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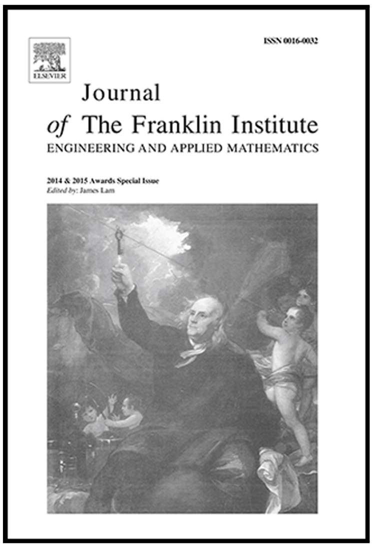

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Event-triggered fault estimation and sliding mode fault-tolerant control for a class of nonlinear networked control systems

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Abstract

This paper is concerned with integrated event-triggered fault estimation (FE) and sliding mode fault-tolerant control (FTC) for a class of discrete-time Lipschtiz nonlinear networked control systems (NCSs) subject to actuator fault and disturbance. First, an event-triggered fault/state observer is designed to estimate the system state and actuator fault simultaneously. And then, a discrete-time sliding surface is constructed in state-estimation space. By the use of a reformulated Lipschitz property and delay system analysis method, the sliding mode dynamics and state/fault error dynamics are converted into a unified linear parameter varying (LPV) networked system model by taking into account the event-triggered scheme, actuator fault, external disturbance and network-induced delay. Based on this model and with the aid of Lyapunov-Krasovskii functional method, a delay-dependent sufficient condition is derived to guarantee the stability of the resulting closed-loop system with prescribed H_∞ performance. Furthermore, an observed-based sliding mode FTC law is synthesized to make sure the reachability of the sliding surface. Finally, simulation results are conducted to verify the effectiveness of the proposed method.

Keywords: Event-triggered scheme; Fault estimation; Sliding mode fault-tolerant control; Nonlinear systems;

1. Introduction

Nowadays, networked control systems (NCSs), in which the sensor, controller, actuator and original plant are connected over a shared communication network, have received significant research attention due to their advantages including simple installation and maintenance, low cost and flexibility. However, the insertion of the communication network inevitably leads to some challenging issues, such as transmission delays, limited communication resources and packet dropouts, which may degrade system performance or even cause system

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