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19BCP101

Div. II, CE 19

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Design & Analysis of Algorithm (20CP209P)

B. Tech - Computer Science & Engineering (Sem-IV)

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Lab 1 Assignment: Comparison of Insertion Sort & Bubble Sort

AIM: To write a C/C++ Program to implement Insertion Sort & Bubble Sort.

ALGORITHMS:

1. Insertion Sort Algorithm (Pseudocode)

```
INSERTION-SORT (A, n)
        for j ← 2 to n
                Do      key ← A[j]
                        i ← j – 1
                        while i > 0 and A[i] > key
                                Do      A [i + 1] ← A[i]
                                        i ← i – 1
                        A [i + 1] = key
```

2. Bubble Sort Algorithm (Pseudocode)

```
BUBBLE-SORT (A, n)
        For i ← 1 to N do
                For j = 0 to N – 1 do
                        If A[j] > A[j+1] then
                                Temp = A[j]
                                A[j] = A[j+1]
                                A[j+1] = temp
```

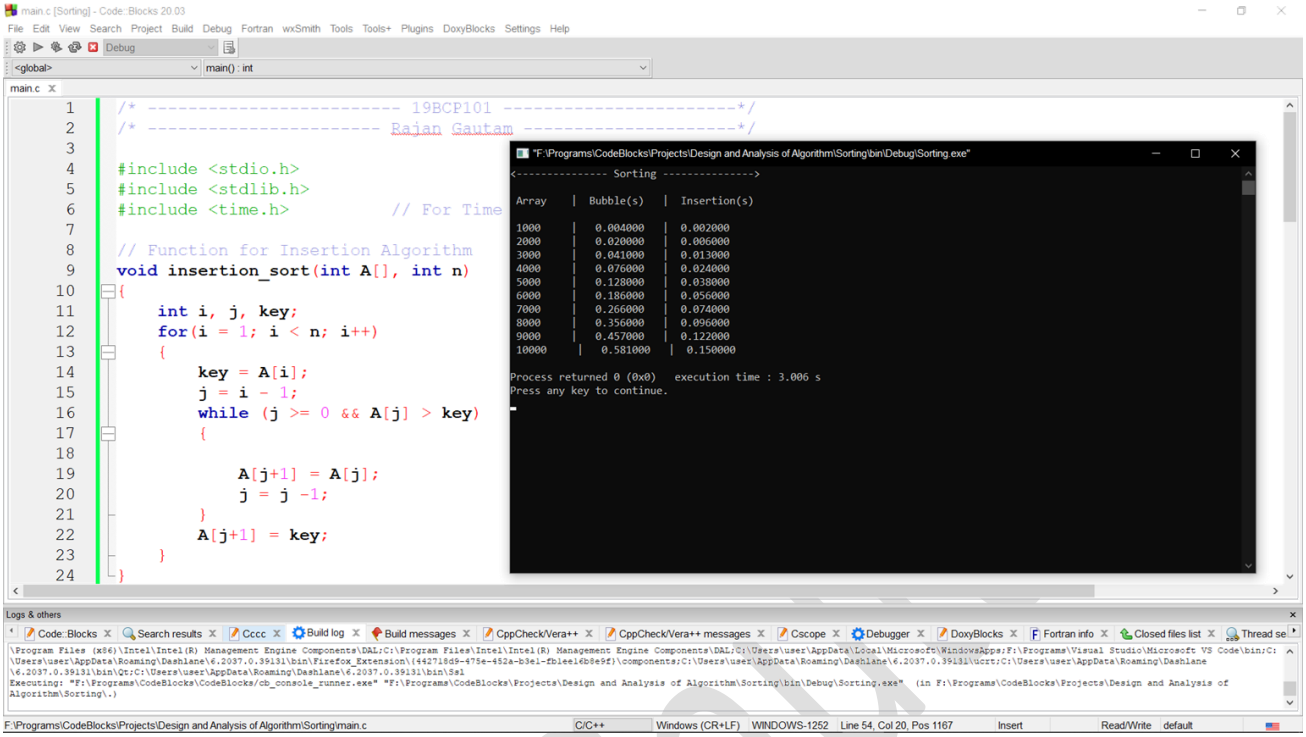
CODE:

```
1. /* ------------------------ 19BCP101 ----------------------*/
2. /* ---------------------- Rajan Gautam --------------------*/
```

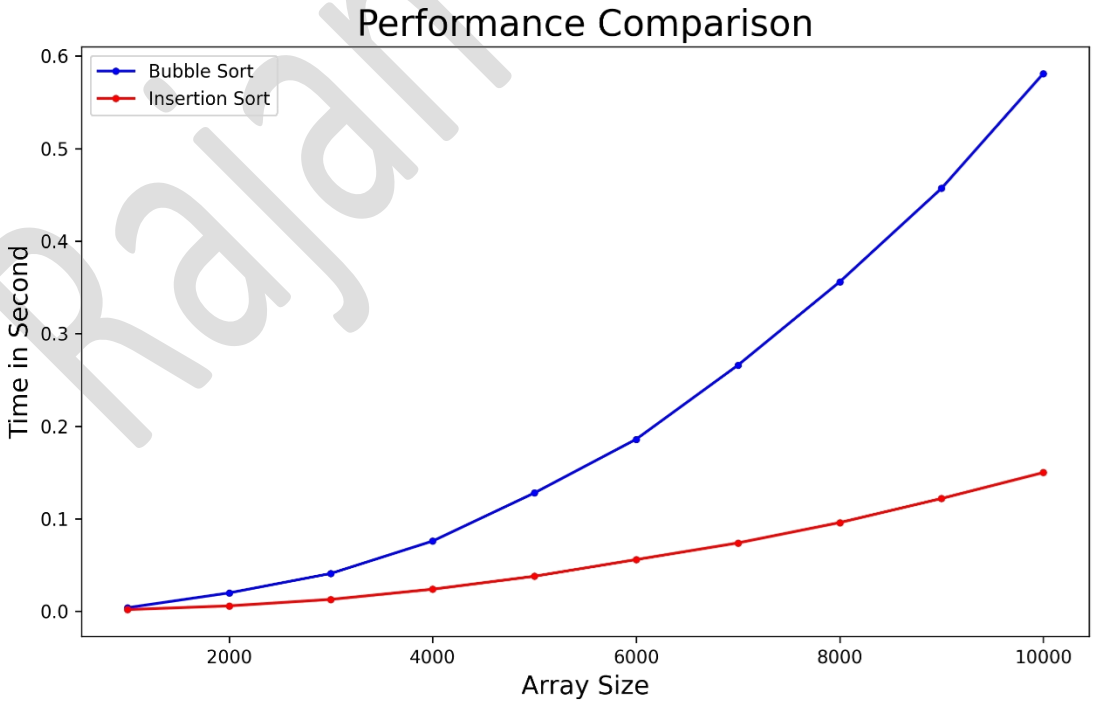
```
3.
4. #include <stdio.h>
5. #include <stdlib.h>
6. #include <time.h>           // For Time Calculation
7.
8. // Function for Insertion Algorithm
9. void insertion_sort(int A[], int n)
10. {
11.     int i, j, key;
12.     for(i = 1; i < n; i++)
13.     {
14.         key = A[i];
15.         j = i - 1;
16.         while (j >= 0 && A[j] > key)
17.         {
18.
19.             A[j+1] = A[j];
20.             j = j -1;
21.         }
22.         A[j+1] = key;
23.     }
24. }
25.
26. // Function for Bubble Sort Algorithm
27. void bubble_sort(int A[], int n)
28. {
29.     int i, j, temp;
30.     for (i = 0; i < n-1; i++)
31.     {
32.         for (j = 0; j < n-i-1; j++)
33.         {
34.             if (A[j] > A[j+1])
35.             {
36.                 temp=A[j];
37.                 A[j]=A[j+1];
38.                 A[j+1]=temp;
39.             }
40.         }
41.     }
42. }
43.
44.
45. int main()
46. {
47.     printf("<--------------- Sorting --------------->\n\n");
48.
49.     int n = 1000, it = 0;
```

```
50.     double time1[20], time2[20];          // To store the time
   values
51.
52.     printf(" Array    |  Bubble(s)    |  Insertion(s) \n\n");
53.
54.     while(it++ < 10)
55.     {
56.         long int a[n], b[n];
57.         for (int i = 0; i < n ; i++)
58.         {
59.             // Generating Random Integer Array for each algorithm
60.
61.             a[i] = (rand() % n);
62.             b[i] = (rand() % n);
63.         }
64.
65.
66.         // For time calculation
67.         clock_t start, end;
68.
69.
70.         // For Bubble Sort Algorithm
71.         start = clock();
72.         bubble_sort(a, n);
73.         end = clock();
74.
75.         time1[it] = ((double)(end - start)/CLOCKS_PER_SEC);
76.
77.
78.         // For Insertion Algorithm
79.         start = clock();
80.         insertion_sort(b, n);
81.         end = clock();
82.
83.         time2[it] = ((double)(end - start)/CLOCKS_PER_SEC);
84.
85.         // Printing the table of array size, time taken by Bubble
   Sort and Insertion Algorithm
86.         printf(" %d     |   %f    |  %f\n", n, time1[it],
   time2[it]);
87.
88.
89.         // Incrementing the value of n by 1000
90.         n += 1000;
91.     }
92.     return 0;
93. }
```

OUTPUT:



COMPARISON:



Link: https://github.com/rgautam320/Design-and-Analysis-of-Algorithm-Lab/tree/master/Lab_1_Sorting