

Divide-and-Conquer Algorithm

MATH 261 Computational Geometry

Input: a set S of n points in the plane, specified by xy -coordinates

Output: a list L of vertices of $\text{conv}(S)$ in counterclockwise order

Algorithm:

1. Sort the points by x -coordinate.
2. Let A be the left half of the points and B the right half of the points.
3. Find the convex hulls of A and B separately. If either set contains three points or fewer, this is trivial; otherwise use the divide-and-conquer algorithm.
4. Merge the convex hulls of A and B to form a single convex hull.

Answer the following questions:

1. Draw your own set of points. Work through the divide-and-conquer algorithm by hand to find the convex hull of your points.

2. How do we merge two convex hulls? Suppose you have left and right hulls, each specified by a list of vertices in counterclockwise order. Create an algorithm to compute the merged hull. How efficiently can you do this?

3. What is the overall computational complexity of the divide-and-conquer algorithm?

4. Download the incomplete Mathematical implementation of the divide-and-conquer algorithm from the course website. Complete the missing code to finish the implementation.