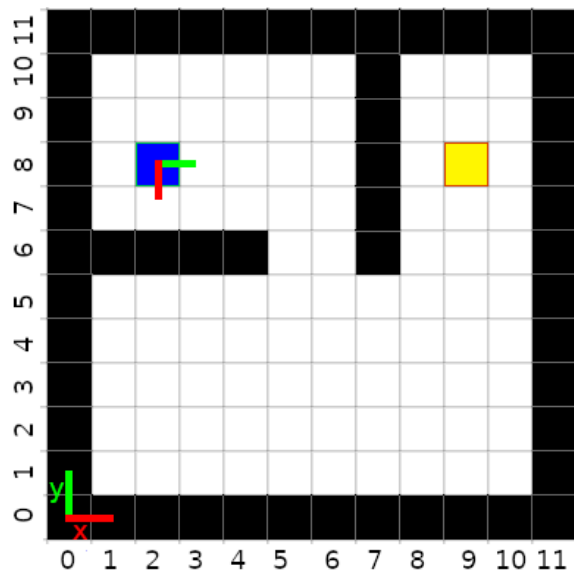


Homework 4

In this assignment, you will put in practice some of the planning concepts learned in class. While there can be other previous classes that are useful, the main material covered with this assignment is from 08-PathPlanning1.pdf and 11-C_Space.pdf.

General Instructions and Submission

Given the following environment represented as a grid (black cells: obstacles, white cells: free space; each cell denoted with coordinates x,y), where a robot, able to move up/down/left/right with cost 1, starts from the blue cell and wants to get to the yellow cell.



Answer to the following questions, showing all the relevant drawings and intermediate math work by uploading a PDF file containing the work. You can include code written by yourself if used for doing some of the repeated calculations, but write down the formulas used on paper.

This assignment is **individual** (i.e., no group work, the work should be your own).

Q1: Apply a depth first search (DFS) algorithm (tree search, without history), where the order of preference for motion is right, down, up, left (with respect to the global map frame located at the bottom left, i.e., East-Right, North-Up,...).

Submit a document file in PDF format where you should:

1. draw the expanded tree, marking the related cell and cost, for each node, and explicitly showing the order in which nodes are expanded, and the final path (if any), found by the algorithm.
2. comment on whether the DFS applied in this question terminates or not. If not, please describe how to solve the non-termination problem.

Q2: Assume that the length of each side of the cell is 0.5m.

Submit a document file in PDF format where you should:

1. **write** what the poses of the robot and the goal are in the odom reference frame, marked at the center of the blue cell with the red and green vectors corresponding to x and y, respectively.
2. **write** also general formulas that for an arbitrary pose will transform coordinates in the grid reference frame to the odom reference frame, and vice versa. Note that in the image, the grid reference frame is where the red and green lines are at the bottom left on the grid.