Indian Institute of Information Technology Kalyani

Algorithms - II
Assignment - 1, 15/09/2020

Due date: 23/09/2020

1. (a) Implement Graham's scan algorithm for convex hull computation.
   (b) Let P_1 and P_2 be two disjoint convex polygons with n vertices in total. Write an $O(n)$ time algorithm that computes the convex hull of $P_1 \uplus P_2$. Use this implementation to compute convex hull of a point set using *Divide and Conquer*.
   (c) Measure the running times of your two implementations (in (a) and (b)) along with the brute force algorithm (total three) on randomly generated point sets (at least ten random input samples; each sample with at least 1000 points) and report the followings as plots:
   the output size as a function of the input size, the running time as a function of input size, the running time as a function of the output size.
   Are the implementations output-sensitive?

2. Compute the convex hull of the following numeral image and show the convex bounding box (the image is shared in classroom).

3. Suppose, you have to report how many concave pockets are there in a simple concave polygon. Write a program to report the number of concave pockets (also the pockets as sequences of vertices). For example, in the following figure there are 3 pockets.

Concave pockets =3