

Heaven's Light is Our Guide
Computer Science & Engineering
Rajshahi University of Engineering & Technology

Lab Manual

Module- 02

Course Title : Sessional based on CSE 2201

Course No. : CSE 2202

Name: Complexity analysis of searching algorithm (Linear search and Binary search)

Algorithms:

- Linear Search
- Binary Search

Linear Search

Iterative

Suppose an array A with elements indexed 1 to n is to be searched for a value x. The following pseudo code performs a forward search, returning n + 1 if the value is not found:

Linear_Search(A,x)

Set i to 1.

Repeat this loop:

 If $i > n$, then exit the loop.

 If $A[i] = x$, then exit the loop.

 Set i to $i + 1$.

Return i .

Recursive

Linear search can also be described as a recursive algorithm:

LinearSearch(value, list)

 if the list is empty, return Λ ;

 else

 if the first item of the list has the desired value, return its location;

 else return LinearSearch(value, remainder of the list)

Task:

1. Find out the complexity of these two algorithms for linear search mathematically.
2. Code these algorithm in any language(i.e. C/C++/Java)
3. Find the running time for a set of list (let size 1000, 5000,10000, 15000 etc) search a value x.
4. Write down a report on it.

Binary Search

Iterative

```
BinarySearch(A[0..N-1], value) { low =  
    0  
    high = N - 1  
    while (low <= high) { mid =  
        (low + high) / 2 if (A[mid] >  
        value)  
            high = mid - 1  
        else if (A[mid] < value) low =  
            mid + 1  
        else  
            return mid // found  
    }  
    return -1 // not found  
}
```

Recursive

The most straightforward implementation is recursive, which recursively searches the sub range dictated by the comparison:

```
BinarySearch(A[0..N-1], value, low, high) { if
    (high < low)
        return -1 // not found
    mid = (low + high) / 2
    if (A[mid] > value)
        return BinarySearch(A, value, low, mid-1)
    else if (A[mid] < value)
        return BinarySearch(A, value, mid+1, high)
    else
        return mid // found
}
```

Task:

1. Find out the complexity of these two algorithms for linear search mathametically.
2. Code these algorithm in any language(i.e. C/C++/Java)
3. Find the running time for a set of list (let size 1000, 5000,10000, 15000 etc) search a value x.
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Now Compare between linear search and binary search and write down a report on it.