

***Week 5:
Ubiquitous
Computing***

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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
- Mobiquitous
- 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)**

CalmTechnology

- **Other word for Ambient Interfaces (Ishii)**
- **Example:**
 - **dangling string representing network traffic (Jeremijenko)**
 - **Inner office windows**
 - **Internet muticast (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>