

CS504 PhD qualifying exam

1. Describe a plane sweep algorithm for computing the Voronoi diagram of n points in the plane. Define the events, the data structure to store the events, and the data structure for the sweepline status, and how to process each event. Analyze the running time of your algorithm.
2. Compute the average number of Voronoi vertices in the Voronoi diagram of n points in the plane. Justify your answer.
3. For each of the computations below indicate how efficiently one can perform the calculation in term of big-O notation (e.g., $O(n)$, $O(\log n)$, $O(n \log n)$, $O(n^2)$). Try to give the best upper bound possible. Justify your answer briefly.
 - (a) Determine whether or not a set S of n line segments in the plane has *any* point of intersection among the segments.
 - (b) Compute the Euclidean minimum spanning tree of n points in the plane.
 - (c) Given a set P of n points in the plane, determine the closest pair.