



Bangladesh University of Engineering and Technology

Course No: CSE 204

Course Title: Data Structure & Algorithm - I

Offline Assignment – 8

DIVIDE AND CONQUER

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Complexity Analysis

Here in this offline we had to approach divide and algorithm process to find the second closest point. So at first we had to sort the points with respect to X axis for n points it took asymptotically $O(n \log n)$ times.

Then to find the second closest point, the complexity of divide and conquer algorithm produced the following recurrence relation

$$T(n) = 2T(n/2) + Cn \text{ ----- (1)}$$

Here divide and combine process took $O(n)$ times

Complexity for Merging:

In the merging process we had to build a rectangular strip to find the second closest pair of points. In the strip there can be at most n points and every points can be compared at most 7 times with the other points in the strip to find the second closest one ignoring the closest point which was previously found. So in the strip, for at most n elements the combine step took at most $(7n+k)$ times which can be denoted by $O(n)$

Solving Recurrence Relation:

Here ,the recurrence relation is ,

$$T(n)=2T(n/2) + Cn$$

Using master theorem, $a=2, b=2, f(n)=Cn$

$$f(n) = Cn = O(n^{\log_2 2})=O(n)$$

So, 2nd case will be applied and according to 2nd case ,the complexity is

$$T(n) = O(n \log n)$$

As the same algorithm was used twice to find the second closest one and the points was sorted initially ,So,

Total asymptotic complexity,

$$T(n) = O(n \log n) + O(n \log n) + O(n \log n) = O(n \log n)$$