CENG 570
Computational Geometry
Assignment #1
Programming Assignment on Convex Hulls

Due Date: March 4, 2018 23:55 (via ODTU-CLASS)

In this assignment, your goal is to implement convex hull algorithm and analyze its running time for the Farthest Points problem.

You will be given a set of N points as a text file (each point is unique in the file, i.e., there are no duplicate points). The first line will contain the number of points and the following N lines will contain the tab-separated x and y coordinates of the N points, one point per line. The coordinates will be integer coordinates in the range [0 : 2,147,483,647]. The coordinates of the points are from a uniform random distribution in this range. Your goal is to write a program to find the farthest pairs of points (each solution is unique in the provided input datasets). As output you have to specify the indices of the points, smaller index point first. The indices of the points start at 1 and end at N and are assigned to the points in the order they appear in the input file.

In this assignment, will be implementing two solutions to solve this problem: 1) Exhaustive search for the farthest pair by computing the distances between every pair of N points. Computational complexity: $O(N^2)$. 2) First compute the convex hull then find the farthest pair by examining each pair of convex hull vertices. Computational complexity: $O(N\log N + k^2)$, where k is the number of vertices of the convex hull of N points. After implementing the two solution in any language you want, you are going to report the solutions along with the running time performance of the solutions on the 10 input datasets provided at the following link:

http://www.ceng.metu.edu.tr/~tcan/ceng570_s1718/hw1inputs.zip

You should report the solution and the time required for each individual test dataset.

Provide a short, one-paragraph analysis of your results along with the table showing the times.

Submit your report as a single PDF, JPEG, or WORD document along with the source code of your solution (in the Appendix) via ODTU-CLASS before the deadline.

Notes: You are free to use any programming language of your choice. You are free to use any resource including source codes you find on the Internet provided that you cite them properly in your report and in your code.

Late submission policy: Late submission is allowed with 20 points penalty per day.