Non-linear filtering

PERCEPCIÓ I COGNICIÓ EN L'EXPLORACIÓ ROBÒTICA

Practice 2

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Q1. What are the different lines shown in the turtle playground? and why are they different? In the turtle playground, each line represents the position and direction of turtle1 as calculated by various methods. The differences arise from their respective data sources: the grey line is based on the actual position of turtle1, the blue line is derived from a simulated position sensor with inherent errors, the red line comes from odometry using an inaccurate velocity sensor, and the green line is a result of merging data from both simulated sensors.

Q2. Why the green light does not start on top of the turtle initial position?

The green light doesn't align with the turtle's initial position because it represents an estimate made by the EKF algorithm. Initially, there's significant uncertainty about the turtle's position, treated as unknown. Consequently, the starting position is set at (0,0) and then quickly adjusts to match the turtle's actual position.

Q3. Why is the localization w.r.t. the map vibrating? Is it really globally-better compared to the local odometry estimation (EKF_local)?

Map-based localization appears unstable due to its reliance on intermittent sensor data, like GNSS, which isn't continuously available and varies between readings. This causes frequent adjustments in position estimates. Despite this, it's more accurate globally than the EKF_local estimation. EKF_local only provides local positioning relative to the odom frame, which can significantly deviate from the actual map position due to sensor errors. Therefore, global localization is essential to correct these deviations and maintain a continuous transformation from odom to base_link.

Q4. An image showing the rqt graph with a zoom in the localization-related nodes (e.g., ekf_gps)

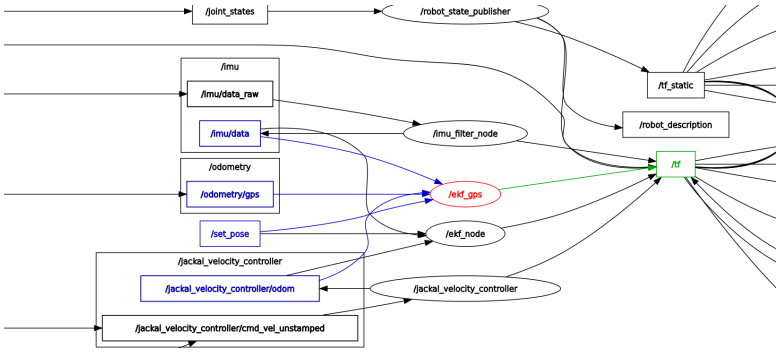

Figure 1.1: EKF localization nodes for exercise 3

Q5. An image showing the rqt graph with a zoom in the localization-related nodes (e.g., ukf_gps)

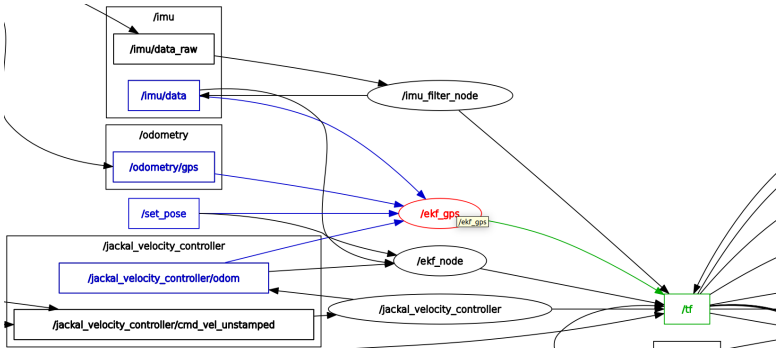

Figure 1.2: UKF localization nodes for exercise 4