Context-sensitive interactive systems

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Your context:

1. Introduction to Advanced Interaction Media (AUG 17: GAB) — (1_Lecture.pdf)
2. History of Interactive Technology (AUG 24: GAB) — (2_Lecture.pdf)
3. Input Techniques (SEP 8: ALS) — (3_Lecture.pdf)
4. User experience (SEP 15: ALS) — (4_Lecture.pdf)
5. Tangible interaction (SEP 21: ALS) — (5_Lecture.pdf)
6. Ubiquitous computing (SEP 28: ALS) — (6_Lecture.pdf)
7. Simulation environments (7_Lecture.pdf)
8. TangiSense (OCT 20: CK) — (8_Lecture.pdf + 8_Demo.pdf)

9. **Context-sensitive interactive systems (OCT 26: CK)**
Your context:

My context: Context-sensitive systems: also treated in the Lecture #6

Necessity to better understand... and to be context-sensitive...

Possible redundancy problem?
Introduction

Analysis of the context …
Ubiquitous Computing/Tangible Interaction

Don Platt
dplatt@fit.edu

Outline
- Evolution of computing beyond the desktop
- Invisible computers
- From paper to electronic...
- Intent recognition
- Context-aware systems
- RFIDs
- Privacy, trust, ethics...
- Physicality of tangible interaction

Context-aware computing
- Computing services sense aspects of environment (location, user emotion, ..) and tailor provided services
- Walk into conference room, my email is projected on a big screen there

Content: personalized with Don Platt’s point of view, objectives, experiences…
Reaction: personalize the content (Lecture #9) with my point of view, objectives (including the complementarity), experiences…

Agenda

- Context, definitions
- Elements of context
- Context and User modelling
- Context-sensitive interactive system = « intelligent » UI?
- Conclusion
Context, definitions

- **Context**: Context = object of the environment, User localization, time, temperature, season

  - Context Awareness
  - Schilit et al. 1994
  - Ward et al. 1997
  - Set of information allowing to characterize the situation of an entity
    - Environment = <objet, person, event> + task
  - Interaction context
  - Dey et al. 1999
  - Thevenin et al. 1999
  - + Localization of objects
  - + Social context, emotion
  - Calvary et al. 2004
  - + Activity
    - Usage context = <User, Environment, platform>
  - Dey & Mankoff 2005
  - Pascoe et al. 2007

*(Translated from: Ph.D. Thesis Sébastien Kubicki, Valenciennes, France, 2011)*

**Note**: before 1994, other researches have been conducted about contextual interactions, see for instance G. Boy (« Indexing hypertext documents in context, » 1991)
Context, definitions

- Context-sensitive UI or Context-aware UI???

- According to Dey (2000, 2001):

  ➢ **Context** is defined as:
    “any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and application themselves.”

  ➢ **Context awareness** is defined as:
    “A system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user’s task.”

- Dey and Abowd (2000):

  ➢ “Context-aware has become somewhat synonymous with other terms: adaptive [2], reactive [6], responsive [12], situated [15], context-sensitive [19] and environment directed [13]. Previous definitions of context-aware computing fall into two categories: using context and adapting to context.”

  ➢ « Hull et al. [15] and Pascoe et al. [17,18,22] define context-aware computing to be the ability of computing devices to detect and sense, interpret and respond to aspects of a user's local environment and the computing devices themselves.”
Agenda

- Context, definitions

- Elements of context

- Context and User modelling

- Context-sensitive interactive system= «intelligent» UI?

- Conclusion
Elements of context

- Simulation in 1954 of the home computer of 2004:

Scientists from the RAND Corporation have created this model to illustrate how a “home computer” could look like in the year 2004. However, the needed technology will not be economically feasible for the average home. Also, the scientists readily admit that the computer will require not yet invented technology to actually work, but 50 years from now scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use.
21. Ken Olsen, founder of legendary minicomputer company DEC:

“There is no reason for any individual to have a computer in his home.”

(in 1977)
Elements of context

- In reality…

Segway

Space shuttle
Cap Canaveral

European Centre for Spatial Operations (ESA, Darmstadt)
If one considers:

Usage context = <User, Environment, platform>

OR

Context = <User, Environment, platform>
- **Interaction platform:** screen size, data processing capacity, network capacity, memory…
Interaction supports embarked inside an average vehicle

Interaction supports embarked inside a stretched limousine (other possible functions)
- Environment (REY, 2005): set of information, peripherical elements which can influence the human-machine interaction, such as: geographic situation (home, cinema, street, train, car…), day (working day, public holiday…), hour (day, night…), ambiance (quiet, noisy…)
Elements of context

- To take into account the user characteristics, to allow an universal access to information, knowledge, services...

Research way: « CHI Kids », ACM SIGCHI

Elderly, ageing population
(photo: JAUBERT/SIPA)

Brain-computer interfaces

www.apt.gc.ca/pt_ns08F.asp?Id=1

© C. Kolski

Integra-Mouse | www.click2go.ie
Elements of context

- Conceptual data model:

- Importance to **adapt/personalize** the HCI according with the needs of the different members of the organization
Task: Managing the position

Initial state: controlled environment

Final state: position controllable with safety

Goal: According with the traffic level, to manage the control positions

Pre-condition: -

Post-condition: to manage the priorities

Formalisation of task with a view to integrate it explicitly in the system

- Needs for formal language(s) for task description: cf. classical logics; non-classical logics; textual or linguistic task models (the first models: GOMS, ALG, CLG…)

- Capacities to identify permanently (in real time) the current task, the current goal or subgoal (i.e. intention)
Agenda

- Context, definitions
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User model:
aspects to be taken into account in the design and evaluation phases
(adapted and translated from Jean-Marc ROBERT, 03)

Context and user modelling

Socio-demographic data:
- number, age, male/female, language, geographic situation

Impairments/handicaps:
- physical: upper extremities, lower limbs
- sensorial: visual, auditory, etc.

Sociological data:
- historical, social, cultural, politics, economic

Education and skills:
- Education level: bachelor’s degree, master’s degree, PhD…
- Speed in reading
- Skill in using the keyboard

Work and experience:
- job category (physician, pilot, nurse, dental technician…)
- knowledge about the task: novice, intermediary, expert
- Work location: home, office, at the customer’s, on displacement, etc.

Knowledge and system use:
- knowledge on the computing system: novice, intermediary, expert
- knowledge on other same systems
- Type of use: continuously, occasional
- frequency of use: low, middle, high

Knowledge in computer science:
- general knowledge: low, middle, high
- plateforms: PC, Macintosh, workstation, PDA…
- Operating systems: Unix, Windows, MacOS, Linux…
- Tools for the web: web browser, electronic mail, search engine, etc.
- Software category: CAD, office, etc.

Psychological aspects:
- attitude: positive, negative, neutral
- motivation: low, middle, high

All usable as HCI adaptation criteria

Next slide: example of user profile with special needs

Many sub-elements of context
Context and user modelling

Profile: users with cerebral palsy, athetosis
(due to neurons damaged from lack of oxygen at birth)
- Involuntary movements, lack of movement precision, slurred speech, low speed entry

Examples of joysticks used to command a virtual keyboard

Ph.D. (Yohan Guerrier)
“Proposal of a software support for information entry in degraded situations: Application for users with Cerebral Palsy athetosis in transport and daily activities” (translated from french)

Objectives:
to communicate with systems and people in different contexts, to perform complex tasks
- Different contexts to consider:
- Design and prototyping of the COMMOB (COMmunication and MOBility) system (embarked on the wheelchair), to be used in different contexts (GUERRIER et al., 2013; Ph.D. GUERRIER, 2015):

**Communication with humans or systems**

First evaluation in mobility (in a mall):


*HP Slate tablet computer, Windows 7, Java*
Context and user modelling

- Current researches on **Persona**: fictitious characters, based on composite archetypes, and encapsulating ‘behavioural data’ gathered from ethnography and empirical analysis of actual users (Cooper, 1999); adapted in **HCI**

As a certified aerobics instructor Anna has her spatiality in boxercise. She is 31 years old and has been practicing aerobics and different forms of workout for ten years. When she got offered a job as an instructor she became very delighted. Anna is mostly very happy and really loves to work with her body and the contact with other people. She is also sort of an entertainer that likes to make people laugh.

Anna doesn’t make any big money on her job, but she manages. Sometimes Anna plays on greyhound races. She wants so bad to win that million that cold help her to renovate her flat and to by a car. She isn’t actually interesting in dogs or races at all. It was her ex boyfriend that always watched those dog races and Anna was involuntarily introduced to the sport. Now that is the only way of betting that she is good at so she sticks to the dog races with that million in mind.

Sometimes, or quite often actually, Anna misses the greyhound race on TV. But, Anna doesn’t care much as she can look for the results in the morning paper the day after. Anna has a quite sophisticated digital TV box that is included in the flat rent. She spends most of the evenings in front of the TV watching mostly movies. In order to find out the program chart for the movie channels she learned how the watch text TV. She hasn’t found out that she can see the greyhound race result on text TV as soon the races are finished though.
- Current researches on **Persona in HCI:**

<table>
<thead>
<tr>
<th>Persona Components</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity</td>
<td>Include a first and last name, age and other demographic information.</td>
</tr>
<tr>
<td>Status</td>
<td>Whether the user is a primary, secondary, tertiary, or anti-user of the application. Typically, only primary and in some cases, secondary users are included.</td>
</tr>
<tr>
<td>Goals</td>
<td>Besides goals related to the application, it includes personal and professional goals as well.</td>
</tr>
<tr>
<td>Knowledge and Experience</td>
<td>Knowledge and experience including education, training, and specialized skills. This should not be limited only to the application.</td>
</tr>
<tr>
<td>Tasks</td>
<td>Frequency, importance and duration of most important tasks related to the application.</td>
</tr>
<tr>
<td>Relationships</td>
<td>Include information about user associates, since this could give insight on other stakeholders.</td>
</tr>
<tr>
<td>Psychological profile and Needs</td>
<td>Include information about cognitive and learning styles, as well as needs such as guidance and validation of decisions.</td>
</tr>
<tr>
<td>Attitude and Motivation</td>
<td>Include information about the user’s attitude to information technology and level of motivation to use the system.</td>
</tr>
<tr>
<td>Expectations</td>
<td>Information about how the user perceives the system works, and how the user organizes information related to his/her task, domain or job.</td>
</tr>
<tr>
<td>Disabilities</td>
<td>Any disabilities, such as color-blindness, related to mobility, eyesight (wears contacts), etc.</td>
</tr>
<tr>
<td>Photograph</td>
<td>Include a photograph which fits with the name.</td>
</tr>
</tbody>
</table>

(adapted from Courage and Baxter, 2005)
- Current researches on **Persona in HCI**:

  Central role of a persona within a **user-centred design** (from Seffah et al., 2009)

- Persona for **interactive system design**

Context and user modelling

- Towards new adaptive, context-aware, context-sensitive systems, example of potential domain:
  
  ➤ Control of complex and dynamic industrial systems; high complexity of the tasks, thousands of variables: necessity to anticipate problems, to propose effective supports

Problem, criticity of level 2 in 6 min

Problem, criticity of level 3, in 8h

Necessity of domain models, but not only…
- **Needs in cognitive models:**
  Ex.: Problem solving model (RASMUSSEN, 1980; 1986), identification of 3 types de behaviours (skill-based, rule-based, knowledge-based)

- **Numerous researches:**
  new cognitive models, integration in design processes, computerized models, seen as a base for intelligent supports in complex situations
- Another interest of the problem solving model: to help the identification of needs concerning supports for the human activities

Possible Thought framework for the designers:

« We know that… In consequence… »
- Revision of the Rasmussen’s model by Hoc and Amalberti (1995), under the angle of the dynamics of the situations and reasoning.

**Context and user modelling**

- Prescribed goals, Log, Action Plan
- Slow changes in the representation system

**Evaluation**

- General knowledge
  - about the process
  - about action

**Goal definition**

- Planning
  - of the process (anticipation)
  - of action (plan), specified schemas and plans
  - resource management

**Operator time vs Task:** slow diagnosis caused by revision of current representation, construction of a new representation.

**Necessity of continuous adaptation of the interactive system?**

- Operator time vs current episode adjustment and refinement of understanding rapid diagnosis oriented by the current representation. Few hypotheses formulated.

- Virtually instantaneous symptomatic diagnoses connected to immediate control of the situation, oriented by possibilities for action and the process. Pre-planned diagnosis and responses.

**Process time**

- Weakly dependent on operator (control margins)

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From a cognitive model…


… To the consideration of **HCI needs** at each abstraction level (LTIFI et al., 2015, Decision Support Systems)
Context and user modelling

- Necessity to take into account the diversity of the actors (or actor profiles):

Adapted from:
### Subjects

#### Acceleration sequence in a power plant

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Acceleration sequence</th>
<th>Number of sub-sequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very skilled engineer</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Skilled Engineer</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Skilled operator (1)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Skilled operator (2)</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Skilled operator (3)</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>t/mn translated by: revolution per minute</th>
</tr>
</thead>
</table>
Elements of context

- Limited specification of context:
  - Usually:
    - Context = (User, Platform, Environment)
  - Many other possible approaches, for instance:

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Features</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Factors</td>
<td>User</td>
<td>Identifier</td>
<td>Integer, Integer, Character</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age, Permission, Task experiment, System experiment, Motivations, Physical characteristics, Frequency of utilisation, Preferences...</td>
<td>Low-Medium-High, Expert,...-Novice, Low-Medium-High, Character, Integer, Character</td>
</tr>
<tr>
<td>Social Environment</td>
<td>Stress</td>
<td>Co-location of others, Social interactions, Group dynamics, Collaborative tasks...</td>
<td>Low-Medium-High, Within – Outside, Low-Medium-High, Low-Medium-High</td>
</tr>
<tr>
<td>Physical Environment</td>
<td>Conditions</td>
<td>Light, Pressure, Temperature, Noise, Time...</td>
<td>Low-Medium-High, Real, Real, Low-Medium-High</td>
</tr>
<tr>
<td>IT device</td>
<td>Identifier</td>
<td>Screen resolution, Color available, Processor, Frequency, RAM, Graphical toolkit, Exploitation system, Bandwidth...</td>
<td>Integer, Integer, Integer, Character, Integer, Character, Character, Integer</td>
</tr>
<tr>
<td>Location</td>
<td>Absolute position, Relative position...</td>
<td>Real, Real</td>
<td></td>
</tr>
<tr>
<td>Organization Environment</td>
<td>Type of organization, Structure, Roles...</td>
<td>Character, Character, Character</td>
<td></td>
</tr>
</tbody>
</table>

(Vanderdonckt, Grolaux, Van Roy, Limbourg, Macq & Michel, IASSE’2005)
Context model

- First example (explained last week) in relation with interactive tables:

First attempt:

See an enriched version next week...
- Other example in relation with **text entry in healthcare domain** (using categories of the AUTOS Pyramid (Boy, 1998, 2012)):

**Context model**


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Agenda

- Context, definitions
- Elements of context
- Context and User modelling
- Context-sensitive interactive system = « intelligent » UI?
- Conclusion
Recognition of the situation →

- Identification of the context change
- Identification of the candidate solutions
- Detection of context change
- Selection of a candidate solution
- Capture of the context
- Execution of the prologue
- Execution of the epilogue
- Execution of the reaction

CALS VARY and COUTAZ, 2002
Recognition of the situation

Identification of context change

Detection of context change

Capture of the context

Execution of the prologue

Execution of the epilogue

Execution of the reaction

Identification of candidate solutions

Selection of a candidate solution

Calculation of a reaction

Context-sensitive interactive system = « intelligent » UI?

(CALVARY and COUTAZ, 2002)
Context-sensitive interactive system = « intelligent » UI?

Identification of contexte candidates

Recognition of the situation

Detection of context change

Capture of the context

Execution of the prologue

Execution of the epilogue

Identification of des solutions candidates

Selection of a candidate solution

Execution of the reaction

Calculation of a reaction

(CALVARY and COUTAZ, 2002)
Context-sensitive interactive system = « intelligent » UI?

- Example of context-sensitive system:

*The Terminator*, autonomous and context-sensitive system, in charge of a mission among humans, necessity to interact with them.

Its mission: to « terminate » Sarah Connor
- Example of context-sensitive system:

**Situation**: the terminator is repairing itself in its hotel room. It is disturbed by a person knocking at the door, asking if there is a problem.

**Selection of a candidate solution, execution of a reaction:**
- Researches and developments since the end of the seventies (EDMONDS, 81; SCHNEIDER-HUFSCHMIDT et al., 93; KOLSKI and LE STRUGEON, 98; HOOK, 00; BRUSILOVSKY et al. 98, 07…; see also User Modeling and User-Adapted Interaction Journal; ACM IUI Conferences)

► Numerous possible adaptation criteria: about the user(s), see (ROBERT, 03), the task, the situation gravity…

- Different approaches studied in the past, currently or… in the future (again):

► Adaptive, intelligent, human-error tolerant, context-aware, plastic HCI; intelligent assistant operators, assistant systems, intelligent agents, electronic training partner…

Assistance in Office environment (previous editions)

E-commerce, personalization
- Thought framework (SCHNEIDER-HUFSCHEIMDT et al., 1993):

<table>
<thead>
<tr>
<th>System</th>
<th>User</th>
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</thead>
<tbody>
<tr>
<td>Initiative</td>
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<tr>
<td>Proposal</td>
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<tr>
<td>Decision</td>
<td></td>
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<tr>
<td>Execution</td>
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</tbody>
</table>

Example of configuration:

<table>
<thead>
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<th>User</th>
</tr>
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<tbody>
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<td>Decision</td>
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<tr>
<td>Execution</td>
<td></td>
</tr>
</tbody>
</table>
- Thought framework (SCHNEIDER-HUFSCHMIDT et al., 1993), **extension**:


<table>
<thead>
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<th>User</th>
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<tr>
<td>Execution</td>
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<tr>
<td>Evaluation</td>
<td></td>
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</tbody>
</table>

- Then, return of experience, relatively the obtained results (positive or negative), **generalization** by use of machine learning algorithms
  - **Improvement** of initiation, proposition, decision and/or execution processes
- Concepts of **Human Error Tolerant Interface** represented in the ARCH model (derived from the SEEHEIM model):

(KOLSKI and LE STRUGEON, 98; BEKA BE NGUEMA *et al.*, 00)
Context-sensitive interactive system= «intelligent» UI?

- Concepts of **Adaptive Interface** represented in the ARCH model, inspired by (Tendjaoui et al., 1992):

![Diagram of the ARCH model](image)


![Diagram of Context-sensitive interactive system](image)

**Context-sensitive interactive system= « intelligent » UI?**

**Utilisateur**
Context-sensitive interactive system = « intelligent » UI?

- From « Assistant » in previous versions of Office environment...

I begin with a tittle

Difficulty for the user to do a boxed text

-To conversational agents, personal managers, etc. (affective computing, consideration of emotion...)

http://www.filebuzz.com/fileinfo/58034/Ultra_Hal_Assistant.html
- Concepts of **Intelligent Agent** represented in the ARCH model:

![Diagram of ARCH model](image)
- **Plastic UI**: first definition introduced at Interact’99 Conference (THEVENIN and COUTAZ, 1999)

  ► Progressive evolution of the definition, from:

  *Capacity to adapt to the diversity of the platforms* (PC, PDA, mobile phone....) and to the *environment* in which the interaction happens (at home, at work....); the software adaptation to the diversity of the *interaction contexts* has to be *economic* for the developer while preserving the *system usability*

  **Later: to adapt to the user** (see also current researches by Gaëlle CALVARY)

- **Context of use**: Cu=F(P,E,U)

  ► **Platform**

  ► **Environment**

  ► **User**
- Context-Aware or context-sensitive Computing: necessity of sensors

- **Model-based** (context-sensitive) User Interfaces:

Here: CTT task model (Paterno, 2000)

**Context-sensitive interactive system = « intelligent » UI?**

**Cameleon framework** (Calvary et al., 2003)

See also: Model-Based UI XG Final Report, W3C Incubator Group Report 04 May 2010

http://www.w3.org/2005/Incubator/model-based-ui/XGR-mbui-20100504/
Context-sensitive interactive system = « intelligent » UI?

Adapted from (PATERNO, 2003)
Example of **graceful degradation**: the presentation is maintained as usable as possible while the screen resolution is decreasing (see Ph.D. Murielle Florins, 2006)

(Vanderdonckt, Grolaux, Van Roy, Limbourg, Macq & Michel, IASSE’2005)
- Example of **multi-platform HCI: FlexClock** (GROLAUX et al., 2002)

- Other possible information: hours in different cities in the world (other time zones), multilingualism, weather, agenda...
Context-sensitive interactive system = « intelligent » UI?


<table>
<thead>
<tr>
<th>User</th>
<th>Platform</th>
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<tbody>
<tr>
<td>...</td>
<td>Age</td>
</tr>
<tr>
<td>Handicap</td>
<td>...</td>
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<tr>
<td>Visual</td>
<td>Auditory</td>
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<td>-</td>
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<tr>
<td>-</td>
<td>Yes</td>
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<td>No</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Platform</th>
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<tbody>
<tr>
<td>Screen</td>
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<td>Size</td>
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<table>
<thead>
<tr>
<th>Concept</th>
</tr>
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<tbody>
<tr>
<td>Reaction (To darken the colors of the HCl)</td>
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<td>-</td>
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</table>

Ex. : with C4.5 algorithm (extending ID3) (QUINLAN, 1993)
- Current tendency: to provide users of information systems with more and more personalized services

► To adapt the content (the information) to goals, preferences, human characteristics

- Currently: very active research way (HCI, e-commerce, information retrieval…)


- Often: process based on algorithms from Machine Learning
- **Personalization process** in MAPIS (MultiAgent Personalized Information System):

**Phase #1: semi-personalization**
- Stereotypes
- Profile initialization
- Questionnaire

**Phase #2: personalization**
- User profile
- Data
- Enrichment (observation, Reasoning…)
- Use (collaborative filtering, statistics…)

Knowledge acquisition


**Collaborative filtering**: machine learning technics, comparison of several profiles (issued from the same prototype), and observation of their evolution

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-**PerSyst** (Personalization System: **multi-agent architecture** (Ph.D. ANLI, Valenciennes, 2006), see also (KOLSKI, book HCI in Transport 2011):
- Personalization of transport information (PREDIT AgenPerso & Mouver.Perso projects):
- Difficulty: **articulation between services** which are naturally or not interconnected

- In fact, underlying objective:

  ➢ **Incitation to use public transportation (variety of collective means):**
Context-sensitive interactive system = « intelligent » UI?

- Personalization:

According to technological criteria concerning the interaction plateform

Selection and display of the train timetable only
**Personalization:**

```
<textual-message id="88">
  <message quality-level="High" language="FRE" text="Vers la droite" validity-domain=""/>
  <message quality-level="High" language="ENG" text="To the right" validity-domain=""/>
  <message quality-level="High" language="GER" text="Nach Rechts" validity-domain=""/>
</textual-message>
```

According to **technological criteria** concerning the interaction **platform**

According to **linguistic criteria**

According to **localization criteria**

**Context-sensitive interactive system = « intelligent » UI?**

- Personalization using a **cognitive method** (*content-based)*:

Preference: *a priori* known:

« I like science-fiction »

Preference: identified **via interactions**:

The user chooses often: 6.30 a.m. (bus)

Recommandation according to the **similarity** of the content with the content of previous items (use of human **preferences** to filter the data)

- Personalization using a **social method**:

Recommandation according to the **interest** of people with similar preferences

Context-sensitive interactive system= « intelligent » UI?

- **Personalization**, example:

  ![Amazon Recommendations](http://www.amazon.fr/Robin-bois-Blu-ray-Russel-Crowe/dp/B003LO3Q6Q/ref=pd_tg_d_1?ie=UTF8&asid)

  **Produits fréquemment achetés ensemble**

  - **Cet article**: Robin des bois [Blu-ray] ~ Russel Crowe Blu-ray EUR 19,98
  - **Prince of Persia [Blu-ray]** ~ Jake Gyllenhaal Blu-ray EUR 21,98
  - **L'immortel [Blu-ray]** ~ Jean Reno Blu-ray EUR 17,98

  **Prix pour les trois**: EUR 59,94

  - Ajouter ces trois articles au panier
  - Afficher la disponibilité du produit et le mode de livraison

  **Qu'achètent les clients après avoir consulté cet article ?**

  - **95% achètent l'article présenté sur cette page**:
    - Robin des bois [Blu-ray] ~ Russel Crowe Blu-ray ★★★★★ (27)
      EUR 19,98
  - **2% achètent**:
    - Prince of Persia [Blu-ray] ~ Jake Gyllenhaal Blu-ray ★★★★☆ (15)
      EUR 21,98
  - **1% achètent**:
    - L'immortel [Blu-ray] ~ Jean Reno Blu-ray ★★★★★ (9)
      EUR 17,98
  - **1% achètent**:
    - Lost, saison 6 [Blu-ray] ~ Matthew Fox Blu-ray ★★★☆☆ (6)
      EUR 66,98

  - [Découvez des articles similaires](#)
Context-sensitive interactive system = «intelligent» UI?

- **Design space**:

  - Task
  - Domain
  - User
  - Interaction object
  - Device
  - Computing platform
  - Physical environment
  - Organization
  - Application
  - Presentation
  - Dialog
  - Help
  - Guidance
  - Tutorial

  With respect to what?

  Action (Before):

  - Execution
  - Decision
  - Proposal
  - Initiative

  Design

  - For what?

  - With what?

  - User
  - Mixed
  - System

  - At design time
  - At run time
  - At both design and run time

  - One
  - Some
  - Many

  Reaction (After):

  - When?
  - How many?

(Vanderdonckt, Grolaux, Van Roy, Limbourg, Macq & Michel, IASSE’2005)
Towards new natural interactions, wearable interfaces…

- **SixthSense** (MIT Media Lab): “SixthSense' is a wearable gestural interface that augments the physical world around us with digital information and lets us use natural hand gestures to interact with that information”

http://www.pranavmistry.com/projects/sixthsense/
- Google glasses (https://www.google.com/glass/start/) or systems of such type
Agenda

- Context, definitions
- Elements of context
- Context and User modelling
- Context-sensitive interactive system = « intelligent » UI?
- Conclusion
Conclusion

- Numerous researches concerning « intelligent » HCI since… the eighties

- Rich approach: context-aware & context-sensitive HCI

- Many possible architectures

- Promising design approach: model-based development

- Many research perspectives about methods, models and tools for context-aware & context-sensitive HCI design and evaluation

- New types of input and output devices (webcam, pico-videoprojector…); see SixSense project, Google Glasses…
Context-sensitive interactive systems

THANK YOU FOR YOUR ATTENTION

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