Implementation of Two Delaunay Triangulation Algorithms and Comparing Their Performance

Group Members
Elif Kurtay 21803373          Atakan Dönmez 21803481

Project Description
For our project we will be implementing two different algorithms for Delaunay Triangulation in two dimensions. The algorithms are The Randomized Incremental Algorithm and The Planar Divide-And-Conquer Algorithm. The project will feature an interface upon which the user is able to adjust the parameters and examine the 2D nature of the triangulation graphically. Due to the three algorithms following different solutions to the triangulation, differences in performance are expected to occur and they are to be tested and reported as part of the project.

Algorithm Descriptions
The algorithms will be further inspected and analysed during the implementation phase however here are an overview of the aforementioned algorithms.

1. The Randomized Incremental Algorithm
The algorithm updates the Delaunay Triangulation by incrementally adding a vertex at each step. Addition of a new vertex to the triangulation requires partitioning the Delaunay faces that contain the new vertex to create new faces. The algorithm is expected to have a worst-case runtime of $O(n\log n)$.

2. The Planar Divide-And-Conquer Algorithm
The algorithm uses splitting lines to recursively divide the set of vertices in half and compute the Delaunay Triangulations separately to then merge them back again. The algorithm is expected to have a worst-case runtime of $O(n\log n)$, however for some specific distributions the algorithm may run on $O(n\log n)$ or even $O(n)$. 