Questions?

• Google storage now 8 times cheaper
• Droid
• Quiz
• HW
• Next week

Cognitive engineering

• Gulfs of execution and evaluation [Norman 86]
### Gulf of evaluation: statistical analysis (1)

**Real world:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>0.67</td>
<td>0.79</td>
</tr>
<tr>
<td>0.32</td>
<td>0.63</td>
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<tr>
<td>0.39</td>
<td>0.72</td>
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<tr>
<td>0.27</td>
<td>0.66</td>
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<tr>
<td>0.71</td>
<td>0.43</td>
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<tr>
<td>0.63</td>
<td>0.09</td>
</tr>
<tr>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>0.20</td>
<td>0.54</td>
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<tr>
<td>0.51</td>
<td>0.38</td>
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<td>0.11</td>
<td>0.33</td>
</tr>
<tr>
<td>0.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>

**Conceptual model:**

x,y correlated?

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### Gulf of evaluation: statistical analysis (2)

**Real world:**

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**Conceptual model:**

x,y correlated?
**Gulf of evaluation: statistical analysis (3)**

Real world:

\[ \rho = -0.29 \]

Conceptual model:

x, y correlated?

**Gulf of execution: Drawing a rectangle (1)**

Real world

Gulf

Conceptual model:

Draw a rectangle

Execution

Move 90 30
Rotate 35
Pen down
...
Gulf of execution: Drawing a rectangle (2)

Real world
- Draw a rectangle
- Rotate the shape

Conceptual model: Draw a rectangle

Execution

Gulf of execution: Drawing a rectangle (3)

Real world

Conceptual model: Draw a rectangle

Execution
Cognitive engineering example

• Move “paper.tex” from ~/conferences/CHI_04 to ~/conferences/UIST_04
  – Using a Unix shell (current directory is ~)
  – Using a GUI (starting from the desktop, no window open)

• What are the evaluation and execution gulfs?

Direct manipulation

• Central ideas
  – Object understood by their visual characteristic
    • Using good affordances
    • Using a good conceptual model and convincing metaphors
  – Actions understood in term of their effects on the screen
    • Rapid
    • Incremental
    • Easily reversible
    • Immediate visual feedback

• Outcome
  – Direct engagement
    • the feeling of working directly on the task
    • No need to know the implementation details
  – The display becomes reality: the WYSIWYG interface
  – Fewer error messages?
  – Is driving a car direct manipulation?
Direct Manipulation Tradeoffs

- Good for intermediate users
  - Recognition versus recall trade-off
  - What about expert? Fast?
  - Accuracy?
- Explicit versus implicit command
  - How to automate, generalize tasks?
  - “rename each file by adding `_old` to its name”
- Metaphor might be too restrictive
  - WYSIAYG: What You See Is All You Get
- In practice, often mix
  - Direct manipulation
    - Tools, drag and drop interactions...
  - Abstraction
    - Menus, dialog boxes, scripting, ...

Grammatical structure

- Action-Object (Verb noun)
  - Modal
    - Modes are problematic
  - Often more efficient
  - Examples
    - Pick a tool, then use it...

- Object-action (Noun verb)
  - Modeless
  - Action always within the context of objects
  - Examples
    - Drag and drop...
    - Select and delete

Why not always go modeless?