Fundamentals of
Data Structures using C

Linear Search

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Introduction

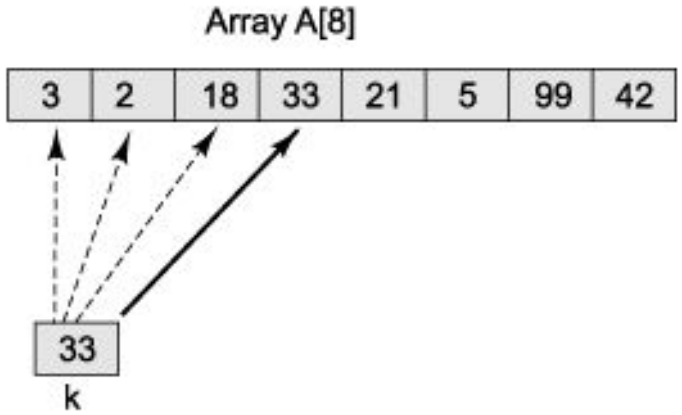
- It is one of the conventional searching techniques that sequentially searches for an element in the list.
- It typically starts with the first element in the list and moves towards the end in a step-by-step fashion.
- In each iteration, it compares the element to be searched with the list element, and if there is a match, the location of the list element is returned.

Introduction

- Consider an array of integers A containing n elements.
- Let k be the value that needs to be searched.
- The linear search technique will first compare A[0] with k to find out if they are same.
- If the two values are found to be same then the index value, i.e., 0 will be returned as the location containing k.

Introduction

- However, if the two values are not same then k will be compared with A[1].
- This process will be repeated until the element is not found.
- If the last comparison between k and A[n– 1] is also negative then the search will be considered as unsuccessful.
- Figure depicts the linear search technique performed on an array of integers.



Introduction

- As shown in Fig., the value k is repeatedly compared with each element of the array A.
- As soon as the element is found, the corresponding index location is returned and the search operation is terminated.

Routine

```
int LinearSearch(int a[], int n, int key)
{
        int i;
        for (i = 0; i < n; i++)
                if (a[i] == key)
                        return i;
        return -1;
}
```

Efficiency of Linear Search

- Assume that an array containing n elements is to be searched for the value k.
- In the best case, k would be the first element in the list, thus requiring only one comparison.
- In the worst case, it would be last element in the list, thus requiring n comparisons.
- To compute the efficiency of linear search we can add all the possible number of comparisons and divide it by n.
- Thus, efficiency of linear search = (1 + 2 + . . . + n) / n

  = n(n + 1) / 2n

  = O(n)

Advantages of Linear Search

- It is a simple searching technique that is easy to implement.
- It does not require the list to be sorted in a particular order.

Limitations of Linear Search

- It is quite inefficient for large sized lists.
- It does not leverage the presence of any pre-existing sort order in a list.

Queries?

Thank You!