

Project Proposal

I intend to do the following project: “(32). *Implement and experiment with Timothy Chan’s convex hull algorithm ($O(n \log h)$) in 2D. Ideally, show an animation of the algorithm to help make it clear how it works.*”

Problem: Timothy Chan’s Ultimate convex hull algorithm. This algorithm splits the input points into m groups, each of size n/m . Ideally, the value of m will be h , otherwise we will use repeated squaring until m is greater than or equal to h . The algorithm works by computing the m convex hulls of the smaller point sets of size n/m . This is done in $O(n \log m)$ total time. Next the algorithm will perform only m steps of gift wrapping on these smaller hulls, in order to create the overall convex hull. If m is greater than or equal to h , then this will complete, and we will have the convex hull in $O(n \log h)$. If m is less than h , we will square the value of m , and attempt the previous steps again.

Plan: In order to implement this algorithm, I will need to implement the following other algorithms used by Chan’s: Any $O(n \log n)$ CH algorithm (Graham’s scan, Divide and conquer, etc) and Gift wrapping. I intend to code the algorithm using python, and have a graphical display using matplotlib. I would have an option to run the algorithm with and without graphical display. When not displaying the graphics, this would make it easier to time the algorithm and compare to the implementation of the other ($O(n \log n)$) CH algorithm implemented.