An analysis of state covariance of mobile robot navigation in unstructured environment based on ROS

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ABSTRACT

This paper deals with mobile robot navigation in unstructured environment by using Robot Operating System (ROS). ROS is a framework to develop robotic application and it consists of algorithms to build maps, navigate, and interpret sensor data. The system is used to define a condition of mobile robot navigation in a specific environment to evaluate the estimation performance. The research aims to analyze and investigate the mobile robot movement in unknown environment by using Kalman Filter approach considering uncertainties. Only one LiDAR sensor and one IMU sensor are applied to measure the relative distance and then provide the information for estimation purposes. An experiment of a Turtlebot that can keep track autonomously with collision avoidance has been organized to recognize the mobile robot motions through the application of Kalman Filter. Once the simulation is successfully performed as expected, then only the experimental analysis are organized. The results shown that Kalman Filter can sufficiently estimate the condition of the environment with only depending on a LiDAR and IMU sensors with good performance. Besides, the calculated state covariance is also agreed with the theoretical analysis.

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