

LAB 05

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SECTION: AM

SUBJECT: Data Structure and algorithms Lab

- **LINEAR SEARCH:**

Source Code:

```
#include<iostream>
using namespace std;
```

```
class linearSearch{
public:
    int arr[];
    int Snum;
    int index;
    int size;
    int i;
    int counter = 1;

    void LS(){
        cout<<"Enter the size of an array : "<<endl;
        cin>>size;
        int arr[size];

        cout<<"Enter the element : "<<endl;
        for(i = 0; i < size; i++){
            cin>>arr[i];
            counter++;
        }
        cout<<"\nEnter a Number to Search: ";
        cin>>Snum;

        for(i = 0; i < size; i++)
        {
            if(arr[i] == Snum)
            {
                index = i;
                break;
            }
        }
    }
};
```

```

        }
    }
    cout<<"\nFound at Index No."<<index;
    cout<<endl;

    cout<<"The performance of the program is : "<<counter<<endl;
}

};

```

```

int main(){

    linearSearch ls;
    ls.LS();
}

```

Picture:

```

Enter the size of an array :
10
Enter the element :
10
21
30
12
15
50
7
11
60
60
60
Enter a Number to Search: 2
Found at Index No:6
The performance of the program is : 11
=====
Process exited after 35.38 seconds with return value 0
Press any key to continue . . .

```

- **BINARY SEARCH:**

Source Code:

```

#include <iostream>
using namespace std;

```

```

class BinarySearch{
public:
    int size;
    int arr[100];
    int counter = 1;
    int i;

```

```
int Snum;  
int index;
```

```
void SetAllData(){  
    cout<<"Enter the Size of an array : "<<endl;  
    cin>>size;  
    arr[size];  
}
```

```
void SortanArray(){  
    cout<<"Enter the element of array : "<<endl;  
    for(i = 0; i < size; i++){  
        cin>>arr[i];  
        counter++;  
    }  
  
    for(i = 0; i < size; i++){  
        for(int j = i+1; j < size; j++){  
            if(arr[i] > arr[j]){  
                int temp = arr[i];  
                arr[i] = arr[j];  
                arr[j] = temp;  
            }  
        }  
    }  
    cout<<"Array After Sorting : "<<endl;  
    for( i = 0; i < size; i++){  
        cout<<arr[i]<<" ";  
        cout<<endl;  
    }  
}
```

```
void binarysearch(){  
  
    cout<<"Enter the Number for Search : "<<endl;  
    cin>>Snum;  
    for(i = 0; i < size; i++){  
        if(arr[i] == Snum){  
            index = i;  
            break;  
        }  
    }  
    int start = 0;
```

```

int end = size - 1;
int mid = (start+end)/2;

while(start <= end){

    if(Snum == arr[mid]){
        cout << "Your element is found at: " << mid << endl;
        break;
    }

    else if(Snum > arr[mid] ){
        start = mid+1;
        mid = (start+end)/2;
    }

    else{
        end = mid-1;
        mid = (start+end)/2;
    }

}

};

```

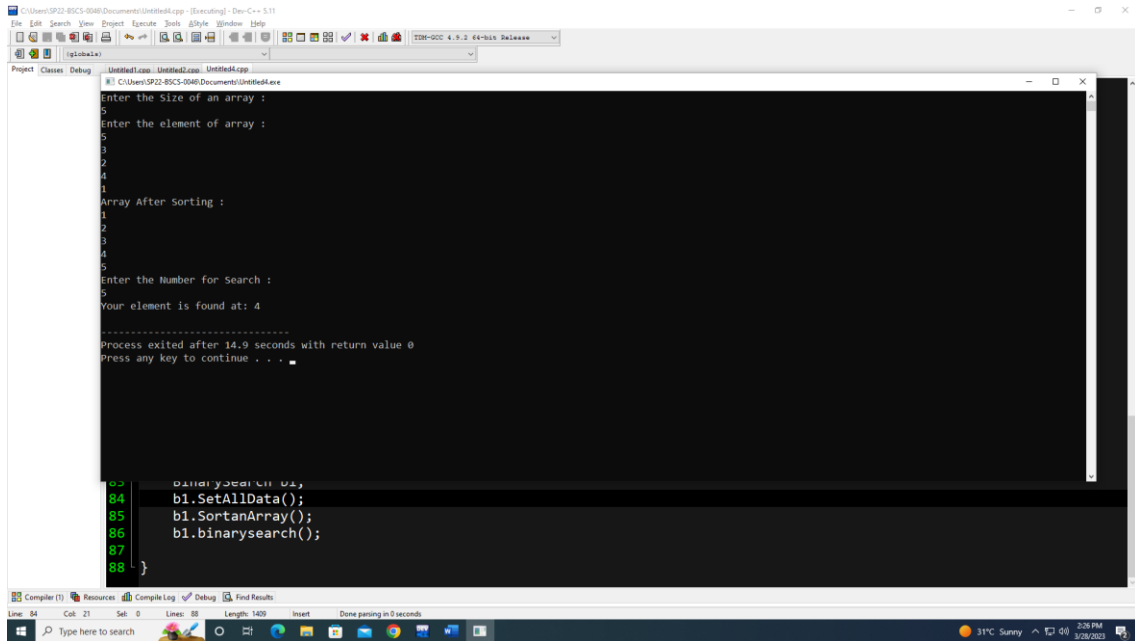
```

int main(){
    BinarySearch b1;
    b1.SetAllData();
    b1.SortanArray();
    b1.binarysearch();

}

```

Picture:



```
Enter the Size of an array :
5
Enter the element of array :
5
3
2
4
1
Array After Sorting :
1
2
3
4
5
Enter the Number for Search :
5
Your element is found at: 4
-----
Process exited after 14.9 seconds with return value 0
Press any key to continue . . .

83  b1.SetAllData();
84  b1.SetAllData();
85  b1.SortanArray();
86  b1.binarysearch();
87
88 }
```

- **EXPONENTIAL SEARCH:**

Source code:

```
#include<iostream>
```

```
using namespace std;
```

```
class ExponentialSearch{
```

```
public:
```

```
int arr[100];
```

```
int size;
```

```
int i;
```

```
int index;
```

```
int Snum;
```

```
void SortAnArray(){
```

```
cout<<"Enter the size of an array : "<<endl;
```

```
cin>>size;
```

```
int arr[size];
```

```
cout<<"Enter the element of an array : "<<endl;
```

```
for(i = 0; i < size; i++){
```

```
cin>>arr[i];
```

```
}
```

```
for(i = 0; i < size; i++){
```

```

        for(int j = i+1; j < size; j++){
            if(arr[i] > arr[j]){
                int temp = arr[i];
                arr[i] = arr[j];
                arr[j] = temp;
            }
        }
    }

    cout<<"Sorted Array : "<<endl;
    for(i = 0; i < size; i++){
        cout<<arr[i]<<" ";
        cout<<endl;
    }
}

void exponentialsearch(){
    int start = 0;
    int end = size-1;
    int mid = (start+end)/2;

    cout<<"Enter the number to search : "<<endl;
    cin>>Snum;

    if((end - start) < 0){
        cout<<"Element Found at Index -1 : "<<endl;
    }

    int k = 1;

    while(k < (end - start)){
        if(arr[k] < Snum){
            k *= 2;
            index = k;
            cout<<"Element Found at index : "<<index<<endl;
        }
        else{
            break;
        }
    }
}

```

```

        while(start <= end){
            if(Snum == arr[mid]){
                cout<<"Your element is found at mid : "<<mid<<endl;
            }
            else if(Snum > arr[mid]){
                start = mid + 1;
                mid = (start+end)/2;
            }
            else{
                end = mid - 1;
                mid = (start+end)/2;
            }
        }

    }

};

```

```

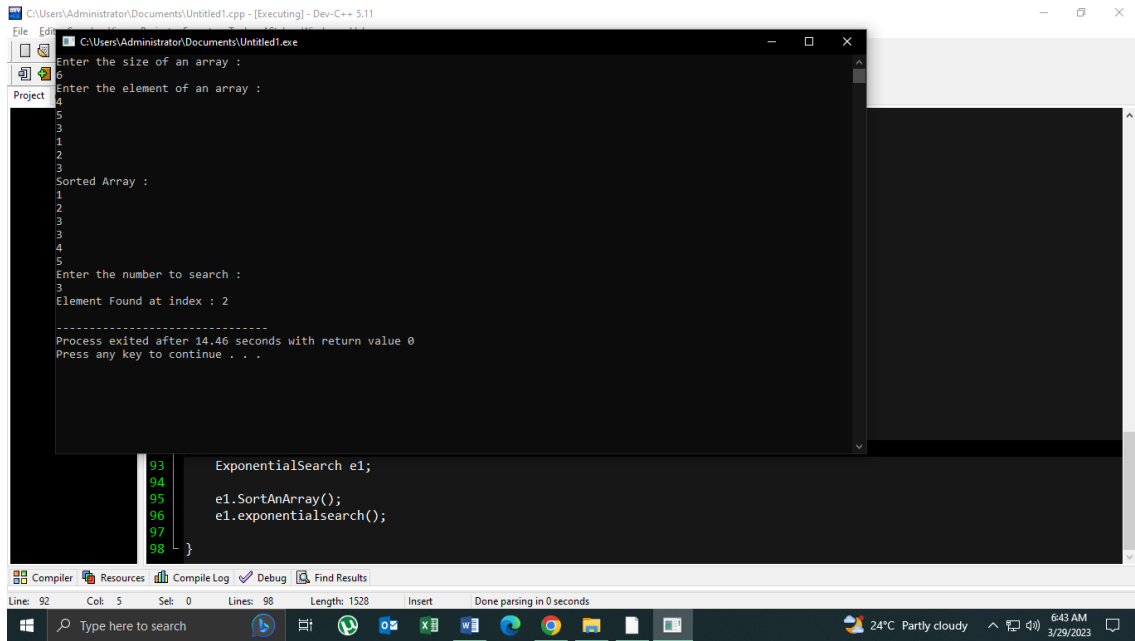
int main(){

    ExponentialSearch e1;

    e1.SortAnArray();
    e1.exponentialsearch();

}
Picture:

```



```
ExponentialSearch e1;
e1.SortAnArray();
e1.exponentialsearch();
```

- **JUMP SEARCH:**

Source code:

```
#include<iostream>
```

```
using namespace std;
```

```
class JumpSearch{
```

```
public:
```

```
int x,size;
```

```
int arr[100];
```

```
void elementarray(){
```

```
    cout << "Enter the number of elements in the array: \n";
```

```
    cin >> size;
```

```
    cout << "Enter the elements of the array: \n";
```

```
    for (int i = 0; i < size; i++)
```

```
        cin >> arr[i];
```

```
}
```

```
void bubbleSort(){
```

```
    int temp;
```

```
    for (int i = 0; i < size; i++) {
```

```
        for (int j = 0; j < size - i - 1; j++) {
```

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

```
                temp = arr[j];
```

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

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

```
            }
```

```
        }
```

```
    }
```



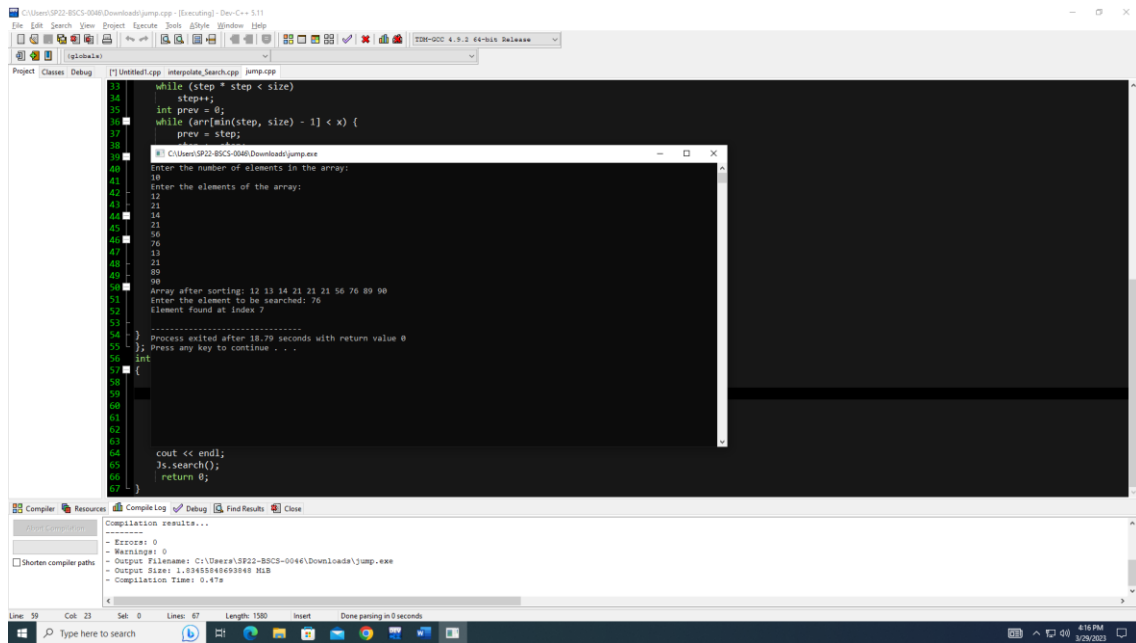
```

    }
    void search()
    {
        cout << "Enter the element to be searched: ";
        cin >> x;
        int step = 0;
        while (step * step < size)
            step++;
        int prev = 0;
        while (arr[min(step, size) - 1] < x) {
            prev = step;
            step += step;
            if (prev >= size) {
                cout << "Element not found";
                return ;
            }
        }
        while (arr[prev] < x) {
            prev++;
            if (prev == min(step, size)) {
                cout << "Element not found";
            }
        }
        if (arr[prev] == x) {
            cout << "Element found at index " << prev << endl;
        }
    }
};

int main()
{
    JumpSearch Js;
    Js.elementarray();
    Js.bubbleSort();
    cout << "Array after sorting: ";
    for (int i = 0; i < Js.size; i++)
        cout << Js.arr[i] << " ";
    cout << endl;
    Js.search();
    return 0;
}

```

Picture:



```

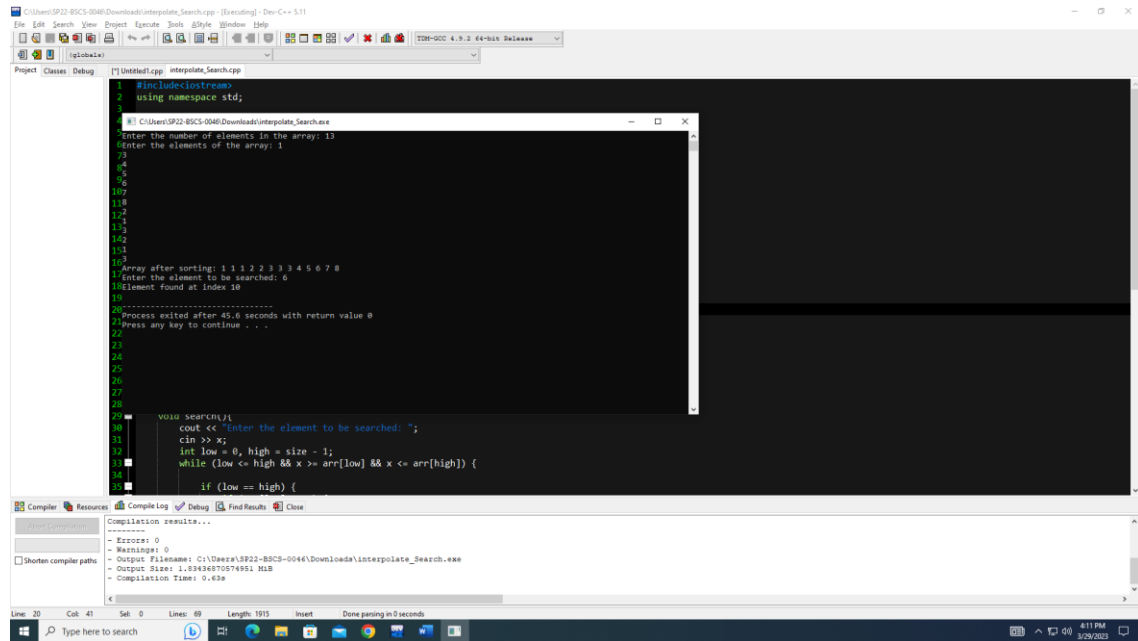
    }
}
}
void search(){
    cout << "Enter the element to be searched: ";
    cin >> x;
    int low = 0, high = size - 1;
    while (low <= high && x >= arr[low] && x <= arr[high]) {

        if (low == high) {
            if (arr[low] == x) {
                cout << "Element found at index " << low << endl;
                return;
            }
            else {
                cout << "Element not found" << endl;
                return;
            }
        }
        int pos = low + ((x - arr[low]) * (high - low)) / (arr[high] - arr[low]);
        if (arr[pos] == x) {
            cout << "Element found at index " << pos << endl;
            return;
        }
        if (arr[pos] < x)
            low = pos + 1;
        else
            high = pos - 1;
    }
    cout << "Element not found" << endl;
}
};

int main(){
    Interpolate ip;
    ip.elementarray();
    ip.bubbleSort();
    cout << "Array after sorting: ";
    for (int i = 0; i < ip.size; i++)
        cout << ip.arr[i] << " ";
    cout << endl;
    ip.search();
    return 0;
}

```

Picture:



The screenshot shows a C++ IDE with a project named 'interpolate_search.cpp'. The main editor displays the source code for a binary search algorithm. The code includes `<iostream>` and `using namespace std;`. It prompts the user to enter the number of elements in the array (13) and the elements of the array (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13). The array is then sorted, and the user is prompted to enter the element to be searched (6). The program outputs 'Element found at index 10' and 'Process exited after 45.6 seconds with return value 0'. The compilation results panel at the bottom shows no errors or warnings, and the output file is 'interpolate_search.exe'.

```
1 #include<iostream>
2 using namespace std;
3
4 #1 C:\Users\SP22-BSCS-0046\Downloads\interpolate_search.exe
5 Enter the number of elements in the array: 13
6 Enter the elements of the array: 1
7 2
8 3
9 4
10 5
11 6
12 7
13 8
14 9
15 10
16 11
17 12
18 13
19 Array after sorting: 1 1 1 2 2 3 3 3 4 5 6 7 8
20 Enter the element to be searched: 6
21 Element found at index 10
22
23 Process exited after 45.6 seconds with return value 0
24 Press any key to continue . . .
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