Programming Assignment 3: Hopscotch

CECS 328

1 Deadline

THERE'S MORE HERE

2 Introduction

On the planet Xeebo, where there is no gravity and physically-questionable hyperspace portals are commonplace, children play hopscotch on a cylindrical surface. A giant cylinder is stood upright, with the circular base on the ground. A rectangular grid is then wrapped around the cylinder so that it's ends touch together, and each square on the grid is given a positive integer score. The player is required to enter the cylinder from any top or bottom position. A player will hop all the way around the cylinder, adding up the scores on the squares touched along the way.

A legal hop must move in a counterclockwise motion around the cylinder (i.e. to the right within the grid) and can only be either (a) directly to the right (b) to the right and up one (c) to the right and down one. If a player moves off the grid and into the ground, he/she reenters the grid through the top of the cylinder (via hyperspace portal). Similarly, if a player moves off the grid through the top of the cylinder, he/she reenters the grid through the bottom of the cylinder (again, via hyperspace portal).

A player will make only a single traversal around the cylinder and is required to exit the cylinder after the full traversal has finished through either the top or bottom (so that the player will hit every column in the cylinder exactly once). The player with the highest total score wins. Your job is to find the path of the optimal player.

3 Your code

The grid will be presented to you as a two-dimensional matrix $m \times n$ indexed in the usual computer science way (starting from 0). The first dimension will represent rows and the second dimension will represent columns. Your path will consist of a list of integers. The first will be a 1 (top) or 0 (bottom), depending on whether the player enters the cylinder from the top or bottom. The next will

be the column of entry. After that point, there will be $n-1$ movement integers: 0 means move directly to the right, 1 means move right and up, -1 means move right and down.

If you are writing the file in Java: StudentSolver.java should have a function with the header `public static ArrayList<Integer> solve(ArrayList<ArrayList<Integer>> grid)`

If you are writing the file in Python: studentsolver.py should have a function with the header `def solve(grid):`

If you are writing the file in C++: StudentSolver.h should have a line with the header `static std::vector<int> solve(std::vector<std::vector<int>> grid);`

4 Example

Consider the input given by the following grid:

3, 4, 1, 2, 8, 6
6, 1, 8, 2, 7, 4
5, 4, 3, 9, 9, 5
5, 9, 8, 3, 2, 6
8, 7, 2, 9, 6, 4

The answer should be: 1, 4, 0, 1, 1, 0, -1