Personalized Adaptive Interfaces

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Today’s Mass-Produced Interfaces
Today’s Unsupported Users
Custom-built interfaces need to be provided for each individual user reflecting her preferred interaction devices, abilities, preferences, ever changing tasks and situation context.
Users With Impairments And GUIs

CSE Radio
Location Preprocessing Delivery
Delay 0 s
Preamp 0 db
....
Volume
Source KFOO
Slight Motor Impairment

Very small targets

Dragging is difficult

CSE Radio

Location Preprocessing Delivery
Delay 0 s
Preamp 0 db
....
Volume Source KFOO

Slight Motor Impairment

Very small targets

Dragging is difficult
Slight Motor Impairment
Severe Vision Impairment

Very small visual cues
Severe Vision Impairment

Magnifying lens view size
Severe Vision Impairment

Magnifying lens view size
Severe Vision Impairment
Combination of Vision and Motor Impairments
Thesis

Custom-built interfaces need to be provided for each individual user reflecting her preferred interaction devices, abilities, preferences, ever changing tasks and situation context.
Approach

Custom-built interfaces need to be provided for each individual user reflecting her preferred interaction devices, abilities, preferences, ever changing tasks and situation context.
Custom-built interfaces need to be provided for each individual user reflecting her preferred interaction devices, abilities, preferences, ever changing tasks and situation context.
Approach

Custom-built interfaces need to be provided for each individual user reflecting her preferred interaction devices, abilities, preferences, ever changing tasks and situation context.
SUPPLE

Interface Model

SUPPLE

Interaction Model
User Interface Generation as Optimization

- **Flexible** with respect to screen size
- **Versatile:** Same algorithm for different devices
- **Fast:** Less than 2 seconds on a typical desktop computer
How Does One Create an Interaction Model for Each User's Individual Needs?
Personalizing Automatic UI Generation

- Parameters of the optimization function do not correspond to obvious design criteria
- There are many interacting parameters to adjust
Personalizing Automatic UI Generation

- Adapting to preferences
  - Care giver, consultant or the user
  - Example UIs
  - Feedback

- Basic Device Model
- Custom Interaction Model
- Personalizer

- Adapting to capabilities
  - The user
  - Diagnostic tasks
Binary Queries

In general, how do you prefer Level to be displayed?

Option A

Level 7

Option B

Level

Your choice:

- Option A
- Neither
- Option B

Submit
Example Critiquing
Example Critiquing
Preference Elicitation

- Useful when:
  - Good design heuristics are known for a particular user population
  - Aesthetics are important
Quantifying User’s Abilities

• Useful when:
  • No clear design rules exist for a given user population
  • Usability is the primary concern
Preliminary Results
Example of What We Have: “Large Fonts” in Windows
Adaptive User Interfaces

They optimize the UI for the individual!

They disorient the user!
Prior Work

↑ Greenberg and Witten [1985]
↕ Trevellyan and Browne [1987]
↓ Mitchell and Shneiderman [1989]
↑ Sears and Shneiderman [1994]
↑ McGrenere, Baecker and Booth [2002]
↓ Findlater and McGrenere [2004]
↔ Tsandilas and shraefel [2005]
Commercial Deployments
Split Interfaces

Adaptive toolbar -->

Recently used symbols:

$\begin{align*}
&\text{€ £ ¥ © ® TM ± ≠ ≤ ≥ ÷ × ∞ μ α β}
\end{align*}$
Putting It All Together

<table>
<thead>
<tr>
<th>Interaction Mechanics</th>
<th>Algorithm Behavior</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>stability</td>
<td>frequency of adaptation</td>
<td>interaction frequency</td>
</tr>
<tr>
<td>locality</td>
<td>accuracy</td>
<td>task complexity</td>
</tr>
<tr>
<td></td>
<td>predictability</td>
<td></td>
</tr>
</tbody>
</table>
Split Interface Adaptation in Supple
Split Interface Adaptation in Supple
Contributions

• An optimization-based approach to automatically generate custom-tailored adaptive user interfaces.

• Techniques to allow end users to easily personalize optimization-based systems to match their preferences and abilities.

• Design guidelines for designing automatic system-driven adaptation that improves both user satisfaction and performance.
Contributions

And we did it so that we can provide each individual with custom-built interfaces reflecting her preferred interaction devices, abilities, preferences, ever changing tasks and situation context.
More Information

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SUPPLE project page:
http://www.cs.washington.edu/ai/supple/
or
Google: supple interfaces