

Automated GUI Design

Intelligent User Interfaces

Professor Charles Rich
Computer Science Department
rich@wpi.edu

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 hierarchical 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)