

COMP3121 Assignment 3 - Q4

Demiao Chen z5289988

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Answer

We solve all subproblems of the form: “What is the maximum total enjoyment we can get by only choosing activities in the first k days, such that the $(k - 1)^{th}$ day’s activity b is different from the k^{th} day’s activity a .” The base case is $opt(0, b) = 0$. The recursion is:

$$opt(k, a) = e(k, a) + \max\{opt(k - 1, b) : a \neq b\}$$

Here, $e(k, a)$ is the enjoyment obtained by choosing activity a on day k .

To reconstruct the sequence of activities we choose for each day, we define the following function:

$$from(k, a) = \arg \max_{1 \leq b \leq N} \{opt(k, b) : a \neq b\}.$$

Here $\arg \min$ returns the value of b that produces the maximum value of $\{opt(k, b) : a \neq b\}$. The maximum enjoyment can get is $opt(N + 1, a)$. To get the sequence of activities we chose, we backtrack from post n giving the sequence $\{n, from(n), from(from(n)), \dots, 1\}$. The complexity is $O(N)$ because there are N days, and number of activities are fixed.