Pipe Mania

Teachers from Computation and Discrete structures require students to develop a Pipe Mania game implementing graphs in both of its forms (using adjacency matrices and adjacency lists), also having a graphical user interface for the game.

The player has three different types of pipes to use, a vertical pipe, an horizontal pipe and a circular pipe. The vertical pipe allows water to flow in a horizontal way, and it can be connected directly to the water source or the drain. The horizontal pipe allows water to flow horizontally, and it can be connected directly to the water source or the drain as well. The circular pipe can be used to change the water flow by 90 degrees, and it can be connected to any pipe or the drain and source.

Regarding the board, it must be an 8x8 board that randomly generates the location for the water source and the drain at the beginning of the game. The player must be able to start a game by typing its name into the user interface. For placing a pipe, the player must provide a (row, column) coordinate and the type of the pipe they wish to place. Then, the pipe must appear on the board just as the player selected. The player can place as many pipes as they wish until they consider that the solution they provided, allows water to flow from the water source to the drain. They also should be allowed to modify any pipe they already placed, as well as delete it. However, the program must show an alert when the user tries to make an action in the water source or the drain and restrict this action by not applying the changes. This applies for placing a pipe in both the water source or the drain or trying to modify or delete any of them.

Whenever the player considers that their solution is valid and its completed, they must be allowed to simulate the waterflow from the water source. If their solution is valid, the program must show a message that their pipe system was correct, and the game is over. In case that their pipe system isn’t well done, the game must show an alert saying that their solution is incorrect, and the game continues. For the solution to be valid, it mustn’t have any interruption, any empty space or any invalid condition mentioned before. When a game is over, the program goes back to the main menu and the player that completed the game receives the score. The program calculates the punctuation of the player with the following formula:

Score = (100 - pipes used) \* 10 - time in seconds

In case the player could not provide a solution that allows water to flow from the source to the drain, the software must provide an option to view the shortest solution for the player to know how to solve it by using the least amount of pipes.