

CS 266 Homework 6

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Due Date: May 22

Problem 6.13

As a vertical line sweeps across, it will be making a trapezoid.

At a left endpoint, there are three trapezoids:

1. One already existing to the right
2. One being made above existing segment
3. One being made below existing segment

There are n segments and thus $2n$ endpoints. Considering that there are 3 trapezoids at each endpoint, this makes $6n$ trapezoids. However, we are double counting each trapezoid, making it $3n$ trapezoids. We are not however double counting in the case of the first endpoint that is considered because the trapezoid before it was not created by another endpoint, thus that adds 1 trapezoid. This means that there are at most $3n + 1$ trapezoids for n line segments.

Problem 6.15

Although we have started with the point location problem on the surface of the earth, we have only treated planar point location. But the earth is a globe. How would you define a spherical subdivisiona subdivision of the surface of a sphere? Give a point location structure for such a subdivision.

Divide the sphere into cross-sections by x-coordinate. The top and bottom ones would be degenerate ones. You then divide up the cross-sections.

Identically, each point on the surface of the sphere can be described by two angles (θ, ϕ) . You can take these coordinates for each point and put them into a 2-D space and then do the point location map. Vertical segments will correspond to the cross sections described above.