Information Design

Goal: *identify methods for representing and arranging the objects and actions possible in a system in a way that facilitates perception and understanding*

- Define and arrange the visual (and other modality) elements of a user interface
  - Screen layout, icon design, vocabulary selection
  - But also the “big picture” or overall info model
  - Models of perception, psychology guide this

- Engineering an information design
  - Make sure what people see (hear, etc.) makes sense, and helps them to pursue meaningful goals
  - Depends on *what they are doing*, hence the important role of user interaction scenarios
Stages of Action in HCI

Making Sense
- System goal
- Action plan

Perception
- Execution
- Focus of interaction design

GULF OF EVALUATION
- Making sense
- Perception
- Focus of information design

Making Sense of an Information Display

**Making Sense**
- Income worksheet,
- Total tax income is being calculated, the wrong multiplier is being used

**Interpretation**
- Excel worksheet, a cell is selected, formula is displayed at top

**Perception**
- Color, shading, lines
- Characters, squares, spatial organization

Last month’s budget...?
Perception

• Organize and encode sensory data in the mind
  – Lines, shapes, colors are “extracted”
  – Very fast, generally with no conscious thought
  – May be influenced by expectations, “top-down”

• Low-level units then grouped and organized
  – Perceived as rows, columns, grids, figures
  – Seeing the relationships among different elements

• Design goal: make this perceptual process rapid and accurate

Don’t Just Perceive!

REDGREENREDORANGEBLUE
GREENBLUEREDORANGERED
GREENREDORANGEREDBLUE
GREENBLUEREDORANGERED
REDGREENREDORANGEBLUE
GREENREDORANGEREDBLUE
Gestalt Principles of Perception

Proximity

Similarity

Closure

Area

Symmetry

Continuity

Gestalt in User Interface Design

Try the “squint test”...
What principles are in action?
Tradeoffs: Designing for Perception

- Task-relevant information versus complexity
  - Decompose tasks, link to less critical information

- Offer visual distinctions, but not too many levels
  - Too many variations (e.g., different colors) will make the cues hard to discriminate, slowing perception

Elegant designs exploit position, thematic repetition, low-key color schemes, and white space, instead of lines, boxes, and labels to organize information

Interpretation

- Perceiving enables interpretation
  - Perceptual processing identifies major display structures (rectangles, text strings, etc)
  - Users must interpret what these display structures mean in the system

- Designers must anticipate and support user reactions to interface elements
  - Choosing familiar images, symbols, words
  - Refining elements through abstraction
  - Promote affordances that users can recognize
• Which state has highest income?
• Relationship between income and education?
• Outliers?

<table>
<thead>
<tr>
<th>State</th>
<th>Per Capita Income</th>
<th>College Degree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minnesota</td>
<td>130,40%</td>
<td>144%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>134,5%</td>
<td>149%</td>
</tr>
<tr>
<td>Missouri</td>
<td>122,3%</td>
<td>153%</td>
</tr>
<tr>
<td>Montana</td>
<td>120,3%</td>
<td>158%</td>
</tr>
<tr>
<td>Nebraska</td>
<td>126,0%</td>
<td>162%</td>
</tr>
<tr>
<td>Nevada</td>
<td>123,3%</td>
<td>167%</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>124,4%</td>
<td>173%</td>
</tr>
<tr>
<td>New Jersey</td>
<td>120,1%</td>
<td>177%</td>
</tr>
<tr>
<td>New Mexico</td>
<td>125,5%</td>
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<td>189%</td>
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<tr>
<td>North Carolina</td>
<td>122,2%</td>
<td>192%</td>
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<tr>
<td>Ohio</td>
<td>122,3%</td>
<td>194%</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>128,5%</td>
<td>195%</td>
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<tr>
<td>Oregon</td>
<td>127,5%</td>
<td>197%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>127,2%</td>
<td>198%</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>128,5%</td>
<td>199%</td>
</tr>
<tr>
<td>South Carolina</td>
<td>124,9%</td>
<td>200%</td>
</tr>
<tr>
<td>South Dakota</td>
<td>125,9%</td>
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<td>120,1%</td>
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<td>Texas</td>
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</tr>
<tr>
<td>Utah</td>
<td>120,0%</td>
<td>204%</td>
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<tr>
<td>Vermont</td>
<td>125,1%</td>
<td>205%</td>
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<tr>
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<td>206%</td>
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<td>Wisconsin</td>
<td>129,0%</td>
<td>209%</td>
</tr>
<tr>
<td>Wyoming</td>
<td>125,7%</td>
<td>210%</td>
</tr>
</tbody>
</table>

Per Capita Income

College Degree %

Relationship between income and education should be explored through statistical analysis, such as correlation coefficients. Outliers can be identified using statistical methods, such as Z-scores or box plots.
Human Limitations for Short-Term Memory

- Miller’s $7 \pm 2$ magic number
  - People can recognize $7 \pm 2$ chunks of information at a time and hold these chunks in memory for 15-30 seconds
- Chunking
  - Ability to cluster information together
  - Size of chunk depends on knowledge, experience, and familiarity

Chunking Example 1

HEC ATR ANU PTH ETR EET
Chunking Example 2

THE CAT RAN UP THE TREE

Other Chunking Examples

- Image sequences
- Facial recognition
- Word/letter familiarity
- Hierarchies of information
- Others?
Leveraging Familiarity

- Choose a user interface “vocabulary” that people are used to reading or seeing
  - Display vs. Render; Copy vs. Reproduce
  - Document container icons are folders, not boxes
- Caution: many familiar words are ambiguous
  - View, update, object, enter
- 2nd caution: consider audience carefully
  - What is familiar to an adult may not be to a child; what is expected by one culture may be surprising to another

*Check out the many examples in the Interface Hall of Shame: http://www.iarchitect.com/*

Images: Realism and Refinement

- Realistic images recognized more accurately, but are more complex, take longer to process
- Analyze task carefully, remove unnecessary detail
Making Sense

- Last step in crossing the Gulf of Evaluation
  - Information has been perceived and interpreted
  - Users must “make sense” of information by relating it to their tasks, goals, and interests
- Designers must support people’s abilities to detect patterns and relationships
  - Consistent use of shape, size, color, position
  - Visual metaphors support real world knowledge
  - Information models (e.g., hierarchies) organize data
  - Dynamic displays cue users to structure

Napoleon’s March

Chart depicting the successive loss of French Army soldiers during Napoleon’s Russian Campaign (1812–1813).

What information encoding techniques are at work?
What does knowledge of visual metaphors (maps) tell you?
Is there an information model at work here?
How could dynamic displays help cue recognition?
Principles of Design

- Provide a good conceptual model
  - How does it work?
  - What does it say to the user? (don’t lie!)
- Leverage gestalt principles of perception
  - Proximity, similarity, closure, area, symmetry, continuity
- Make things visible (leverage affordances)
  - What can user see/feel/grab/push?
  - What does it look like it will do?

Stages of Action in HCI