Introduction

Hello and good morning everyone! We’re here to present our project in a poster form. Our topic is mobile-robot localization using Extended Kalman Filter and Laser range finder.

The localization problem recurring issue in everyday's life. Whether they are smart-phones, our computers or even mobile robots all of them have a method of self-localization, usually by triangulation (GPS). It is therefore a key topic today.

Our project consists of locating a mobile robot (Pioneer P3-DX). To accomplish this task we used the Extended Kalman Filter (EKF) with the help of a Laser Range Finder that scans the environment and allows us to acquire a map. The communication platform between the algorithm and the robot is the ROS, which is not only the basis implementation of all parts to a good functioning of the program, but also allows the integration of new packages developed by the user.

So as said before we have a global map for the robot. This map is uploaded as an jpeg image and with the help of the laser range finder we identify all of its boundaries, walls, into line segments, with the

occupancy grids method, that divides the environment in cells. In other words, we match a position of the pixel of the image to a distance travelled by the robot. After, we use a method called Least Squares to match a line between the obtained points.

The Extended Kalman Filter provides optimal estimates for non-linear systems and is composed by 2 steps the Prediction Step and the Update Step. The EKF helps us find the main objective that is to correct the pose of the robot by subtracting the parameters of matching lines from local and global maps. We have a global map (the uploaded one) and the one that the robot "sees" called the local map, composed by information of the Odometry and the Laser.

Localization is a fundamental problem in mobile robotics. In order for the robot to be autonomous, it needs to know its own pose in the environment. Localizing the robot using only data provided by odometry is inaccurate, since the measurement noise is constantly accumulating.

Taking this into consideration, the robot will need to improve the information about its pose, which can be achieved by comparing the current environment scan with an already built global map, subsequently resulting in a better pose estimation. This map is then subjected to a post-process that transforms all its boundaries (mainly walls) into linesegments, through a method of Least Squares. The environment is scanned with the aid of a Laser Rangefinder (LRF).