Algorithm

Programming Assignment 1

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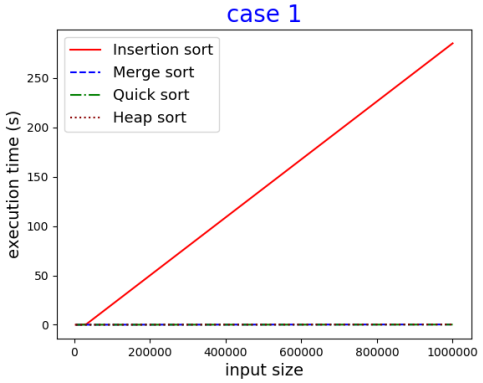
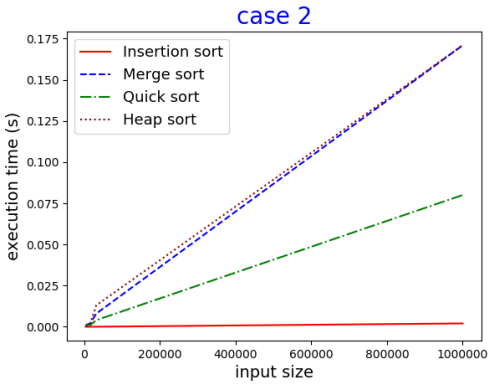
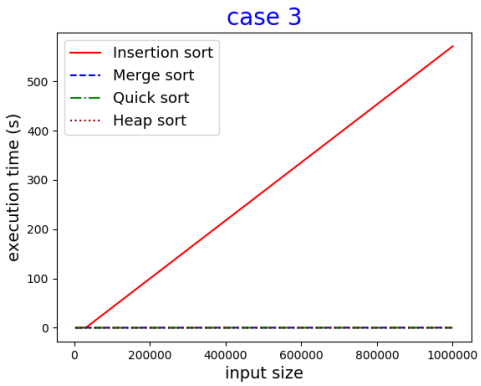
➢ Comparison of performance

	IS	IS	MS	MS	QS	QS	HS	HS
	CPU time (s)	Memory (KB)	CPU time (s)	Memory (KB)	CPU time (s)	Memory (KB)	CPU time (s)	Memory (KB)
4000.case2	0	12500	0.001	12500	0.001	12500	0	12500
4000.case3	0.015998	12500	0.001	12500	0	12500	0	12500
4000.case1	0.004999	12500	0.001	12500	0.006999	12500	0	12500
16000.case2	0	12648	0.001999	12648	0.001	12648	0.001999	12648
16000.case3	0.215967	12648	0.001999	12648	0.007998	12648	0.001	12648
16000.case1	0.101985	12648	0.006	12648	0.011999	12648	0.003	12648
32000.case2	0	12648	0.007999	12648	0.003999	12648	0.012998	12648
32000.case3	0.770883	12648	0.008999	12648	0.004998	12648	0.003998	12648
32000.case1	0.489925	12648	0.011998	12648	0.006999	12648	0.010998	12648
1000000.case2	0.002	18668	0.170974	20524	0.07998	18668	0.170974	18668
1000000.case3	570.957	18668	0.175972	20524	0.078988	18668	0.113983	18668
1000000.case1	285.260	18668	0.253961	20524	0.144978	18668	0.305954	18668

➢ Analyzation of execution time







Case1:
In case 1, the input data is distributed averagely between minimum and maximum value. Thus, it can be observed that the execution time mainly related to the time complexity of the algorithm in average case. The time complexity of Insertion sort in average case is O(n^2), while the others are O(n log n). The bigger the input size, the more obvious the gap.

Case2:
In case 2, the input data are in ascent order. Thus, in this case, it requires few operations for insertion sort. Even the time complexity for the other algorithms are lower, the execution time grows larger when the input size becomes larger. Note that the quick sort is implemented using randomized partition. Thus, the complexity is still O(n log n). If normal partition method is utilized, the time complexity will be O(n^2).

Case3:
In case 3, the input data are in descent order. Thus, it becomes the worst case for insertion sort. The execution time grows significantly with large input size. For other algorithms, due to the fact that the average complexity are all O(n log n). Thus, the growth of the execution time may not be so obvious.