

Convex hulls

The Graham scan, Giftwrap and Monotone chain convex hulls



June 6, 2017

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**Giftwrap Algorithm**

The gift-wrap algorithm generally works by having an inner loop which runs through and checks every point in the set of points. The outer loop then checks for each point on the hull. This is generally how this algorithm works. This gives this algorithm a run time of O(**nh**), **n** being the total number of points and **h** being the number of points on the convex hull. The run time is fairly fast through testing the provided data sets. However, as the function (def readDataPts(filename, N): ) increases as N increases, which increases how many lines or points are included in the scan algorithm (especially towards the 30000 lines maximum) a noticeable delay is seen.

**Graham scan Algorithm**

Sorting the points on a graham scan algorithm gives a time complexity of O (n log n), **n** being the total number of points. Unlike the gift-wrap algorithm where n increases linearly based on the number of hull vertices. However, as the function (def readDataPts(filename, N): ) increases as N increases, which increases how many lines or points are included in the scan algorithm (especially towards the 30000 lines maximum) a noticeable delay is seen.

**Monotone chain Algorithm**

The chosen algorithm for amethod (the last method which was to be a chosen method of our choice) was the Monotone chain algorithm. The monotone chain convex hull algorithm constructs the convex hull of a set of 2-dimensional points in O(n log n) time.

It does so by first sorting the points lexicographically (first by x-coordinate, and in case of a tie, by y-coordinate), and then constructing upper and lower hulls of the points O(n) time.

**RESOURCES**

1. "Algorithm Implementation/Geometry/Convex Hull/Monotone Chain." *Algorithm Implementation/Geometry/Convex Hull/Monotone Chain - Wikibooks, Open Books for an Open World*. WIKIBOOKS, Accessed on 07 June 2017.