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**ASSIGNMENT 1**

**ABSTRACT:**

The purpose of the assignment is to create understanding between execution time and time complexity.

**METHODOLOGY:**

**GENERATION OF SORTED AND RANDOM ARRAY:** Random array is generated through rand function and sorted array is generated by sorting random array then it was used.

**ALGORITHM:** The algorithms used in the assignments are selection, bubble and insertion. Both selection and bubble involves swapping while insertion does not involve it. It involves sorting of **one million elements**.

**TIME MECHANISM:** For calculating time Chrono is used and time is only measured of sorting. The time is measured in **seconds**.

**ALGORITHMS TIME COMPEXITY:**

**SELECTION SORT** The time complexity for selection sort is O(n2) in all three cases of best, average and worst case.

**BUBBLE SORT** The time complexity for worst and average case is O(n2) and for best it is O(n).

**Insertion sort** The time complexity for best case is O(n) and worst and average case is O(n2).

**EXPERIMENTS AND RESULTS:**

The table contains algorithm and their executions for same array of the size of **one million**.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ALGORITHM** | **TYPE** | **TIME1(sec)** | **TIME2** | **TIME3** | **TIME4** | **TIME5** | **TIME6** | **TIME7** | **TIME8** | **TIME9** | **TIME10** |
| INSERTION | RDM | 1860 | 1471 | 1472 | 2274 | 1467 | 1457 | 2272 | 1499 | 1490 | 1471 |
| INSERTION | SRT | 1347 | 1282 | 1289 | 1345 | 1287 | 1288 | 1343 | 1252 | 1281 | 1321 |
| SELECTION | RDM | 1944 | 2066 | 1465 | 1470 | 1472 | 1472 | 1271 | 1469 | 1468 | 1468 |
| SELECTION | SRT | 2220 | 1336 | 1378 | 1347 | 1323 | 1350 | 1348 | 1342 | 1348 | 1337 |
| BUBBLE | RDM | 4675 | 4758 | 6130 | 5076 | 4798 | 4664 | 4713 | 4672 | 5332 | 4724 |
| BUBBLE | SRT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



GRAPH FOR RANDOM ELEMENTS

**Observation:**

We can see from the graph for random array bubble sort is taking much time as compared to other sorting .and for sorted array bubble sort is taking almost no time. In case of selection sort, it is taking almost same in both random and sorted. But in insertion sorted is taking somehow less than random. But in bubble there is huge difference due to their time complexities in best and average case. In insertion sort it is due to the the loop that executes n-1 times must whether it is sorted or not.in bubble sort its due to if else condition.

**RESULT:**

For random sorting selection is good but for sorted bubble if good. however, insertion is also a good sorting .7