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Each Lab program must be followed by Objective, Algorithm and Source Code written in C Language

Experiment No: – 01

1.1 Aim: Understanding the searching algorithm of linear search and binary search.

1.2 List of Equipment: Minimum Requirement
- *PC Configuration:* Intel (R) Pentium (R) 4 CPU 2.67 GHZ, 256 MB RAM)
- *Operating System:* MS Windows XP Professional Service Pack 2
- *Printer Configuration:* DMP, TVS: MS P245
- *Language Used:* 'C' language.

1.3 Objective: Write a program of linear search and Binary search in 'C' language.

1.4 Theory in brief

Linear search is a very simple search algorithm. In this type of search, a sequential search is made over all items one by one. Every item is checked and if a match is found then that particular item is returned, otherwise the search continues till the end of the data collection.

Binary search is a fast search algorithm with run-time complexity of $O(\log n)$. This search algorithm works on the principle of divide and conquers. For this algorithm to work properly, the data collection should be in the sorted form.

Binary search looks for a particular item by comparing the middle most item of the collection. If a match occurs, then the index of item is returned. If the middle item is greater than the item, then the item is searched in the sub-array to the left of the middle item. Otherwise, the item is searched for in the sub-array to the right of the middle item. This process continues on the sub-array as well until the size of the sub-array reduces to zero.

For a binary search to work, it is mandatory for the target array to be sorted. We shall learn the process of binary search with a pictorial example. The following is our sorted array and let us assume that we need to search the location of value 31 using binary search.

Algorithm of linear search:

Linear Search (Array A, Value x)

Step 1: Set i to 1
Step 2: if i > n then go to step 7
Step 3: if A[i] = x then go to step 6
Step 4: Set i to i + 1
Step 5: Go to Step 2
Step 6: Print Element x Found at index i and go to step 8
Step 7: Print element not found
Step 8: Exit

Pseudo code of linear search

procedure linear_search (list, value)

for each item in the list

if match item == value

return the item's location

end if

end for

end procedure

Pseudo code of Binary search

Procedure binary_search

A ← sorted array
n ← size of array
x ← value to be searched

Set lowerBound = 1
Set upperBound = n

while x not found
   if upperBound < lowerBound
      EXIT: x does not exists.

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set midPoint = lowerBound + ( upperBound - lowerBound ) / 2

if A[midPoint] < x
    set lowerBound = midPoint + 1

if A[midPoint] > x
    set upperBound = midPoint - 1

if A[midPoint] = x
    EXIT: x found at location midPoint

end while

end procedure
```