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Distributed consensus-based estimation with unknown inputs and random link failures.
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Summary: This paper focuses on the distributed state estimation problem for linear time-varying systems with unknown exogenous inputs and random link failures. The unknown inputs appear both in the system equation and the measurement equation, and no information of them is available. The communication links between sensor nodes are unreliable and suffer from random link failures governed by a set of independent Bernoulli processes. By modeling the unknown inputs as processes with non-informative priors, a novel minimum mean square error (MMSE) estimator is derived. Then, a distributed consensus-based estimation algorithm is developed by repeatedly fusing local information from the neighbors possessing the successful link communications, in the sense that each sensor exchanges the local information obtained by performing the local MMSE estimation with its neighbors. Further, sufficient conditions are given to guarantee the stability of the proposed distributed estimator, in which the estimation error in each sensor is uniformly bounded in mean square. Finally, numerical examples are provided to show the effectiveness of the proposed technique.

MSC:

93D50 Consensus
93E10 Estimation and detection in stochastic control theory
93C05 Linear systems in control theory

Keywords:

distributed consensus-based estimation; sensor networks; unknown inputs; random link failures

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