CS 4720/5720 Design and Analysis of Algorithms

Homework #3b

Due: Thursday, November 1, 2018

If written: due in class

If typed and submitted on Canvas: 11:59 pm

Submission requirements:

1. **5% extra credit** if you submit *digital, typed* writeups in PDF format to the "Homework 2 Writeup" assignment on the Canvas site. However, you may also turn in handwritten assignments in class – but assignments submitted in person will not receive the 5% extra credit. The due dates are the same for either submission method, but I will need handwritten assigments turned in to me in class.
2. Note: this is a "short" homework with no programming assignment, and will be worth 50 points, half as much as a normal homework.

Assignment:

1. Read Example 3 in Section 8.1 of the textbook, "Coin-collecting Problem." Then look at problem 8.1.5, which asks "How would you modify the dynamic programming algorithm for the coin-collecting problem if some cells on the board are inaccessible for the robot?"

   (a) Explain, in words, how this algorithm is different from the ordinary one in the book.

   (b) Write pseudocode for this modified algorithm. The algorithm should have two inputs: $C[1..n, 1..m]$ that encodes the locations of the coins, and $B[1..n, 1..m]$ that encodes the locations of the inaccessible squares on the board. Your algorithm should return the maximum number of coins that the robot can pick up. Note that the robot has to start in the upper-left, and finish in the lower-right – so the location of the barriers might make it impossible for the robot to solve the problem!

   (c) Use your algorithm to solve this problem instance (O's are coins, and X's are inaccessible places).

	X		O		
				O	X
X		X	O		O
		O		O	
	O			X	
O				X	

   As part of your answer, fill out two grids like Figure 8.3(b)-(c) in the textbook, showing the maximum number of coins collectible up to each of the squares on the board.