Human-Computer Interaction for Universal ~~Computing~~ Task Support

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Endeavor Mini Retreat, 5/25/99

Technical Problem: Good Info. Appliance UIs Hard to Design

- ✔ Single device design is easier
  - * specialized & can design in isolation -- simplistic
- ✔ Hard to design the same "application" in a consistent manner across many devices
  - * e.g., calendar app.: 1 speech based & 1 GUI based
- ✔ Hard to take advantage of context of use
  - * which device is used when?
    - hands busy/free, eyes busy/free, speech busy/free
  - * multiple modalities/device, which to "display"?
    - e.g., PDA speech, pen, & visual I/O
- ✔ Goal: Synergy - whole greater than sum of the parts

State of the Art

- ✔ Traditional tools & methodologies (paper, VB, …)
  - * no support for multimodal UIs (especially speech)
  - * do not allow targeting one app to platforms w/ varying I/O capabilities (assume like a PC)
- ✔ Model-based design tools
  - * force designers to think abstractly about design
- ✔ Context-aware widgets (GA Tech)
  - * how do devices communicate high-level contexts?
- ✔ XML
  - * still need to understand what should be expressed

Key Concepts: Sketches, Models & Context-aware Design Tools

- ✔ Tools should support multimodal UIs
  - * representation should be informal ("sketchy")
- ✔ Infer a model from design "sketches"
  - * model is an abstraction of apps UI design
  - * model for representing contexts & UI implications
- ✔ Use models to
  - * semi-automatically generate UIs on diverse platforms
  - * dynamically adapt a particular appliance UI to changing context of use

What We've Accomplished So Far

- ✔ Informal tools for UI design
  - * sketch-based tools for GUI / Web design
    - built & tested 1st generation, building next gen. now
  - * informal tool for speech UI design
    - designed & implementation in progress
- ✔ Automatic generation of simple control UIs
  - Hodes & Newman
- ✔ First cut designs for multimodal
  - * UI design tool & appliance **(SpeechCorder w/ ICSI)**
- ✔ Experience w/ appliances & simple context
  - * NotePals

1-3 Year Plan for Success

- ✔ Year 1
  - * finish implementation of informal tools
    - study usage (especially of speech UI design)
    - use results to finish design of multimodal design tool
  - * develop algorithms for extracting app model
  - * build context-aware applications w/o tools
    - two testbeds to create & study
      - + wirelessly networked PDAs in learning (op6)
      - + extraction of tacit context using social networking (op5)
    - build taxonomy of contexts
      - + how they should effect UI?
    - explore extraction of context from other sources
      - + sensors & streams (op1 & 3)

1-3 Year Plan for Success (Cont.)

- ✔Year 2
  - * design & implement tool for multimodal UI design
    - extracts model & generates UI for 2 diverse platforms
    - uses simple context ques
  - * develop algorithms for capturing user's context
  - * evaluate usage (apps & tools) in target settings
- ✔Year 3
  - * extend multimodal UI design tool
    - generate multi-platform UIs that dynamically adapt
      - + allow context to be fully integrated in decisions
  - * integrate with S/W & H/W design tools
  - * evaluate usage (apps & tools) in target settings

7