HW 4

CS 381

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(a). (b).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | j | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| I |  | Y | M | I | N | N | E | S | O | T | A |
| 0 | X | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 3 | S | 0 | 0 | 0 | 0 | 0 | 0 |  |  |  |  |
| 4 | H | 0 | 0 | 0 | 0 | 0 | 0 |  |  |  |  |
| 5 | I | 0 | 0 |  |  |  |  |  |  |  |  |
| 6 | N | 0 | 0 |  |  |  |  |  |  |  |  |
| 7 | G | 0 | 0 |  |  |  |  |  |  |  |  |
| 8 | T | 0 | 0 |  |  |  |  |  |  |  |  |
| 9 | O | 0 | 0 |  |  |  |  |  |  |  |  |
| 10 | N | 0 | 0 |  |  |  |  |  |  |  |  |

(c).

Another subsequence “INT” is not discovered.

Because when I = 6, j = 4, the program finds the first same “N”, and then it automatically skips the other “N” in MINNOESOTA. That makes sense for the program because the LCS result is basically the same.



First come up to the brain. But time is O(2^n) which is because do not use memorizing method.

Count = 0

Function wordbreak(string, N) // N is the size of string

For I to N:

Prefix = string.substring(0,I)

If prefix is a word:

If I == N:

Count ++

Return

WordBreak( string.substring(I, N-I), N – 1)

End

End

End

So redo the problem by another way of thinking.

Step1: Characterize the structure of optimal solution

Set function F[i] which means how many ways that substring 0 to index “i” can be separated perfectly

Step2: Recursively define the value of optimal solution

If string.substring(j, I) is a word && F[j] != 0:

F[I] += F[j]

Step3: Compute the value by bottom-up way

For I from 1 to N:

For j from 0 to I-1:

If string.substring(j, I) is a word && F[j] != 0:

F[I] += F[j]

End

End

Step4: Construct the solution from step 3

F[n] is exactly how many ways one could break the string into a sequence of words.

Pseudo code:

Function WordBreak (string)

N = length of string

// initial array F to record how many ways that string can be separated to word

For I = 1 to N + 1:

F [I] = 0

End

// for prefix start from 0

F[0] = 1

For I from 1 to N:

For j from 0 to I-1:

If string.substring(j, I) is a word && F[j] != 0:

F[I] += F[j]

End

End

Return F[n]

Time analyze:

Because it has two loops and inside the loop, the time is constant. Also the initialization time is constant.

T(n) = O(N^2)

Pseudo code:

Function WordBreak (string)

N = length of string

// initial array

Count

// initial array F to record whether the string can be separated to word

For I = 0 to N + 1:

F [I] = False

F[0] = True

For I from 1 to N:

For j from 0 to N+1:

If string.substring(j, I) is a word:

Word\_flag = true

Else:

Word\_flag = false

F[i] = F[i] || F[j] && Word\_flag

// 这个F[i] 因为有另一种方法也可以了在i的时候

End

End

Return F[n]