Longest Palindromic Substring | Set 2

Given a string, find the longest substring which is palindrome. For example, if the given string is "forgeeksskeegfor", the output should be "geeksskeeg".

We have discussed dynamic programming solution in the previous post. The time complexity of the Dynamic Programming based solution is O(n^2) and it requires O(n^2) extra space. We can find the longest palindrome substring in (n^2) time with O(1) extra space. The idea is to generate all even length and odd length palindromes and keep track of the longest palindrome seen so far.

Step to generate odd length palindrome:
Fix a centre and expand in both directions for longer palindromes.

Step to generate even length palindrome
Fix two centre (low and high) and expand in both directions for longer palindromes.

```
// A O(n^2) time and O(1) space program to find the longest palindromi
#include <stdio.h>
#include <string.h>

// A utility function to print a substring str[low..high]
void printSubStr(char* str, int low, int high)
{
    for( int i = low; i <= high; ++i )
        printf("%c", str[i]);
}

// This function prints the longest palindrome substring (LPS)
// of str[]. It also returns the length of the longest palindrome
int longestPalSubstr(char *str)
{
    int maxLength = 1;  // The result (length of LPS)
```

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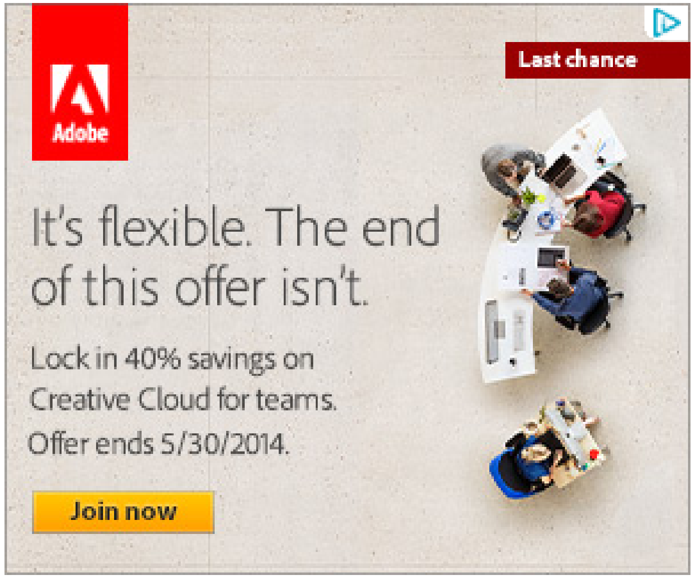
```
    int start = 0;
    int len = strlen(str);

    int low, high;

    // One by one consider every character as center point of
    // even and length palindromes
    for (int i = 1; i < len; ++i)
    {
        // Find the longest even length palindrome with center points
        // as i-1 and i.
        low = i - 1;
        high = i;
        while (low >= 0 && high < len && str[low] == str[high])
        {
            if (high - low + 1 > maxLength)
            {
                start = low;
                maxLength = high - low + 1;
            }
            --low;
            ++high;
        }

        // Find the longest odd length palindrome with center
        // point as i
        low = i - 1;
        high = i + 1;
        while (low >= 0 && high < len && str[low] == str[high])
        {
            if (high - low + 1 > maxLength)
            {
                start = low;
                maxLength = high - low + 1;
            }
            --low;
            ++high;
        }
    }

    printf("Longest palindrome substring is: ");
    printSubStr(str, start, start + maxLength - 1);

    return maxLength;
}

// Driver program to test above functions
```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```
int main()
{
    char str[] = "forgeeksskeegfor";
    printf("\nLength is: %d\n", longestPalSubstr( str ) );
    return 0;
}
```

Output:

```
Longest palindrome substring is: geeksskeeg
Length is: 10
```

Time complexity: O (n^2) where n is the length of input string.
Auxiliary Space: O (1)

We will soon be adding more optimized method as separate post.

Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above.

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Byron Formwalt • 19 days ago

In *Ruby*, this can be accomplished writing less code.

```
#!/usr/bin/env ruby

class String
  def largest_palindrome
    s1  = self.split("")
    s2  = s1.reverse
    p   = ""
    (s2.length).times do |i|
      # Determine the max length of aligned letters.
      c = s1.each_with_index.collect do |v1,j|
        v1 == s2[j] ? v1 : "_"
      end
```

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Neha I think that is what it should return as, in...

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```
        end
        c = c.join.split("_")
        n = c.collect{|e| e.reverse == e ? e.length : 0}.max || 0
        p = c.find{|e| e.length == n} if n > p.length
        s2.rotate!
```

see more

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mccullum · a month ago

the following does the job in O(n)

```
#include<stdio.h>

int func(char *str)

{

int i=0,length=0,mlength=0,j;

while(*(str+i)!='\0')

{

if(i!=0 && (*(str+i-1)==*(str+i+1)))

{

length=1;

i=1;
```

see more

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shashi · a month ago

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inside while condition:
high < len,
this will never be true.??
m I missing something here...

^ | ⌄ • Reply • Share ›

atreyee ➦ shashi • a month ago

it is len not low i guess u have mistaken there

^ | ⌄ • Reply • Share ›

shashi ➦ atreyee • a month ago

ohh yes...

^ | ⌄ • Reply • Share ›

sukisukimo • 2 months ago

```
/*

* Program to find the longest palindrome
* The algo time complexity is O(n^2) and space complexity is O(1)

*/

static String getBigPalindrome(String str)

{

int i = 0, j = 0, tempi = 0;

int maxLen = 0, currentLen = 0;

String maxpalin = null;

String currentpalin = null;
```

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```
char[] carr = str.toCharArray();
```

see more

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Deepak Kushwah • 9 months ago

```
//here is the recursive solution.
#include<string.h>
#include<stdio.h>
#include<iostream>
#include<algorithm>
using namespace std;.
int longestPalSubstr(char str[], int low, int high).
{

if(low>high) return 0;.

int low1=low;int high1=high;.

while(low1<=high1).

{.

if(str[low1]!=str[high1]).

{
```

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shek8034 • 10 months ago

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shek8034 ➜ shek8034 • 10 months ago

http://leetcode.com/2011/11/lo...

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O(N) Solution : Manacher’s algorithm
http://leetcode.com/2011/11/lo...

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Manisha Barnwal • 10 months ago

/*Longest Palindromic Substring*/.
//I guess I have one better solution, please let me know if it works for every cas

```
#include<stdio.h>

void find_palindrome(char *str, int low, int high).
{

int i, j,k, len;.

char *buffer;.

i=low;j=high;.

if(str[i]!=str[j]).

find_palindrome(str, low+1, high-1);.

else.

{.
```

see more

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ap • a year ago

In reply to a previous query, I have tried to write an O(n) time complexity code. desired test cases.

```
 /* Paste your code here (You may delete these lines if not writing c
#include<stdio.h>
#include<string.h>
int main()
{

        char s[50]="forgeeksskeegfor";

        int k,i,j,c=0;
        int len=strlen(s);


        for(i=0,j=len-1;i<j;i++,j--)
        {

```

see more

Reply • Share ›

ap ➦ ap • 11 months ago

My bad...I got the question wrong!

```
/* Paste your code here (You may delete these lines if not wr
```

Reply • Share ›

abhishek08aug • a year ago

Intelligent :D

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^ | ⌄ • Reply • Share ›

koolkeshaw • a year ago

```
[sourcecode language="java"]

public class longestPalindromicSubString
{

String str="geeksforrofsekabcdefedcba";
public static void main(String[] args)
{
longestPalindromicSubString lpstring=new longestPalindromicSubString();
String result=lpstring.callLongestPalindrome();
System.out.println(" "+result);

}
String callLongestPalindrome()
{
int lPLength=0;
String lSubPalin=new String();
int oLength=1;
int i=1;
```

see more

^ | ⌄ • Reply • Share ›

koolkeshaw ➦ koolkeshaw • a year ago

Please inform me of any test case where the above code fails........

^ | ⌄ • Reply • Share ›

coderAce ➦ koolkeshaw • a year ago

Let me ask you something? 90 percentage of code posted by c
errors or do not follow the correct strategy. So given all that, do

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simply paste a piece of code and follow up by ordering others t

People come here to prepare and not test some one's code wh
explanation about the algorithm he is using.

If any test case fails, then probably it's because your strategy w
strategy. Don't just paste a piece of code and order people to le

1 ^ | ⌄ • Reply • Share ›

Amit • a year ago

Can we make 2 suffix tree one with given string and one with reverse of string
when we are getting common path then find the size of that suffix tree and prir

1 ^ | ⌄ • Reply • Share ›

Amateur_coder ➦ Amit • a year ago

I think what u are trying to say is its like when u create a tree with the e
LONGEST_COMMON_sequence of the 2 strings.....

```
/* Paste your code here (You may delete these lines if not wr
```

^ | ⌄ • Reply • Share ›

Amateur_coder ➦ Amateur_coder • a year ago

sorry...it was a wrong response.didnt read d question properly..

^ | ⌄ • Reply • Share ›

Amit • a year ago

```
/* Paste your code here (You may delete these lines if not writing co
@geeksforgeeks/Venki:-
Can we make 2 suffix tree one with given string and one with reverse (
```

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invictus • a year ago

This can be done in O(n)complexity and O(n) extra space using Mancher's Al

```
/* Paste your code here (You may delete these lines if not writing co
```

^ | ˅ • Reply • Share ›

shanky • 2 years ago

@Geeksforgeeks can you post O(n) approach for the same ?

```
/* Paste your code here (You may delete these lines if not writing co
```

^ | ˅ • Reply • Share ›

jj ➦ shanky • a year ago

see leetcode.com fr d same

```
/* Paste your code here (You may delete these lines if not wri
```

^ | ˅ • Reply • Share ›

Rainer • 2 years ago

sorry,
but I messed up the code, should be:

```
    for (int i = 0; i < len; ++i)
        low = i - 1;
        while (low >= 0
```

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>   while (low >= 0

I think the condition for while will always be false, but probably I simply don't ur
the while loop will be executed if i = -1?

thanks again
Rainer

^ | ˅ • Reply • Share ›

Aashish ➦ Rainer • 2 years ago
The while will not execute for i = 0. Observe that while loop is true for h

We have updated the post. Keep it up!

^ | ˅ • Reply • Share ›

Rainer • 2 years ago
Hello,
i don't know C but like your website and try to translate your examples to other
Could you please explain how the while loops are supposed to work?

for (int i = 0; i = 0 && ...

...
low = i - 1;
while (low >= 0 ...

i do not understand how either of the while loops will be executed.

Thank you for your help & your great website
Rainer

^ | ˅ • Reply • Share ›

theredkhan • 2 years ago

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Or perhaps the input string is not meant to a palindrome in itself...

• Reply • Share ›

theredkhan • 2 years ago

"forgeeksskeegfor" is not a palindrome!!

It should surely be "forgeeksskeegrof".

• Reply • Share ›

anirudh • 2 years ago

gud code

```
/* Paste your code here (You may delete these lines if not writing coo
```

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naveen anirudh • 8 months ago

the condition in the for loop can be optimized to the following: for(i=1;i<len-maxlength+1;i++) explaination:="" if="" we="" found="" a='
then="" we="" need="" not="" to="" search="" for="" any="" palindrome
the="" condition="" is="" failed="" then="" this="" would="" mean="" tha
any="" palindrome="" of="" length="">= n.

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