Object Avoidance Using Full State Observer and Pole Placement.

Problem Formulation

Object Avoidance by autonomous systems is of increasing importance in todays technology. With the advent of self-drving cars and Amazon's dream to deliver packages via self-driven autonomous UAV's, basic object avoidance and navigation by autonomous systems has a become a highly valuable research undertaking.

In this paper we will explore multiple object avoidance using dynaimc programing to determine the shortest path through a maze of obstacles, and then design a full-state observer and controller using pole placement with error intergator and controller dynamics to follow a time dependant trajectory and navigate the maze autonomously.

Part 1: Setup

In the first part we begin by constructing a 10x10 grid with discretizations at 0.1 along the X and Y axis, as well as obstacles. The Setup code initializes various parameters including the max and min values for x and y, the starting position and goal for the robot, as well as initializing a matrix to represent obstacles and well as a matrix to represent the "distance-to-go" at each discretized point in the grid. This code also sets up a "buffer zone" around all of the obstacles to prevent our robot from coming too close to the walls of the maze.

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Setup;
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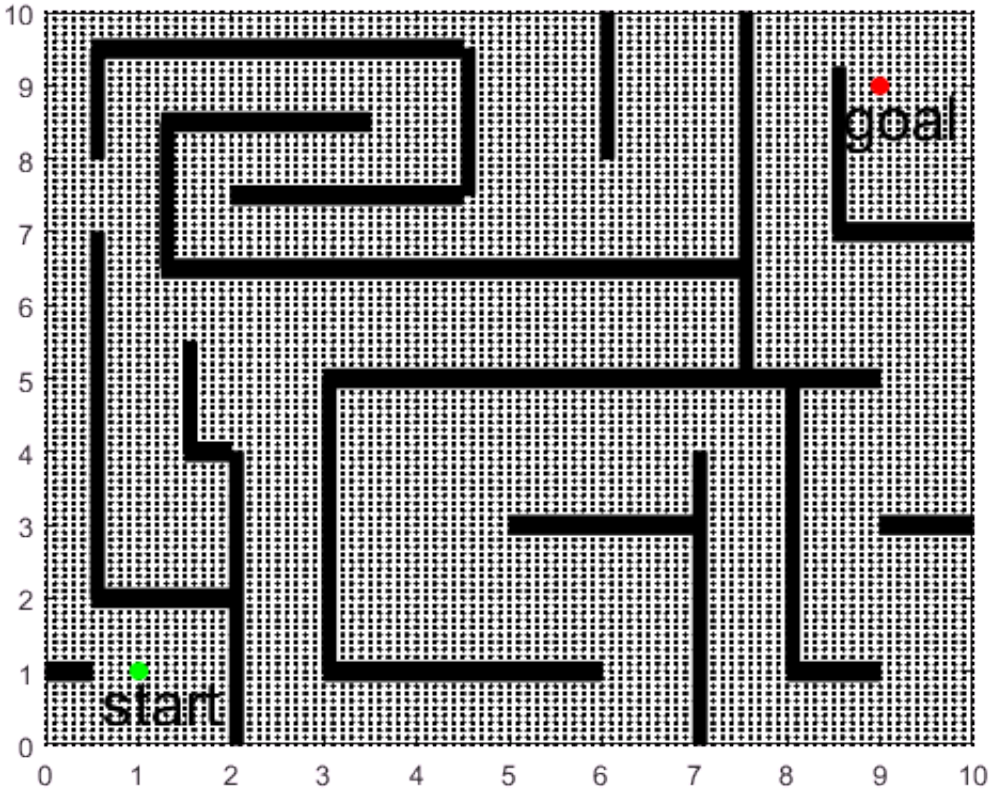

Part 2