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CS590 Homework Assignment 10: Dynamic Programming Creativity Exercises

Due Date: April 3, 2022

## Problem 12.8.14:

Telescope scheduling problem is a list, L, of observation requests, where each request, i, consists of the following elements:

- a requested start time, $S_i$
- a finish time, $f_i$
- a positive numerical benefit, $b_i$

pseudo-code:

1) First sort jobs according to finish time.
2) Now apply following recursive process
   // Here B[] is array of n observations
   findMaximumProfit(B[], n)
   {
       a) if (n == 1) return B[0]
       b) Return the maximum of following two profits.

a. Maximum profit by excluding current observation, i.e., findMaximumProfit(B, n-1)

b. Maximum profit by including the current job

}

To find the profit including current observation:

The idea is to find the latest observation before the current observation (in sorted array) that doesn't conflict with current observation B[n-1]. Once we find such a observation, we recur for all observations till that observation and add profit of current observation to result.

Time complexity of recursive calls <= n => O(n).

Another Algorithm: Using bubble sort, for the best case, it takes O(n) and worst case time complexity is O(n^2)

```
for i = 1:n,
    swapped = false
    for j = n:i+1
        if B[j] < B[j-1]
            swap B[j, j-1]
            swapped = true
        ? invariant: B[1..i] in final position
        Break if not swapped
end
```