Ubiquitous Computing and Beyond

Mobile Communication changed the world – what else do we need?

Albrecht Schmidt
Pervasive Computing
University Duisburg-Essen

http://www.pervasive.wiwi.uni-due.de/

Overview
- Ubicomp and Beyond
- Technology trends that change computing
- What are the applications?
  - Magic beyond the screen
- Some research trends and projects

how many computers* have you used** to come to here?

*what is a computer anyway…
** use – probably need to define that new

how many computer* will you use** in 20 years while having breakfast?

*what is a computer anyway…
** use – probably need to define that new
Ubiquitous Computing

Enabling Intelligent Devices & Environments

- Processing: cheap, fast, small, energy efficient
- Storage: big and fast
- Networking: global, local, ad-hoc, low-power

"The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it." (Mark Weiser)

Internet of Things

"Indeed, with the benefit of integrated information processing, industrial products and everyday objects will take on smart characteristics and capabilities. They may also take on electronic identities that can be queried remotely, or be equipped with sensors for detecting physical changes around them. Eventually, even particles as small as dust might be tagged and networked. Such developments will turn the merely static objects of today into newly dynamic things, embedding intelligence in our environment, and stimulating the creation of innovative products and entirely new services."


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some (technology) trends…

objects and garments will become aware and adaptive to their environment – software adds value

computing (software) will become a main feature and value generator in many areas that are till now “non electronically”

http://www.slashgear.com/genius-scientists-create-a-smart-bra-118964/

mobile (data) communication and electronic signage will be ubiquitous

when electricity became ubiquitous there was more than the evolution of light bulbs…

A question familiar to people who were born in the 60s and before

“If I only would know when the others come and where they are now…”

will be completely alien to people born after 2000!

tracking and logging of location, activity, and interaction of people and objects will be common

and most of us will share this information with their friends and colleagues, just for pure convenience…

Dual Reality

“Dual reality is the concept of maintaining two worlds, one virtual and one real, that reflect, influence, and merge into each other by means of deeply embedded sensor/actuator networks. Both the real and virtual components of a dual reality are complete unto themselves, but are enriched by their mutual interaction.”

http://www.media.mit.edu/research/dual_reality.html
our understanding of privacy, and what we consider private will radically change

our personal information will likely become a commodity that we trade...

classical computing limitations will play very little role in the future for consumer devices

we will be so used to having bandwidth, memory and processing in excess that we may forget the terms...

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User Needs & Technology Drive

- Looks at user needs on a more general level (e.g. Maslow's hierarchy of needs)
- Successful designs have addressed
  - Survival
  - Safety
  - Food
  - Love
  - Communication
  - Recognition / admiration
  - ...
- Allow technology to drive actual applications

Excursus:

Excurse: Maslow's hierarchy of Human Needs

Successful designs have addressed

The next big thing?

Making our life – and the world in general – more predictable

Looking into the future
Predicting the future: Imagine…

1. each car, bus, train, truck, …, object is tracked in real-time
2. each person is tracked (location, activity, …, food intake, eye-gaze) in real-time
3. environmental conditions are continuously sensed – globally and locally sensed
4. with have a complete (3D) model of our world (e.g. buildings, street surface, …)
5. based on the data you can predict a likely future – short and long term
6. using a “physics engine” you can calculate the immediate future

Implicit Data Generation Beyond the Desktop

Think about:
- Your car navigation system
- Your mobile phone
- Your radio and TV
- Your gas/electricity/water supply meter

- …
- Your clothes and shoes
- Your waste bin
- Your sewage leaving the house
- …

- A great wealth of information?
- Predicting the future and Anticipating needs
- Understanding human behavior
- Providing just in time services
- New services and products

- Or just pure horror?

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Research Examples

steps that researchers take…

Smart artifacts and intelligent environment

- Objects that communicate with other objects and take actions
- Environments that are reactive to the users and proactive in providing services

Communication and social networking support

- Creating awareness between people
- New forms of communication (haptic, touch, smell, emotions…)

[DiSalvo,03] [Mynatt,01]
Implicit interaction and embedded Information

- Interaction with systems by interacting with the real world to accomplish a task
- Information provided at the right place in the right time – without extra effort for the user

Creating additional memories

- Recording and preserving visual and audio impression
- External memory

Towards Implantable computing

- Symbiosis between human and computer
- Direct interfacing of electronics with the body

More Discussion…

- our world will more radically change as most people think…
- there are still many hard technical challenges to solve
- experiments and deployment in the real world are essential
- we will depend on those systems
  - failure/malfunction can be fatal
  - opt-in / opt-out
  - what happens if all kids at school do have a memory prosthesis?
  - Will it be acceptable to opt-out?
- there are so many opportunities :-)
References 2


