

National and Kapodistrian University of Athens

Faculty of Sciences

Department of Informatics and Telecommunications

Spring Semester: 2022-23

Computational Geometry Computational Exercise

Implementation 1: Convex Hull

1. Implement the following algorithms for finding the convex hull in the plane:
 - Incremental algorithm
 - Gift wrapping algorithm
 - Divide and Conquer algorithm
 - QuickHull algorithm
2. Discuss the behavior of the above algorithms in degenerate cases.
3. Implement an algorithm for finding the convex hull in 3 dimensions.

Application 1:

1. Consider 80 random points in the plane.
 - (a) Find their convex hull using the algorithms mentioned above. Present the results as a list of points and schematically.
 - (b) Visualize the steps of one of the above algorithms for constructing the convex hull.
2. Consider various sets of points in the plane and compare the above algorithms based on their implementation time and the quality of the results obtained.
3. Consider 50 points in 3D space and apply the algorithm you have implemented to construct their convex hull.

Algorithm Implementation:

The implementation of the algorithms can be done either in Python or using the CGAL library in C++.

Submission Guidelines:

You will submit a compressed file in the "Assignments" section of e-class. The compressed file should contain:

- All C++ or Python programs.
- A text file with presentation and commentary on the results.
- A presentation file (optional).