Usman Institute of Technology

Department of Computer Science – Fall 2018

CS-212 Data Structures and Algorithms
Lab Manual # 2

OBJECTIVE:

1. *Understand searching in an array and implement Linear Search.*
2. *Application of the binary search on a list of elements stored in an array.*
3. *Understand and Implement Recursive Binary Search.*

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Name   : _____

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Semester   : _____ Section: _____

Date   : _____

Remarks   : _____

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Lab 02: Implementation of Searching Algorithm

Activity #1:

Implement a **linear search** algorithm in a non-empty array DATA with N numerical values. Find value X and print its location LOC in the array.

Binary Search:

We will implement a Binary search by finding the location LOC of the searching value X from a non-empty, sorted array DATA with N numerical values. The steps included are:

1. Initialization: LB = 0, UB = N-1 and MID = Midpoint of array ((LB + UB) / 2)
2. Check: Repeat steps 3 and 4 until LB <= UB AND DATA[MID] $\neq$ X
3. Compare: X with DATA[MID]:
   If X < DATA[MID], then Set UB = MID – 1, Else Set LB = MID + 1
4. Compute: MID = INT ((LB + UB) / 2)
5. If DATA[MID] = X, then Set LOC = MID Else Set LOC = NULL

Binary Search Recursive:

For this we make a recursive function which returns the mid of the array, say

> **INT BinarySearchRecursive (DATA, X, LB, UB)**

The above procedure will be followed only the step 3 & 4 is replaced by:

3. Compare: X with DATA[MID]:

   If X < DATA[MID]

   > Return BinarySearchRecursive (DATA, X, LB, MID-1)

   Else

   > Return BinarySearchRecursive (DATA, X, MID+1, UB)

EXERCISES
1. Implement Binary Search in C#.
2. Implement Binary Search Recursive in C#.
3. Modify the Binary Search algorithm to insert the element in the array if the search remains unsuccessful. Make sure that the array remains sorted after the insertion. Implement the revised algorithm in C#.
4. Modify the linear search to replace that element in the array with the user input (*input should be other than searched item*) if the search becomes successful. Implement the revised algorithm in C#.

HOME TASK:

   Implement all algorithms in Object Oriented structure using JAVA or C++ programming language