21BRS1296 – Anika Kamath

Design and Analysis of Algorithms (Lab)

L37+L38

Experiment No.: 2.1

Q. Insertion Sort Algorithm with Random Input and Time taken for execution

Code:

```
#include<iostream>
#include<ctime>

using namespace std;

void insertionSort(int a[],int n){
int key,j;
    for(int i=1;i<n;i++){
     key=a[i];
     j=i-1;
     while(a[j]>key && j>=0){
          a[j+1]=a[j];
          j--;
     }
        a[j+1]=key;
    }
    cout<<"Array sorted using Insertion Sort: "<<endl;
    for(int i=0;i<n;i++){
        cout<<a[i]<<" ";
    }
    cout<<endl;
}
```

```
int main(){
int n;
cout<<"Enter number of elements in array: ";
cin>>n;
int a[n];
for(int i=0;i<n;i++){
        /*
        cout<<endl<<"Enter element "<<i+1<<": ";
cin>>a[i];
        */
       int random=rand();

}
insertionSort(a,n);

    //time
    clock_t tstart=clock();
    double time1=(double)clock()-(tstart)/CLOCKS_PER_SEC;
    cout<<"Time taken to execute: "<<time1<<endl;

return 0;
}
```

Output:

When n=10

```
student@205A-scope--50:~/Desktop/21BRS1296$ g++ lab2_insertionsort.cpp
student@205A-scope--50:~/Desktop/21BRS1296$ ./a.out
Enter number of elements in array: 10
Array sorted using Insertion Sort:
-524230272 -378418560 -378418448 -362437632 0 10 22041 32765 32765 1639730147
Time taken to execute: 4420
```

When n=50

```
student@205A-scope--50:~/Desktop/21BRS1296$ g++ lab2_insertionsort.cpp
student@205A-scope--50:~/Desktop/21BRS1296$ ./a.out
Enter number of elements in array: 50
Array sorted using Insertion Sort:
-1680226816 -1680226816 -1566040170 -1566040170 -870158458 -867570197 -866755328 -86674
5000 -23884276 -23884272 -23884240 -23884224 -23884212 -23884112 -23883872 -23883872 -1
 -1 0 0 0 0 0 0 0 0 0 0 0 0 50 21909 21909 21909 32591 32591 32591 32591 32765 32765 32
765 32765 32765 32765 32765 32765 16777216 118751616 118763872 118763872
Time taken to execute: 4463
```

When n=100

```
student@205A-scope--50:~/Desktop/21BRS1296$ g++ lab2_insertionsort.cpp
student@205A-scope--50:~/Desktop/21BRS1296$ ./a.out
Enter number of elements in array: 100
Array sorted using Insertion Sort:
-1292097280 -1292097280 -1140084352 -1140083704 -1140072096 -1140072096 -858993460 -858
993460 -583659642 -582253408 -581071381 -580989059 -580256512 -580256512 -580256512 -58
0252128 -580246208 -580246184 -1 -1 -1 -1 -1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 1
0 10 100 100 22065 22065 22065 22065 32603 32603 32603 32603 32603 32603 32603 32603 32
603 32603 32767 32767 32767 32767 32767 32767 32767 32767 32767 32767 32767 32767 32767
 32767 32767 32767 16777216 214748364 214748364 1116249658 1116249696 1116249712 111624
9712 1116249712 1116249744 1116249852 1116249852 1116249856 1116249856 1116249888 11162
49904 1116249916 1116250016 1116250256 1116250256 1368766166 1368766166 1368766166 2147
483647
Time taken to execute: 4509
```

Graph:

Array inputs	Time
10	4420
50	4463
100	4509
500	5313
1000	7334
5000	10023