Questions?

- Project #2
- HW#4 due today
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?
Gulf of evaluation: statistical analysis (2)

Real world:

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

Gulf

Conceptual model:
Draw a rectangle

Execution
Interaction design: a double gulf?

Interaction user

- Evaluation
- Conceptual model
- Execution

Interaction designer

- Representation
- Interface
- Data
- Manipulation
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)
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
Grammatical structure

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

• Action-Object (Verb noun)
  – Modal
    • Mode can be dangerous
  – Often more efficient
  – Examples
    • Pick a tool, then use it...
Interface metaphors

• Definition
  – Use of one kind of object or idea in place of another to suggest a likeness or analogy between them

• Purposed
  – Leverages our knowledge of familiar, concrete objects/experiences
  – Transfer this knowledge to abstract computer and task concepts

• Examples
  – Desktop, files, folders, trash can…
  – Paintbrush in a painting program
Metaphors caveats

• Too limited
  – The metaphor restricts interface possibility

• Too powerful
  – The metaphor makes believe that the system can do things it can’t

• Too literal or cute
  – Make it difficult to operate

• Mismatched
  – The metaphor makes it difficult to carry out the task
Direct manipulation: Good or Evil?

- Good for intermediate users
  - Recognition versus recall trade-off
- Explicit versus implicit command
  - “rename each file by adding ‘_old’ to its name”
- Limit of reification
  - How to align an object?
- 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,...*