DISTRIBUTED SECURE STATE ESTIMATION WITH THE TURTLEBOT PLATFORM

by

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Distributed Filter Another name for the Discrete Filter. *see* Discrete Filter

Self Filter Another name for the Continuous Filter. *see* Continuous Filter

Distributed Secure State Estimation with the TurtleBot Platform

Abstract

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Mobile robot localization is one of the fundamental problems of robotics. Without the ability to localize itself in the world, a mobile robot is almost useless. As mobile robotic systems become more present, the need for reliable and cheap state estimation systems has grown. The increasing coverage of wireless networks and density of network cyber-physical systems has lead to an opportunity for distributed systems coordinated between multiple agents. This thesis examines the feasibility of a distributed state estimation system using Kalman filters, and its resilience to erroneous or compromised sensor measurements. This system is implemented on the TurtleBot platform using the Robot Operating System, and performance is evaluated with the Gazebo simulator.

Chapter 1

Introduction

This is an introduction.

1.1 Problem Statement

Now, I specify the exact localization problem that this thesis addresses. Our system contains the following assumptions and constraints.

1. M independent mobile robots operating in a planar environment.
2. Wireless communication abilities between all robots in the environment.
3. No known map of environment, but GPS for localization in a world frame is available.
4. Localization must be able to seamlessly transition between operating with and without pose estimates from other robots.
5. Minimize complexity and added computations to Extended Kalman Filters used for localization.