Implementation of Three Voronoi Diagram Computation Algorithms and Comparing Their Performance

In this project, a program that calculates and visualizes the Voronoi Diagram of a set of points in 2D will be implemented. While calculating the Voronoi Diagram, the following three algorithms will be used:

- Randomized Incremental Algorithm
- Fortune’s Algorithm which uses a sweepline across the plane
- The Flipping Algorithm that starts with an initial arbitrary triangulation and converts it by flipping the diagonals. Lexicographic Triangulation will be used for creating the initial arbitrary triangulation.

The program will generate a set of random points in 2D using various distributions as input and calculate and visualize the 2D Voronoi Diagram as graphical output. The program will have an easy-to-use user interface with the following features:

- Specifying the number of points
- Zooming in/out, and translating while the 2D Voronoi Diagram is displayed.

Different colors will be assigned to each cell of the Voronoi Diagram for better visualization. Moreover, the steps of Fortune’s Algorithms will be visualized to observe how the visual result of the current Voronoi Diagram changes as the algorithm proceeds.

Lastly, the program will be tested with arbitrary point sets in 2D and the performance of each algorithm will be compared thoroughly in a report. The number of test cases will vary between 100 and 1,000,000.