02-201 Homework 0

Fall 2015

DUE: Friday, September 4 at the end of recitation.

Reading: Read chapters 1 and 2 of the "Introduction to Go Programming" textbook, which is online here: `http://www.golang-book.com/books/intro`

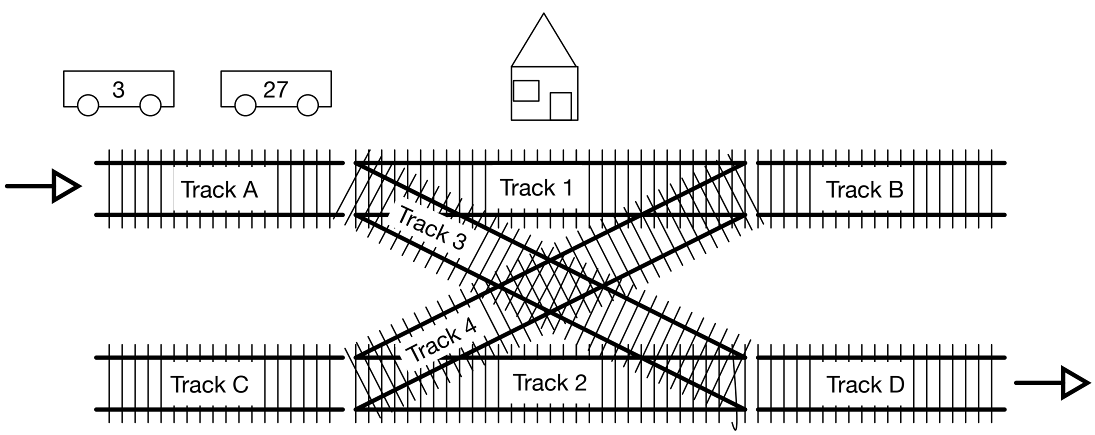
0. Piazza. Sign into the course's Piazza page at: `https://piazza.com/cmu/fall2015/02201`

1. Going Go. Install or find a way to run "Go" and to create a text file. See our Piazza's "Resources" page for instructions on how to do this for various types of computers.

Submit a program to Autolab that prints your name. (You don't necessarily need to understand all the aspects of how this program works yet, but you should be able to experiment to get your program working.)

The following problems should be handed in as a hardcopy at the end of Friday's recitation.

2. Running railroad. You are a railroad manager in charge of this section of track (that's your house at the top of the picture):

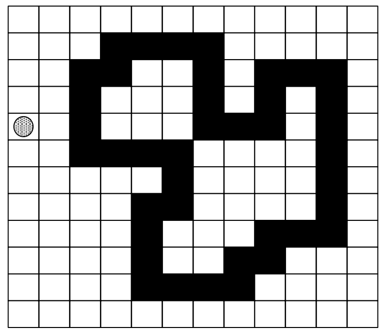


Train cars come in on track A and they eventually must leave on track D. The cars all have numbers. The cars arrive in any order, but they must leave on track D in *order of increasing number*. Your job is to make sure this happens.

To do this, you are in charge of turning on and off tracks 1,2,3, and 4 when needed. When a track is on, a train can use it; when it is off, no train can go on that track. Only one of track 1,2,3,4 can be turned on at any one time. You can also tell cars to stop, start, or reverse direction. You know how many cars will arrive.

Explain how you could get the cars to leave in sorted order no matter what order they arrive in. You can assume that the tracks can hold as many cars as you need them to.

3. Moving microscope. You have a microscope arm positioned someplace over a field — you don't know exactly where. In the field is a cell where the cell wall has been stained so it shows up very dark. We assume the field is divided into discrete units (analogous to pixels). The situation looks something like this:



where the microscope arm is positioned at the shaded circle in this example, and this particular stained cell wall is shown as black squares.

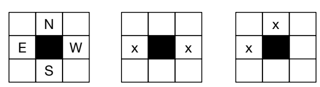
The microscope can be given the following commands:

- LEFT, RIGHT, UP, DOWN: move one unit in the given direction
- CHECK_IF_WALL: reports whether the microscope is currently positioned over the cell wall.
- GET_COORDINATES: reports the (x, y) coordinates of where the microscope is currently.

You don't know what shape the cell wall will take and you don't know where the microscope will start. However, you can assume that:

a. the microscope starts on the outside of the cell.

b. for any cell-wall (filled) unit, exactly two of its adjacent units to the N, S, E, W are also filled (such as below or rotations of below):



Describe a procedure (in English) that will move the microscope from wherever it is to someplace *into the interior* of the cell. Your procedure should work no matter where the microscope starts outside the cell and for any cell shape that obeys restriction (b) above.

4. Answer the following questions (after Wednesday, September 2).

1. How would you write the decimal number 133 in binary?
2. How would you write the decimal number 333 in base-3 notation?
3. What is the decimal value of the binary number 11010?
4. What is the decimal value of the hexadecimal number 0xCF02?
5. What is the *binary* value of the hexadecimal number 0xACEBEEF?