

CS-F402 Computational Geometry

Programming Assignment

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1 Line Segment Intersection

The Sweep Line Algorithm was implemented as mentioned in the course. This only handles the non degenerate cases successfully.

The test cases were generated manually using [GeoGebra](#). I was able to test for inputs around 5 to 15 line segments.

The code runs as expected in $O((n+I)\log n)$ time and using only $O(n)$ space. The timings recorded for the few inputs are given below. This was tested with the CPU AMD Ryzen 7 4800H on Windows 11.

No.	Line Segments	Intersections	Time
1	8	12	0.04s
2	5	1	0.01s
3	5	7	0.03s
4	14	18	0.11s

2 Map Overlay

The Map Overlay for the worst case is when the n segments intersect all the other n segments of other map. I have generated a case that forms a grid with n horizontal and n vertical segments. When passed the value of n as a command line argument, it outputs the runtime and solution for the overlay.

Looking at the data, we see that both time and space would be a bottleneck at bigger values of n . But we can parallelize the code which can reduce the time significantly. Hence, when the algorithm is implemented on multiple threads, time would not be a bottleneck but space will be.

The code runs in $O((n+I)\log n)$ time and uses $O(n^2)$ space. The timings recorded for the inputs are given below. This was tested with the CPU AMD Ryzen 7 4800H on Windows 11.

No.	n	Time
1	2	0.001s
2	5	0.002s
3	10	0.006s
4	20	0.026s
5	50	0.130s
6	100	0.521s
7	300	5.21s

Appendix

The source code can also be viewed at github [here](#)

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