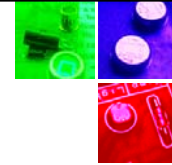




Dagstuhl Seminar on Ubiquitous Computing
11/Sept/2001, Schloss Dagstuhl, Germany
<http://www.inf.ethz.ch/vs/events/dag2001>



Context-Awareness, Disappearing and Distributed User Interfaces

Experience, *Open Issues and
Research Questions*

Albrecht Schmidt
Lancaster University, UK
albrecht@comp.lancs.ac.uk

UbiComp@Lancaster

<http://www.comp.lancs.ac.uk/~albrecht/>

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Disappearing UI

- User Interfaces that are not seen as an “access point” to computing/control
- Interaction that is perceived as the normal way to get something done
- The situation/what the user does already describes the input to the system
- Term: Implicit HCI
- Anticipatory systems – do they need to be smart? Can they be smart enough?

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Distributed UIs

- User Interfaces are everywhere - at least a part of them
- Alternative UI – same function is offered in different UI components
- Compound UI – a function is distributed over several UI components
- Distribution of UIs over physical space and modalities
- Application-to-Application transition – what is an application?

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Experience I TEA-Phone

- Mobile Phone that recognizes context using sensors and reacts accordingly
 - In pocket, in users hand, ..., meeting
 - User specifies the reaction given a certain context
 - See <http://www.teco.edu/tea/>
- Problem: how to evaluate with “real people” in a non generated situation?
 - How often does it happen the phone rings when it is in your hand?
 - How much added value is necessary to make something successful – how to find this out?
- How to recover if you get it wrong? (and you will get it wrong sometimes!)



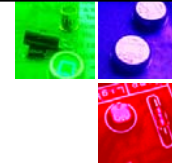
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Experience II TEA-Wearable

- Distribution of sensing technology over the body
- Contexts
 - walk
 - go up / down stairs
 - run
 - stand
 - sit
- Implicit input to a wearable computer
- UI dilemma – stability vs. plasticity
- Validity in time?
- Order of contexts (which is more important than the other?)



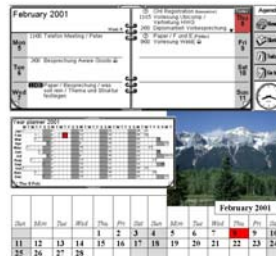
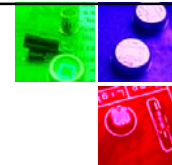
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Experience III Proactive Environment

- Calendar application
- Used contexts
 - People, time, activity
- Different view
 - Work, artistic, leisure
- Distribution of sensors
- Building the application vs. building the sensor network
- Problems:
 - Debugging?
 - How to split work?
 - Separation of concerns?
 - What are components?
 - How to match context? (between provider and consumer)



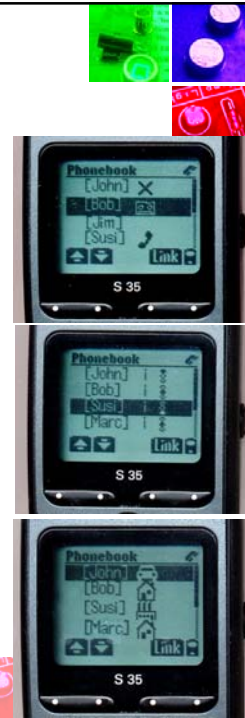
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Experience IV Context Phone Book

- A phone book on a mobile phone that includes information about
 - Connection state (phone off, answering machine, busy)
 - Whereabouts (home, at work, on the road)
 - Acceptance for a call (red, yellow, green)
 - Integration with making the phone call
 - See <http://www.comp.lancs.ac.uk/~albrecht/contextphone/>
- Problem:
 - Blur between applications for the user but not for the developer!
 - usefulness vs. privacy (level of abstraction)



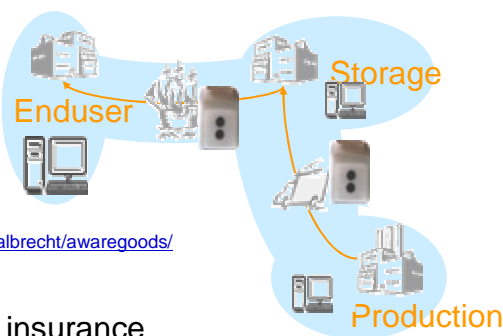
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Experience V Aware Goods

- Recording context in a supply chain
 - Temperature
 - Moisture
 - Magnetic field
 - Shock, Vibration
 - See <http://www.comp.lancs.ac.uk/~albrecht/awaregoods/>
- Context is a proof for the insurance
 - Security
- Integration, Standards?



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Context

- Abstract representation of the situation
- Facts that matter for an application/user/device
- Often inherently connected to time and location
→ matter most at a certain place and at a certain time
- IMHO up to not very well understood

- Context \neq Event
- Context \neq Location

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Describing Context

- Context = (description, unit, domain, probability)
that is bound to
 - time of origin,
 - location of origin
 - distribution-rules

- Ist it just “Knowledge Representation”?
- Natural Language, e.g. Ontologies?
- Dimensions are useful? What are they?
- Describing the whole world?
- How to restrict the domains and keep it open at the same time?

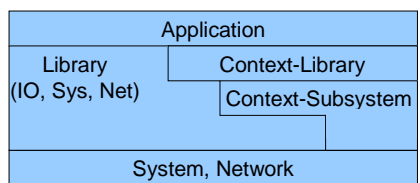
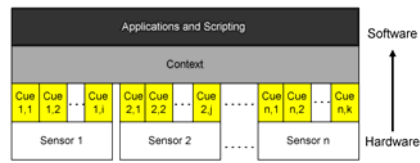
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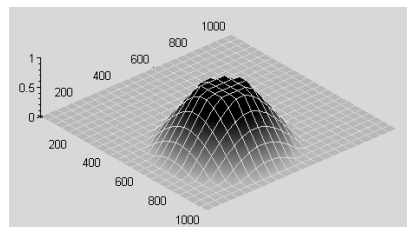
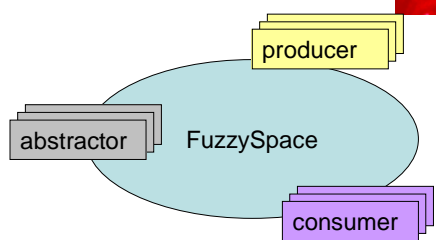
Architecture(s)

- Separation of concerns
 - Context producer
 - Context consumer
 - (Context abstractor)
- “garbage collection” for contexts
- Distribution, Communication models
- Support for the programmer
 - Push vs. pull



Distribution

- Local and temporal validity of context?
 - Application dependent
 - Sensor dependent
- Of special interest
 - Co-location
 - Simultaneous (close in time)
- Ordering



Perception / Sensing

- Perception (if not trivial) is not 100% reliable
- New cost measures for perception
 - Calibration
 - Power
 - Constraints on physical design (e.g. window for a light sensors, opening for a microphone)
 - Setup time
 - Reliability
 - Unobtrusiveness – acceptability
- Value for cost

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Debugging the Systems Simulation

- Can I debug the sensors system without the application?
- Is the sensor infrastructure exchangeable?
- Can I debug the context-aware application without the sensor infrastructure?
- Can I simulate the sensor infrastructure

- Figure out if context usages makes sense for an application using an optimal sensor network (e.g. simulation of context sensing by humans)?

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Evaluation

- “Lesson 4: Only if building something allows you to explore its full design potential”
(from the talk by Roy Want: <http://www.inf.ethz.ch/vs/events/dag2001/abstracts/roy.html>)
- So how to evaluate something (e.g. fragile prototypes) that only works under lab conditions but is designed for other user groups?
- Is the “living lab” approach valid? – Is it still science?, How to deal with the bias? If not is there another way?
- Often Ubicomp systems are built to provide the user with a certain experience or to make a task more pleasant and not necessarily more efficient! This is often highly subjective! Similar issues are found in design and art.
- Is the evaluation “of parts of a Ubicomp system” with the methods used in other field (HCI, networks, AI etc) enough/useful/appropriate?

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Cross-Field Developments

- “Interwoven Engineering”
 - Hardware
 - Communication
 - Software
 - User Interface
 - Design
- Often issues are not new in each of the fields but still the combination is hard and potentially more than the sum
- Sometimes researcher in Ubicomp have a really hard problems from other subjects (e.g. AI speech recognition) as a minor sub-problem in their system (and sometimes don't realize it).
- Is it possible to define useful interfaces between these fields – how to work together?
- Moving borderlines – e.g. when the software works it is rebuild in hardware

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