161. One Edit Distance

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Given two strings **s** and **t**, determine if they are both one edit distance apart.

Note:

There are 3 possiblities to satisify one edit distance apart:

1. Insert a character into **s** to get **t**
2. Delete a character from **s** to get **t**
3. Replace a character of **s** to get **t**

Example 1:

```
Input: s = "ab", t = "acb"
Output: true
Explanation: We can insert 'c' into s to get t.
```

Example 2:

```
Input: s = "cab", t = "ad"
Output: false
Explanation: We cannot get t from s by only one step.
```

Example 3:

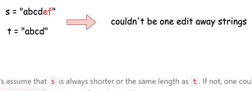
```
Input: s = "1203", t = "1213"
Output: true
Explanation: We can replace '0' with '1' to get t.
```

Solution

Approach 1: One pass algorithm

Intuition

First of all, let's ensure that the string lengths are not too far from each other. If the length difference is 2 or more characters, then `s` and `t` couldn't be one edit away strings.

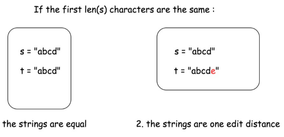


For the next let's assume that `s` is always shorter or the same length as `t`. If not, one could always call `isOneEditDistance(t, s)` to inverse the string order.

Now it's time to pass along the strings and to look for the first different character.

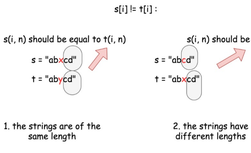
If there is no differences between the first `len(s)` characters, only two situations are possible :

- The strings are equal.
- The strings are one edit away distance.



Now what if there *is* a different character so that `s[i] != t[i]`.

- If the strings are of the same length, *all* next characters should be equal to keep one edit away distance. To verify it, one has to compare the substrings of `s` and `t` both starting from the `i + 1` th character.
- If `t` is one character longer than `s`, the additional character `t[i]` should be the only difference between both strings. To verify it, one has to compare a substring of `s` starting from the `i` th character and a substring of `t` starting from the `i + 1` th character.



Implementation

Java Python Copy

```
class Solution:
    def isOneEditDistance(self, s: 'str', t: 'str') -> 'bool':
        ns, nt = len(s), len(t)

        # Ensure that s is shorter than t.
        if ns > nt:
            return self.isOneEditDistance(t, s)

        # The strings are NOT one edit away distance
        # if the length diff is more than 1.
        if nt - ns > 1:
            return False

        for i in range(ns):
            if s[i] != t[i]:
                # if strings have the same length
                if ns == nt:
                    return s[i + 1:] == t[i + 1:]
                # if strings have different lengths
                else:
                    return s[i:] == t[i + 1:]

        # if there is no diffs on ns distance
        # the strings are one edit away only if
        # t has one more character.
        return ns + 1 == nt
```

Complexity Analysis

- Time complexity : $\mathcal{O}(N)$ in the worst case when string lengths are close enough `abs(ns - nt) <= 1`, where `N` is a number of characters in the longest string. $\mathcal{O}(1)$ in the best case when `abs(ns - nt) > 1`.
- Space complexity : $\mathcal{O}(N)$ because strings are immutable in Python and Java and to create substring costs $\mathcal{O}(N)$ space.

Problem generalization : Edit distance

Given two words word1 and word2, find the minimum number of operations required to convert word1 to word2.

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closewen ★ 27 June 30, 2019 11:19 PM

This solution is not O(1) memory, each s.substring will create a new string object.

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milinthosani ★ 31 September 20, 2019 5:35 AM

My 2 pointer approach:
Time complexity: O(max(m,n))
Space complexity: O(1)

```
class Solution{
    public boolean isOneEditDistance(String s, String t){
```

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renjunyao ★ 32 August 12, 2019 12:08 PM

We can use two pointers, instead of substrings to make it O(1) space.

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beauji_1116 ★ 2 April 14, 2020 10:19 AM

Why output should be false when input is "c" and "c"? It didn't say u cannot use the same character to replace the old one, so why i cannot use a letter "c" to replace itself?

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trkx48 ★ 2 March 25, 2020 7:40 AM

Logic is like this

- Get the length of both s & t strings as l1 and l2
- If they differ more than 1, they are more than one edit distance apart, so straight return false.
- Have two pointers i and j, starting with 0th index in s & t strings respectively and loop until they

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AJ007 ★ 6 June 16, 2019 11:58 AM

Correct me if I am wrong but since a substring is created in the approach 1, this algo is O(N) space too since in Java, C# strings are immutable.

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atulagrawal91 ★ 19 February 12, 2019 5:02 PM

```
    if (Math.abs(s.length() - t.length()) > 1)
        return false;
```

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mn002 ★ 1 November 13, 2019 11:29 AM

I would say that identical strings should return true. I hate it when these problems aren't fully specified.

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ssl_91 ★ 35 August 5, 2019 8:14 AM

`return true` works fine for me. Curious to know when `(ns + 1 == nt)` will be executed?

In any, match or not-match case, it should be already returned in the for loop, AFAIK.

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user1999Z ★ 0 June 22, 2020 10:47 PM

2 pointer method: One pass (no string comparison `s == t`)
Time: O(min(m, n))
Space: O(1)

```
class Solution {
    public boolean isOneEditDistance(String s, String t) {
```

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