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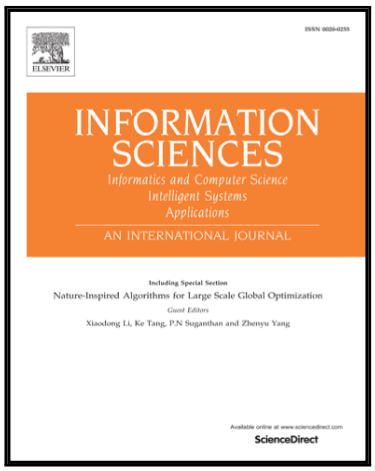

Local Node Cooperative Estimation of Stochastic Systems Using a Switching Network of Heterogeneous Sensors with Communication Delay

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Local Node Cooperative Estimation of Stochastic Systems Using a Switching Network of Heterogeneous Sensors with Communication Delay

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Abstract:

This paper addresses the cooperative stochastic state estimation of a moving target using a switching sensor network that may contain communication delays. The switching in the graph of the sensor network may be due to local communication failures of the neighboring sensors or due to their movements. The network may have heterogeneous sensors with different measurement vectors of various combinations of states. Using a Kalman filter, the states of the target system are estimated at each node having only its local neighboring information. The network nodes cooperate locally with a packet-based communication to improve the estimation. Finally, numerical examples are provided to show the effectiveness of the scheme. The results are compared with the centralized and local estimations.

Keywords: Cooperative estimation, sensor network, heterogeneous sensors, switching topology, delay.

1. Introduction

Multi-agent systems, group networks, and wireless sensor networks (WSNs) have attracted increasing interest due to their widespread applications such as target tracking, formation control, satellite groups, network traffic control, automated highway systems, and mobile robots [3,13,15]. As the measurements are distributed over a network of sensors, the network nodes should cooperate with each other by intercommunication; hence, cooperative estimation and control are suitable approaches in these problems [11,23]. An important challenge in WSNs especially mobile WSNs is

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