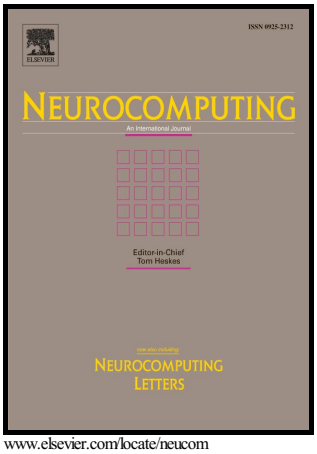

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An Adaptive Kalman Filter Estimating Process Noise Covariance

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Abstract

In this paper, a new adaptive Kalman filter algorithm is proposed to cope with the unknown a priori covariance matrix of process noise for the linear discrete-time systems. The process noise covariance matrix is estimated by the proposed algorithm based on the measurement sequence. Accordingly, we construct a new measurement sequence to sequentially estimate process covariance matrix in terms of the relationship between the measurement and process noise sequence. Then the stability of the proposed algorithm is analyzed. The algorithm shows a simple recursive form and great performance enhancement of application. Finally, the navigation simulation results are presented to illustrate the validity and practicality of the proposed algorithm.

Keywords: Adaptive Kalman Filter, Unknown Process Noise Covariance Matrix, Recursive Covariance Estimating, Stability Analysis

1. Introduction

The Kalman filter technique provides a recursive optimal solution to the linear filtering problem rooted in the state-space dynamical systems[1, 2]. It has been widely employed in inertial navigation, target tracking and fault detection[3, 4, 5]. The optimality of Kalman filters is highly relying on the assumptions on the assumptions that the linear dynamic system model is precisely obtained a priori, and the noises of

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