Algorithm Homework 1

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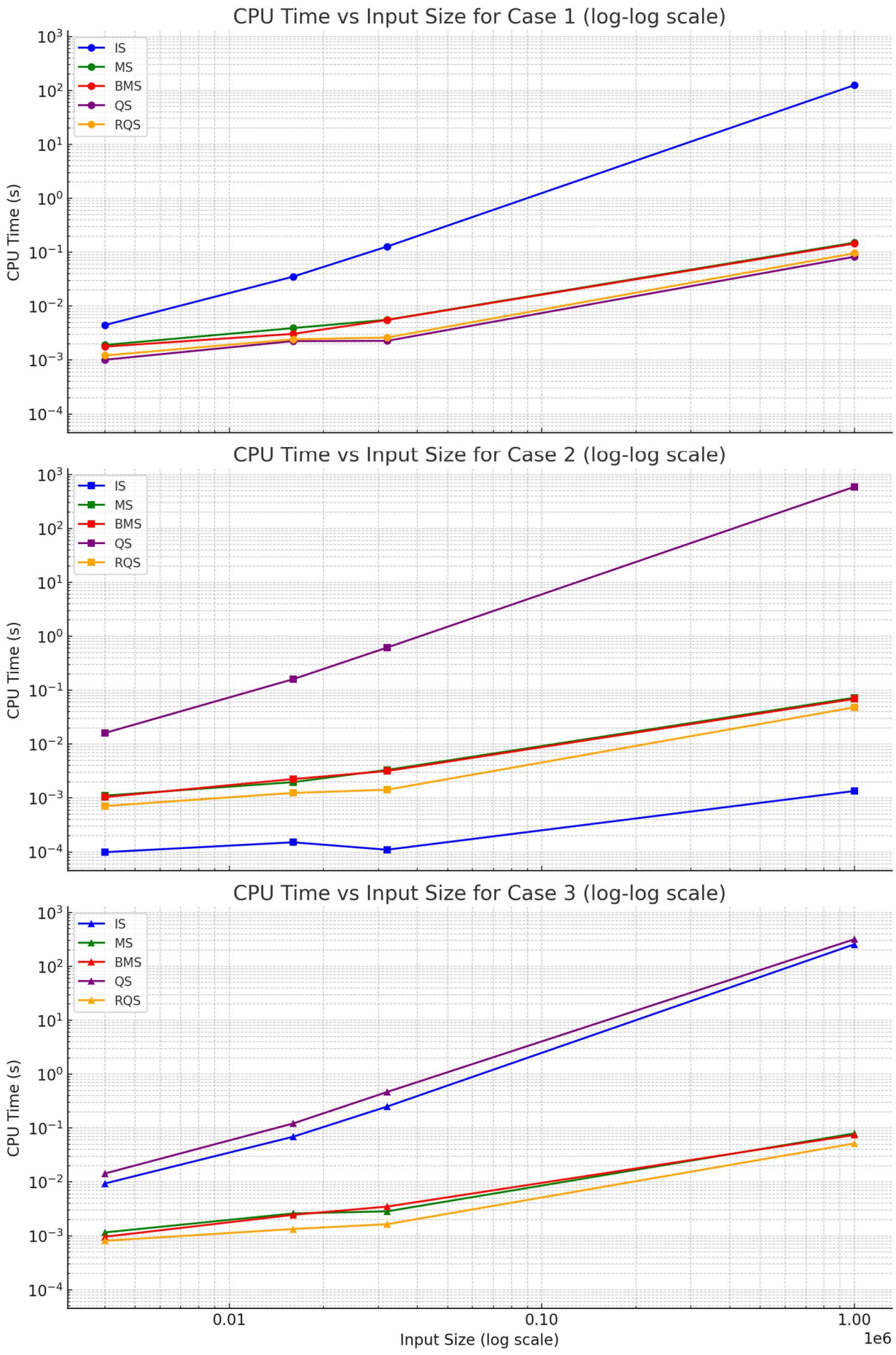
input size	IS		MS		BMS		QS		RQS	
	CPU time(s)	Memory(KB)	CPU time(s)	Memory(KB)	CPU time(s)	Memory(KB)	CPU time(s)	Memory(KB)	CPU time(s)	Memory(KB)
4000.case2	0.000099	5904	0.001108	5904	0.00104	5904	0.016053	5972	0.000711	5904
4000.case3	0.009337	5904	0.001155	5904	0.00096	5904	0.014318	5904	0.000808	5904
4000.case1	0.004449	5904	0.001904	5904	0.001776	5904	0.001012	5904	0.001216	5904
16000.case2	0.000151	6056	0.001971	6056	0.002245	6056	0.15963	6684	0.001244	6056
16000.case3	0.068868	6056	0.0026	6056	0.002448	6056	0.121302	6308	0.001337	6056
16000.case1	0.035195	6056	0.003912	6056	0.003054	6056	0.002245	6056	0.002424	6056
32000.case2	0.00011	6188	0.003324	6188	0.00317	6188	0.617461	7504	0.001424	6188
32000.case3	0.250287	6188	0.002843	6188	0.003485	6188	0.466409	6740	0.001642	6188
32000.case1	0.127365	6188	0.005586	6188	0.005532	6188	0.002269	6188	0.002613	6188
1000000.case2	0.001349	12144	0.072395	14004	0.068882	14000	589.826	56848	0.047978	12144
1000000.case3	255.955	12144	0.079386	14004	0.074293	14000	318.267	27252	0.051671	12144
1000000.case1	125.143	12144	0.150429	14004	0.144554	14000	0.082288	12144	0.09563	12144

I use python to help me draw the graphs of different input sizes corresponding to three cases. Three charts share similar trend with the charts on PA1. We can see in case1(average case), except for insertion sort, the other four algorithm share similar slope as input size grow. However, in case 2(best case), insertion sort has the smallest slope compared with others, while quicksort has the biggest slope. In case 3(worst case), insertion sort and quick sort share similar slope, while the other three sorting have smaller slope.


CPU Time vs Input Size for Case 1 (log-log scale)
CPU Time (s)
IS
MS
BMS
QS
RQS
CPU Time vs Input Size for Case 2 (log-log scale)
CPU Time (s)
IS
MS
BMS
QS
RQS
CPU Time vs Input Size for Case 3 (log-log scale)
CPU Time (s)
IS
MS
BMS
QS
RQS
0.01
0.10
1.00
Input Size (log scale)
1e6

- Comparison between MS and BMS

  In case 1 and case 2, MS and BMS have similar trend. In case 3, MS is faster than BMS when input size is small.
- Comparison between QS and RQS

  In case 1(average case), QS and RQS share similar trend. However, in both case 2 and case 3, QS consumes a lot more time than RQS, since in QS, we always choose the last element of the array to be the pivot, which is very inefficient for QS because it sort all the array into one group each time. Using RQS can prevent this problem from happening, so RQS is efficient in three cases.
- Other finding

  I found that only QS have different memory usage when input sizes are same. Also, when using QS to sort 1000000 case2, we need to set the stack size to 256 MB. This can be attributed to the inefficient situation when we use Quick Sort to deal with extreme cases such as best case and worst case.

  Another finding is though insertion sort is inefficient usually, but it is the fastest in best case.