Automated GUI Design

Intelligent User Interfaces

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Readings

- Gajos & Weld, SUPPLE: Automatically Generating User Interfaces, IUI'04
- Bunt et al, Supporting Interface Customization using a Mixed-Initiative Approach, IUI'07

Motivation

- Hand-building GUI's is very labor intensive (expensive)
  - different versions for different display devices
  - different versions for different users
    - expertise, preferences
    - special needs
  - different versions for different data
    - cf. data visualization ("Ships" DB in 1970s)
- Completely dynamic GUI designs
- Proposed solution is automation

Model-View Separation

- Distinguish between:
  - "semantic" or "functional" ***model*** underlying GUI
    - e.g., boolean switch
  - graphical ***view*** ("presentation", "appearance")
    - usually many alternative views for given model
    - e.g., checkbox, toggle button, radio button, etc.
- Also referred to as:
  - MVC (model-view-controller) approach
  - model-based UI's
- Very old idea (1970s), but still not routinely used in commercial software development

Basic Concepts

- Semantic/Functional Model
  - formalization
- User Model
  - user's goals/tasks
  - usage patterns (traces)
  - psychophysical costs (e.g., visual search)
- Device Model
  - display properties: size, resolution, etc.
  - interaction properties: mouse, touch, etc.

Basic Processes

- "Widget" choice
  - choosing a presentation for a particular underlying model element
  - e.g., choosing checkbox for a boolean
- Layout
  - geometric arrangement of widgets on display
  - usually includes hierarchy (containers):
    - e.g., tabbed panes, scrolling windows, etc.

Two Main Approaches

- Decision tree approach
  - design a large (hierarchical) space of alternatives ahead of time
  - dynamically make choices based on evaluating properties of user, display and data
- Optimization approach
  - model all factors abstractly as utility functions
  - apply general-purpose algorithm, e.g., constraint satisfaction
- Analogous tradeoff to hierachical task networks vs. first-principles planning

Readings

- Gajos & Weld, SUPPLE: Automatically Generating User Interfaces, IUI'04
  - automated widget choice and layout
  - optimization approach
- Bunt et al, Supporting Interface Customization using a Mixed-Initiative Approach, IUI'07
  - “reducing” an existing interface (Word)
  - optimization approach (using GOMS)