工程与应用

传感器失效不确定时滞系统指数稳定可靠控制

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摘要　　针对一类含有时变时滞的不确定参数线性系统，研究了在传感器发生故障情况下系统指数稳定鲁棒可靠控制器设计问题。系统中的参数不确定性满足广义匹配条件，时变时滞及其变化率有界，并假设故障传感器元件的输出为零。经过适当的状态变换，将原系统的指数稳定鲁棒可靠控制问题转化为另一个等价系统的鲁棒可靠控制问题。根据Lyapunov稳定性理论，得到了系统存在指数稳定鲁棒可靠控制器应满足的一个矩阵不等式。为了便于数值求解，将该矩阵不等式转化为线性矩阵不等式（LMI），并给出了可靠控制器的设计方法和步骤。利用该文方法设计的指数稳定鲁棒可靠控制器能够使得时滞系统对于任意允许的不确定性以及传感器失效都具有指定衰减度的渐近稳定性。数值算例说明了所提出设计方法的有效性。

关键词　　可靠控制　指数稳定　不确定系统　时变时滞　传感器失效　线性矩阵不等式

分类号

Reliable control with exponential stabilization for uncertain delay systems against sensor failure

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Abstract

The problem of reliable control with exponential stabilization is investigated for time-varying delayed uncertain systems against sensor failure.In the considered systems，the parameters uncertainties satisfy generalized matching conditions，and the time-varying delay and its derivative are bounded.All the output of the sensor failures is assumed to be zero.By means of state variables transformation，the problem of reliable control with exponential stabilization is reduced to an equivalent problem of reliable control.Based on Lyapunov stability theory，a sufficient condition for the existence of reliable controller with exponential stability is derived and transformed to a Linear Matrix Inequalities （LMI）.Furthermore，the design approaches and steps of reliable controller are given.The resultant controller enables the closed-loop system to tolerate sensor failures and retains exponential stability despite any outages within a prespecified subset of sensors.A numerical example shows the validity of the proposed design method.

Key words　reliable control　exponential stabilization　uncertain system　time-varying delay　sensor failure　Linear Matrix Inequality（LMI）

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