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[2009-0157] 多丢包不确定离散系统的鲁棒Kalman滤波

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摘要
研究了同时具有不确定性和多丢包情况下的离散时变系统的鲁棒滤波问题,其中的不确定性是时变的,范数有界的,且存在于系统的状态矩阵和输出矩阵中.
通过把多丢包问题建模成具有随机参数的系统模型,在允许的不确定性情况下,给出了估计误差方差的上界,并进一步基于矩阵范数的意义最小化该上界.
结果表明,通过求解两个Riccati差分方程,可以设计鲁棒滤波器.最后,提出适合在线计算的鲁棒滤波算法,并通过仿真实例表明所提算法的有效性和实用性.

关键词 参数不确定性 多丢包 鲁棒估计 网络化控制系统(NCSs)

分类号

[2009-0157] Robust Kalman Filtering for Uncertain Discrete-Time Systems with Multiple Packet Dropouts

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Abstract
This paper is concerned with the robust filtering problem for a class of discrete time-varying systems with uncertainties and multiple packet dropouts. The system under consideration is subjected to time-varying norm-bounded parameter uncertainties in both the state and output matrices. Based on a model of multiple packet dropouts, the system is modeled to one with stochastic parameter. An upper bound on the variance of the state estimation error is first found under admissible parameter uncertainties. Then, a robust filter is derived by minimizing the prescribed upper bound in the sense of the matrix norm. It is shown that the desired filter can be obtained in terms of the solutions to two discrete Riccati difference equations. Eventually, a robust filtering algorithm suitable for online computation is summarized and a simulation example is presented to demonstrate the effectiveness and practicable of the proposed algorithm.
Key words robust estimation parameter uncertainties multiple packet dropouts Networked Control Systems(NCSs)
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