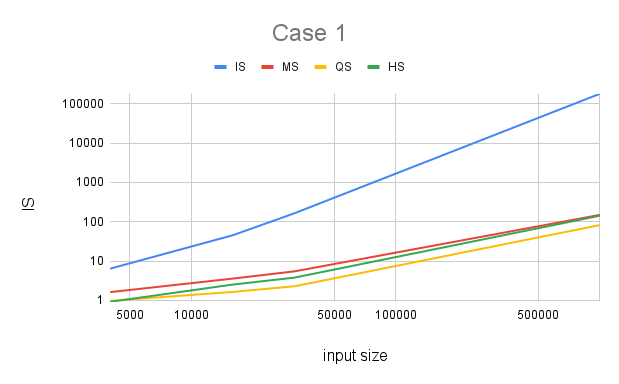
[Algorithms] PA1 Report

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#### Running Time and Memory Usage Table

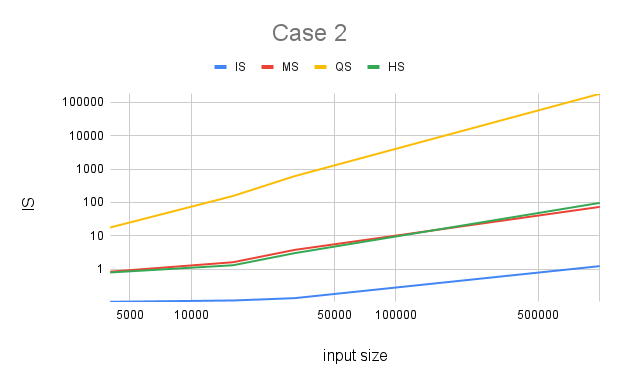
|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Input Size | IS | | MS | | QS | | HS | |
| CPU Time (ms) | Memory (kB) | CPU Time (ms) | Memory (kB) | CPU Time (ms) | Memory (kB) | CPU Time (ms) | Memory (kB) |
| 4000.case2.in | 0.105 | 5904 | 0.839 | 5904 | 17.696 | 5972 | 0.794 | 5904 |
| 4000.case3.in | 12.097 | 5904 | 1.054 | 5904 | 9.93 | 5904 | 0.807 | 5904 |
| 4000.case1.in | 6.426 | 5904 | 1.625 | 5904 | 0.974 | 5904 | 0.922 | 5904 |
| 16000.case2.in | 0.115 | 6056 | 1.612 | 6056 | 156.223 | 6688 | 1.309 | 6056 |
| 16000.case3.in | 85.996 | 6056 | 1.726 | 6056 | 121.582 | 6304 | 1.505 | 6056 |
| 16000.case1.in | 45.697 | 6056 | 3.598 | 6056 | 1.647 | 6056 | 2.536 | 6056 |
| 32000.case2.in | 0.135 | 6188 | 2.017 | 6188 | 611.98 | 7500 | 3.013 | 6188 |
| 32000.case3.in | 331.835 | 6188 | 2.116 | 6188 | 466.309 | 6740 | 2.977 | 6188 |
| 32000.case1.in | 165.135 | 6188 | 5.49 | 6188 | 2.29 | 6188 | 3.803 | 6188 |
| 1000000.case2.in | 1.231 | 12144 | 70.57 | 14004 | N/A | N/A | 75.576 | 12144 |
| 1000000.case3.in | N/A | N/A | 76.749 | 14004 | N/A | N/A | 76.06 | 12144 |
| 1000000.case1.in | N/A | N/A | 149.559 | 14004 | 82.33 | 12144 | 142.523 | 12144 |

#### Growth of Run Time

Case 1

Case 1 is the average case. Insertion sort has time complexity, while the others are, ending up running faster than insertion sort.

Case 2

The input for case 2 is a sorted array. We can see that insertion sort uses the least amount of time, since it has linear complexity for best case. Quick sort is the slowest sorting method because of itscomplexity for worst case, which occurs when the array is already sorted.

Case 3

The input for case 3 is a reversely-sorted array, which is a worst case for quick sort and insertion sort. Both of them hastime complexity. As for merge sort and heap sort, the time complexity is Therefore, merge sort and heap sort is running faster than the other two.

