Questions?

• Project #2
• Grad project proposals due this Thursday

• Won’t be able to answer questions after class this Thursday
• Next week office hours moved to Wednesday
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>
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<tr>
<td>0.27</td>
<td>0.85</td>
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<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>
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<tr>
<td>0.11</td>
<td>0.33</td>
</tr>
<tr>
<td>0.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Gulf

Conceptual model: x, y correlated?

Evaluation
Gulf of evaluation: statistical analysis (2)

Real world:

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

Real world:

\[ \rho = -.29 \]

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
Gulf of execution: Drawing a rectangle (3)

Real world

Conceptual model: Draw a rectangle

Execution
Interaction design: a double gulf?

Interaction user

Evaluation

Conceptual model

Execution

Interaction designer

Representation

Interface

Data

Manipulation
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 and Direct engagement

• **Direct Manipulation Interface**
  – Behaves as though the interaction was with a real-world object
  – Almost always based on a metaphor
    • *Mapped onto some facet of the real world task semantics*

• **Direct Engagement experience**
  – the feeling of working *directly* on the task
    • *No need to know the implementation details*

• **Examples**
  – Deleting a file by putting it in the trash
  – Copying text/file using drag and drop
Direct manipulation

• Central ideas
  – Action understood in term of their effects on the screen
    • *Rapid, incremental* actions
    • *Need for causality*
      – Immediate display of results
    • *Need for reversibility*
      – Safe exploration
    – Intuitively reasonable action can be performed at any time
      • *Good conceptual model*
    – Object understood by their visual characteristic
      • *Affordances*

• Outcome
  – The display becomes reality: the WYSIWYG interface
Grammatical structure

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

- **Action-Object (Verb noun)**
  - Examples
    - *Pick a tool, then use it...*
  - **Modal**
    - *Mode can be dangerous*
  - Often more efficient
Direct manipulation: Good or Evil?

• 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,...
Readings for next class

• “Organization and visual structure”
• Chap 6 (if you have not done so yet)