CSE 557A | Oct 3, 2016

INFORMATION VISUALIZATION

TESTING FOR 2D INTERSECTIONS

Alvitta Ottley

Washington University in St. Louis

TODAY

- Work on the homework.
- Questions?
  - First ask your neighbor
    - Answer found: Share question and answer with class (someone might me wondering the same thing)
  - Answer not found: Pose the question to the class
  - Answer still not found: I will type the answer on Piazza
- Discussion strongly encouraged!

LINE-LINE (OR POINT) INTERSECTION

- Given two points P(Px, Py), Q(Qx, Qy)

- Solve for the line equation:
  - $ax + by = c$

- Start by finding $y = mx + d$
  - Note that m is the slope…
  - Plug in the numbers, solve for m and d
  - Rearrange to find a, b, c

- General form:
  - $(p_y - q_y)x + (q_x - p_x)y = (q_x p_y - p_x q_y)$

LINE-POINT INTERSECTION

Given ax + by = c for a line segments, find if a point (p, q) on the line:

1. Solve:

   a(p) + b(p) = c

2. If a(p) + b(p) – c = 0 then the point is on the line

LINE-LINE INTERSECTION

- Given ax + by = c for two line segments, find if they intersect
  - a1x + b1y = c1
  - a2x + b2y = c2
- Multiply the top equation by b2, bottom by b1
  - a1b2 x + b1b2 y = c1b2
  - a2b1 x + b1b2 y = c2b1
  - Subtract bottom by top
    - (a1b2 –a2b1)x = (c1b2 –c2b1)
    - X = (c1b2 – c2b1) / (a1b2 – a2b1);
- Multiply the top equation by a2, bottom by a1
  - a1a2 x + b1a2 y = c1a2
  - a1a2 x + b2a1 y = c2a1
  - Same as above, get
    - Y = (c1a2 – c2a1) / (b1a2 – b2a1), //which is the same as
    - Y = (c2a1 – c1a2) / (b2a1 – b1a2); //rearrange the det
    - Y = (c2a1 – c1a2) / (a1b2 – a2b1);

LINE-LINE INTERSECTION

- double det = $A_1*B_2 - A_2*B_1$
- if(det == 0) {
- 	//Lines are parallel
- }
- else {
- 	double x = $(B_2*C_1 - B_1*C_2)/det$
- 	double y = $(A_1*C_2 - A_2*C_1)/det$
- }
- //need to check for the range if doing line-segment to line-segment test