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# 水中的鱼



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Monday, March 4, 2013

# [LeetCode] Palindrome Partitioning II, Solution

Given a string *s*, partition *s* such that every substring of the partition is a palindrome. Return the minimum cuts needed for a palindrome partitioning of *s*.

For example, given s = "aab",

Return 1 since the palindrome partitioning ["aa", "b"] could be produced using 1 cut.

#### » Solve this problem

#### [Thoughts]

凡是求最优解的,一般都是走DP的路线。这一题也不例外。首先求dp函数,

定义函数

D[i,n] = 区间[i,n]之间最小的cut数,n为字符串长度

```
ababbababa a i
```

如果现在求[i,n]之间的最优解?应该是多少?简单看一看,至少有下面一个解

此时 D[i,n] = min(D[i,j] + D[j+1,n]) i <= j < n。这是个二维的函数,实际写代码时维护比较麻烦。所以要转换成一维DP。如果每次,从i往右扫描,每找到一个回文就算一次DP的话,就可以转换为D[i] = 区间[i,n] 之间最小的cut数,n为字符串长度,则,

```
D[i] = min(1+D[j+1])  i \le j \le n
```

有个转移函数之后,一个问题出现了,就是如何判断[i,j]是否是回文?每次都从[i,j]比较一遍?太浪费了,这里也是一个DP问题。

定义函数

P[i][j] = true if [i,j]为回文

那么

P[i][j] = str[i] == str[j] && P[i+1][j-1];

基于以上分析,实现如下:

```
int minCut(string s) {
2:
           int len = s.size();
3:
            int D[len+1];
           bool P[len][len];
4:
5:
           //the worst case is cutting by each char
           for(int i = 0; i <= len; i++)
7:
          D[i] = len-i;
           for (int i = 0; i < len; i++)
8:
9:
           for(int j = 0; j < len; j++)
10:
             P[i][j] = false;
11:
              for(int i = len-1; i >= 0; i--){
12:
                  for(int j = i; j < len; j++){
                       if(s[i] == s[j] && (j-i<2 || P[i+1][j-1])){
13:
                           P[i][j] = true;
14:
15:
                            D[i] = min(D[i], D[j+1]+1);
16:
17:
                  }
18:
              }
19:
              return D[0]-1;
```

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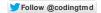
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```
或者可以考虑使用回溯+剪枝,比如:
1:
     int minCut(string s) {
      int min = INT_MAX;
3:
      DFS(s, 0, 0, min);
4:
      return min;
5:
6:
     void DFS(string &s, int start, int depth, int& min)
7:
8:
       if(start == s.size())
9:
10:
          if (min> depth-1)
11:
          min = depth-1;
12:
13:
14:
        for(int i = s.size()-1; i>=start; i--) //find the biggest palindrome first
15:
16:
          if(isPalindrome(s, start, i))
17:
18:
            DFS(s, i+1, depth+1, min);
19:
20:
21:
22:
23:
24:
      bool isPalindrome(string &s, int start, int end)
25:
26:
        while(start< end)
27:
28:
          if(s[start] != s[end])
29:
            return false;
30:
          start++; end--;
31:
32:
        return true;
```

```
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- review (22)
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- May (4)
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- [LeetCode] Unique Binary Search Trees II, Solution...
- [LeetCode] Unique Binary Search Trees, Solution
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- [LeetCode] Palindrome Partitioning II, Solution
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