Some Computer Science Issues in Ubiquitous Computing

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Overview

- Discusses some of the physical issues concerning ubicomp
- Hardware aspects of creating devices that disappear, yet occur plentifully in environment
“...people primarily work in a world of shared situations and unexamined technological skills...”

- Computers today make things worse
- Unlike a regular tool, it consumes attention
  - Attempting to have the system act more human simply legitimizes this issue
Problem of Paradigm

- The problem is not in the GUI in itself
- Attention-centric design is part of affordance
- Also not a limit of capabilities in data handling or multimedia
- Problem exists in the relationship around which computers today are designed
Inspiration

- To be a part of the physical world of the user, the object should be like other physical objects in existence
- Devices should use real-world communication metaphors, instead of attempting to transplant to virtual world
- Led to the tab/pad/board design, and ended there (effectively)
  - Quantizes the information chunks into sizes that map perhaps to talks or subtasks
Hardware

- ParcTAB
  - PDA-like
  - Low bandwidth and processing, small display
  - Main concern: battery life (~ 1 week)
- Pad family
  - Essentially unix-enabled tablet PC’s
  - Custom hardware allows approximately same capability as today’s tablets, scaling for improvements in semiconductors
Hardware and Software

- Design chips that use less voltage and more surface
- Design for reducible clock rates
- Use small cell-based near-field radios, with $r^6$ falloff to allow many cells in one building
- Wireless handshake-based collision detection
- QoS over wireless
- Distributed caching and cache sharing
Apps for Ubicomp

- Shared interaction space
  - Particularly, shared drawing
  - Cotemporaneous with ClearBoard
  - Also, collaborative filtering of content
- Locating people
  - Using active badges
  - Using logins (even to tabs...)
  - Automatic call forwarding
  - People maps
Privacy Issues

- Decentralize data storage to end nodes
  - Personal computers hold actual data
  - User specifies access criteria
- Location data - inherently part of the cellular design
  - In decentralized model, user is the atom
- Profiling individuals
  - Obvious concerns
  - Most benefits
  - Conflict with allowing outside access to location data
Summary

- User studies are critical to success
- Hardware and software is only substrate to the actual work
- Ubicomp should augment the user within the natural context, instead of being a mere tool