Programming Assignment 2: Borderland

CECS 328

1 Deadline

THERE'S MORE HERE

2 Introduction

Arisu has been assigned a game in which there are N rows of 3 light bulbs each. Sets of these light bulbs are connected by wires, and Arisu has the power to control whether there is or is not current flowing through these wires. Usually, when there is current flowing through a light bulb's wire, the light bulb will turn on (and be off otherwise), but there are some light bulbs with red paint around them. Those light bulbs operate in the opposite way: If there is current flowing through a red light bulb's wire, it remains off (and be on otherwise).

The goal of the game is to turn on at least one light bulb in each row by adjusting the current in the wires (on or off for each set of bulbs). (You may assume that if a set consists of only one light bulb, it has a wire also.) Just before the game starts, Arisu notices that the wire connections follow an interesting pattern. It is possible to assign a numbering to the wires with the following property: Any given row will only have light bulbs whose wire sets have numbers within 5 of each other; in other words, the numbers on the bulbs within any given row must be within a range $[x, x+5]$. Quickly, Arisu fixes this numbering because he suspects that it may be helpful to solving the problem.

You are Arisu's friend who graduated from CECS 328. Given the configuration of the red bulbs and the wire sets, determine which wire sets should be turned on so as to allow Arisu to win the game.

3 Your code

Arisu has numbered the sets from 1 to M (where M is the number of wire sets). You will be given N rows with three nonzero integers in each row between $-M$ and M, each integer representing a light bulb. The integers represent which wire set the light bulb belongs to. If the integer is negative, it means that there is red paint around that bulb (not that the bulb number is actually negative).

Your goal will be to return an array/list of length M, a sequence of booleans indicating which wire sets should and should not have current flowing through them.

HINT: Consider the light bulbs of the wire set in the middle first $\lfloor \frac{M}{2} \rfloor$. I claim that it is "easy" to determine *only for those rows that contain light bulbs in that particular wire set* all the different ways to satisfy the requirements of the game. There are now two different *disjoint* problems to consider: What configurations are possible for the "small" wire sets and what configurations are possible for the "large" wire sets? Finally, given all of these possible configurations, how can you determine what the final possible configurations are?

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>> bulbs)`

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

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>> bulbs);`

4 Example

-4, -4, -1
13, -9, -14
4, -7, -2

-2, 6, 3
-6, -8, 11
-4, -3, -6
7, 1, -10
4, -7, 6
5, 6, 4
10, 14, -9

One possible answer is: false, false, false, true, true, false, true, false, false, false, true, false, true, true