G. H. RAISONI COLLEGE OF ENGG., NAGPUR

(An Autonomous Institute under UGC Act 1956)

Department of Artificial Intelligence

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Practical Subject: Data Structures and Algorithms
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Semester	3
Section	A
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Practical Details: Practical Number- 1

Practical Aim	Write a program in C or C++ or java to implement bubble sort.
Theory	***Theory:*** Bubble Sort is one of the most basic and simple algorithms. It takes in an unsorted list and keeps comparing each element with its right-side element in order to sort the data. Whichever element is smaller gets shifted to the left. After completion of one round, the largest number ends up in its correct position. In other words, the largest number bubbles to the top or right in this case. Then, the process is repeated again and again until all of the data is sorted. ***Time Complexity:*** Best: $\Omega(n)$ Average: $\theta(n^2)$ Worst: $O(n^2)$

Procedure	1. We look through the array in an orderly fashion, comparing only adjacent elements at a time. 2. Whenever we see two elements which are out of, we swap them so that the smaller element comes before the greater element. 3. We keep performing the above steps over the array again and again till we get the sorted form.
Algorithm	**Step 1:** START **Step 2:** Set i=0, read array **Step 3:** Set j=0 **Step 4:** If arr[j] > arr[j+1] then swap. Set j = j+1 **Step 5:** If j<size-1-i then goto Step 4 else goto Step 3 and i+=1 **Step 6:** STOP

Program	bubble_sort.c
	`#include<stdio.h>`
	
	`void swap(int *, int *);`
	`void bubble(int *, int);`
	`void display(int *, int);`
	`int main()`
	`{`
	`  int arr[100], i, siz;`
	`  printf("Program Author: Vishal Narnaware");`
	`  printf("\nEnter the size of array: ");`
	`  scanf("%d", &siz);`
	`  for(i=0; i<siz; i++)  {`
	`  printf("\nEnter element %d :", i+1);`
	`  scanf("%d", &arr[i]);`
	`  }`
	`  bubble(arr, siz);`
	`  return 0;`
	`}`
	`void swap(int *a, int *b)`
	`{`
	`  int temp;`
	`  temp = *a;`
	`  *a = *b;`
	`  *b = temp;`
	`}`

```c
void bubble(int arr[], int siz)
{
    int i, j;
    for(i=0; i<siz-1; i++)  {
        for(j=0; j<siz-1-i; j++)    {
            if(arr[j] > arr[j+1])   {
                swap(&arr[j], &arr[j+1]);
            }
        }
    }
    display(arr, siz);
}
void display(int *arr, int siz)
{
    int i;
    printf("\n");
    for(i=0; i<siz; i++) {
        printf("%d ", arr[i]);
    }
}
```

Output

```
C:\Users\bagde\Desktop\Vishal\C\C-Basics\Practical\Practical1>bubble_sort.exe
Program Author: Vishal Narnaware
Enter the size of array: 5

Enter element 1 :10

Enter element 2 :2

Enter element 3 :1

Enter element 4 :9

Enter element 5 :3

1 2 3 9 10
```

Conclusion

Hence, successfully understood time complexity of bubble sort and implemented the algorithm in program.