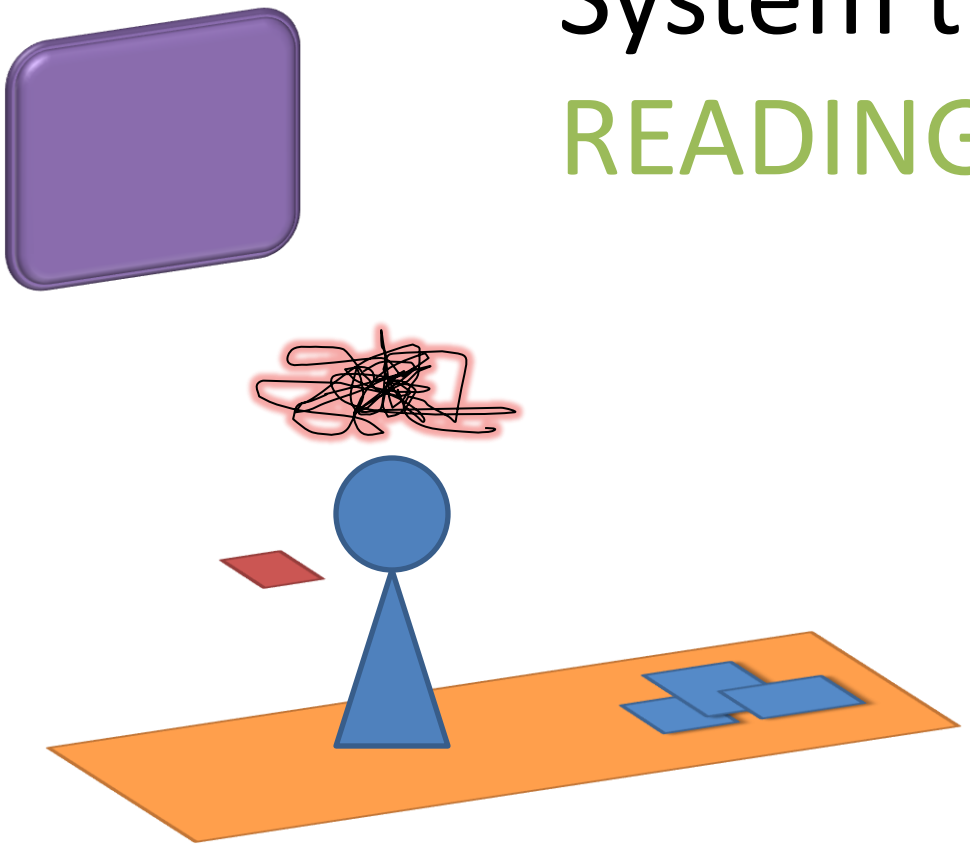
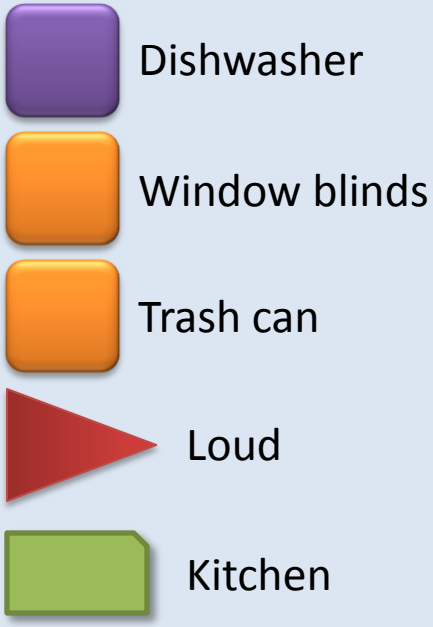


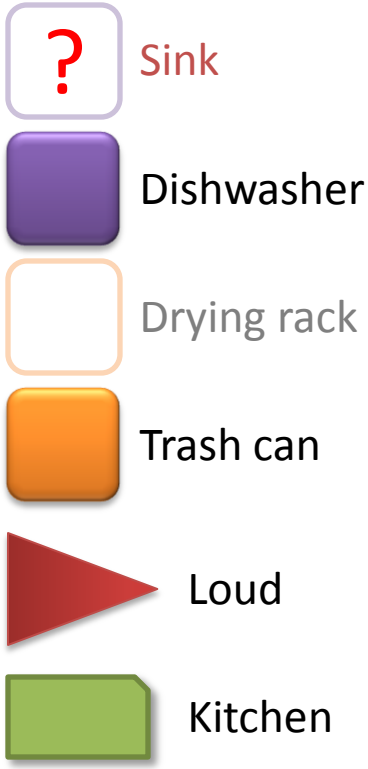
See also:

C. Beckmann, S. Consolvo, & A. LaMarca, "Some Assembly Required: Supporting End-User Sensor Installation in Domestic Ubiquitous Computing Environments," *Proceedings of the 6th International Conference on Ubiquitous Computing: UbiComp '04*, Nottingham, England, (Sep 2004), pp.107-24.

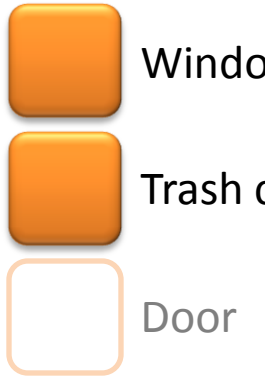
What we saw

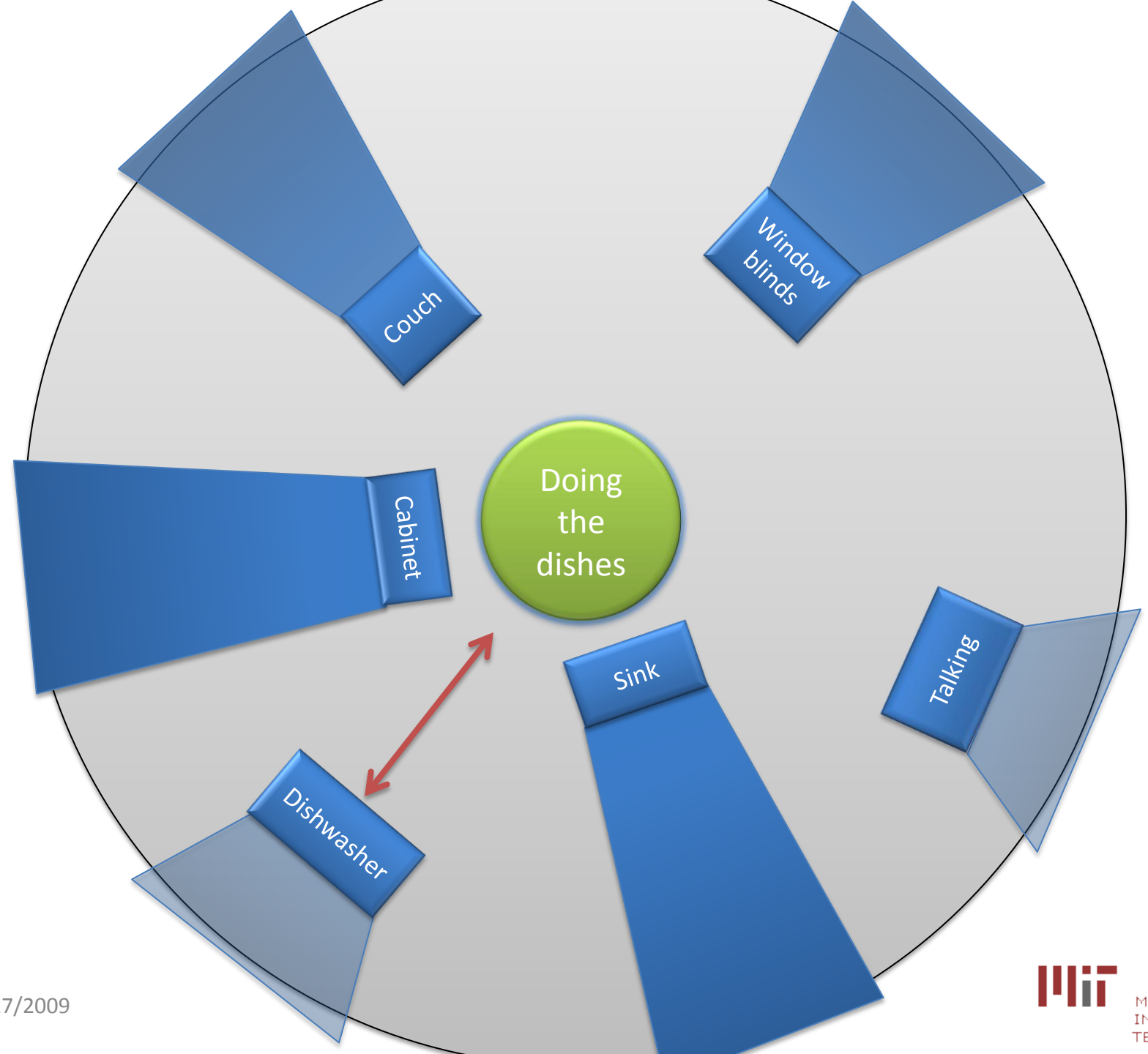


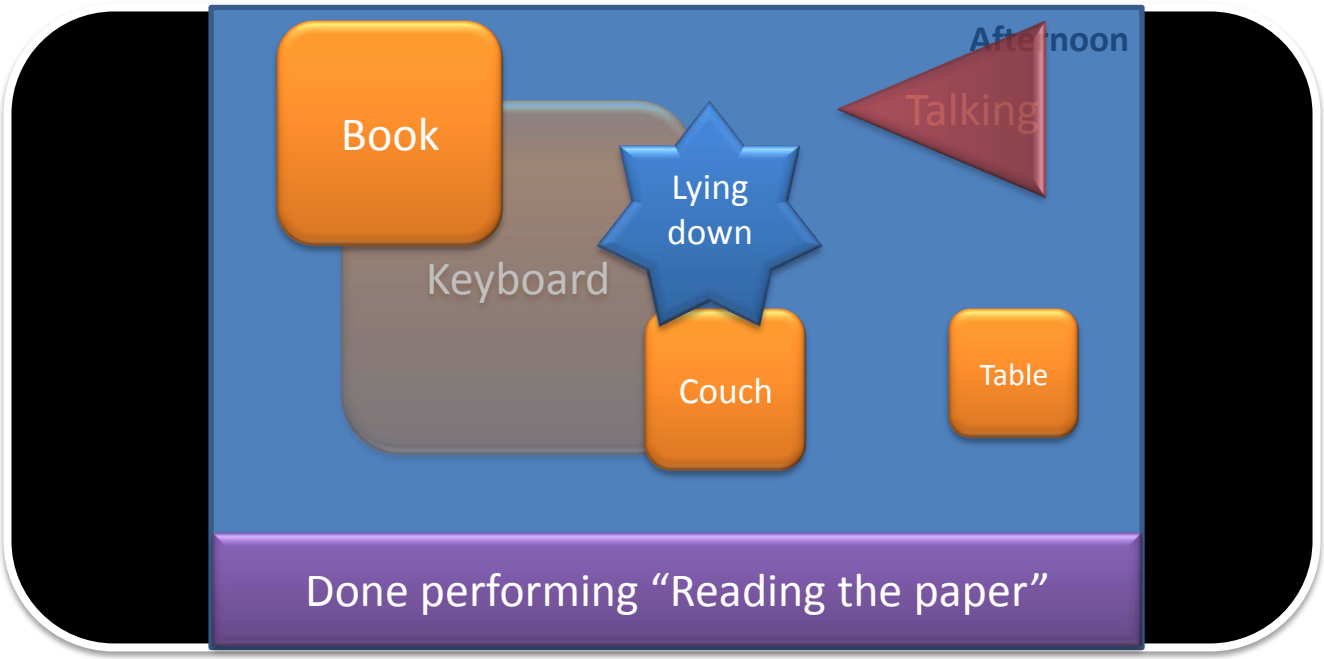
Doing the dishes



Taking out the t






Book
Keyboard
Lying down
Talking
Couch
Table
Done performing “Reading the paper”

Questions?