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CSCI 3104

CPU: 2.8 GHz Intel Core i7

Ram: 16 GB 1600 MHz DDR3

OSX Yosemite

Homework #7

On my honor, as a University of Colorado at Boulder student, I have neither given nor received any unauthorized help.

1. If P[i] is maximum expected profit at location i:

$$P[i] = \max \begin{cases} \max_{j<i} \{ P[j] + f(m_i, m_j) \cdot p_i \} \\ p_i \end{cases}$$

where function f:

$$f(m_i, m_j) = \begin{cases} 0 & \text{if } m_i - m_j < k \\ 1 & \text{if } m_i - m_j \geq k \end{cases}$$

- Maximum expected profit at location i comes from the maximum of expected profits from location j, and whether i can be a new location.

- P[j] shows maximum expected profit at location j
- Location j may or may not have a restaurant.

- If there is no restaurant at location j, then that is case k where $k < j$.
- Another comparison on p_i is required if $p_i > P[j] + f(m_i, m_j) \cdot p_i$

Input: N locations, P[1,...,n] where P[i] is profit at location i

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for i=1 to N:
    Profit [i] = 0
for i=2 to N:
    for j=1 to i-1:
        temp = Profit[j] + f(m_i,m_j) • P[i]
        if temp > Profit [i]:
            temp = Profit [i]
    if Profit[i] < P[i]:
        Profit [i] = P[i]
```

$O(n^2)$ because of the two for loops

2. $\bar{x}$ would be a palindrome of x, if $\bar{x}$ is a reverse of x, and $x = \bar{x}$

From the sub-string $x[i, \dots, j]$ of a string x, a palindrome of at least two characters exist if $x[i] = x[j]$. If they are not the same, then look fol the maximum length palindrome in $x[i+1, \dots, j]$ and $x[i, \dots, j-1]$. Every character $x[i]$ is a 1 char. palindrome of itself. This is the base case, $x[i, i] = 1$.

Maximum length palindrome for $x[i, \dots, j]$ as $L(i,j)$:

$$L(i,j) = \begin{cases} L(i+1, j-1) + 2 & \text{if } x[i] = x[j] \quad \text{else} \\ \max\{L(i+1,j), L(i,j-1)\} & \end{cases}$$

$L(i,i) = 1$ for all i from 1 to n

The first loop runs at $O(n)$, the second loop at $O(n-i)$. Overall time complexity $= O(n^2)$