University of Burgundy

MSCV

POBABILISTIC ROBOTICS

2D GRID LOCALIZATION

by

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Aim: To Implement a **2D grid localization**.

- In order to do this task two functions namely **Sense, move** was considered. Firstly, we consider uniform distribution and declare the **world** with color names which is just a 2D list with Red and Green cell (Red represents as R and Green as G).

- **Measurements** List of the measurement taken by a robot each entry either Red or Green. It is denoted by Z variable.

- Later following tasks are done simultaneously in order to do localization.

Sense Task:

- Here we declare correct measurement and incorrect measurement as P**_Hit** and **P_Miss** and then we use those values to obtain the measurement and world.

- The result of the above task is not normalized therefore we do normalization to get those values summation in the range of zero to one.

- Once we got the sense values then we do motion task.

Move Task:

- Once we sense the color, we do move operation. Here we declare Correct motion, overshoot and Undershoot probabilities in order accomplish the motion task.

- Since our Robot moves in 2D we declare two variables v and u just to declare in which direction robot should move.

- We assign if V == 0 then the robot moves horizontally and for u ==0 the robot moves vertically.

We consider the motion as follows:

- [0, 0] - stay
- [0, 1] - Right
- [0, -1] - left
- [1, 0] - Down
- [-1, 0] – Up

After successful Sense and Move task it should RETURN a 2D list that gives the probabilities that the robot occupies each cell in the world.

Result:

Given world and measurement is as follows

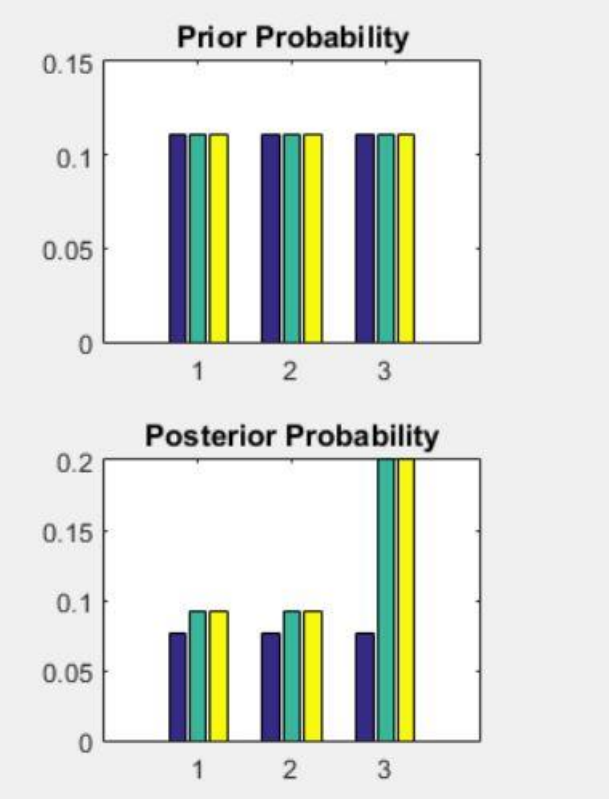
```
1     %         2D Localization
2 -   N = 3;
3 -   world = ['G','G','G';
4               'G','R','R';
5               'G','G','G'];
6
7 -   P = ones(N, N) ./ (N*N); % Prior Probability
8
9 -   Z = {'R'}; % Measurement
10 -  q = P;
11
12 -  for i = 1:length(Z)
13 -      q = sense(q,Z(i),world); % sense
14 -  end
15 -  q = move(q,1,0); % move down
```

The Output is as follows:

	1	2	3	4
1	0.0769	0.0923	0.0923	
2	0.0769	0.0923	0.0923	
3	0.0769	0.2000	0.2000	
4				

As you can see at position (3,2) and (3,3) have higher Probabilities compared to other Positions.

The bar Graph for our Probabilities are as follows:



Please find the MATLAB Code attached.

References:

1) Lecture slides of Dr. Sidibe

2) Video lectures of Artificial Intelligence in Robotics by Sebastian Thrun.