

**CS 478**

**Computational Geometry**

Project Proposal

*Three Delaunay Triangulation*

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# Proposal

In this project, the Three Delaunay Triangulation algorithm for triangulating a set of points in a two-dimensional plane will be implemented. A Delaunay triangulation for a given set P of discrete points in a generic location is a triangulation DT(P) such that no point in P is inside the circumcircle of any triangle in DT in mathematics and computational geometry (P). Delaunay triangulations aim to optimize the minimal angle of all the triangles in the triangulation, avoiding sliver triangles.

In this project, the implementation given in the textbook from the course materials [1] will be taken as the source of truth. Also, another source for us is to sample explanations and test sets [2]. Three Delaunay Triangulation algorithm implementations will be made according to the given specifications and will have the same asymptotic complexity. The algorithm will be implemented using the Randomized Incremental Algorithm. This is an incremental method in which elements are added in random, uniform order.

In order to interact with the algorithm and observe the results, it will be presented through an application interface that displays computational graphics and visualizations. The user interface will allow features such as zoom in, zoom out, rotate and flip when analyzing Delaunay triangulations. This program will allow users to run the algorithm in any input size. It will also allow users to monitor algorithm speed and make performance analyses.

In the test part, a set of randomly generated points on a two-dimensional plane will be given as the input to the program. The number of points in the input will range from a hundred to one million to analyze the performance of the implementation in question. Then the performance results will be compared to the theoretical asymptotic complexities known beforehand.

# References

[1] S.T.E.V.E.N. FORTUNE, “Voronoi diagrams and Delaunay triangulations,” Lecture Notes Series on Computing, pp. 225–265, 1995.

[2] Delaunay triangulation project. (n.d.). Retrieved February 21, 2022, from https://people.eecs.berkeley.edu/~jrs/274/proj.html