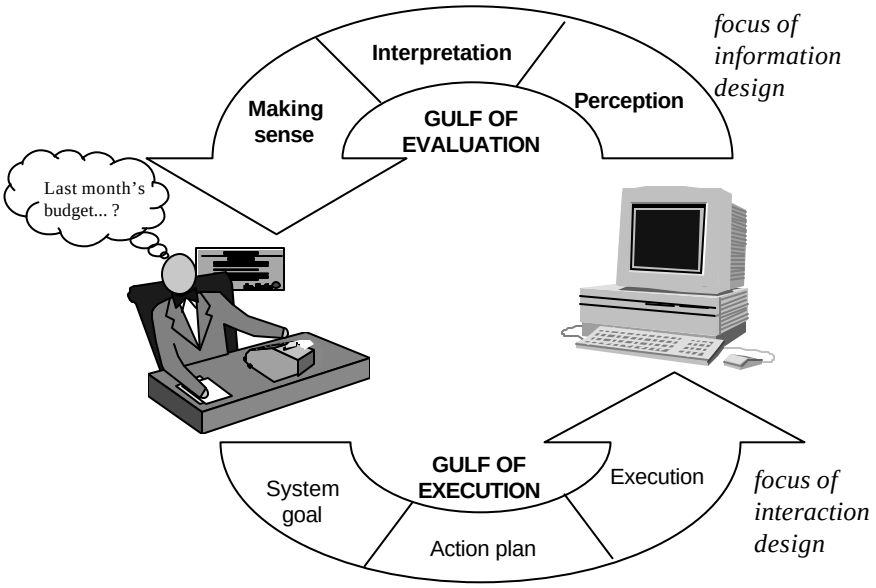
Information Design

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

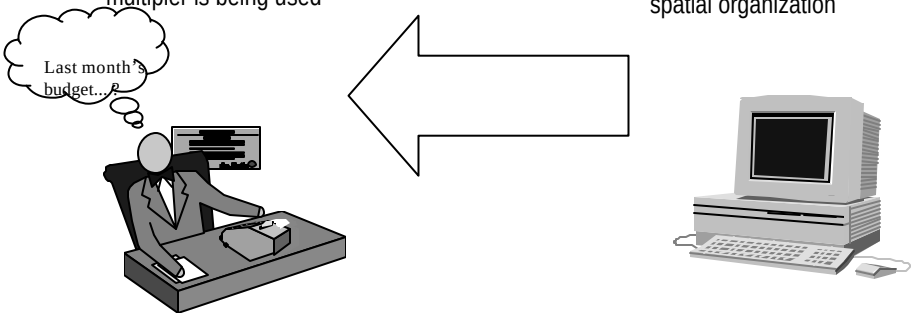


Making Sense of an Information Display

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

Making Sense
Income worksheet, Total tax income is being calculated, the wrong multipler is being used

Perception
color, shading, lines characters, squares, spatial organization



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

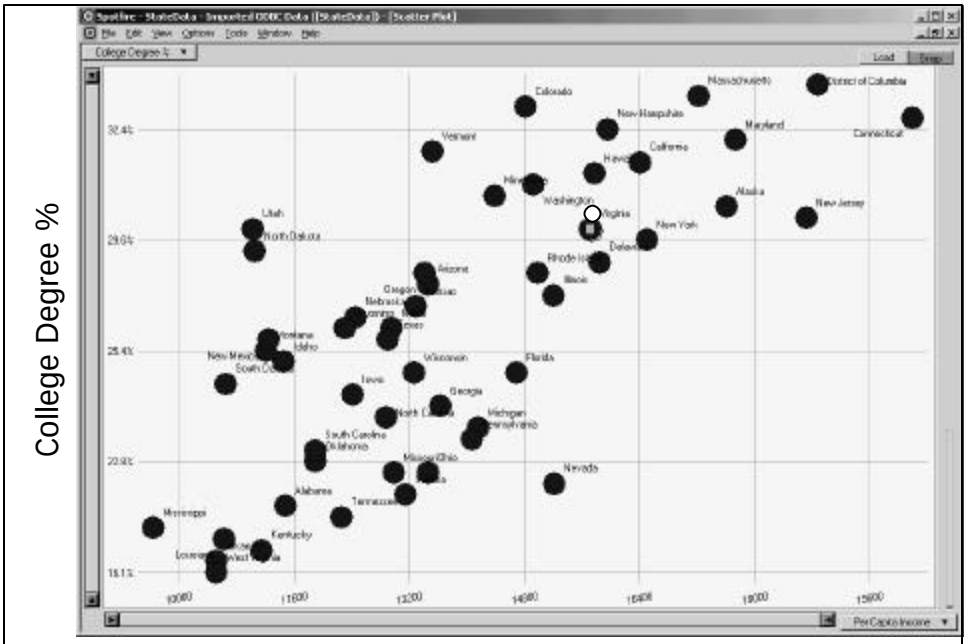
- Highest bandwidth sense (100 MB/sec)
- Parallel processing
- Pre-attentive
- Pattern recognition
- Extends memory and cognitive capacity
- People think visually

- Which state has highest income?
- Relationship between income and education?
- Outliers?

Table - StateData ()

Load | Snap

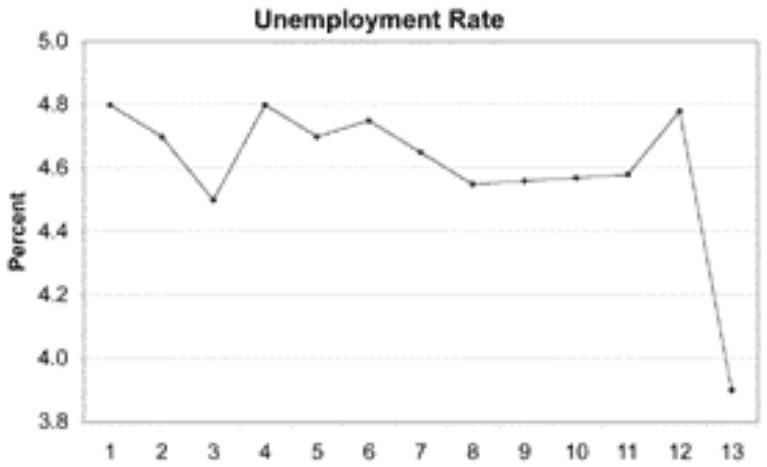
State	College Degree %	Per Capita Income
Alabama	20.6%	11486
Alaska	30.3%	17610
Arizona	27.1%	13461
Arkansas	17.0%	10520
California	31.3%	16409
Colorado	33.9%	14821
Connecticut	33.8%	20189
Delaware	27.9%	15854
District of Columbia	36.4%	18881
Florida	24.9%	14698
Georgia	24.3%	13631
Hawaii	31.2%	15770
Idaho	25.2%	11457
Illinois	26.8%	15201
Indiana	20.9%	13149
Iowa	24.5%	12422
Kansas	26.5%	13300
Kentucky	17.7%	11153
Louisiana	19.4%	10635
Maine	25.7%	12957
Maryland	31.7%	17730
Massachusetts	34.5%	17224
Michigan	24.1%	14154
Minnesota	30.4%	14389
Mississippi	19.9%	9648
Missouri	22.3%	12989
Montana	25.4%	11213
Nebraska	26.0%	12452
Nevada	21.5%	15214
New Hampshire	32.4%	15959
New Jersey	30.1%	18714
New Mexico	25.5%	11246
New York	29.6%	16501
North Carolina	24.2%	12885
North Dakota	28.1%	11051
Ohio	22.3%	13461
Oklahoma	22.8%	11893
Oregon	27.5%	13418
Pennsylvania	23.2%	14068
Rhode Island	27.5%	14981
South Carolina	23.0%	11897
South Dakota	24.6%	10661
Tennessee	20.1%	12255
Texas	26.6%	12904
Utah	30.0%	11029
Vermont	31.5%	13527
Virginia	30.0%	15713
Washington	30.9%	14923
West Virginia	16.1%	10520
Wisconsin	24.9%	13276
Wyoming	25.7%	12311



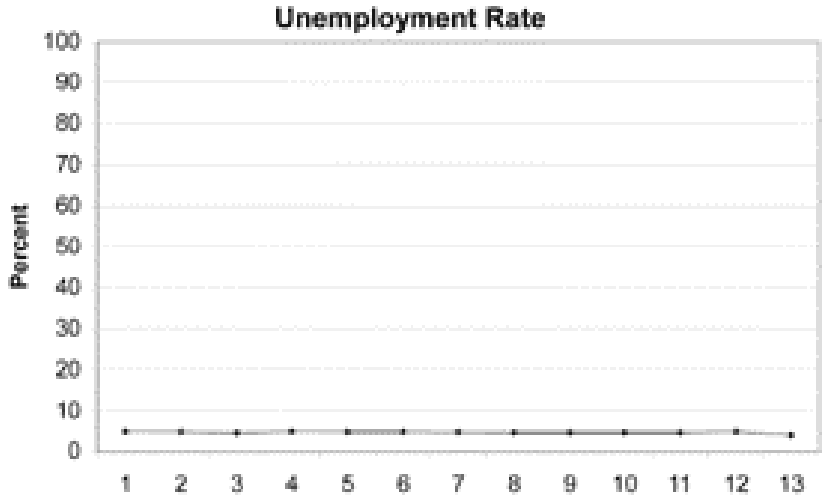
Napoleon's March

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

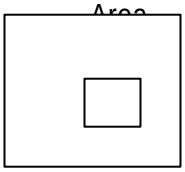
Gestalt Principles of Perception

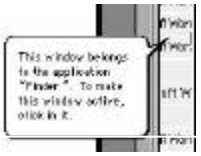
Proximity

Similarity

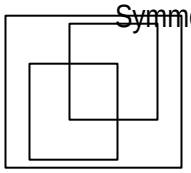
Closure

Area

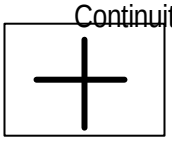


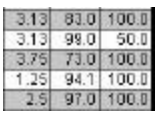


Symmetry



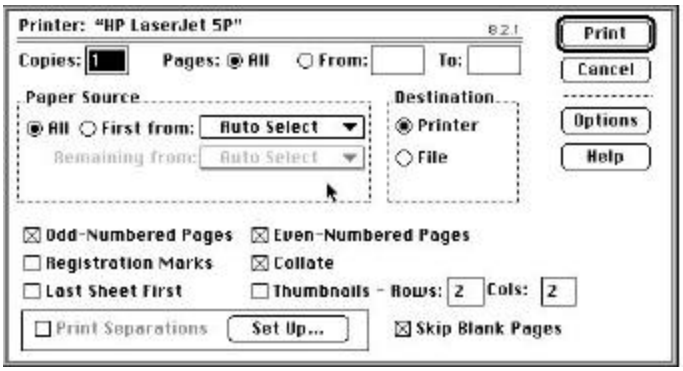
Continuity





3.13	83.0	100.0
3.13	99.0	50.0
3.75	73.0	100.0
1.25	94.1	100.0
2.5	97.0	100.0

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?