

Solution 1

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1  # Copyright © 2020 AlgoExpert, LLC. All rights reserved.
2
3  # O(b + s) time | O(b + s) space - where b is the length of the big
4  # input string and s is the length of the small input string
5  def smallestSubstringContaining(bigString, smallString):
6      targetCharCounts = getCharCounts(smallString)
7      substringBounds = getSubstringBounds(bigString, targetCharCounts)
8      return getStringFromBounds(bigString, substringBounds)
9
10
11 def getCharCounts(string):
12     charCounts = {}
13     for char in string:
14         increaseCharCount(char, charCounts)
15     return charCounts
16
17
18 def getSubstringBounds(string, targetCharCounts):
19     substringBounds = [0, float("inf")]
20     substringCharCounts = {}
21     numUniqueChars = len(targetCharCounts.keys())
22     numUniqueCharsDone = 0
23     leftIdx = 0
24     rightIdx = 0
25     # Move the rightIdx to the right in the string until you've counted
26     # all of the target characters enough times.
27     while rightIdx < len(string):
28         rightChar = string[rightIdx]
29         if rightChar not in targetCharCounts:
30             rightIdx += 1
31             continue
32         increaseCharCount(rightChar, substringCharCounts)
33         if substringCharCounts[rightChar] == targetCharCounts[rightChar]:
34             numUniqueCharsDone += 1
35         # Move the leftIdx to the right in the string until you no longer
36         # have enough of the target characters in between the leftIdx and
37         # the rightIdx. Update the substringBounds accordingly.
38         while numUniqueCharsDone == numUniqueChars and leftIdx <= rightIdx:
39             substringBounds = getCloserBounds(leftIdx, rightIdx, substringBounds[0], substringBounds[1])
40             leftChar = string[leftIdx]
41             if leftChar not in targetCharCounts:
42                 leftIdx += 1
43                 continue
44             if substringCharCounts[leftChar] == targetCharCounts[leftChar]:
45                 numUniqueCharsDone -= 1
46             decreaseCharCount(leftChar, substringCharCounts)
47             leftIdx += 1
48         rightIdx += 1
49     return substringBounds
50
51
52 def getCloserBounds(id1, id2, id3, id4):
53     return [id1, id2] if id2 - id1 < id4 - id3 else [id3, id4]
54
55
56 def getStringFromBounds(string, bounds):
57     start, end = bounds
58     if end == float("inf"):
59         return ""
60     return string[start : end + 1]
61
62
63 def increaseCharCount(char, charCounts):
64     if char not in charCounts:
65         charCounts[char] = 0
66     charCounts[char] += 1
67
68
69 def decreaseCharCount(char, charCounts):
70     charCounts[char] -= 1
71
```

