The Delaunay Triangulation

MATH 261 Computational Geometry

1. Let S be a planar point set, and start with any triangulation T of S. Repeat the following process: If T has an illegal edge, flip it to remove it. Will this lead to the Delaunay triangulation of S? Why or why not?

2. Suppose you have a Delaunay triangulation of a set of points S. If you add a new point p, describe an algorithm for updating the triangulation to obtain the Delaunay triangulation of $S \cup \{p\}$.

3. Does the Delaunay triangulation minimize the total length of all edges in a triangulation? Either explain why or find a counterexample.

4. Consider the following *greedy algorithm* for constructing a triangulation of a set of n points: Compute all $\binom{n}{2}$ distances between pairs of points. Consider all possible edges from shortest to longest, and decide whether to include each edge in the triangulation. If the edge does not cross any previously included edge, then include it in the triangulation.

Does this algorithm produce the Delaunay triangulation? Does it produce the min-weight triangulation?