Questions?
Cognitive engineering

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

Real world:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.79</td>
</tr>
<tr>
<td>0.32</td>
<td>0.63</td>
</tr>
<tr>
<td>0.39</td>
<td>0.72</td>
</tr>
<tr>
<td>0.27</td>
<td>0.85</td>
</tr>
<tr>
<td>0.71</td>
<td>0.43</td>
</tr>
<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>
</tr>
<tr>
<td>0.51</td>
<td>0.38</td>
</tr>
<tr>
<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?

Evaluation
Gulf of evaluation: statistical analysis (2)

Real world:

Gulf

Conceptual model:
x, y correlated?

Evaluation
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

Move 90 30
Rotate 35
Pen down
...

Conceptual model:
Draw a rectangle

Execution
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 evaluative 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 and incremental
    • Immediate visual feedback
    • Easily reversible

• 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?
Direct manipulation: Good or Evil?

• 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

• Applications mix
  – Direct manipulation
    • Tools, drag and drop interactions...
  – Abstraction
    • Menus, dialog boxes, scripting, ...