Augmenting Everyday Life with Sentient Artefacts

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Our Approach towards Context

» Acquiring context through everyday artefacts
» Focusing on the environment
» Making the environment aware not the users
» Non enterprise application (cost and infrastructure constrain!!)
» Keeping it simple and conventional

Sentient Artefact: Sensor augmented everyday objects (like chair, bed, mirror, umbrella, comb, toothbrush, door etc) to acquire context and to provide value added services where and when applicable.

Mere artefacts without any noticeable features.
Example of sentient Artefacts

Anything of our everyday life can be a sentient artefact as long as we know what affordability we can have besides its primary roles.

Design Principles

- Natural Interaction
  - We don’t want to give target users a 100 page manual
  - Domain requires self-explanatory interaction mechanism.
  - Unobtrusive (Pleasurably!!)
  - Balance with mental model

- Preference reflection
- Just in time
Let’s watch a simple scenario

Scenario Movie
### Implementation

<table>
<thead>
<tr>
<th>Scenario Functionality</th>
<th>Required Capability</th>
<th>Augmented Artefact Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display useful information on the mirror</td>
<td>Detecting user’s presence</td>
<td>Mirror augmented with proximity sensors</td>
</tr>
<tr>
<td></td>
<td>Identifying user</td>
<td>Toothbrush as an authenticator of the user</td>
</tr>
</tbody>
</table>

#### AwareMirror

- Toothbrush
- Proximity Sensor
- Mirror
- 3 web services
  - Weather
  - Transport
  - Scheduler

Based on the use of the toothbrush we identified the user and related and effective information about him/her has been collected and presented to the user.
## AwareMirror

- User can provide preference regarding artefacts participation.
- User can provide preferences regarding timing of display and mode of interaction.
- For single user environment toothbrush can be omitted and proximity can serve as the trigger for display.

## Implementation

<table>
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<tr>
<th>Scenario Functionality</th>
<th>Required Capability</th>
<th>Augmented Artefact Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workspace Suggesting user for a refreshment and providing just in time message</td>
<td>Detecting user’s presence</td>
<td>Sentient chairs, state of use of chair as users location and activity</td>
</tr>
<tr>
<td>Workspace Changing workspace environment</td>
<td>Schedule/music extraction/play</td>
<td>Desk lamp with motion sensor</td>
</tr>
<tr>
<td></td>
<td>Capturing neighborhood brightness</td>
<td>Simple scheduler/media player</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Desk lamp with photo sensor</td>
</tr>
</tbody>
</table>
Smart Assistant

- Sentient Chair
- Sentient tray
- Sentient Lamp
- Media Player
- Scheduler
- Mail Agent

It monitors the users activity by capturing the states of chair, tray and lamp and offers refreshment break while serving important schedule information. It can also turn on/off light and play music automatically.

Smart Assistant

- User can provide preference regarding artefacts participation.
- Use can provide preference regarding timing of actuation and music to play.
- The chatting agent can be replaced by sliding pane for notification.
### Implementation

<table>
<thead>
<tr>
<th>Scenario Functionality</th>
<th>Required Capability</th>
<th>Augmented Artefact Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detecting user’s presence</td>
<td>Table augmented with RFID tag reader</td>
<td>Chairs state of use as users presence Or Proximity sensor on the tables</td>
</tr>
<tr>
<td>Display preferred news/information on the table display</td>
<td>Identifying user’s preference</td>
<td>Table augmented with RRD tag reader</td>
</tr>
</tbody>
</table>

#### Byte N Dine

- Table as Display
- Proximity Sensors
- RFID Base Station
- Sentient Chair
- Info Repository

When presence is identified, tags are extracted and preferred information is collected and shown in the table display.
**Byte N Dine**

- No explicit preference mechanism.

- Support groups, maximum 4 category of information, so maximum support for 4 users.

- During deployment mutual exclusive support level should be mentioned. (if 2 persons are present one with tag one without, then what will be systems state!)

- Carrying tag is contradictory. (But we do carry cell phone!!)

**Common Middleware: Prottoy**

- *Context Value Interpretation* to *End User Preference* creating instances and interacting using API.

- *Subscription, Poll Property, Query, Service Actuation* for *Actuation, Acquisition*.

  - *Register* for *Actuation, Acquisition*.

  - *Maps context values to application specific values* dynamically generated to provide end users with the facility to select artefacts' participation in the application.

  - Provides generic API, proxy support and hosts context history.

  - Application logic provided by the developers.

  - Encapsulates context source, provides local discovery and authentication facility.

  - Keeps track of the available artefacts and application binding.

  - Kawsar et al. © Mobiquitous 2005, EUC 2005
Evaluation

- All these applications are evaluated individually by about 15-20 people.
  - AwareMirror is also evaluated by a family for 2 days.

- However the integrated applications are only evaluated by the authors and their group mates.

Evaluation Result

<table>
<thead>
<tr>
<th>Application</th>
<th>No of Participant</th>
<th>Liked</th>
<th>Not Liked</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>AwareMirror</td>
<td>30</td>
<td>95%</td>
<td>5%</td>
<td>Mixed argument regarding privacy and presentation format</td>
</tr>
<tr>
<td>Smart Assistant</td>
<td>26</td>
<td>72%</td>
<td>28%</td>
<td>Does not like Chatting agent</td>
</tr>
<tr>
<td>Byte N Dine</td>
<td>10</td>
<td>70%</td>
<td>30%</td>
<td>Questioned about dining scenario</td>
</tr>
</tbody>
</table>
Issues and Lessons

1. Mental Model
   - Determining balance is very difficult.
   - Actuator selection needs maximum attention.

2. Scenario dependent artefacts
   - Needs guideline for generalization.
   [if possible ever as the combination can be any number!!!]

3. Evaluation Technique
   - How to determine or at least predict acceptability

Questions!!!!

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