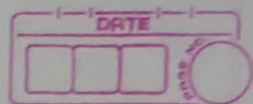


Assignment-4



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Problem Statement/Defination:-

a) Write a python program to store roll no of students in array who attended training program in random order. Write a Function For a Search whether perticular student attended training program or not using linear search and Sentinel Search.

b) Write a python program to store roll no of students in array who attended training program in sorted order. Write a function for searching whether perticular student attended training program or not using Binary search and Fibonacci Search

Objective:-

- To understand Concept of Searching
- To study different Searching methods
- To study application of each method.

Outcome -

- To write function for implementing Searching method
- To use function written for only one application.

SIW and H/W Requirements:-

- Programming language :- python
- operating system :- 64bit Fedora
- programming tool :- Jupyter notebook

Theory:-

Linear Search is a method for finding a target value within a list. it sequentially checks each element of the list for the target value until match have been found or all elements have been searched.

Linear Search runs in an worst case time and makes most n comparisons where n is the length of the list. if each element is equally likely to be searched then linear search have an average $(n/2)$ comparisons.

Sentinal Search is type of linear search where the n of

Comparison are reduced as Compare to linear Search algorithm.

in this Search last element of array is replaced with the element to be searched and linear searched is perform on the array without checking current index.

The no of Comparison in worst Case are $(n+2)$ here.

Binary Search:- Search a sorted array by the repeatedly dividing the search interval by in half. Begin with an interval covering of whole array. if the Value is less than item in middle it will narrow the interval to half. & repeatedly Check until the Value is found or interval is empty.

time Complexity $O(\log n)$

Fibonacci Search is a Comparison-based technique that uses Fibonacci numbers to search an element in a sorted array. Fibonacci search divide given array in unequal parts.

Binary Search uses division operator to divide range

Algorithm :-

- 1 Start
- 2 int n, choice
- 3 take input of n no and store in Array
- 4 read choice and key
- 5 if (choice == 1)
- 6 Search S.linearsearch(key)
- 7 elif (choice == 2)
- 8 S.SentinelSearch(key)
- 9 elif (choice == 3)
- 10 S.binarySearch(key)
- 11 elif (choice == 4)
- 12 S.FibonacciSearch(key)
- 13 elif (choice == 0)
- 14 break
- 15 else :
- 16 wrong choice
- 17 end

* Algorithm for linear Search

- 1 Take input Array
- 2 Take key you want to search
- 3 Set Flag = -1
- 4 Loop: arr[start] -> arr[end]
 - 1 if match Found arr[curr_pos] = x
 - Print "match found at x"
 - Flag = 0
 - abort

5 after loop

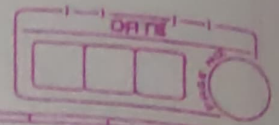
if Flag == -1

* Algorithm For Sentinel Search

```
1 Take input array , key
2 Append the n at the end of array
3 while (arr[i] != key)
4     i++
5 return i if i != n
6 else return i
7 else
8     return -1
```

* Binary Search

```
1 Take input array , n, key
2 Start loop while (left < right)
   mid = left + (right - left) / 2
   • if arr[mid] == x then
       return m
   • else (if arr[mid] less than x) then
       left = m + 1
   • else
       right = mid - 1
3 end loop
4 return -1
```

Test Case	Description	I/p	O/p	Expected O/p	result
1	[1, 2, 3, 4, 5]				
	1. linear	5	present	present	pass
	2. Sentinel				
	3. Binary	5			
	4. Fibonacci				
2	[1, 2, 3, 4, 5, 6]				
		8	Absent	Absent	pass
		6			

Time Complexity

linear Search	:-	$O(n)$
Sentinel Search	:-	$O(n)$
Binary Search	:-	$O(\log(n))$
Fibonacci Search	:-	$O(\log(n))$