Algorithm Design

Lecturer: Dr. Thitipong Tanprasert

Term Project

Menh Keo • 6038302

1354 Palindrome. Again Palindrome
By Denis Nazarov

From timus.online

With difficulty 151
Time limit: 1.0 Second
Memory Limit: 64MB

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Algorithm

Menh Keo • 6038302

“Palindrome is a string which reads from the left to the right and from the right to the left the same way”

Palindrome. Again Palindrome

Description:

If $S_1 = a_1a_2...a_n$ and $S_2 = b_1b_2...b_m$, then $S_1S_2 = a_1a_2...a_nb_1b_2...b_m$. The input contains some word S_1. You are to find a nonempty word S_2 of the minimal length that S_1S_2 is a palindrome.

Palindrome. Again Palindrome

Input:

The first input line contains S_1 (it may consist only of the Latin letters). It's guaranteed that the length of S_1 doesn't exceed 10000 symbols

Palindrome. Again Palindrome

Output:

String S1 concatenate with S2

Palindrome. Again Palindrome

Example:

Input: Online (S_1)

Output: OnlinenilnO (S_1S_2)

Palindrome. Again Palindrome

Coding:

```
S1 = input()
n = len(S1)
revS1 = S1[::-1]
memorize = [-2 for i in range(n)]

first = -1
second = 0
memorize[second] = -1
while (second < n - 1):
    if (first == -1 or revS1[first] == revS1[second]):
        first += 1
        second += 1
        if (revS1[first] != revS1[second]):
            memorize[second] = first
        else:
            memorize[second] = memorize[first]
    else:
        first = memorize[first]
```

While loop run through the reverse string S1 to check whether there is a equal character or not, and add those index number to the list call memorize for using in the next step.

Palindrome. Again Palindrome

Coding:

```
index = 1
reverseIndex = 0
while (index < n):
    if (S1[index] == revS1[reverseIndex] or reverseIndex == -1):
        index += 1
        reverseIndex += 1
    else:
        reverseIndex = memorize[reverseIndex]
```

This while loop will check compare between input string S1 and reverse String of S1 and create the index for generate the next string S2 from reverse String S1.

Palindrome. Again Palindrome

Coding:

```
S2 = ""
for i in range(reverseIndex, n):
    S2 += revS1[i]

print(S1 + S2)
```

Print out the Result.

Palindrome. Again Palindrome

Example:

Input: AbabaAab

Reverse: baAababA

Output: AbabaAababA

S1 S2

The loop will run through and increment the reverse index for using in the next for concatenate S1 and S2, and the previous loop is will check where the reverse index should continue when revS1[reverseIndex] != S1[index]

Palindrome. Again Palindrome

Example:

Input: Online

Reverse: enilnO

Output: $\underbrace{\text{Online}}_{S1}\underbrace{\text{enilnO}}_{S2}$

In this case, there is none equal character, so the revIndex will start from 1 to n

Code(Python3)

```python
S1 = input()
n = len(S1)
revS1 = S1[::-1]
memorize = [-2 for i in range(n)]

first = -1
second = 0
memorize[second] = -1
while (second < n - 1):
    if (first == -1 or revS1[first] == revS1[second]):
        first += 1
        second += 1
        if (revS1[first] != revS1[second]):
            memorize[second] = first
        else:
            memorize[second] = memorize[first]
    else:
        first = memorize[first]

index = 1
reverseIndex = 0
while (index < n):
    if (S1[index] == revS1[reverseIndex] or reverseIndex == -1):
        index += 1
        reverseIndex += 1
    else:
        reverseIndex = memorize[reverseIndex]

S2 = ""
for i in range(reverseIndex, n):
    S2 += revS1[i]

print(S1 + S2)
```

Submission

ID	Date	Author	Problem	Language	Judgement result	Test #	Execution time	Memory used
8654520	10:04:53 26 Nov 2019	Menh Keo	1354. Palindrome. Again Palindrome	Python 3.6	Accepted		0.109	404 KB

Reference

Algorithm:

http://www.voidcn.com/article/p-qkgbkxpk-bdd.html

PowerPoint Template:

https://powerpointify.com/science-powerpoint-template/

Thank You!