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

Information Design

• 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 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 the 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

Human Vision

- Highest bandwidth sense (100 MB/sec)
- Parallel processing
- Pre-attentive
- Pattern recognition
- Extends memory and cognitive capacity
- People think visually
• Which state has highest income?
• Relationship between income and education?
• Outliers?

### Table - State Data

<table>
<thead>
<tr>
<th>State</th>
<th>College Degree %</th>
<th>Per Capita Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>20.8%</td>
<td>14,868</td>
</tr>
<tr>
<td>Alaska</td>
<td>30.3%</td>
<td>12,761</td>
</tr>
<tr>
<td>Arizona</td>
<td>27.1%</td>
<td>13,961</td>
</tr>
<tr>
<td>Arkansas</td>
<td>17.0%</td>
<td>10,920</td>
</tr>
<tr>
<td>California</td>
<td>31.3%</td>
<td>16,403</td>
</tr>
<tr>
<td>Colorado</td>
<td>35.7%</td>
<td>14,921</td>
</tr>
<tr>
<td>Connecticut</td>
<td>33.8%</td>
<td>20,189</td>
</tr>
<tr>
<td>Delaware</td>
<td>27.3%</td>
<td>15,954</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>36.4%</td>
<td>13,888</td>
</tr>
<tr>
<td>Florida</td>
<td>29.3%</td>
<td>16,830</td>
</tr>
<tr>
<td>Georgia</td>
<td>24.3%</td>
<td>13,931</td>
</tr>
<tr>
<td>Hawaii</td>
<td>31.2%</td>
<td>15,761</td>
</tr>
<tr>
<td>Idaho</td>
<td>35.2%</td>
<td>11,870</td>
</tr>
<tr>
<td>Illinois</td>
<td>26.8%</td>
<td>12,801</td>
</tr>
<tr>
<td>Indiana</td>
<td>20.9%</td>
<td>13,149</td>
</tr>
<tr>
<td>Iowa</td>
<td>24.8%</td>
<td>12,402</td>
</tr>
<tr>
<td>Kansas</td>
<td>28.5%</td>
<td>12,080</td>
</tr>
<tr>
<td>Kentucky</td>
<td>17.7%</td>
<td>11,152</td>
</tr>
<tr>
<td>Louisiana</td>
<td>35.4%</td>
<td>18,536</td>
</tr>
<tr>
<td>Maine</td>
<td>25.7%</td>
<td>12,987</td>
</tr>
<tr>
<td>Maryland</td>
<td>31.7%</td>
<td>17,719</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>34.5%</td>
<td>17,324</td>
</tr>
<tr>
<td>Michigan</td>
<td>24.1%</td>
<td>14,154</td>
</tr>
<tr>
<td>Minnesota</td>
<td>30.4%</td>
<td>14,469</td>
</tr>
</tbody>
</table>

![Per Capita Income vs College Degree %](image-url)
Napoleon’s March

How to Lie With Visual Displays

• Only show data ranges that accentuate your argument (chop off bottoms)
• Choose time spans appropriate for you
• Compare logarithmic data on a non-logarithmic graph
• Use multiple dimensions to show one-dimensional data
• Change scale in the middle of your graph
Another View
Good News or Bad News?

Logarithmic Scale
Dimensional Pictures

Changing Scale
How NOT to Lie With Visual Displays

• Show meaningful data ranges
• Choose representative time spans
• Use appropriate scales in displaying information
• Use dimensions in an appropriate manner
• Maintain a common scale throughout your graph

Gestalt Principles of Perception

- Proximity
- Similarity
- Closure
- Area
- Symmetry
- Continuity
Gestalt in User Interface Design

Try the “squint test”...
What principles are in action?

Images: Realism and Refinement

- Realistic images recognized more accurately, but are more complex, take longer to process

- Analyze task carefully, remove unnecessary detail
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/

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
Human Limitations for Short-Term Memory

• Miller’s 7 +/- 2 magic number
  - People can recognize 7 +/- 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?
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?