Evaluations - Right Now
• official TA evaluations
• unofficial course evaluations - my custom form
• much more specific questions than the official ones
• I do not look at these until after official ones returned, long after grades are out
• please also fill out official teaching surveys for instructor (me!) at the CoursesEval website https://eval.olt.ubc.ca/science

Assignments
• project
  • P4 due today 5pm (plus grace/late days)
  • project 4 demo signup sheet, for last time
  • I will scan and post so you can check your time
  • you must contact me by Fri to schedule if you weren’t in class to sign up
  • there’s a 2% homework penalty
  • email me in advance if you need to change
    • otherwise 2% midterm penalty
• homework
  • H4 solutions released Friday
  • homework not accepted after Thu 5pm
  • again, if you hand in late, do include time/date at top
  • H4 will be graded before exam
    • stay tuned, I’ll announce on discussion group when they’re ready to pick up

Final Exam
• Apr 23 8:30-11:30am, location DMP 310
  • across the hall
  • exam will be 2.5 hrs
  • extra 30 min in case of fire alarms, etc
  • if we stayed at same level, midpoint above line (d<0)
  • doubling both sides
  • from $f(x,y) = 0$ to $2f(x,y) = 0$
  • $f(x,y) = (y_0 - y_1)x + (x_1 - x_0)y + x_0y_1 + x_1y_0$

Correction: Premultiplying Colors
• specify opacity with alpha channel: rgba(x,y,0,0)
  • 0: opaque, x,y, 0, 0: transparent
  • C = α(A + B)
• but what if D is also partially transparent?
  • $C + (1-α)A$ = (B + (1-α)α)B
  • $y = y_0 + (1-α)y + (1-α)αy$
  • 3 multiples, different equations for alpha vs. RGB

Clarification: Midpoint Check
• $f(x,y) = (y_0 - y_1)x + (x_1 - x_0)y + x_0y_1 + x_1y_0$
  • implicit equation: on line when $f(x,y) = 0$
  • above line when $f(x,y) < 0$
  • below line when $f(x,y) > 0$
• midpoint against line
  • midpoint to check is at $x+1$, $y+5$
  • if $f(x+1, y+5) < 0$ then midpoint is below line
  • $y = y_0 + 1$
  • $d = d + (x_1 - x_0) + (y_1 - y_0)$
  • if $d < 0$ then
    • $y = y + 1$
    • $d = d + (x_1 - x_0) + (y_1 - y_0)$

Review: Direct Volume Rendering

Review: Visual Encoding
• attributes
  • parameters, control, mark, appearance
  • separable channels
  • flowing from retina to brain

Review: Channel Ranking By Data Type

Office Hours
• extra TA office hours in lab 005 for P4/H4
  • Wed 4/14 2-4, 5-7 (Shailen)
  • Thu 4/15 3-6 (Kai)
  • Fri 4/16 11-4 (Garrett)
• my office hours for rest of term
  • Fri 4/16 4pm
  • by appointment - send me email to book
  • (I’m out of town 4/24-4/27, right after exam)

Graded Work
• still have some marked work not picked up, come grab it!
  • homeworks, midterms
• some extra handouts in lab
  • or print out yourself, everything posted on web site
  • don’t forget to check ugrad account for grading updates
  • find out what you got
  • also cross-check our records against yours

• position
  • size
  • grey level
  • texture
  • color
  • orientation
  • shape

Position
  • Height
  • Width
  • Depth

Lightness
  • Brightness

Hue
  • Tone

Slope
  • Angle

Volume
  • Area

Placement
  • Containment

Connection
  • Containment

Entrenchment
  • Containment

Physical Linking
  • Containment

Visual Linking
  • Geometric

Graphical Linking
  • Geometric

Interpretation
  • Spatial

Construction
  • Spatial

Material
  • Spatial

Semiotic
  • Spatial
Review: Integral vs. Separable Channels

• not all channels separable

[Colin Ware, Information Visualization: Perception for Design. Morgan Kaufmann 1999.]

Space vs Time: Showing Change

• animation: show time using temporal change
  • good: show process
  • good: flip between two things
  • bad: flip between many things
  • interference between intermediate frames

Space vs Time: Showing Change

• small multiples: show time using space
  • overview: show each time step in array
  • compare: side by side easier than temporal
  • external cognition vs internal memory
  • general technique, not just for temporal changes

Nonspatial/Information Visualization II

• pixel-oriented views
  • overviews with high information density
  • superimposing/layering
  • shared coordinate frame
  • redundant visual encoding

Composite Views

• internal structure where subregions have different visual channel encodings

Composite Views: Glyphs

• internal structure where subregions have different visual channel encodings

Dimensionality Reduction

• mapping from high-dimensional space into space of fewer dimensions
  • generate new synthetic dimensions
  • why is lower-dimensional approximation useful?
    • assume true/intrinsic dimensionality of dataset is (much) lower than measured dimensionality?
    • only indirect measurement possible?
    • fisheries: want sparse rates
    • have water color, air temp, catch rates...
    • sparse data in verbose space?
    • document: word occurrence vectors
    • 10k+ dimensions, want dozens of topic clusters

Parallel Coordinates

• only two orthogonal axes in the plane
  • instead, use parallel axes!

Parallel Coordinates

• point in Cartesian coords is line in par coords
  • point in par coords is line in Cartesian n-space
Par Coords: Correlation

Hierarchical Parallel Coords: LOD

Node-Link Graph Layout

- minimize
  - crossings, area, bends/curves
- maximize
  - angular resolution, symmetry
- most criteria individually NP-hard
  - cannot just compute optimal answer
- heuristics: try to find something reasonable
- criteria mutually incompatible

Force-Directed Placement

- nodes: repel like magnets
- edges: attract like springs
- start from random positions, run to convergence
- very well studied area!
- many people reinvent the wheel

Interactive Graph Exploration

- geometric and semantic fisheye

Treemaps

- containment rather than connection
  - emphasize node attributes, not topological structure

Cushion Treemaps

- show structure with shading
  - single parameter controls global vs local view

Beyond 314: Other Graphics Courses

- 424: Geometric Modelling
- 426: Computer Animation
  - was offered this year
- 514: Image-Based Rendering - Heidrich
- 526: Algorithmic Animation - van de Panne
- 533A: Digital Geometry - Sheffer
- 533B: Animation Physics - Bridson
- 533C: Information Visualization - Munzner

Beyond UBC CS

- SIGGRAPH conference in Vancouver next year!
  - August 7 - August 11 2011
  - ~29K people: incredible combination of research, entertainment, art
  - Electronic Theater, Exhibit, ETech, ...
  - pricey: but student rate, student volunteer program
- local SIGGRAPH chapter
  - talk series, SPARK FX festival, ...
  - http://siggraph.ca

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