Localisation of a Maze Solver using EKF

1 Introduction

This project describes the implementation of a Maze Solver bot in a maze environment using EKF Localisation method.

2 Methodology

This project has two main parts: (i).Implementing traditional path finding algorithms to find a solution of an unkonwn maze environment. (ii).Once the solution of the maze is found, implementing the solution in the environment using Extended Kalman Filter based Localisation.

For the first step, a random Maze is generated by removing the 'walls' of a nxn square grid ensuring that proper paths are formed through the cells and a solution path from the start to end also exists. Next using traditional graph search algorithms like either Dijkstra, A* or D*, we can find a solution path for a given maze.

Once the solution path is found, the path is fed into the Maze solver robot which moves within the enviornment with a noisy motion. There are landmarks set across the environment which can be tracked by the robot. It has a sensor which can track the landmarks within its field of view with a certain accuracy. Based on the two measurements from the dynamic model and the sensor observations, the robot predicts and updates its next state. Doing this repeatedly, the robot traverses through the calculated path trying to minimise the error through EKF.

3 Implementation

The EKF filter is implemented through a two-step process involving of a prediction step and a correction step.

3.1 Dynamic Model

The Dynamic model of the solver robot is based on a Planar 3-DoF mobile robot.

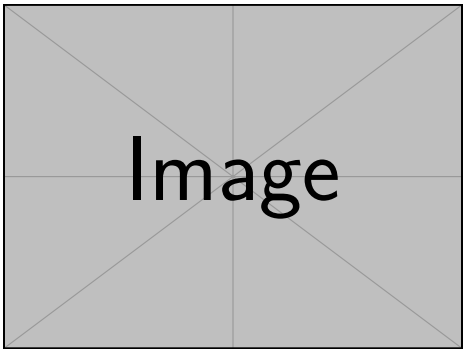

Figure 1: Example Figure

3.2 Prediction Step

The Prediction step is based on the dynamics of the robot.

3.3 Update Step

4 Results of Localisation

Discuss the results and their implications in this section.

5 Conclusion

Summarize your project and its key findings.

6 References

List any references or sources you used in your project.