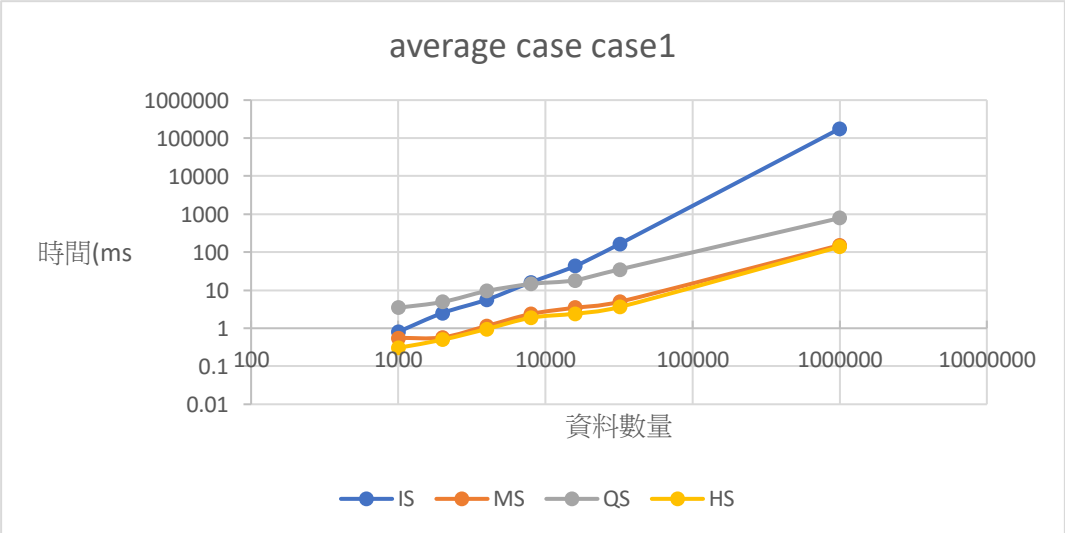
PA1 report

Algs23s065 b09901036 邱士倫

Result of algorithm:

Case 1:

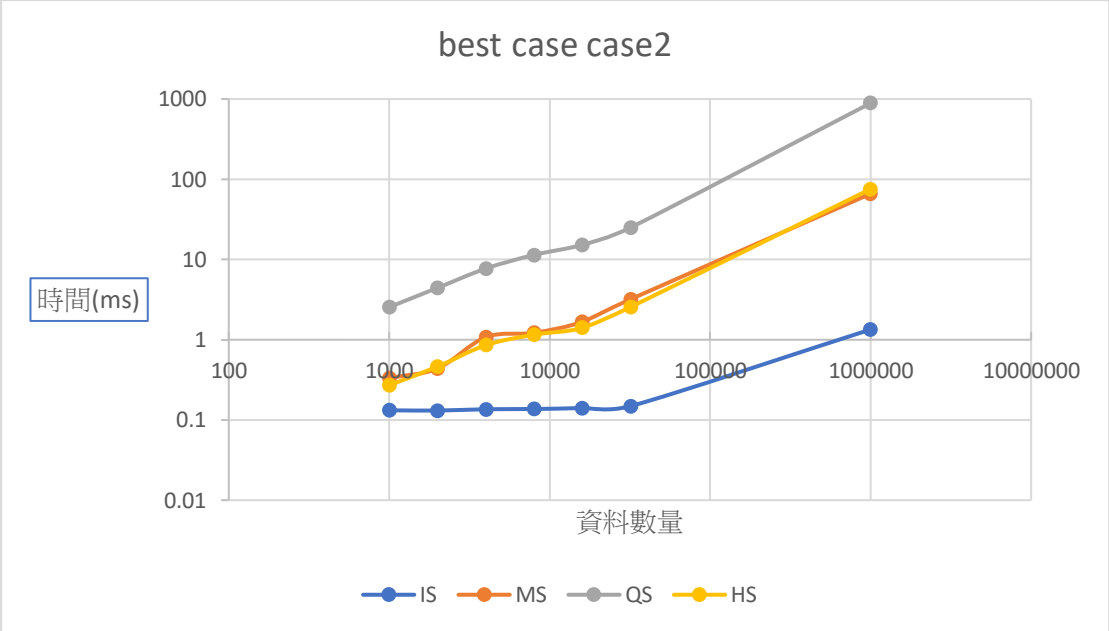
case1								
input file	IS		MS		QS		HS	
	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)
1000	0.807	5904	0.558	5904	3.464	5904	0.306	5904
2000	2.517	5904	0.574	5904	4.917	5904	0.499	5904
4000	5.659	5904	1.152	5904	9.529	5904	0.96	5904
8000	16.275	6056	2.38	6056	14.614	6056	1.894	6056
16000	43.543	6056	3.481	6056	18.332	6056	2.424	6056
32000	165.06	6188	4.974	6188	35.36	6188	3.623	6188
1000000	177069	12144	152.745	14004	788.685	12144	138.696	12144



In case 1 (average case), the Merge sort and Heap sort have same tendency(O(nlgn) time) and Quick sort has same but with higher time cost due to randomized partition , which may increase time cost eventually. However, the Insertion sort should have distinctive tendency with its average case cost O(n^2) time.

Case 2:

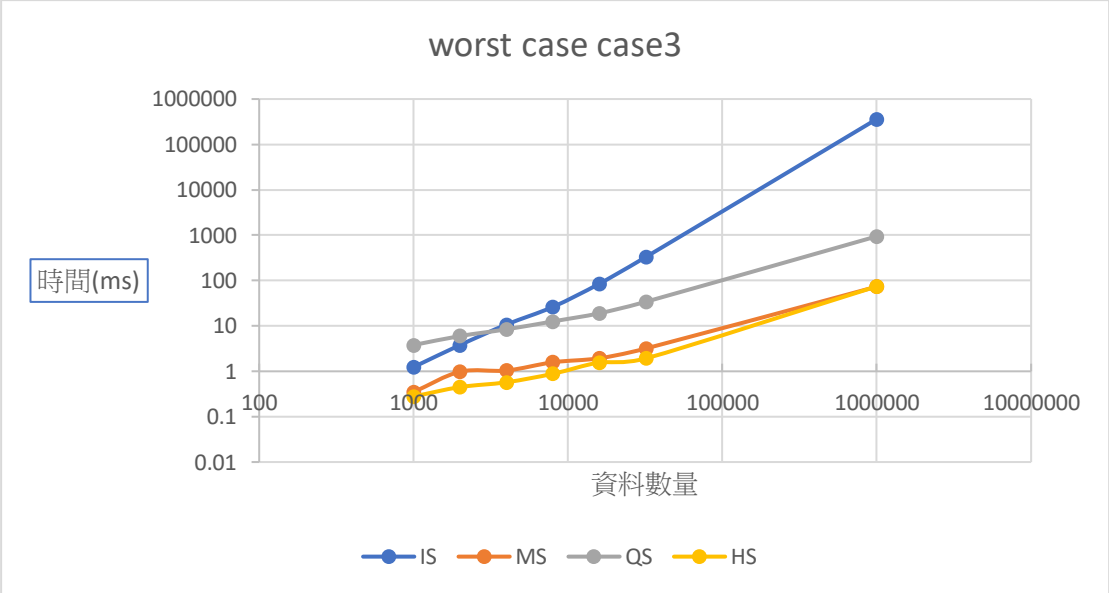
case2								
input file	IS		MS		QS		HS	
	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)
1000	0.132	5904	0.333	5904	2.549	5904	0.271	5904
2000	0.131	5904	0.438	5904	4.428	5904	0.462	5904
4000	0.136	5904	1.077	5904	7.715	5904	0.856	5904
8000	0.137	6056	1.222	6056	11.414	6056	1.156	6056
16000	0.141	6056	1.673	6056	15.252	6056	1.406	6056
32000	0.149	6188	3.203	6188	25.104	6188	2.563	6188
1000000	1.342	12144	65.936	14004	889.689	12144	75.562	12144



In case 2 (best case), which all data had been already sorted ,the Merge sort and Heap sort have same tendency (O(nlgn) time)and Quick sort has same but with higher time cost due to randomized partition , which may increase time cost eventually. However, the Insertion sort should have distinctive tendency(with lower time cost) with its best case cost O(n) time instead of O(nlgn) time as Merge sort and Heap sort or even worse O(n^2) in some randomize partition of Quick sorts .

Case 3:

case3								
input file	IS		MS		QS		HS	
	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)	cpu time(ms)	memory (kb)
1000	1.239	5904	0.349	5904	3.79	5904	0.279	5904
2000	3.795	5904	0.978	5904	5.987	5904	0.449	5904
4000	10.73	5904	1.04	5904	8.417	5904	0.574	5904
8000	26.33	6056	1.582	6056	12.588	6056	0.884	6056
16000	85.395	6056	1.937	6056	19.002	6056	1.572	6056
32000	331.053	6188	3.185	6188	34.125	6188	1.927	6188
1000000	361676	12144	73.438	14004	942.409	12144	74.288	12144



In case 3 (worst case), which all data had been already sorted backwardly ,the Merge sort and Heap sort have same tendency (O(nlgn) time) even compared with case 1 and case 2 . Quick sort has same but with higher time cost due to randomized partition , which may increase time cost eventually. However, the Insertion sort has much higher tendency of extremely high time cost) with its worst case cost O(n^2) .

Conclusion

Among the four sorting algorithm have each method ways of using: Quick sort may be a little inefficient compared to merge sort in every possible scenario ,but it takes less memory space than merge sorts. Heap sort is undoubtly fastest but with instable when more than two identical numbers. Insertion sort is an easy way to implement and sometimes efficient , however not so efficient in most scenarios. Merge sort can satisfy both stable and efficient but needs much more memory space when data is huge