Serena Zheng
COS 451
January 14, 2016

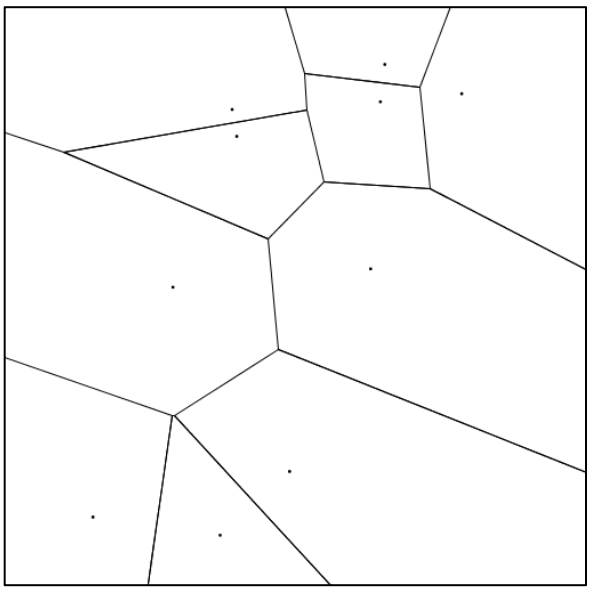
Final Project: Computing Voronoi Diagrams

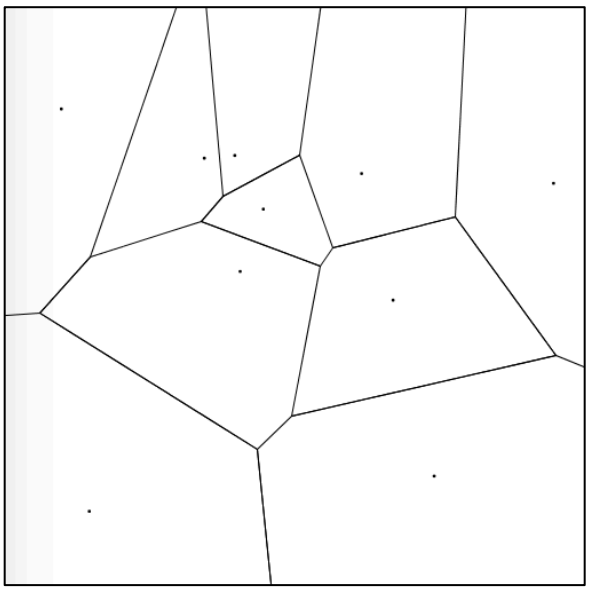
Timing: The main data structure used in Fortune's sweep line algorithm is a binary tree that represents a beach line, which is comprised of a series of parabolas (equidistant from each processed site and the sweep line) and vertices bisecting adjacent sites. When the algorithm handles a new site or a new vertex, the process requires adding or removing node(s) from the tree, which takes O (log *n*) time. Since the total number of events is linear (the number of faces on the Voronoi diagram is equal to the number of sites N, so the maximum number of vertices on any face will be some multiple of N), overall runtime of the algorithm is O (*n* log *n*). Below is empirical evidence captured on my laptop from my implementation of Fortune's algorithm.

N	time (s)
10000	0.123
20000	0.189
40000	0.354
80000	1.067
160000	2.615
320000	6.186
640000	22.857
1280000	71.449

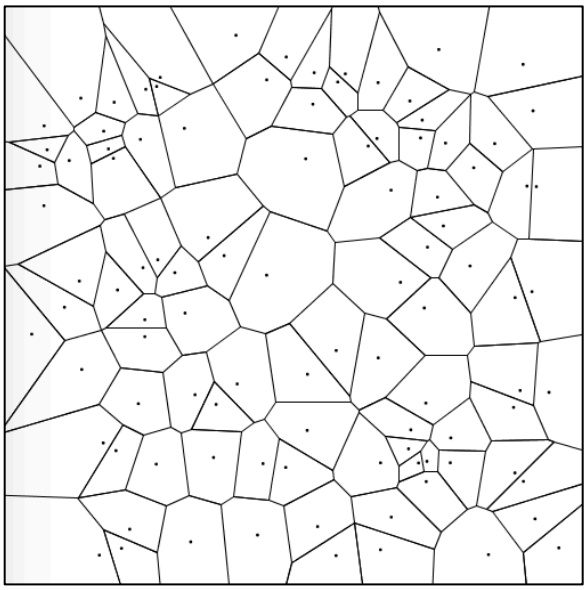
Graphical evidence:
Command: % java-introcs Voronoi N

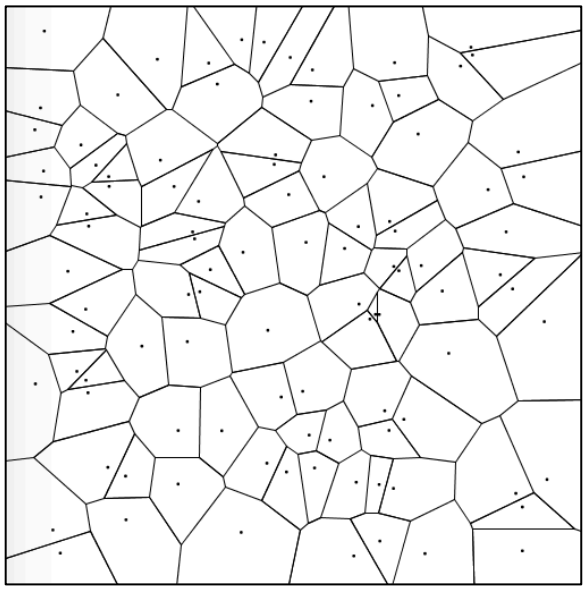
N = 10



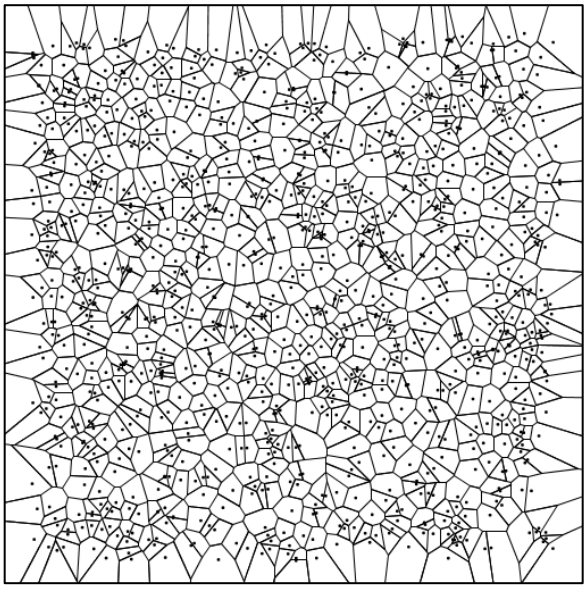


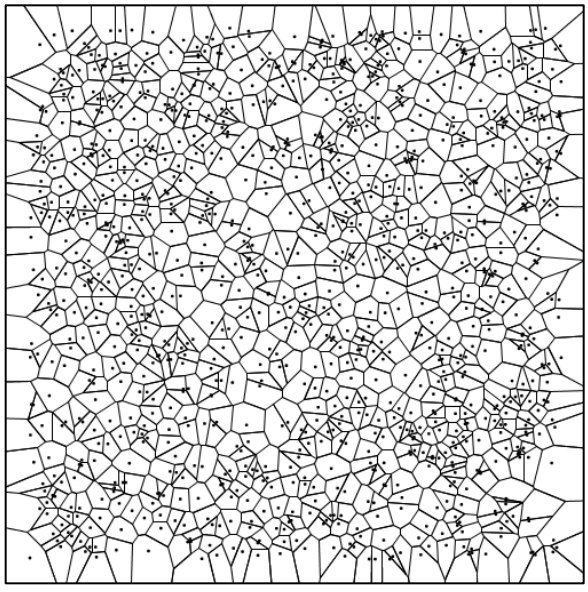
N = 100





N = 1000





N = 10000