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 \Lambda;
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 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.
- 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
}</pre>
```

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
}</pre>
```

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.
- 4. Write down a report on it.

Now Compare between linear search and binary search and write down a report on it.