INFSCI 2480
Adaptive Information Systems

Adaptive Mobile Guides

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The Vision
Introduction

Limited Resources

Technical resources

Cognitive resources

Screen size
Display resolution
Bandwidth
Ergonomics
Connectivity
Attention span
Cognitive load
Unfamiliarity
Time pressure

Adaptation on a desktop is a luxury. Adaptation on a mobile device is a necessity. Barry Smyth

User-Adaptive vs. Context-Based

1. Context-based, not adapted to the user as a person
2. User-adaptive but not context-based
3. Context-based and user-adaptive
What is the Context?

<table>
<thead>
<tr>
<th>Environment</th>
<th>User</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Technical (devices and services in use and available)</td>
<td>1. Abilities, skills, knowledge, habits, feelings</td>
<td>What the user is doing</td>
</tr>
<tr>
<td>2. Physical (place, location coordinates)</td>
<td>2. What the user has in mind, where his/her attention is</td>
<td>2. has been doing</td>
</tr>
<tr>
<td>3. Ambient (e.g. temperature, noise, lightness)</td>
<td></td>
<td>3. plans to do</td>
</tr>
<tr>
<td>4. Social (e.g. cultural environment, people near by)</td>
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</tbody>
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A prospect of context-based and ubiquitous computing

Four Dimensions for Mobile Guides

Social          Platform-adaptive

User-adaptive     Location and context-based
How to Model

- Modeling user/community characteristics
  - Traditional UM approach – observing user/community, asking the users
- Modeling device characteristics
  - Device profiles
- Modeling location and context
  - Sensing!
  - Location, acceleration, light, time…

Ontology-based Modeling

- Mobile applications require a variety of spatial, temporal, physical, and activity
- Using Ontology model
  - To enable exchange of knowledge
  - To share common understanding of the structure of information among people or websites
  - To enable reuse of domain knowledge
  - To separate domain knowledge from the operational knowledge
Users, context and situation modeling: an ontology-based approach

- UbisWorld: the modeling and representation of users, context, and situations

An Ontology for Location Modeling
UserML forms the syntactic description in the knowledge exchange process. Semantic definition of each concept is defined in GUMO.

Detecting Location

Where am I?

Outdoor

Indoor

GPS

Cell Tower

RFID

Museum Guides

Shopping Assistants
City Guides: Guide

- A context-aware tourist guide
  - User Interests
  - Location
  - Time of the day
- Example of adaptation-Nearby attractions page
  - System performs both filtering and information visualization
  - Uses visitor's current location, attractions already visited
- Uses two models
  - User model (wizard type interface)
  - Environment model (information regarding attractions within the city)


Guide: The Sensing Part

- Network cells defined by strategically placed wireless access points determine current position of the user (does not rely on GPS)
MOG (2003)

• MoG, the mobile guide, providing multimedia content about the city of Cesena, using both WLAN and GPRS
• MoG delivered multimedia content. MoG uses W3 standard SMIL (Synchronized Multimedia Integration language)


• A context-aware tourist guide that assists roaming tourists
• Approach used: the deployment of intelligent agents which collectively determine the user context and retrieve and assemble multi-media presentations that are wirelessly transmitted and displayed on a PDA
  • As tourists near attractions, Genie displays an electronic map with their position and orientation highlighted on it.
  • As they approach a tourist attraction, Genie will start pre-caching a presentation.
  • When user is at attraction, attraction is presented as a small image with a list of available topics.
• Each topic has a sound file that introduces the attraction.
• List of topics are based on the user’s interests.


- Type: Resource adapting
- An entirely system that combines a desktop route planning, a car navigation system, and a multi-modal in-door pedestrian navigation
- Provide a seamless service for travelers in different situations


Just-For-Us (2005)

Just-for-Us: A Context-Aware Mobile Information System Facilitating Sociality
Jasper Kjeldskov and Jeni Paay
Proceedings of the Mobile Human Computer Interaction, 2005
Just-For-Us: Functionality

- Making the Invisible Visible: Augmenting the user’s physical surroundings
- Supporting Ad-Hoc Communication about Places, Activities, and Time
- Indexing Recommendations and Content to History and Context
- Representing Activities within Proximity and Indexing to Familiar Places

The System Architecture
NaviTime (2007)

- Type: Resource adapting
- Provide users with total navigation support
  - All mode of transportation such as walking, driving, and riding trains, buses, taxis, and airplanes
- Encompasses the entire traveling activity
- The best route is calculated based on user’s preference (e.g., route with minimum expenses)


iCity Project (2008)

- Type: resource adapting
- An adaptive, social, multi-device recommender guide
- The combination of the principles of adaptation and web 2.0
- Allowing users to post new events, rate existing items, provide comments and judgments to a resource
- Provide the adaptive presentation based on the device between desktop and mobile
- The recommended items are tailored to individual according to the user model and contextual elements

Sotto Voce Museum Guide

- Type: Resource adaptive
- A handheld electronic guidebooks
- Take into account the special needs of groups, not individual user
- By having pictures of the walls presented on the PDA’s screen and asking from the user to select the exhibit he/she is interested in, by pressing it
- Encourage communications among group members by using audio sharing mechanism called “eavesdropping”


Agent Salon Project

- A life-like character-based system for personal guidance
- Require explicit personal interests and rate each exhibit during the tour
- Support face-to-face discussions and exchange of knowledge by tempting users to chat with each other

Sumi, Y., Maake, K. Interface Agents that facilitate knowledge interactions between community members. Springer-Verlag (Cognitive Technologies series), 2004: 405-427
PEACH

- Using the virtual character acts as a tour guide
- Using “like-o-meter” to collect user feedback
- Provide the seamless ubiquitous presentation between a handheld device and a stationary device
- Provide automatically generated, adaptive video documentaries on mobile device
- Provide automatically generated post-visit summaries that reflect individual interests of visitors


PhoneGuide

- Using mobile phones for on-device object recognition
- Image classification techniques with user feedback are used to automatically recognize objects
- Provide a visitor with multimedia information

Smart Shopping Assistant (2003)

- Utilizing plan recognition techniques (inferring a user’s plan by observing his actions) to aid a user while shopping
  - Provide product information
  - Provide product recommendation
  - Provide product comparison
  - Provide recipe hints

Metro Future Store (2006)

- Type: Resource adapted
- Integrate multiple emerging technologies into an existing store
- Electronic shopping lists
- Provide product information and navigate customer within a store
- Recommend promotional information using video and animation
- Smart check out system
Magitti

- Started as Japanese project, aiming to develop a service to replace printed city-guides, sponsored by Dai Nippon Printing Co., Ltd.
- Magitti
  - Activity-centered mobile leisure-time guide.
  - For young city-travelers (20-30) interested in all kinds of leisure activities, emphasizing spontaneity rather than fixed and planned sightseeing.
- What does it do?
  - It first **predicts ongoing and future activity** based on the user’s context and models of past behavior, and then
  - **Predicts (and recommends) what information** will be most useful within the predicted activity.


Design Requirements

- Context: Field study in Tokyo.
- After a study for understanding leisure time priorities (interviews and mockups, online survey, focus groups, mobile phone diaries, street activity sampling, expert interviews, and informal observation) they obtained the following design requirements:
  - Relaxation, Serendipity and Spontaneity
  - Avoidance of Information Overload
  - Minimal Size (keitai – handhelds)
  - One-handed operation (commuters on subway)
Magitti Features

- **Context Awareness:**
  - It knows about current time, location, weather, store hours, and user patterns.
  - It also lets people specify a future context for planning.
- **Activity Awareness:**
  - It filters items to recommend based on its user’s inferred or explicitly specified activity modes.
  - Five modes were derived from observations in field work: **Eating, Shopping, Seeing, Doing**, or **Reading**.
  - Each item in the Magitti database is explicitly tagged as being associated with these modes.
- **Serendipitous, relaxing experience:**
  - Users need not enter profile, preferences, or queries.
  - They can rely on context and activity inferencing for Magitti to continually and automatically update recommendations.

Magitti System Design

- System shows up to 20 recommendations and updates while the user moves

![Figure 1. Magitti’s Main Screen (left) and Detail Screen (right).](image-url)
Magitti System Design - II

• Mode

Figure 2: Main Screen with partial map view (left) and Main Screen marking menu (right).