LASER RANGEFINDER NAVIGATION

INTRODUCTION

Localization in an unknown environment is a common problem in engineering. In this project we deal with a mobile robot, specifically a forklift, that needs to move in a warehouse environment not known a priori. The robot would use odometry data to gather information about its own status, and a laser rangefinder LIDAR sensor to gather data about the environment.

The goal of this project is to implement a Simultaneous Localization and Mapping (SLAM) system, that allows the robot to map the surroundings and at the same time to give an estimate about its position inside the map. SLAM can be implemented in different ways and with different algorithms, but in every case, one of the main steps is the choice of the estimator and in this project the Extended Kalman Filter (EKF) is used. EKF is a widely used algorithm for estimating the state of nonlinear systems, making it a suitable choice for SLAM in this context.

The tree basic operations of the SLAM, that need to be reiterated at each time step, are:

* Motion model of the robot
* Extraction of the features
* Use of the known features to correct the localization of the robot and of the features

ODOMETRY + LIDAR

MODEL OF THE ROBOT

EXTRACTION OF THE FEATURES

EKF