

Week 5: Ubiquitous Computing

Pattie Maes
MIT Media Lab

Ubiquitous Computing

■ Required reading:

- **Ubiquitous Computing, Weiser, 1993**
- **Perspectives article for ACM Interactions, Weiser 1993**
- **The coming age of calm technology, Weiser & Seely Brown, 1996**

Ubiquitous Computing

■ Optional Readings:

Some computer science issues in ubiquitous computing, Weiser 1993 – Sajid Sadi
<http://www.ubiq.com/hypertext/weiser/UbiCACM.html>

Charting Past, Present, and Future Research in Ubiquitous Computing
GD Abowd, ED Mynatt, 2000 – Sajid Sadi

Selection from UbiComp Proceedings/Videos last couple of years – Aaron Zinman

Class 5 (cont)

■ PROJECT PROPOSAL DUE!!!

- **2-3 pages:**
 - What is it & why is it interesting?
 - Usage Scenario
 - How will it be implemented?
 - What parts will you complete for this class
 - What do you hope to learn?

Mark Weiser's vision (1988-on)

- “Disappearing technologies” are most profound ones
 - Eg writing: ubiquitous, does not require active attention, ready for use at a glance
- The best tools are invisible tools (focus is on the task not the tool)

Information Technology is not (yet) a “disappearing technology”

- Computer remains in world of its own, not integrated in environment
- Approachable only through complex jargon that has nothing to do with tasks being used for
- Not just UI issue, also a hardware issue

What does it mean for a technology to “disappear”?

- Not consequence of technology
- But of human psychology
 - When people learn something sufficiently well, they cease to be aware of it, they can focus beyond the technology on new (true) goals
 - Called “compiling” by H. Simon, or “periphery” by J. Seely Brown

Weiser's vision: *Ubiquitous Computing*

- Computers everywhere, disappearing/integrated in environment/objects around us
- Computer no longer isolates us from tasks/environment, no longer focus of attention
- Social Impact
Similar to writing: found everywhere from clothes labels to billboards
- Similar to electricity which surges invisibly through the walls of every home, office, car

Ubiquitous computing constitutes a reversal of some other trends

- **Ubiquitous computing does not mean:**
 - Computers that can be carried everywhere
 - Multi-media computers (using more sensors/output modalities)
 - Virtual reality (create a world inside the computer, rather than enhance the real world with computer data)
 - Computer as personal assistant, “agent”

Ubiquitous Computing

- Hundreds of computers in every room
- Wirelessly networked
- With their own display
- Computation happens in the background

Xerox Parc Experiments in Ubiquitous Computing

- Focus on devices that transmit & display information
- Two important issues:
 - Location (UC's must know where they are so they can adapt their behavior)
 - Scale (different scales needed to suit different tasks): tabs (post-it), pads (paper) and boards
 - Typical room: hundred tabs, 10-20 pads, 1-2 boards, all inter-connected

Some TAB examples

- Active badges for people or objects
 - Automated call forwarding based on location of people
 - Automatic login to computers
 - Automatic diaries (eg meeting)
- Tabs as extensions of computer screens (to make programs/file portable to other machine)

Some PAD examples

- Differ from conventional portable computers: intended as “scrap computers”; no individualized identity or importance; spread many around the desk, in drawers, etc
- Increase desk size of current computers

*Some **BOARD** examples*

- **Number of purposes: video screen, bulletin board, white board, flip chart, electronic bookcase (download things onto a PAD)**
- **“Liveboard”: works with wireless, electronic “chalk”, is interactive**
 - **permits collaboration at a distance**
 - **Also used as personalized bulletin boards (user wears active badge)**

Cons of Ubiquitous Computing

- The current computer is:
 - Generic
 - Adaptive
 - Programmable (extensible)
- Space
- Cost
- ...

State of Ubiquitous Computing

■ Conferences:

- Ubicomp
- Mobiitous
- Pervasive Computing
- ...

■ Journals:

- IEEE Pervasive Computing journal
- Springer Personal & Ubiquitous computing journal

Calm Technology, Weiser & Seely Brown

- Ubicomp community went off track
- Ubicomp technology should be “calm”: stay out of the way while informing
- Contrast with the way technology is designed now: in your face, highly interactive, using multiple modalities, etc

Calm Technology, Weiser & Seely Brown

- Calm technology enhances our peripheral reach (bringing more details into the periphery)
- Periphery: What we are attuned to without attending to explicitly, Informing without overburdening,
- Calm technologies move easily between center of attention & periphery (eg text)

Calm Technology

- Other word for Ambient Interfaces (Ishii)
- Example:
 - dangling string representing network traffic (Jeremijenko)
 - Inner office windows
 - Internet multicast (window of awareness)

Class 6: User Modeling, Personalization & Recommender Systems

- Required reading:
 - Alfred Kobsa, Generic User Modeling Systems, User Modeling and User-Adapted Interaction, v.11 n.1-2, p.49-63, 2001

Class 6: User Modeling, Personalization & Recommender Systems

- Optional resources on recommender systems:
 - **Recommender Systems**, Resnick & Varian
<http://www.acm.org/pubs/cacm/MAR97/resnick.html>
 - **Recommender systems in ecommerce**, Shafer et al
<http://www.cs.umn.edu/Research/GroupLens/papers/pdf/ec-99.pdf>
 - **Empirical Analysis of Predictive Algorithms for Collaborative Filtering**, Breese, Heckerman and Kadie
<http://www.research.microsoft.com/users/breese/cfalgs.html>

Class 6: User Modeling, Personalization & Recommender Systems

- Optional resources on user modeling & personalization:
 - User Modeling in Adaptive Interfaces, Langley
<http://www.cs.utah.edu/classes/cs5350/handouts/adapt.um99.pdf>
 - User Modeling in Human-Computer Interaction, Fischer,
<http://l3d.cs.colorado.edu/~gerhard/papers/umuai2000.pdf>