CS531 Computational Geometry

Problem Set 3
Subdivision and Triangulation

Handed out: Monday, February 6
Due: Monday, February 13

Problem 1. Subdivision

This problem optimizes the sweep algorithm for convex polygons.

(a) Prove that two convex polygons with a total of n vertices have at most n intersection points.

(b) How does this improve the asymptotic running time of the sweep algorithm?

(c) Describe a modified sweep algorithm that computes the intersection points in $O(n)$ time.

Problem 2. Triangulation

This problem extends the polygon triangulation algorithm to inner boundaries.

(a) Explain why the proof that every polygon has a triangulation still works or fix it if necessary.

(b) The incoming and outgoing edges of vertex v_i are no longer e_{i-1} and e_i. Explain how to find them using the doubly linked list representation.

(c) Explain how dangling edges are handled.

Problem 3. Greedy Triangulation

Explain why the greedy triangulation algorithm treat the last point specially.