Quick Hull

Madiba Hudson-Quansah

Kelvin K. Ahiakpor

Ronelle Cudjoe

Tanitoluwa O. Adebayo

Algorithm Design and Analysis

Mr. Samspon Asare

Prof. Olaf Hall-Holt

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1 What is a Convex Hull?

2 Algorithms for finding the convex hull?

3 Quick Hull

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Algorithm 1 QuickHull (S)
\triangleright Find convex hull from the set S of n points, where n \ge 3
\triangleright Input: A set S of n points
\triangleright Output: The set H of the points that make up the convex hull
 1: H := \{\}
                                                                              ▶ The convex hull
 2: Find left and right most points, A and B to convex hull
 3: The segment AB divides the remaining n-2 points into two groups S_1 and S_2 where
    S_1 are points in S that are on the right size of the segment AB
 4: FINDHULL(S_1, A, B)
 5: FINDHULL(S_2, B, A)
 6:
 8: function FINDHULL(S_k, P, Q)
                                       \triangleright Find points in convex hull from the set S_k of points
 9:
                                               \triangleright that are on the right side of the segment PQ
10:
11:
       if S_k has no points then
12:
           return
13:
       end if
14:
        From the set of points S_k find the farthest point C from the segment PQ.
15:
        Add point C to H at the location between P and Q
16:
17:
       The three points P, Q and C partition the remaining points of S_k into 3 subsets: S_0,
    S_1 and S_2, where:
        S_0 are points inside the triangle PCQ, S_1 are points on the right side of the segment
18:
    PC, and S_2 are points on the right side of the segment CQ
        FINDHULL(S_1, P, C)
19:
        FINDHULL(S_2, C, Q)
20:
21: end function
```