22C : 031 (CS : 3330 : 0001) Algorithms

Homework 7

April 10, 2012

This homework is based on our discussions of Dynamic Programming.

1. This is based on Exercise 2 of Chapter 6. (3.5 points)
   (a) Do Part (a) of Exercise 2.
   (b) Let $OPT(i)$ denote the value of the optimal plan for weeks $1 \ldots i$. Write down a recurrence that, for $i > 2$, expresses $OPT(i)$ in terms of $OPT(1), \ldots, OPT(i-1)$. (This is the step where we express the optimal solution to the problem in terms of optimal solutions to smaller problems.)
   (c) Based on this recurrence, write down a polynomial-time algorithm that computes $OPT(1), \ldots, OPT(n)$, thus solving Part (b).
2. This is based on Exercise 3 of Chapter 6. (3.5 points)
   (a) Do Part (a) of Exercise 3.
   (b) Let $OPT(i)$ denote the length of the longest path that begins at v_1 and ends at v_i. Write down a recurrence that, for $i > 2$, expresses $OPT(i)$ in terms of $OPT(1), \ldots, OPT(i-1)$.
   (c) Based on this recurrence, write down a polynomial-time algorithm that computes $OPT(1), \ldots, OPT(n)$, thus solving Part (b).
3. Solve Exercise 6. Instead of developing a polynomial-time algorithm from scratch, just reduce this problem to the optimal segmentation problem discussed in class. (A link to notes for this problem is available from the course pages.) Doing this amounts to setting up the costs of the chunks in the segmentation problem correctly. (3 points)

The homework is due Wednesday, April 18, in class; if you can't make it to class on that day, just make sure you get it to me by that time.