

CONTEST # 2: MAZE

Purpose

The maze is intended to present a test of navigational skills by an autonomous robot. The scoring is done in such a way as to favor robots which are either brutally fast or which can learn the maze after one pass. The object is for a robot, which is set down at the entrance of the maze, to find its way through the maze and reach the exit in the least amount of time.

Physical Characteristics

The maze is constructed of $\frac{3}{4}$ " wood. The walls are approximately 10 inches high, and are painted white color. The walls are set on a grid with 12 inch spacing. Due to the thickness of the plywood and limitations in accuracy, the hallways may be as narrow as 10 inches. The maze can be 20-foot square, but may be smaller, or bigger depending on the space available for the event.

The maze will be set up on tile floor. The maze will be under cover, however, it may be exposed to various temperatures, and lighting conditions. The maze is a classical two-dimensional proper maze: there is a single path from the start to the finish and there are no islands in the maze. Both the entrance and exit are located on outside walls. Proper mazes can be solved by following either the left wall or the right wall. The maze is carefully designed so that there is no advantage if you follow the left wall or the right wall.

Robot Limitations

The main limit on the robot is that it be autonomous: once started by the owner or handler, no interaction is allowed until the robot emerges from the exit, or it becomes hopelessly stuck. If the robot becomes stuck, the owner can help the robot. The maximum distance that the robot can be helped by the owner is 6 inches forward or backward. Obviously the robot needs to be small enough to fit within the walls of the maze. It may touch the walls, but may not move the walls to its advantage –no bulldozers. The judges may disqualify a robot which appears to be moving the walls excessively. The robot must not damage either the walls of the maze, nor the floor. Any form of power is allowed as long as local laws do not require hearing protection in its presence or place any other limitations on it.

Maximum Time to Complete Course

Four minutes.

Assembling

For the maze competition assembly will include breadboard circuits required for the event.

Scoring

I. Time: 80 points

The team that completes the trial in the least amount of time will be awarded the full 80 points. Following teams will be deducted a total of 1/4 point for each additional second above the lowest time. Teams will be allowed a total of 5 helps for each trial. Meaning, if the robot gets stuck, or travels off the course the team will be able to help the robot back on course within a radius of 6 inches for a penalty of 4 points each time the team helps the robots. The best run from the two runs will be used in the total score.

II. Program: 20 points

Teams will be responsible for providing their codes in the flash drive given at the training day. In the flash drive should be only two codes, one for the Line Following and other for the Maze. If code is modified after first trial, make sure you save in the flash drive. The code will be graded based on originality, and clarity. Any code found to be an exact duplicate of online examples will be an automatic loss of all 20 points. Teams should review examples, but try to use different methods of accomplishing the same thing. Examples of clarity are using comments, labels for constants and pin declarations, etc.

III. Bonus:

Teams will be rewarded 15 points per trial for completing course without helps.
Teams will be rewarded 5 points per trial for remotely starting the robot.

Logistics

Each robot will make one run, proceeding until all robots have attempted the maze. Each robot then does a second run through the maze. The judge will allow some discretion if a contestant must delay their run due to technical difficulties. A team may modify the circuit or the code before the second run. A robot may remember what it found on a previous run to try to improve its time (mapping the line following on the first run), and can use this information in subsequent runs-as long as the robot does this itself.