Vorlesung
Advanced Topics in HCI
(Mensch-Maschine-Interaktion 2)

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- User Interfaces for Ubiquitous Computing

How do we interact with mobile and ubiquitous systems?

Write on paper → capture on photo → send as MMS

First some trends…

Trends (1)

mobile communication is ubiquitous

- Terminals for mobile communication have advanced significantly over recent years
- **Infrastructure is ubiquitously deployed**
- Interesting developments happen beyond the classical handsets (when thinking of electricity it is not the advances in light bulbs that changed the world)

- How many handset will a user have 10 years?
  →a guess 2-6 (some mobile phones, car phone, …)
- How many communicating appliances and devices will users have in 10-20 years?
  → a guess 20+ (security system, TV, front door, dog collar, wrist watch, camera, headset, coffee machine, alarm clock…)

Trends (2)

mechanical and electro-mechanical systems will be computer controlled

- Mechanical and electro-mechanical systems become computer controlled.
- User interfaces for mechanical and electro-mechanical systems have a tradition of being tangible.
- Many **design restrictions** due to mechanics **are gone** – novel interfaces (for the better or the worse) are possible and emerge.
- **Sensing of actions and reactions from users becomes an interface option**.
- Examples: automotive, industrial machinery, tools, buildings.

Trends (3)

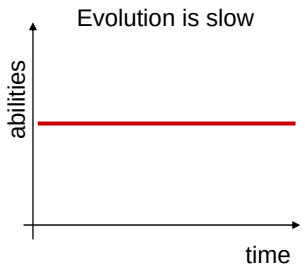
declining willingness for training

- An average person acts today as driver, telephonist, photographer, film-maker, and type setter without much training (many task with just one device – the phone).
- In a fast paced job market training to operate a system is a significant obstacle (and cost factor) for the introduction of new systems.
- Dangerous actions should be prohibited in the first place by the controls available in the user interface.
- User interfaces that have **clear affordances** and draw on the **prior knowledge** of potential users ("intuitive UIs" and "natural interaction") reduce the need for leaning

Trends (4)

user's abilities

- Abilities of un-augmented users in general do not change a lot over time, e.g.
  - ability to cope with cognitive load
  - willingness to cope with stress
  - time one can concentrate on a particular problem
- Abilities between individual users vary a lot
  - long term, e.g. physical and intellectual abilities
  - short term, e.g. effect of stress or fatigue
- Abilities of one individual users changes over time (e.g. getting old)



Human in the loop
Interactive systems for "augmenting the human intellect" as alternative to automation.

Trends (5)

technology becomes widely available

- Technologies that may be today "specialist devices" become common in a *few* years
- Technologies that are shared now may become personal technologies
- Technologies that are expensive at one point are not even considered as additional cost in the future, e.g.
  - Video camera connected to a computer
  - Biometric authentication
  - Book printing on demand
  - Eye gaze tracking
  - 3D scanning and printing
  - Integrated production systems

Trends (6)

appliance computing

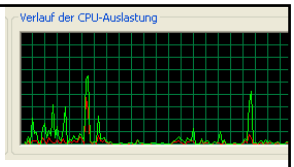
- Post-PC area
  - Specific tools that are designed to support a specific task
  - Not a all-round tool
  - Different tools for different tasks

- *"[…] the primary motivation behind the information appliance is clear: simplicity.* ***Design the tool to fit the task so well that the tool becomes part of the task****, …"* (Don Norman)

- Context and adaptation to the real world is an option to overcome the multi-device dilemma

Trends (7)

computing, storage and communication are not the limit



- For personal computing there are few technical limitations
- Processing power is available
  - Already now desktop machines run with minimal processing power
- Massive amounts of storage are readily available
  - Phones with 4GB disk
  - Record everything you ever said on a hard drive
  - Have all movies ever produced in a single device
- Bandwidth (wireless and wired) is huge
  - While you tie your shoe laces you can cache all the latest 20 different news papers
  - While you wait for the bus you can transfer a complete movie

User interfaces and interaction for networked devices that are embedded into the users' lives.

- Anytime and everywhere
- Design restrictions are gone
- Sensing and actuators are part of the UI
- Must be obvious to use (affordances)
- Current cost of technology is not an issue

The interface between the user and the machine is most critical to create effective and efficient systems

Advanced Topics in HCI

- many topics are still not covered in detail
- The following videos are to from conferences an report on current research in the area of new user interfaces in the field of ubiquitous an pervasive computing

User Interfaces Beyond the Desktop

- Roomware (Video 7:06)
  http://www.ipsi.fraunhofer.de/ambiente/english/projekte/projekte/roomware.html
- MetaDesk (Video 3:43)
  http://www.zib.de/ullmer/videos/metaDESK/
- MediaBlocks (2 Videos 4:45)
  http://www.zib.de/ullmer/videos/DataTiles/index.html
- Attentive Office Cubicles: Mediating Visual and Auditory Interactions Between Office Co-Workers (Video 1:58)
  Aadil Mamuji et al. Ubicomp 2004 Video Proceedings