Hello Everyone

Course Code : CSE201

Course Title : Data Structure

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Linear Search

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Introduction to Search

- The Definition of a Search is the process of looking for something or someone.
- Searching is the process of finding a given value position in a list of values.
- It decides whether a search key is present in the data or not.
- It is the algorithmic process of finding a particular item in a collection of items.
- It can be done on internal data structure or on external data structure.

What is Linear Search?

- 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.

Pseudo Code

- Start from the leftmost element of arr[] and one by one compare x with each element of arr[]
- If x matches with an element, return the index.
- If x doesn’t match with any of elements, return -1.

Example of Linear Search

When int x=20,int arr[10];

Index :	0	1	2	3	4	5	6	7	8
Value :	10	50	30	70	80	60	20	90	40

Explain:

- First of all check leftmost index and it is 0,value is 10 but not equal to x
- Then check index 1,here value is 50 but not matches x
- Then check index 2,3,4,5 and value is respectively 30,70,80 & 60 but not equal to x
- Finally check index 6,value is 20 and equal to x. So return index 6.

Code in C++

B_Factorial_Yen_Coin.cpp | D_Shortest_Path_Querie.s2.cpp | A_Reconnaissance.cpp | Linear_Search.cpp | B_Borze.cpp | C_Fair_Candy_Distribution.cpp | 11631_Dark_roads.cpp | 10048_Aud

```cpp
#include <iostream>
using namespace std;

int Linear_Search(int arr[], int n, int x)
{
    int i;
    for (i = 0; i < n; i++) {
        if (arr[i] == x) {
            return i;
        }
    }
    return -1;
}

int main(void)
{
    int arr[] = {10, 50, 30, 70, 80, 60, 20, 90, 40};
    int x = 20, n, i, result;
    n = sizeof(arr) / sizeof(arr[0]);

    result = Linear_Search(arr, n, x);

    if (result == -1)cout << "Element is not present in array" << endl;
    else cout << "Element is present at index " << result << endl;

    return 0;
}

//Tushar Sarkar_____Linear Search
```

C:\WINDOWS\system32\cmd.exe - pause

```
Element is present at index 6
Press any key to continue . . .
```

Complexity

Best Case :

- The element being searched may be found at the first position.
- In this case, the search terminates in success with just one comparison.
- Thus in best case, linear search algorithm takes O(1) operations.

Worst Case :

- The element being searched may be present at the last position or not present in the array at all.
- In the former case, the search terminates in success with n comparisons.
- In the later case, the search terminates in failure with n comparisons.
- Thus in worst case, linear search algorithm takes O(n) operations.

Advantages & Disadvantages

Advantages :

- Will perform fast **searches** of small to medium lists. With today's powerful computers, small to medium arrays can be searched relatively quickly.
- The list does not need to sorted. ...
- Not affected by insertions and deletions.

Disadvantages :

- **Linear Search** is very slow for large lists.
- As the number of elements in the array/list increases the time complexity also increases.

Conclusion

- The sequential search, also known as the linear search, are the most basic search algorithms and are often the first search method learned in introductory computer science courses.
- The basic strategy is straightforward.
- Every element in the data set is examined in the order presented until the value being searched for is found.
- If the value being searched for doesn't exist, a flag value is returned (such as -1 for an array or NULL for a linked list).

Thank You