Relative luminance judgements
- perception of luminance is contextual based on contrast with surroundings

Relative color judgements
- color constancy across broad range of illumination conditions

Ch 6: Rules of Thumb

No unjustified 3D: Power of the plane
- high-ranked spatial position channels planar spatial position
  - not depth!

No unjustified 3D: Danger of depth
- we don’t really live in 3D: we see in 2.05D
- acquire more info on image plane quickly from eye movements
- acquire more info for depth slower from head/body motion

Occlusion hides information
- occlusion
- interaction complexity

No unjustified 3D example: Time-series data
- extruded curves: detailed comparisons impossible

Justified 3D: shape perception
- benefits outweigh costs when task is shape perception for 3D spatial data
- interactive navigation supports synthesis across many viewpoints

Towards Away
Up
Down
Right
Left
Thousands of points up/down and left/right
We can only see the outside shell of the world

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Perspective distortion loses information
- perspective distortion
  - interferes with all size channel encodings
  - power of the plane is lost!

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Why not animation?
• disparate frames and regions; comparison difficult vs. contiguous frames vs. small region vs. coherent motion of group
• change blindness – even major changes difficult to notice if mental buffer wiped
• safe special case – animated transitions

Resolution beats immersion
• immersion typically not helpful for abstract data – do not need sense of presence or stereoscopic 3D
• resolution much more important – pixels are the scarce resource – desktop also better for workflow integration
• virtual reality for abstract data very difficult to justify

Eyes beat memory
• principle: external cognition vs. internal memory
  – easy to compare by moving eyes between side-by-side views
  – harder to compare visible item to memory of what you saw
• implications for animation
  – great for choreographed storytelling
  – great for transitions between two states
  – poor for many states with changes everywhere
• consider small multiples instead

Eyes beat memory example: Cerebral
• small multiples: one graph instance per experimental condition – same spatial layout
  • color differently by condition

Overview first, zoom and filter, details on demand
• influential mantra from Shneiderman
  – overview = context, focus on details
  – progression and severity
  » especially useful for deciding what types of interventions to prescribe for the patient

Artery Visualizations for Heart Disease Diagnosis

Critique
• many strengths
  – carefully and well justified design, convincing human-subjects experiment
  – bringing visualization best practices to medical domain
• limitations
  – paper does not clearly communicate why colormap is diverging not sequential
  – answer by email
• construction of not represented correctly
  – extreme values in data remain very disparate (2-4 range): difficult to compare by moving eyes between side-by-side views

HemoViz: Design study + evaluation
• formative study with experts – task taxonomy
• HemoViz design
• deploy attempt fails – experts: demand 3D and shadows
• quantitative user study
  – med students: real data
  – 91% with 2D/line graph vs. 39% with 3D/shadows
  – experts: willing to use

Study results: Error

Study results: Time

Paper types: Validation
• design studies
  – qualitative discussion of result images/videos
  – abstraction & informal validation: case studies, field studies, design justification
  – technical/algorithm
• question discussion of result images/videos
  – algorithm validation for algorithm papers: computational benchmarks

Papers: Types, Reading Strategies
Paper structures
• typical research paper vs expectations for this course final report
  – more on implementation
  – novel research contribution not required

http://www.cs.ubc.ca/~tmm/courses/547-19/projectdesc.html#outlines

Reading visualization papers
• one strategy: multiple passes
  – title
  – abstract, authors/affiliation
  – flip through, glance at figures, notice structure from section titles
  – skim intro, results/discussion (maybe conclusion)
  – fast read to get big ideas
    – if you don’t get something, just keep going
  – second pass to work through details
  – later parts may cast light on earlier parts for badly structured papers
  – third pass to dig deep
    – if it’s highly relevant, or you’re presenting it to class

• literature search
  – decide when to stop reading: is this relevant to my current concerns?

Literature search
• this course: I will give you seed papers during our 1-on-1 meetings
• forwards vs backwards search
  – Google Scholar forward citations
    – only a subset of forwards & backwards citations will be what you need
  – building up landscape
    – authors/affiliations will have more signal as you develop expertise

In-Class Exercise:
Decoding

Reading for Next Time
• VAD book Ch 7: Arrange Tables
• VAD book Ch 10: Map Color and Other Channels
• paper: D3 (Data-Driven Documents)
  – [type: system]

[link: http://www.cs.ubc.ca/~tmm/courses/547-19/projectdesc.html#outlines]