

Unit-05Searching

Searching is a process of finding an element within the list of elements stored in any order.

Searching is divided into two categories.

1. Linear search or sequential search
2. Binary search

### 1. Linear Search :-

In linear search, we access each element of an array one by one sequentially, and see whether it is a desired element or not. A search will be unsuccessful if all the elements are accessed and the desired element is not found.

### ★ Algorithm :-

Linear\_Search ( A[], n, k, loc )

- 1) Initialize I = 0
- 2) for I = 0 to n
- 3) If ( A[i] = k )  
    print A[i]
- 4) EXIT

✶

★ Binary search:-

Binary search is a very efficient search technique which works for sorted list.

This search technique searches the given item/element in minimum possible comparisons.

To do the binary search first we have to sorted the array elements.

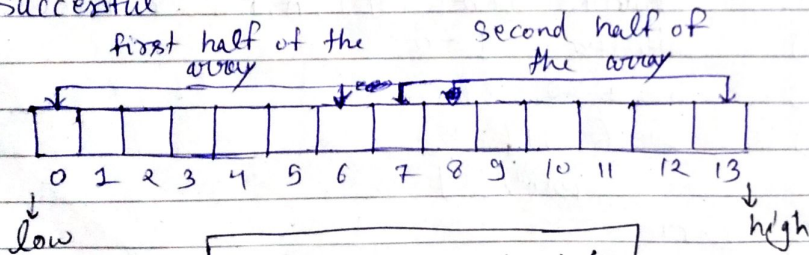
The logic behind this technique is given below:-

- 1) Find the middle element of the array.
- 2) Compare the middle element of the array. There are three cases arise.

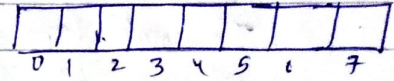
(a) If it is less than the desired element, then search only the first half of the array.

(b) If it is greater than the desired element then search only the second half of the array.

(c) If it is a desired element then search is successful.



★ Algorithm:-



A → name of the array  
R → index no.

Binary search (A, k)

- 1) low = 0
- 2) high = n - 1
- 3) while (low ≤ high) && (A[mid] != k)
- 4) do mid ← (low + high) / 2
- 5) if (k = A[mid])
- 6) return A[mid]
- 7) else if (k < A[mid])
- 8) high ← mid - 1
- 9) else
- 10) low ← mid + 1
- 11) EXIT.

★ Sorting:-

Sorting is the process of arranging the elements in some given sequence either in ascending order or descending order.

Sorting is divided into two parts.

1. Internal sorting
2. External sorting

## 1. Internal sorting:-

Internal Sorting means we are arranging the numbers in the array only which is in Computer primary memory that is RAM and ROM.

exp:- Bubble sort, insertion sort, quick sort, selection sort etc.

## 2. External sorting:-

External sorting is the sorting of no. from the external file by reading it from secondary memory i.e. harddisk.

exp:- Merge sort, Tape sort, polyphase sort, External Radix sort, External merge sort.

## (a) Bubble sort :-

In Bubble sort each element is compared with its adjacent element.

If the first element is larger than the second one then the position of the elements are interchanged otherwise it is not change. And the same process is repeated for all the elements in the array.

\* Algorithm:-  $A \rightarrow$  Array  
 $N \rightarrow$  size of Array  
Bubble sort  $(A, N)$

- 1) Initialization set  $I = 0$
- 2) Repeat steps ③ to ⑤ until  $I < N$
- 3) set  $J = 0$
- 4) Repeat step ⑤ until  $J < N - I - 1$
- 5) IF  $(A[J] > A[J+1])$ , then  
Set  $TEMP = A[J]$   
Set  $A[J] = A[J+1]$   
Set  $A[J+1] = TEMP$   
[End if]
- 6) Exit.

Q. Sort the following list of element using bubble sort  $A = \{7, 9, 6, 5, 1, 3\}$

Sol<sup>n</sup> Pass 1:-

$N \left[ \begin{array}{cccccc} 7 & 7 & 7 & 7 & 7 & 7 \\ 9 & 9 & 6 & 6 & 6 & 6 \\ 6 & 6 & 9 & 5 & 5 & 5 \\ 5 & 5 & 5 & 9 & 1 & 1 \\ 1 & 1 & 1 & 1 & 9 & 3 \\ 3 & 3 & 3 & 3 & 3 & 9 \end{array} \right.$					
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Pass 2:-

$\left[ \begin{array}{cccc} 7 & 6 & 6 & 6 \\ 6 & 7 & 5 & 5 \\ 5 & 5 & 7 & 1 \\ 1 & 1 & 1 & 7 \\ 3 & 3 & 3 & 7 \\ 9 & 9 & 9 & 9 \end{array} \right.$				
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Pass 3:-

6	5	5	5
5	6	1	1
1	1	6	3
3	3	3	6
7	7	7	7
9	9	9	9

Pass 4:-

5	1	1
1	5	3
3	3	5
6	6	6
7	7	7
9	9	9

Best case time complexity =  $\Omega(n)$   
 Average " " " =  $O(n^2)$   
 Worst " " " =  $O(n^2)$