

# Situated Profiles for Aware Environments

End User Programming of System Behavior



Pervasive 2004 – Workshop 4

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# Introduction

Aware systems in future home environments can adapt to for example their inhabitants, activities, and events.



# Example of a Future Scenario

## Part I: Situated Settings

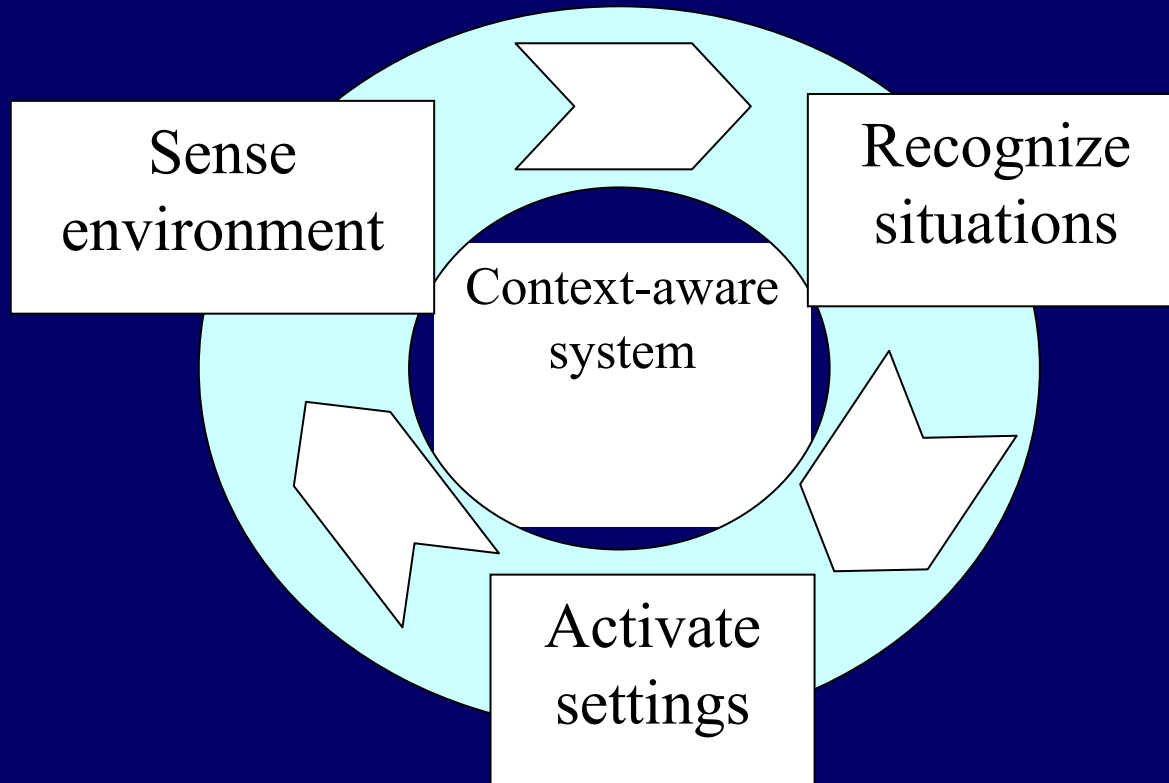
- It is 2030, Bill lives in an aware house in Seattle, and he arrives home after a day of hard work. A camera next to the front door recognizes his face and his mood, and activates the appropriate personalized home atmosphere settings: dimmed lights and relaxing background music. Bill likes to watch the Jay Leno late night show when he comes home. He instructs the system: "When I enter the living room after work, I want to see the latest Jay Leno show on the TV." The next day, when Bill enters the room after work, the show is started automatically.

# Example of a Future Scenario

## Part II: Mediation

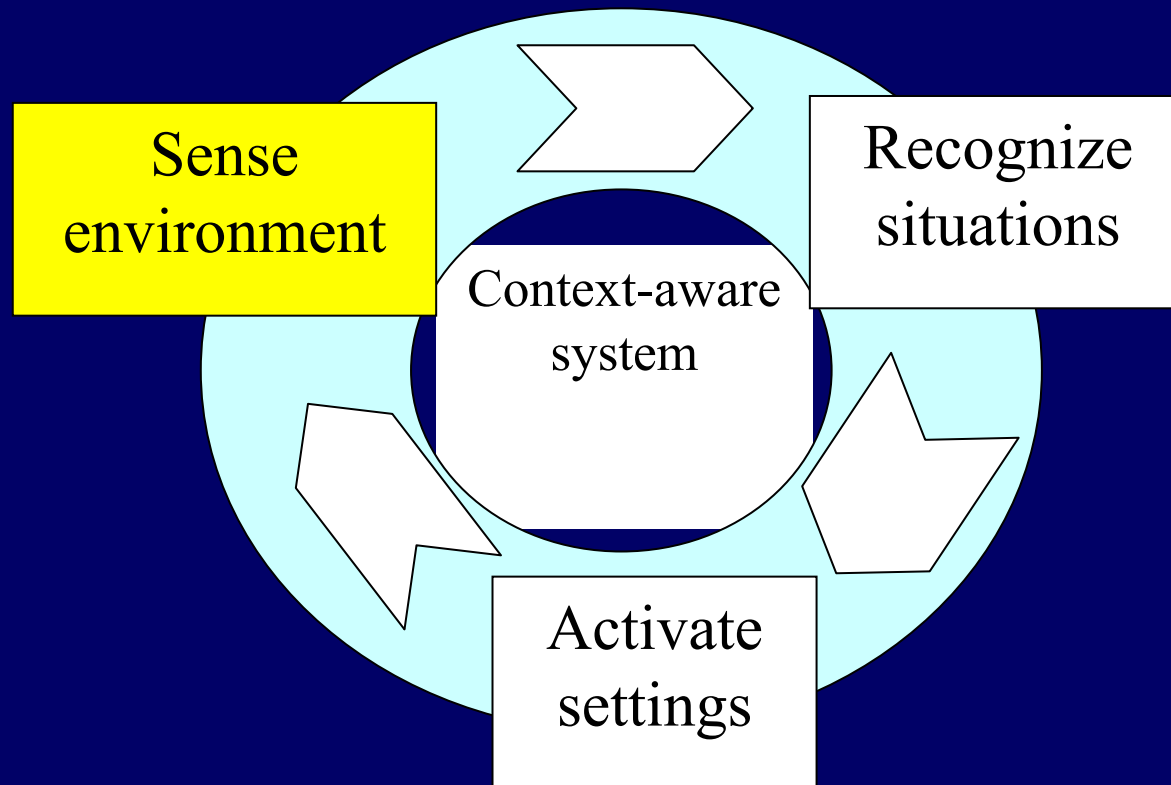
- After watching the show, Bill carries the rubbish bag to the street corner, and he locks the house for the night. When he returns to the living room, the situated preference is triggered again; the system recognizes Bill entering the living room after work. The profiler notifies Bill already saw the show, and decides to ask Bill what to do. The television screen shows the message “press PLAY to see Jay Leno again”. Bill does not press PLAY, and the profiler decides to update the situation in the profile.

# Introduction



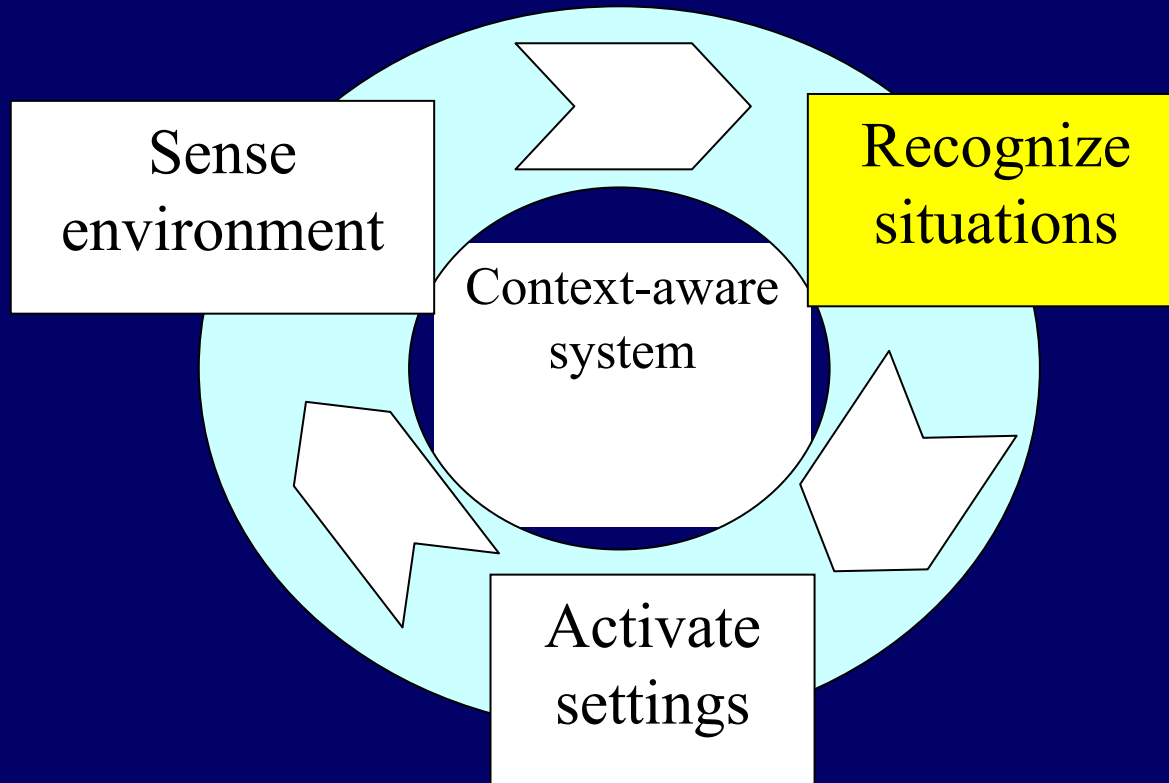
Context-aware system diagram

# Introduction



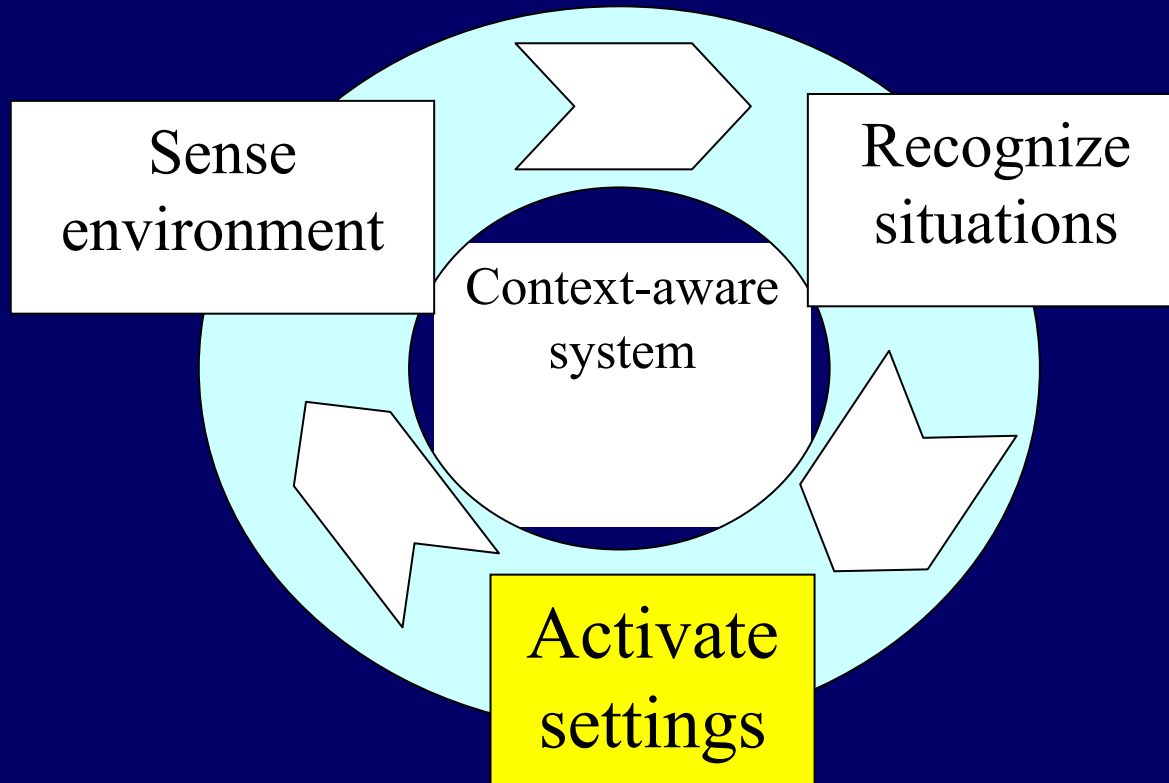
1. Sense low-level stimuli in the environment.

# Introduction



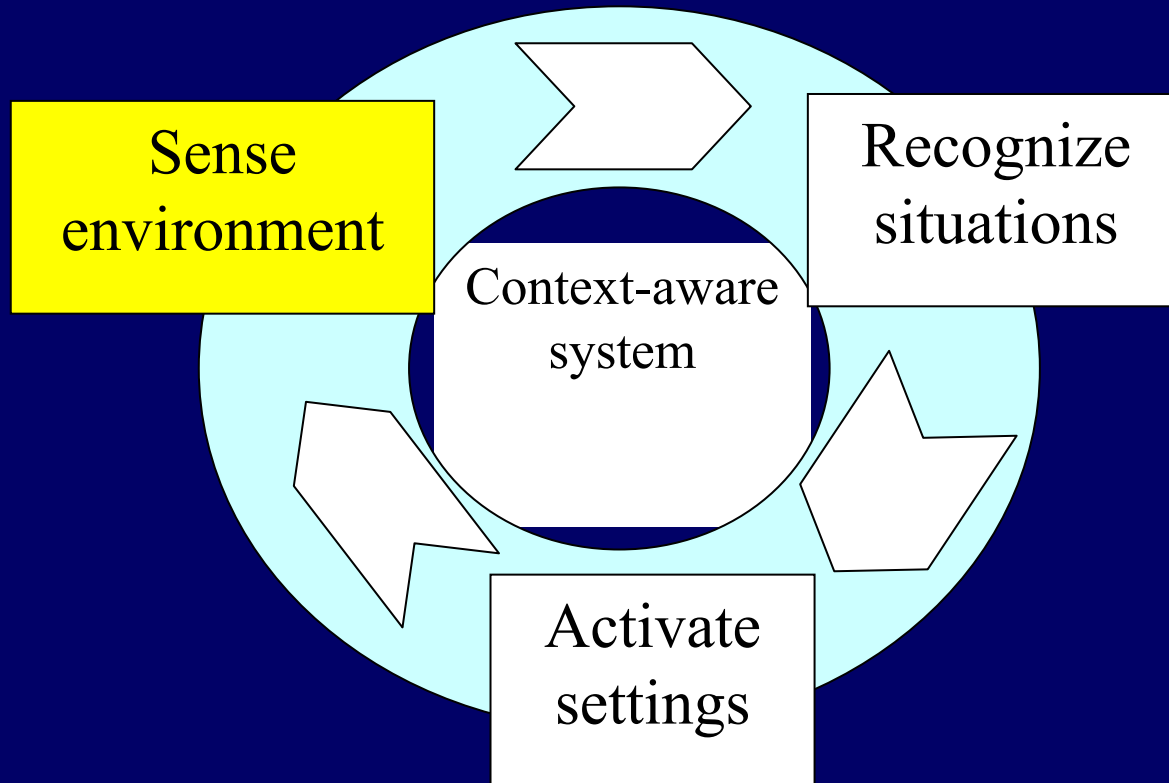
2. Interpret the environment by clustering low-level stimuli from sensors into abstract situations.

# Introduction



3. These situations trigger appropriate system actions based on stored settings.

# Introduction



System actions and user actions change the environment and the cycle is started again.

# Introduction

Challenge for future aware home systems:

Create a user experience that fits into the home experience.

Many hardware solutions are already available; we now face the challenge of creating the right user experience.



# Personalization

The behavior of an aware system can be personalized.

These personal settings are stored in a user profile. A *user profile* is a container with attribute-value couples for a specific user.

Hypothesis: from a user perspective, many of these preferences are grounded in situations.

User studies needed to support this claim.

# Situated Profiles

- A **situation** refers to the current state of the environment.  
Crowley: assignment of entities (physical objects) to roles (‘way of using an entity’) completed by a set of relations between entities.
- Use situations as a framework for a user profile:  
A **situated profile** is a user profile where the values are relative to situations, thus the values are only valid in specific situations.

(example: music taste: Bach at night)

# Situated Profiles

- A dynamic environment is unpredictable in nature (e.g., Suchman)
- Actions cannot be planned in advance
- People are not solely working on logical tasks and goals, they are unpredictable emotional beings

Hypothetically, a system that reacts to situations can better handle the dynamic world compared to a system based on logical steps.

# Situated Profiles (2)

| Non-situated Profile |            |
|----------------------|------------|
| attribute            | value      |
| music-taste          | Bach       |
|                      | News radio |
| ...                  | ...        |

# Situated Profiles (2)

| Non-situated Profile |            | Situated Profile |                      |            |
|----------------------|------------|------------------|----------------------|------------|
| attribute            | value      | attribute        | situation            | value      |
| music-taste          | Bach       | music-taste      | at night, when alone | Bach       |
|                      | News radio |                  | at breakfast         | News radio |
| ...                  | ...        | ...              | ...                  | ...        |

# Intelligence Objects

Next to personal settings, a profiler can also store intelligence on how to update the profile.

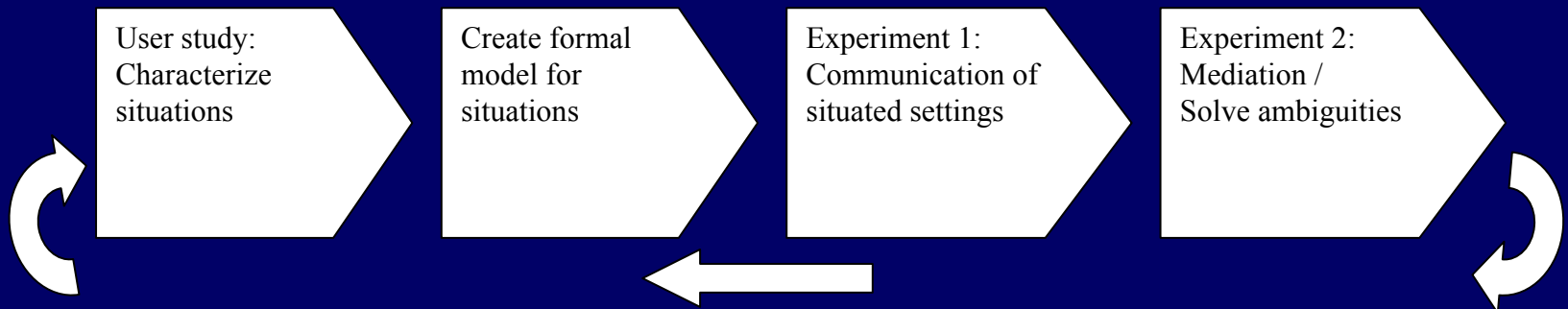
Application-specific intelligence could be stored as objects inside the profiler. An application can then create “intelligence”-objects, and feed them to the profiler.

These intelligence-objects tell the profiler what information to sense and store, and how to reason about the information in the model.

The intelligence-objects can also be situated, i.e., the intelligence would only be active in specific situations.

# Methodological Approach

- research-through-design process / iterative / users in the loop
- multiple small-scale qualitative user studies
- focus on building an ontology, that will be used to create a situation model



*How do people build mental models of situations in home, and how these situations can be characterized and communicated?*

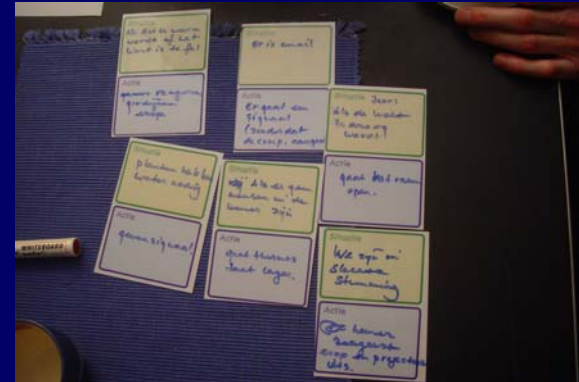
# User Studies

Focus: how do people build mental models of situations in the home.

Qualitative approach / grounded theory. Data is collected using:

- Interviews
- Diaries
- Sessions at home
- Puzzle-like assignments

Quick iterations.



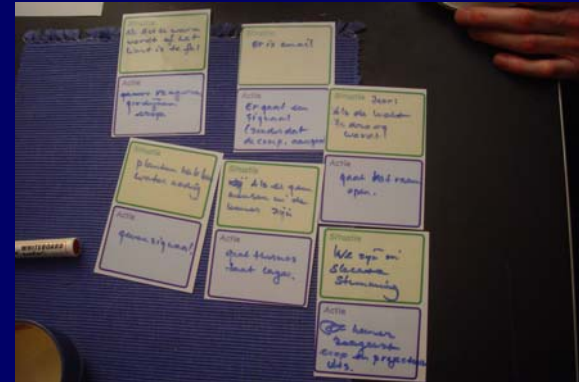
# User Studies

The preliminary results of the study indicate people tend to think in

- activities (“I am reading a book”)
- events (“I enter the room”)
- needs (“The flowers need water”)

Do people consider certain views of situations more natural than others?

Then use this when designing a formal model!



# Ambiguity, Abstraction and Concretization

- Humans and computers do not necessarily communicate at the same abstraction level.
- “When I’m working at home”: informal, ambiguous. Ambiguities can not be solved in advance!
- This is a problem for automated systems, but for human users it is natural.

How to make the problem manageable:

- 1) Help the user to accurately specify the situation, and
- 2) Build a system that knows how to cope dynamically with ambiguous situations as they occur.

# Mediation

Profiler might contain intelligence on how to deal with conflicts:

- Detect part of the conflicts before they occur
- Compare alternative approaches to solve the specific conflict
- Decide if it is necessary to bother the user with the conflict

Dey [3]:

- Use AI techniques to reduce ambiguity
- Involve end users in removing any remaining ambiguity, through a process called mediation

# Questions

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