**Experiment 1**

**Implementation Of Bubble Sort Algorithm**

**Date:** 26-08-2020

**Aim:** To implement the bubble sort and it’s algorithm

**Data Structure Used:** Arrays

**Operation Used:** Comparisons and Swapping

**Algorithm:**

**Input:** Unsorted array of length n

**Output:** Sorted array of length n

Step 1 : Start

Step 2 : Receive the size of the array in a variable n

Step 3 : i←0 //Receive the elements in the array

Step 4 : Repeat Step 5 to 6 until i=n

Step 5 : Receive an element and store it in a[i]

Step 6 : i←i+1

Step 7 : i←0 //Beginning the bubble sort

Step 8 : Repeat steps 9 to Step 16 until I = n-1

Step 9 : j←0

Step 10 : Repeat steps 11 to step 15 until j=n-i-1

Step 11 : if arr[j]>arr[j+1] then do Step 12 to Step 14 else skip to Step 15

Step 12 : temp = arr[j]

Step 13 : arr[j] = arr[j+1]

Step 14 : arr[j+1] = temp

Step 15 : j=j+1

Step 16 : i+=i+1 //Bubble sort ends here

Step 17 : i←0 //Print the sorted array

Step 18 : Repeat Step 19 to 20 until i=n

Step 19 : Print the value of arr[i]

Step 20: i=i+1

Step 21 : Stop

**Details of the Algorithm:**

The Bubble sort algorithm takes a given array and keeps swapping the elements in such a way that the largest number (in case of ascending order) is guaranteed to come at the end of the loop on the first iteration of the i loop. This then divides the array into two parts, sorted and the unsorted, the sorted part is the one from n-i-1 to n-1 and the unsorted part is from 0 to (n-i-2)th element. In the second iteration of the I loop the largest element of the unsorted part gets moved to the n-i-1 th position (the previous (n-i-1)th position since the value of i is incremented by one). This continues until the value of i=n-1 in which case the value of the last element of the unsorted sub array becomes n-n+1-2 = -1 and the first position of the sorted sub-array becomes n-n+1-1=0 this proves that the whole array is sorted. The time complexity is O(n2), since the total number of comparison is n(n-1)/2

**Result:** the Program is successfully compiled and the desired output is obtained.

**Program/ Source Code:**

#include<stdio.h>

void main(){

int comp=0,swaps=0,i,j;

int arr[100];

int n,temp;

printf("Enter the number of elements in the arrat: ");

scanf("%d",&n);

printf("Enter the elements in the array : ");

for(i=0;i<n;i++)

scanf("%d%\*c",arr+i);

for(i=0;i<n-1;i++){

for(j=0;j<n-i-1;j++){

if(arr[j]>arr[j+1]){

temp = arr[j];

arr[j]=arr[j+1];

arr[j+1]=temp;

swaps++;

}

comp++;

}

}

printf("Sorted Array: ");

for(i=0;i<n;i++){

printf("%d ",arr[i]);

}

printf("\nNumber of comparisons = %d\n",comp);

printf("Number of swaps= %d\n",swaps);

}

**Sample Input/Output**

Sample Input 1:

5

23 43 56 78 91

Sample Output 1:

Sorted Array: 23 43 56 78 91

Number of comparisons = 10

Number of swaps= 0

Sample Input 2:

5

91 78 56 43 23

Sample Output 2:

Sorted Array: 23 43 56 78 91

Number of comparisons = 10

Number of swaps= 10

Sample Input 3:

5

78 43 56 91 23

Sample Output 3:

Sorted Array: 23 43 56 78 91

Number of comparisons = 10

Number of swaps= 6

**Experiment 2**

**Implementation of Selection Sort Algorithm**

**Date:** 26-08-2020

**Aim:** To implement the Selection sort and it’s algorithm

**Data Structure Used:** Arrays

**Operation Used:** Comparisons and Swapping

**Algorithm:**

**Input:** An unsorted array of length n

**Output:** Sorted Array of length n

Step 1 : Start

Step 2 : Receive the size of the array in a variable n

Step 3 : i←0 //Receive the elements in the array

Step 4 : Repeat Step 5 and 6 until i=n

Step 5 : Receive an element and store it in a[i]

Step 6 : i←i+1

Step 7 : i←0 // Beginning of Sorting process

Step 8 : Repeat steps 9 to 20 until i=n

Step 9 : pos←i

Step 10: smallest←arr[i]

Step 11: j←i

Step 12: Repeat Steps 13 to 16 until j=n

Step 13: if arr[j] < smallest then do Steps 14 to 15

Step 14: smallest ← arr[j]

Step 15: pos← j

Step 16: j← j+1

Step 17: if pos != I then do steps 18 to 20

Step 18: temp ← arr[i]

Step 19: arr[i] ← arr[pos]

Step 20: arr[pos] ← temp

Step 21: i ← i++ //Selection Sort ends here

Step 22: i←0

Step 23: Repeat Step 22 to 23 until i=n //Print the sorted array

Step 24: Print the value of arr[i]

Step 25: i=i+1

Step 26: Stop

**Description of the Algorithm:**

The selection sort as the name implies selects the smallest element (in case of ascending order) from the unsorted sub array, initially the unsorted sub array is from 0 to n-1 where n is the number of element in the array, and swaps it with the first element in the said sub-array making the array from 0 to the i-1 sorted and the remaining () unsorted. This process goes on until the value of i becomes n at which the starting and ending indices of the sorted array becomes 0 and i-1 which is equal to n-1. Hence we can say that the array is sorted. The time complexity is O(n2), since the total number of comparison is n(n-1)/2

**Result:** the Program is successfully compiled and the desired output is obtained.

**Program/ Source Code:**

#include<stdio.h>

void main(){

int comp=0,swaps=0,i,j;

int arr[100];

int n,temp,smallest,pos;

printf("Enter the number of elements in the array: ");

scanf("%d",&n);

printf("Enter the elements in the array: ");

for(i=0;i<n;i++)

scanf("%d%\*c",arr+i);

for(i=0;i<n;i++){

smallest =arr[i];

pos =i;

for(j=i;j<n;j++){

if(arr[j]<smallest){

smallest= arr[j];

pos =j;

}

comp++;

}

if(pos!=i){

temp = arr[pos];

arr[pos] = arr[i];

arr[i]=temp;

swaps++;

}

}

printf("Sorted Array: ");

for(i=0;i<n;i++){

printf("%d ",arr[i]);

}

printf("\nNumber of comparisons = %d\n",comp);

printf("Number of swaps= %d\n",swaps);

}

**Sample Input/Output**

Sample Input1 :

5

23 43 56 78 91

Sample Output1 :

23 43 56 78 91

Number of comparisons : 15

Number of swaps : 0

Sample input 2:

5

91 78 56 43 23

Sample Output 2:

Sorted Array: 23 43 56 78 91

Number of comparisons = 15

Number of swaps= 2

Sample input 3:

5

43 78 56 91 23

Sample output 3:

Sorted Array: 23 43 56 78 91

Number of comparisons = 15

Number of swaps= 3