

Closest Pair Report

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May 13, 2020

1 Results

The script shows all files to have the right output. It takes the program on average to run the largest file 10 seconds, with 2 seconds being devoted to reading the input and 8 seconds being used by the actual recursion.

2 Implementation details

The solution was implemented using the divide and conquer principle. We use two arrays as data structures, where one stores the points by increasing x-coordinate and one by increasing y-coordinate. These are sorted before the recursion starts. We also pass in a range for the x-array so we don't have to recreate it every time.

The overall running time is $O(n \log n)$; the sorting of the arrays before the recursion starts costs $O(n \log n)$. In the recursion, the divide step costs $O(n)$ as dividing the y-array is a $O(n)$ operation; we find the shortest distance in both halves and then we find the shortest distance in the strip, which is at most a $O(n)$ operation. Because no operation is more than $O(n)$, we can use the master theorem to find that the overall time complexity of the recursion, and thus also the program, is $O(n \log n)$.