# Visualization Design
# Rules of Thumb
# Part I

Visualization Design Advice and Guideline

# Topics Outline

- No Unjustified 3D
  - The Power of the Plane
  - The Disparity of Depth
  - Occlusion Hides Information
  - Perspective Distortion Dangers
  - Tilted Text Isn't Legible
- No Unjustified 2D
- Eyes Beat Memory
- Resolution over Immersion
- Overview First, Zoom and Filter, Detail on Demand
- Responsiveness Is Required
- Get It Right in Black and White
- Function First, Form Next

# No Unjustified 3D

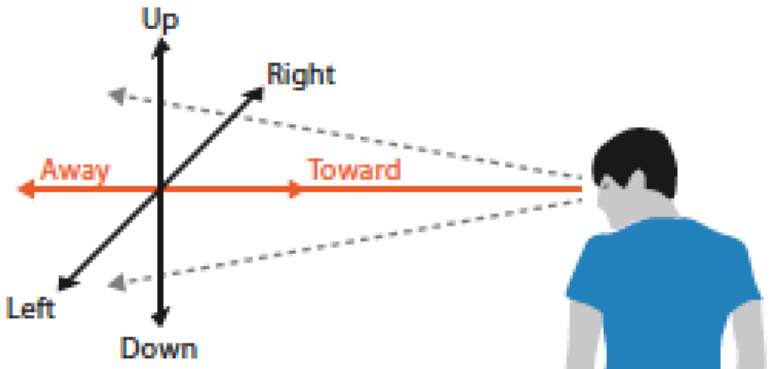
- 3D Vis is easy to justify when the task involves shape understanding from inherently 3D spatial data
- In other contexts, 2D visualization is better than 3D
- Issues to discuss:
  - The Power of the Plane
  - The Disparity of Depth
  - Occlusion Hide Information
  - Perspective Distortion Dangers
  - Tiled Text is Legible

# The Power of the Plane

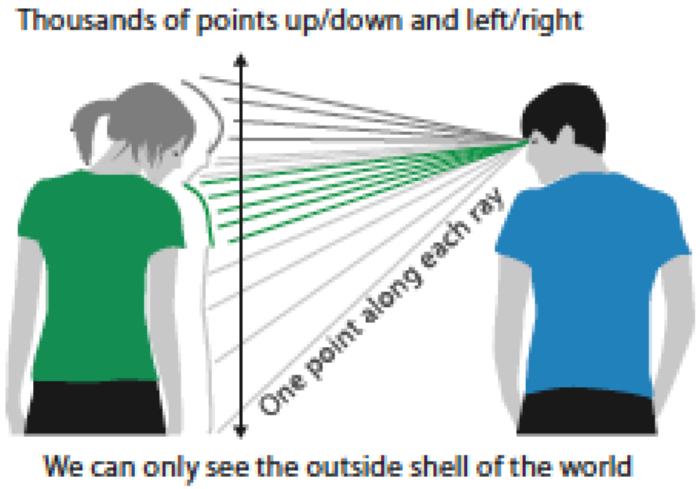
- Spatial position channels apply only to planner spatial position, not 3D positions
- Height position differences are perceived more important than horizontal differences
- But more horizontal pixels are usually given
- Reading conventions also matter when placing items (left to right, right to left, top down etc).

# The Disparity of Depth

- 2.5D or 2.05D (Ware)



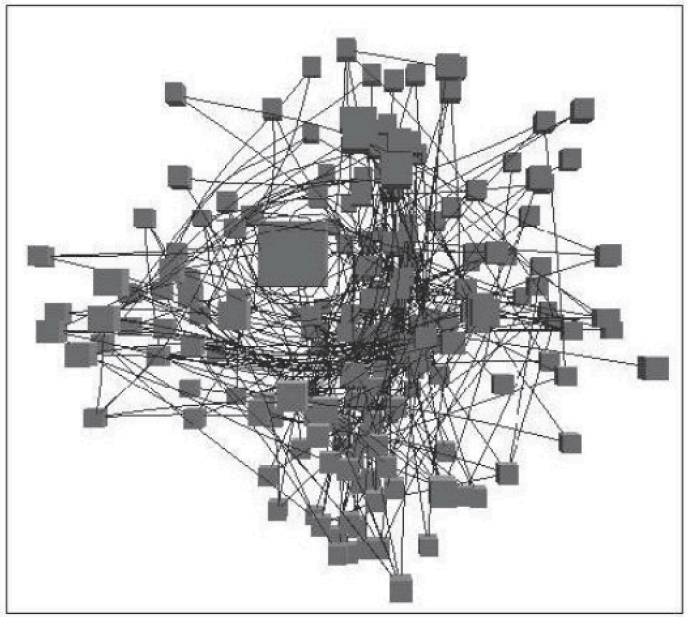

(a)




(b)

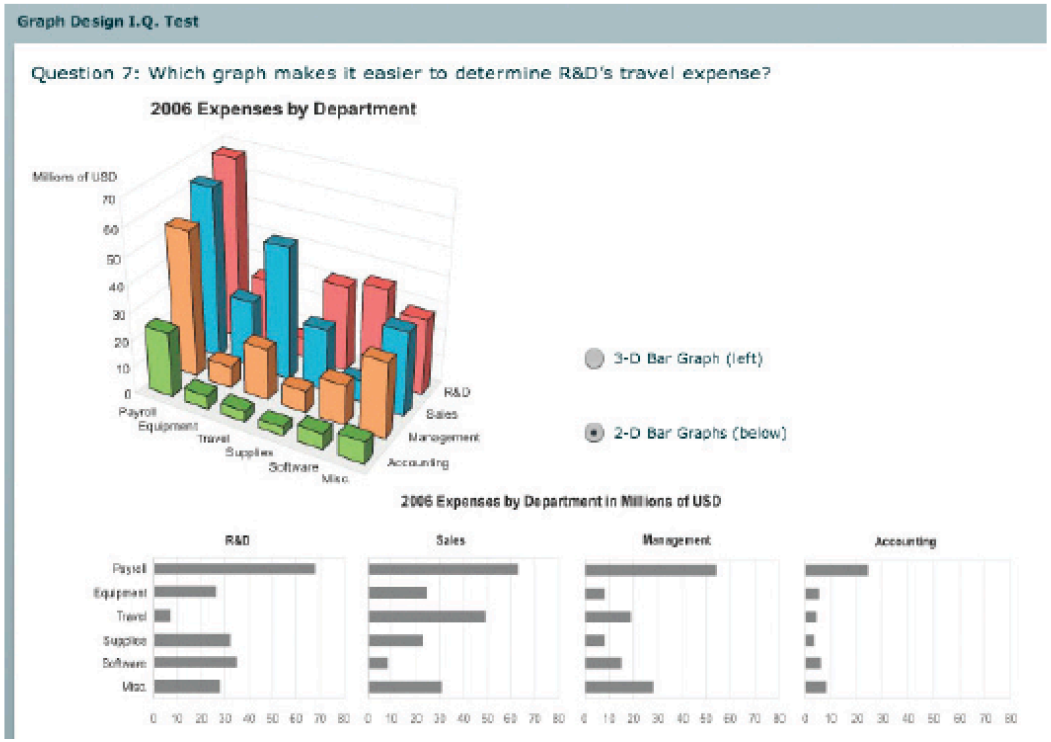
# Occlusion Hides Information

- Important information can be hidden, and discover of which via navigation is time consuming
  - People must use internal memory to remember what was seen in previous views



# Perspective Distortion Danger

- Distant objects appear smaller
  - The power of the plane (spatial position and size channels) is lost



# Other Depth Cues

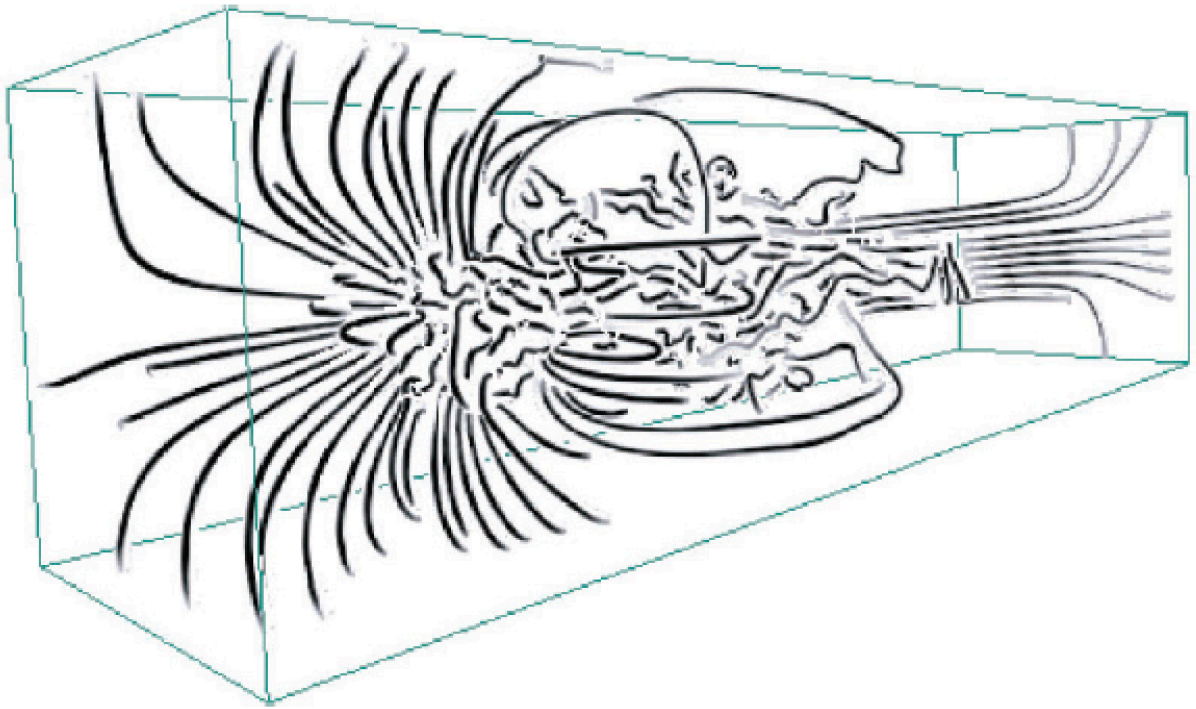
- Size – we can probably judge the size of a car based on its the distance but not for abstract data
- Shadows – cause visual clutter; shadow can occlude true marks; shadows interfere with colors
- Stereoscopic depth – only useful for nearby objects (an arm's length)

# Tiled Text is Not Legible

- 3D display can dramatically reduce text legibility
  - Text fonts are mostly designed for pixels on a 2D plane

# Benefits of 3D Display

- Shape perception



# No Unjustified 2D

- If data can be simply displayed with 1D list, then 2D needs to be justified
  - Lists can show the maximum of information in minimum space
  - Lists are excellent for lookup tasks
  - 2D visualization such as node and link networks are good for displaying topological information than lists

# Eye Bests Memory

- Using our eyes to switch between views that are visible simultaneously is easier than consulting our memory, i.e., lower cognitive load
- Topics to discuss
  - Memory and attention
  - Animation versus Side-by-Side View
  - Change blindness

# Eye Beats Memory

- Memory and attention
  - Our short-term memory is limited
  - Human attention also has limits (search for multiple terms)
- Animation vs. Side-by-Side Views
  - Animation is good when used for transitions between two data sets: maintain the context
  - But, making comparison between frames relies on internal memory
- Change Blindness
  - We fail to notice even quite dramatic changes if our attention is directed elsewhere

# Overview vs. Detail

- Overview first, zoom and filter, details on demand

  - Ben Shneiderman

  – Overview: give the user a broad awareness of the entire information space.
    - Example: Zoom out to show every data items
  – Zoom and filter: reduce the number of items shown in the visualization
    - Thresholding (e.g. age > 25)
  – Details on demand: show the details of the data item
    - Display the attributes as numbers