Probability Robotics – 2D Grid localization

PARMAR hardiksinh

Localization:

1 Introduction:

Localization is the process of establishing correspondence between the map coordinate system and the robot's local coordinate system.

The most common form of intelligent localization and navigation is to use a map, combined with sensor readings and some form of closed-loop motion feedback. But a robot needs to do so much more than just localizing itself. Often, we'd like our robots to be able to build their own maps, since map building by hand is tedious, boring, and error-prone. The field of robotics that studies localization and mapping.

For this lab we have to perform Localization of a Robot in a randomly generated 2D grid environment.

2.Procedure:

We have Create a Map of 2D environment with different colors here I am using 'red' and 'green'.
And then we have to compute the Bayesian Probability for each grid using the measurement data.
A MATLAB function **sense_2D** computes the posterior probability for a given measurement.

```
p_Hit = 0.6;
p_Miss = 0.2;
```

The sensing function allows the robot to sense where are the tiles of a given color, by comparing the words of a measurement to the given world (MATLAB function strcmp). The obtained result for each cell is then part of the probability matrix of the environment of the robot.

Probability Robotics – 2D Grid localization

PARMAR hardiksinh

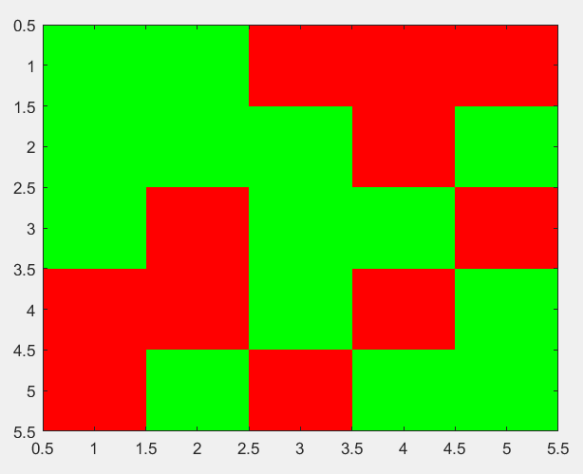
To Move the robot in the simulated environment and again compute the Bayesian Probability. A MATLAB function **move_2D** does this motion.

p_Correct = 0.8;
p_OverShift = 0.1;
p_UnderShift = 0.1;

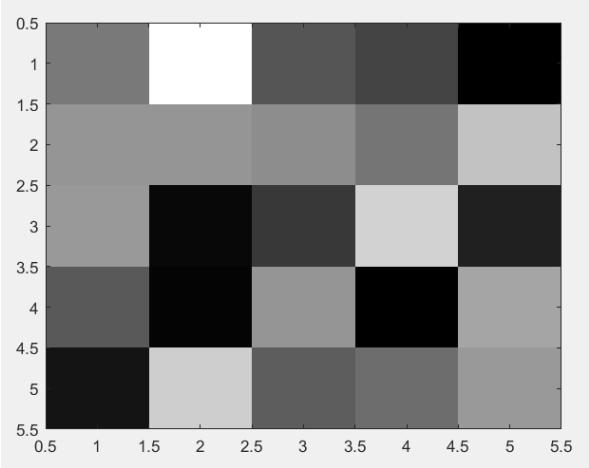
The movement function implemented here read the created world, the probability map modified by sensing loops, and a vector corresponding to our movement. Inside the function, inaccuracy probabilities inherent to the robot's displacement are defined.

3.Result:

The simulation is started with a uniform probability as we do not know where the robot is on the map.
Here I implement Sense and Move in a way that each sense takes 3 sensors measurements and computes the Posterior Probability.
And the results are given below.



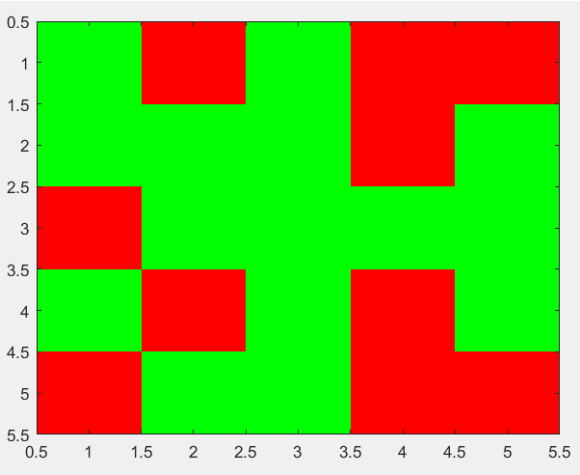
2D Environment



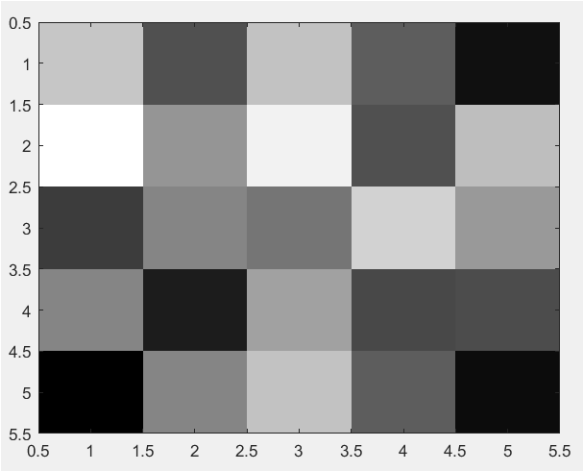
Output

Probability Robotics – 2D Grid localization

PARMAR hardiksinh



2D Environment



Output