LAB REPORT - 1

PROBABILISTIC ROBOTICS

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Desire SIDIBE

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Chapter 1

Localization

1.1 Introduction

Mobile Robot Localization in general, (commonly known as **Position Estimation** or **Position Tracking**) is the process of determining the pose of a robot relative to a given map of the environment. Localization is seen as a perceptual problem of coordinate transformation in Robotics because the Maps are often described as Global coordinate system, which is independent of a robot's pose[1].

Localization is the process of establishing correspondence between the map coordinate system and the robot's local coordinate system. Knowing this coordinate transformation, a robot can interpret its location and can design a Navigation Map in its own coordinate frame[1].

The key issue in Localization is that the Robot's sensor cannot estimate its pose accurately. Therefore the real-time sensor's data should be integrated with some additional data to increase the accuracy of localization. This data can be multiple measurements, Motion data, etc. In this lab we have performed Localization of a Robot in a randomly generated 2D grid environment.

1.2 Procedure

We have performed 2D grid Localization in three steps.

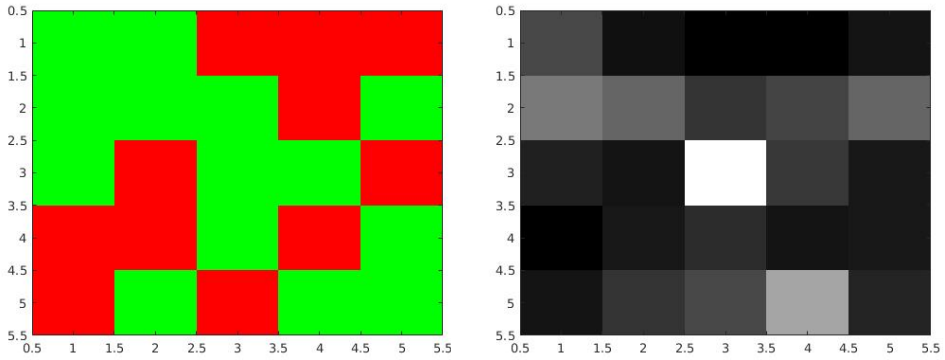
- **Step 1:** Create a Map of 2D environment with different colors (Red and Green in this case). A MATLAB function $create2D$ creates a random 2D environment of size $(M \times N)$.

- **Step 2:** Compute the Bayesian Probability for each grid using the measurement data. A MATLAB function $sense2D$ computes the posterior probability for a given measurement (Measurement can be one or many).
- **Step 3:** Move the robot in the simulated environment and again compute the Bayesian Probability. A MATLAB function $move2D$ does this motion.

$Note$: $sense2D$ and $move2D$ can be called repeatedly to Localize the Robot with highest Probability.

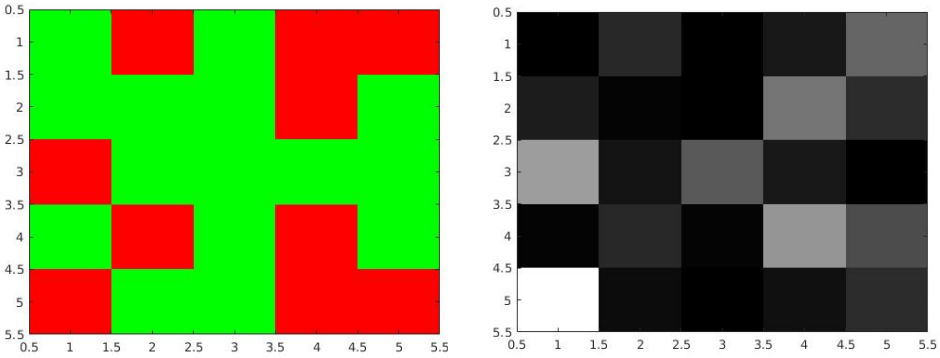
1.3 RESULTS

I tried to implement ***Sense*** and ***Move*** 5 times in a way that each sense takes 3 sensors measurements and computes the Posterior Probability followed by a Motion *(see: main.m)* and the output for 3 different random inputs of World, Measurement and Motion is given below.



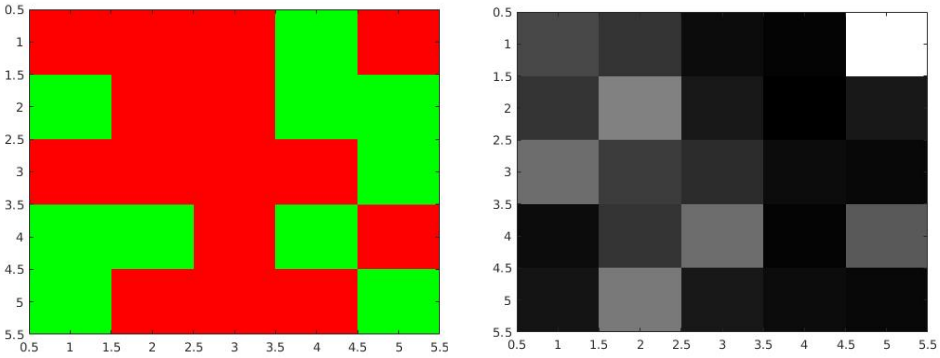
(a) 2D Environment **(b)** Output of Localization

Figure 1.1



(a) 2D Environment **(b)** Output of Localization

Figure 1.2



(a) 2D Environment **(b)** Output of Localization

Figure 1.3

Bibliography

[1] J. Bongard, “Probabilistic robotics. sebastian thrun, wolfram burgard, and dieter fox.(2005, mit press.) 647 pages,” 2008.