

## CLRS Exercise Solutions- Greedy Algorithms

### An activity-selection problem

#### **15.1-1**

Give a dynamic-programming algorithm for the activity-selection problem, based on recurrence (15.2). Have your algorithm compute the sizes  $c[i, j]$  as defined above and also produce the maximum-size subset of mutually compatible activities.

Assume that the inputs have been sorted as in equation (15.1). Compare the running time of your solution to the running time of GREEDY-ACTIVITY-SELECTOR.

The given algorithm would just stupidly compute the minimum of the  $O(n)$  numbers or return zero depending on the size of  $S_{ij}$ . There are a possible number of subproblems that is  $O(n^2)$  since we are selecting  $i$  and  $j$  so that  $1 \leq i \leq j \leq n$ . So, the runtime would be  $O(n^3)$ .

#### **15.1-2**

Suppose that instead of always selecting the first activity to finish, you instead select the last activity to start that is compatible with all previously selected activities. Describe how this approach is a greedy algorithm, and prove that it yields an optimal solution.

This becomes exactly the same as the original problem if we imagine time running in reverse, so it produces an optimal solution for essentially the same reasons. It is greedy because we make the best looking choice at each step.

#### **15.1-3**

Not just any greedy approach to the activity-selection problem produces a maximum-size set of mutually compatible activities. Give an example to show that the approach of selecting the activity of least duration from among those that are compatible with previously selected activities does not work. Do the same for the approaches of always selecting the compatible activity that overlaps the fewest other remaining activities and always selecting the compatible remaining activity with the earliest start time.

# Algorithm Clrs Exercise Solution Internautemalin

**Annelies Wilder-Smith**



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