


CS Bridge Module 13 Searching

1. Searching

1.1 CS Bridge: Searching




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CS Bridge: Searching

Module 13
Itay Tal

1.2 The Searching Problem



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The Searching Problem

Problem

Implement the following function:

```
int search(int arr[], int arrSize, int val);
```

The function should return an index in `arr`, where `val` appears first, or -1 if `val` is not one of `arr`'s elements.

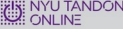
Examples

If `arr` is an array containing: [5, 8, 12, 7, 8, 10]

- The call: `search(arr, 6, 8)` should return 1
- The call: `search(arr, 6, 4)` should return -1

1.3 Searching Code Sample

Searching Problem Coding Sample



```
int search(int arr[], int arrSize, int val){
    int i;

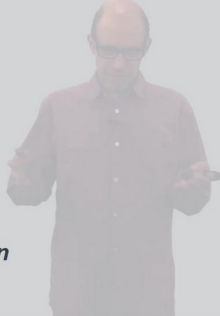
     $\Theta(1)$  i = 0;
    while (i < arrSize){
         $\Theta(1)$  if (arr[i] == val)
            return i;
        i++;
    }
     $\Theta(1)$  return -1;
}
```

$\Theta(\# \text{ of iterations})$

- $T(n) = \Theta(\# \text{ of iterations})$
- In worst-case: $(\# \text{ of iterations}) = n$


\downarrow

$T(n) = \Theta(n)$



1.4 The Sorted-Search Problem

The Sorted- Search Problem



Problem

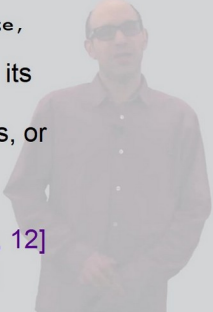
Implement the following function:

```
int sortedSearch(int srtArr[], int srtArrSize,
                int val);
```

The function is given a sorted array `srtArr`, its size, and `val` to search for. It should return an index, where `val` appears, or -1 if `val` is not one of `srtArr`'s elements.


Example

If `srtArr` is an array containing: [5, 7, 8, 8, 10, 12]
The call `sortedSearch(srtArr, 6, 8)` could return 3

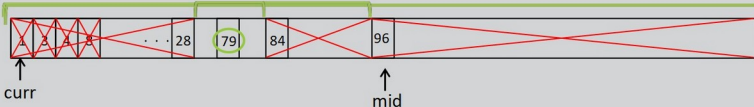


1.5 The Sorted-Search Problem

The Sorted-Search Problem

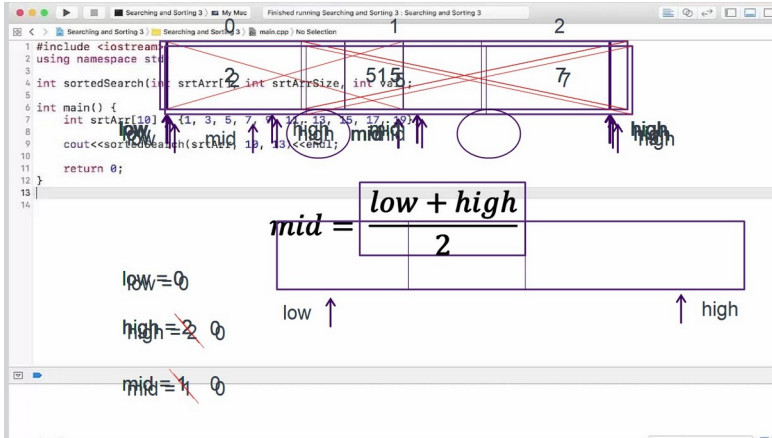


`val = 79`

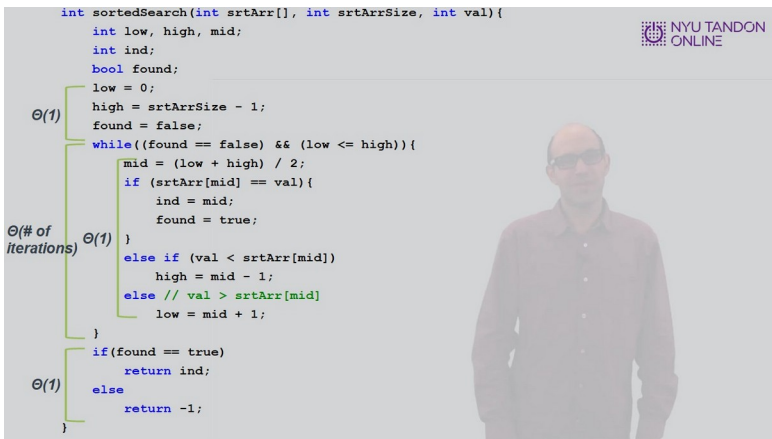


$T(n) = \Theta(n)$

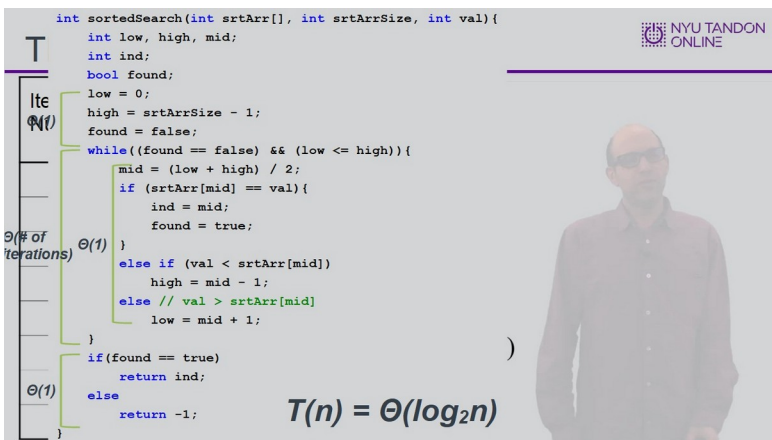
1.6 Sorted Search Implementation



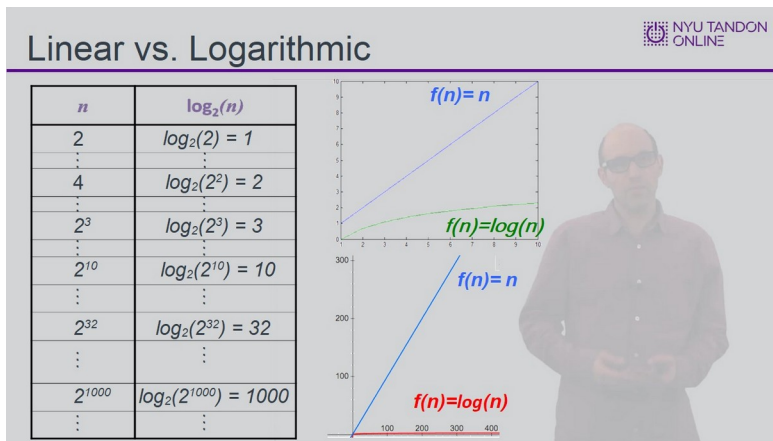
1.7 Implementation



1.8 The Sorted-Search Problem



1.9 Linear vs Logarithmic



1.10 Knowledge Check

(Multiple Choice, 10 points, 5 attempts permitted)

Knowledge Check

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What is the running time for the following linear search?

```
For (int i = 0; i < n; i++)  
    //linear search  
For (int i = 0; j < n; j++)  
    //linear search
```

☐ $O(n^2)$

☐ $O(2n)$

☐ $O(\log n)$

☒ $O(n)$

Correct	Choice
	$O(n^2)$
	$O(2n)$
	$O(\log n)$
X	$O(n)$

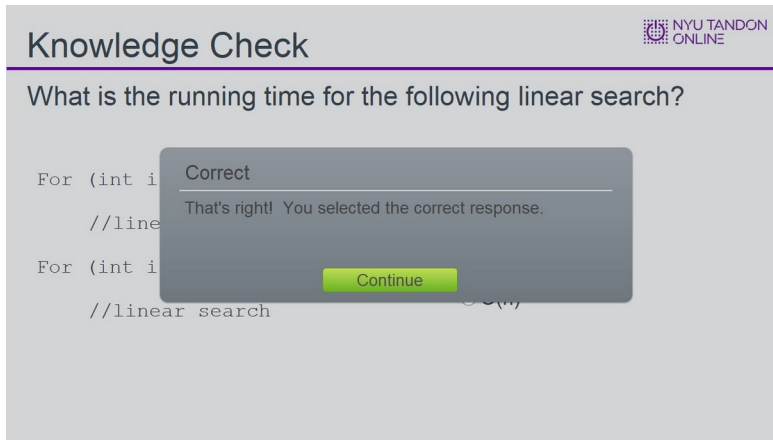
Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

You did not select the correct response.

Correct (Slide Layer)

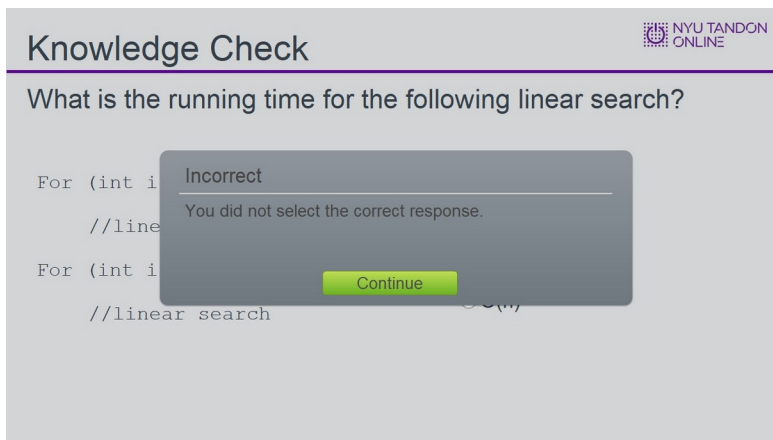


The screenshot shows a slide titled "Knowledge Check" with the NYU Tandon Online logo in the top right corner. The question is "What is the running time for the following linear search?". Below the question is a code snippet:

```
For (int i = 0; i < arr.length; i++)  
    //linear search  
    if (arr[i] == target)  
        return i;  
return -1;
```

 A grey feedback box is overlaid on the code, containing the text "Correct" and "That's right! You selected the correct response." with a green "Continue" button at the bottom.

Incorrect (Slide Layer)



The screenshot shows a slide titled "Knowledge Check" with the NYU Tandon Online logo in the top right corner. The question is "What is the running time for the following linear search?". Below the question is the same code snippet as in the previous slide. A grey feedback box is overlaid on the code, containing the text "Incorrect" and "You did not select the correct response." with a green "Continue" button at the bottom.

Try Again (Slide Layer)

Knowledge Check

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What is the running time for the following linear search?

```
For (int i = 0; i < arr.length; i++)  
    //linear search  
    if (arr[i] == target)  
        return i;  
return -1;
```

Incorrect

That is incorrect. Please try again.

Try Again

1.11 Knowledge Check

(Multiple Choice, 10 points, 4 attempts permitted)

Knowledge Check

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Solve the following equation for k, where n is a positive integer. (Note that $\log(n)$ refers to \log_2)

$$\frac{n}{2^{\left(\frac{2k}{3}\right)-1}}$$

- ☐ $k = \left(\frac{2}{3}\right)(1 + \log n)$
- ☒ $k = \left(\frac{3}{2}\right)(1 + \log n)$
- ☐ $k = \left(\frac{1}{2}\right)(1 + \log 3n)$
- ☐ $k = \left(\frac{1}{3}\right)(1 + \log 2n)$

Correct	Choice
	$k = \left(\frac{2}{3}\right)(1 + \log n)$
X	$k = \left(\frac{3}{2}\right)(1 + \log n)$
	$k = \left(\frac{1}{2}\right)(1 + \log 3n)$
	$k = \left(\frac{1}{3}\right)(1 + \log 2n)$

Feedback when correct:

That's right! You selected the correct response.

Feedback when incorrect:

You did not select the correct response.

Notes:

Correct (Slide Layer)

Knowledge Check

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Solve the following equation for k, where n is a positive integer. (Note that log(n) refers to log 2)

$$\frac{n}{2^{\left(\frac{2k}{3}\right)}} = \log(n)$$

Correct

That's right! You selected the correct response.

Continue

Incorrect (Slide Layer)

Knowledge Check

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Solve the following equation for k, where n is a positive integer. (Note that log(n) refers to log 2)

$$\frac{n}{2^{\left(\frac{2k}{3}\right)}} = \log(n)$$

Incorrect

You did not select the correct response.

Continue

Try Again (Slide Layer)

Knowledge Check

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Solve the following equation for k, where n is a positive integer. (Note that log(n) refers to log 2)

$$\frac{n}{2^{\left(\frac{2k}{3}\right)}}$$

Incorrect

That is incorrect. Please try again.

Try Again

1.12 End of Module

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End of Module

Exit