

CS302 - Assignment 13

Due: Thursday, April 12 at the beginning of class

Hand-in method: paper



<http://xkcd.com/801/>

Greedy or DP

One of the problems below can be solved more efficiently using a greedy approach and the other cannot (i.e. you must use dynamic programming). For each problem clearly describe your algorithm and state the run-time. For the greedy problem, prove that your solution is optimal.

1. (10 points) You're going on a road trip with friends. Unfortunately, your headlights are broken, so you can only drive in the daytime. Therefore, on any given day you can drive no more than d miles. You have a map with n different hotels and the distances from your start point to each hotel $x_1 < x_2 < \dots < x_n$. Your final destination is the last hotel. Describe an algorithm that determines which hotels you should stay in if you want to minimize the number of days it takes you to get to your destination.
2. (10 points) Same setup as above, however, you also want to do some sightseeing along the way. To make sure you don't spend too little or too much time in any one place, you decide to add a penalty for having too much free time. If you travel x miles in a day, then the penalty for that day is $(d - x)^2$. Describe an algorithm that determines the hotel sequence that minimizes the total penalty, that is the sum of the daily penalties over all travel days.