



HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK UNIVERSITY

Fall 2021

T-301-REIR, Reiknirit

S2: Pattern Recognition

Mikael og Valur

kt. 101299-8329

kt. 220500-2170

Group 42

September 24, 2021

TA: Bent Ari Gunnarson

1 Implementation

Brute force

The brute force method for this problem is simply to go through every unique combination of four points and check if they are in a row. We checked that they were in a row by comparing the slope of point 1 and 2 to point 2 and 3 and point 2 and 3 to point 3 and 4, and if they were all equal we knew they were in one line. Then we just add those points to the output.

The slope function for points in our implementation uses the difference between the two Y coordinates divided by the difference between the two X coordinates. Though if both differences were zero we output negative infinity, if only the difference between the two Y coordinates was zero we output zero or negative zero depending on if the difference between the Y values is negative or not. If only the difference between the two X coordinates was zero we output positive infinity.

The Compare function for points in our implementation compares outputs which point has a lower Y value breaking tie with the X value.

Sorting solution

The sorting solution uses 2 arrays of the points one is sorted depending on the slopes for each element on the first array. Then we only have to go through the sloped list to find each line that has length > 4 . To avoid duplicates we keep another array for the answers and check for duplicates before adding the line to the solution list

2 Empirical Analysis

The table below shows the actual running times in seconds compared to how many points were tested for each of the algorithms.

N to seconds		
<i>N</i>	brute	sorting
150	0.5	...
200	1.0	...
300	3.0	...
400	9.4	...
800	160.0	...
1600	>180	...
3200	>180	...
6400	>180	...
12800	>180	...

Estimate with tilde notation

Brute: $\sim N^4$

Sorting: $\sim N^2 \log(n)$

Theoretical

Theoretically the worst case for brute is $O(N^4)$ because we use four nested for loops running approximately to N

Theoretically the worst case for sorting is $O(N^2 \log(n))$ since N times we sort through java's inbuilt sort for arrays which is $N \log(n)$ and go through the sorted list of N length giving us a complexity of $N(N \log(n) + N) = N^2 \log(N) + N^2$ which can be simplified into $N^2 \log(N)$

3 About This Solution

No this is the first time for both of us

Hours to complete assignment: 11

3.1 Known Bugs / Limitations.

The code we used only worked for fast2 on Mooshak and Mikael submitted it (Mikael19).

3.2 Help Received

No Help Received.

3.3 Problem Encountered

We were trying to make our solution work for fast1 on mooshak but it was solved when the announcement was made about fast 2 being enough for the project.

3.4 Comments

No comments needed.