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 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
  }
```

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.