

Online Distributed Estimation via Adaptive Sensor Networks

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Abstract

The paper presents an online distributed estimation scheme over adaptive sensor networks. The objective of the algorithm is consistent with distributed least squares without prior assumptions on the uncertainties in the operating environment of the sensors or the quality of sensor observations. Specifically, it is assumed that the observation process is time-varying due to the sensor's susceptibility to unknown errors. Furthermore, there is no probabilistic assumption made on the additive measurement noise. Inspired by recent advances in distributed convex optimization, we propose an online distributed algorithm based on a dual subgradient averaging for the solution of the corresponding estimation problem. Moreover, we examine the situation where the algorithm adapts the weights of the communication links in the network due to uncertainty on the reliability of neighboring sensors. An upper bound on the regret of the algorithm as a function of the underlying network topology is then discussed, followed by simulation results for a few representative classes of sensor networks.

Index Terms

Sensor networks; distributed estimation; network topology design; online optimization

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