Experiment No. 01

Name of the Experiment: Complexity analysis of various sorting algorithms.

TIME COMPLEXITY

i) **Bubble Sort**

The time complexity for bubble sort is calculated in terms of the number of comparisons f (n) (or of number of loops); in bubble sort two loops (outer loop and inner loop) iterates (or repeated) the comparisons. The number of times the outer loop iterates is determined by the number of elements in the list which is asked to sort (say it is n). The inner loop is iterated one less than the number of elements in the list (i.e., n-1 times) and is reiterated upon every iteration of the outer loop

$f(n) = (n - 1) + (n - 2) + \ldots + 2 + 1$
$= n(n - 1) = O(n^2)$

ii) **Selection Sort**

Time complexity of a selection sort is calculated in terms of the number of comparisons f (n). In the first pass it makes n – 1 comparisons; the second pass makes n – 2 comparisons and so on. The outer for loop iterates for (n - 1) times. But the inner loop iterates for n*(n – 1) times to complete the sorting.

$f(n) = (n - 1) + (n - 2) + \ldots + 2 + 1$
$= (n(n - 1))/2$
$= O(n^2)$

iii) **Insertion Sort**

In the insertion sort algorithm (n – 1) times the loop will execute for comparisons and interchanging the numbers. The inner while loop iterates maximum of $((n - 1) \times (n - 1))/2$ times to computing the sorting

$f(n) = (n - 1) + \ldots\ldots 2 + 1$
$= (n (n - 1))/2$
$= O(n2)$

Machine configuration:

HP 240 Note book PC

Processor: Intel® Core™i3-3110MCPU@2.40 GHz

Installed memory (**RAM**):   4.00 GB

System type: 64-bit Operating System

Procedure:

First, required number of data is picked up randomly in a specified range.Then they are written in a file and after that they are read from that file and sorted by bubble sort , selection sort and insertion sort respectively and required time is measured in each algorithm .

**Table1: Table of required time for specified amount of data in various sorting**

No. of Data	Required Time		
	Bubble Sort	Selection Sort	Insertion Sort
1000	0.01	0	0
5000	0.08	0.04	0.02
10000	0.34	0.15	0.08
15000	0.77	0.35	0.19
20000	1.4	0.63	0.33

Graph: If the amount of data and required time is plotted along x-axis and y-axis respectively for bubble sort, selection sort and insertion sort then the below mentioned curve is found:

Line Graph:
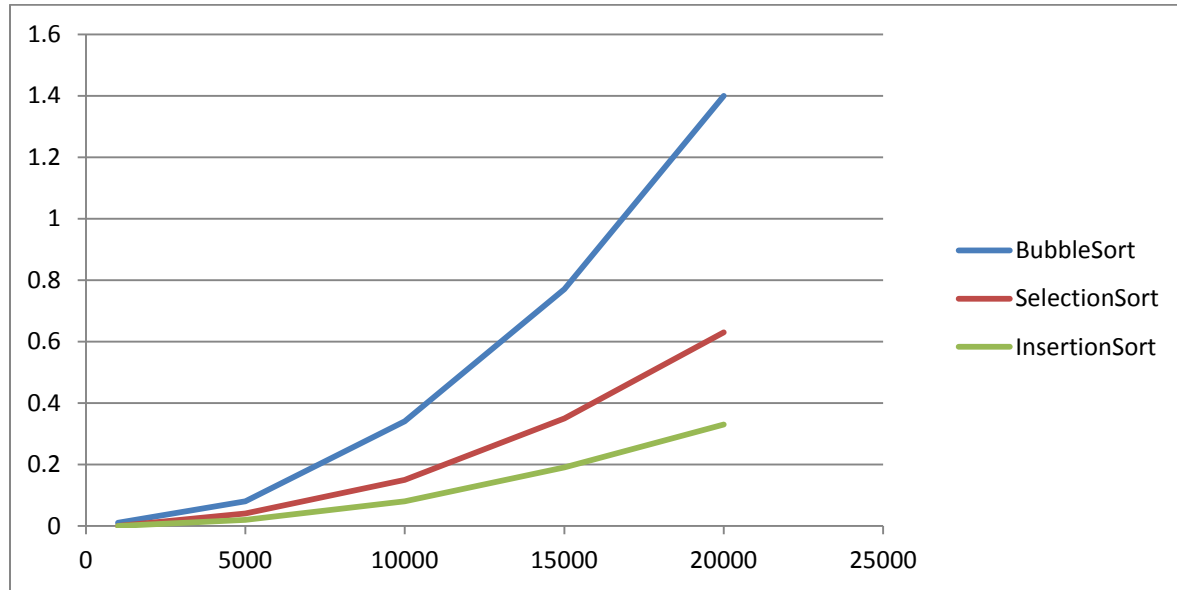
Bar Graph:
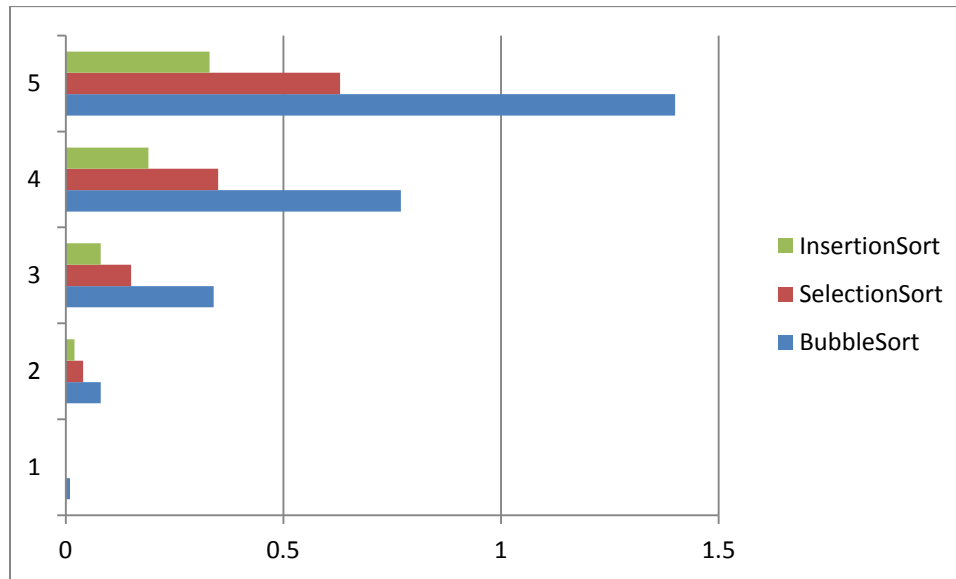
Conclusion: Comparing among the three sorting algorithm it is found from the table and graph that the insertion sort needs fewer time than the two other .