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

Computers and People

- "...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