CS133 Assignment 5

Due date: Thursday 6/6/2019 , 11:59 PM

1. (2 points) One of the primitives we use in Delaunay triangulation algorithms is to test whether a point lies inside the circumcircle of three other points. In other words, given four points $p_1 \dots p_4$, test whether the point p_4 lies inside the circumcircle of p_1, p_2, p_3. Describe how to make this test efficiently.
2. (2 points) In Fortune's plane-sweep algorithm of Voronoi diagram, one parabola can appear more than once in the beach line, i.e., the BST τ. For n sites, what is the upper bound on the number of occurrences of a specific parabola? Can you craft an example where one parabola reaches this upper limit?
3. (3 points) Given a set P of points in the plane, describe an algorithm that finds one Voronoi cell for a designated site p_i without computing the entire Voronoi diagram. Provide a pseudo code and analyze the running time of your algorithm.
4. (3 points) Given a set of sites P and their Delaunay triangulation represented in a DCEL data structure. Describe an algorithm that, given a site p_i, computes the Voronoi cell for this site $V(p_i)$. Provide a pseudo-code and analyze the running time of your algorithm.