

This problem can be regarded as a SLS problem but with fixed length of each “line” (m). For the sub problem in the minutes m_1, m_2, \dots, m_j , if we denote wait time as t , the optimal solution will be:

$$\begin{aligned} OPT(j) &= \min_{1 \leq i \leq j} (t_{i,j} + OPT(i-1)) \\ &= \min_{1 \leq i \leq j} (mc_i + (m+1)c_{i+1} + \dots + (m+j-i)c_j + OPT(j-1)) \end{aligned} \quad (1)$$

The algorithm is stated as follow:

Algorithm 1 Algorithm for problem 3

Set array $T[0, 1, \dots, n]$

Set $T[0] = 0$

For all pairs $i \leq j$

Compute the time cost

Endfor

For $j = 1, 2, \dots, n$

Use the recurrence (Equation (1)) to compute $T[j]$

Endfor

Return $T[n]$

Time complexity analysis:

In this algorithm, if we have pre-computed the time cost, the time complexity would be $O(n^2)$ since pairs (i, j) are within i to j .

An idea that may decrease the complexity to $O(mn)$: (just some thoughts)

Since we know the processing time m is fixed. We can just let i be no less than $j - m$ (i.e., let $j - m \leq i \leq j$ in Equation (1) (if $j - m < 0$ then 0)). Then we let j skip 0 if it meets 0. So that the scope of i will be decreased from n to m , which gives $O(mn)$.