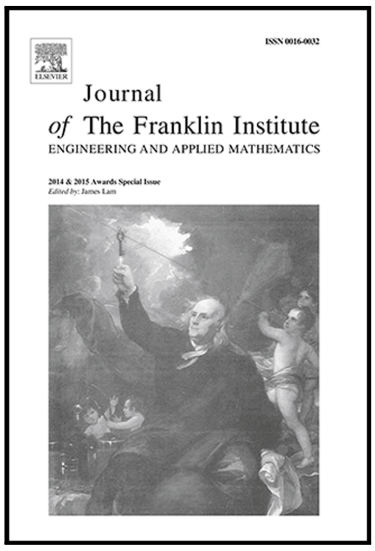

Distributed extended Kalman filter with nonlinear consensus estimate

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Distributed extended Kalman filter with nonlinear consensus estimate

Wenling Li, Yingmin Jia, Junping Du

Abstract

This paper is concerned with the distributed filtering problem for discrete-time nonlinear systems over a sensor network. In contrast with the distributed filters with linear consensus estimate, a distributed extended Kalman filter (EKF) is developed with nonlinear consensus estimate. Specifically, a new nonlinear consensus protocol with polynomial form is proposed to generate the consensus estimate. By using the variance-constrained approach, the Kalman gain matrix is determined for each node to guarantee an optimized upper bound on the state estimation error covariance despite consensus terms and linearization errors. It is shown that the Kalman gain matrix can be derived by solving two Riccati-like difference equations. The effectiveness of the proposed filter is evaluated on an indoor localization of a mobile robot with visual tracking systems.

Index Terms

Distributed filter, Sensor network, Consensus, Extended Kalman filter

I. Introduction

In the past decade, consensus-based distributed filters have received increasing attention in the signal processing and control communities, and different kinds of distributed filtering algorithms have been proposed, according to the communication scheme, the sensor node links and the available information. In the consensus-based algorithms, each node in a network shares its

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