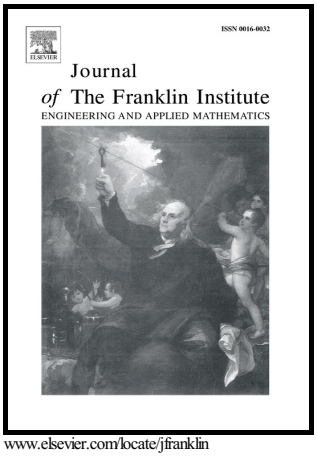

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Fault tolerant control using adaptive output integral-type sliding mode

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Abstract

This paper proposes a novel fault tolerant control scheme for linear systems with unknown bounded uncertainty and time-varying fault. In this scheme, adaptive output integral-type sliding mode is incorporated with adaptive unknown input observer to cope with aforementioned systems using only input and output information. More specifically, the adaptive unknown input observer is exploited to estimate state and fault simultaneously, and the adaptive output integral-type sliding mode is designed to attenuate unknown bounded uncertainty and tolerate time-varying fault. Then, Lyapunov stability theory is applied to synthesize the design of the observer and nominal controller. Finally, the effectiveness of the proposed method is verified by a numerical example.

Keywords: Fault tolerant control (FTC), output integral-type sliding mode, adaptive unknown input observer, fault estimation

1. Introduction

Over the last several decades, the increasing demand for safety, reliability, maintainability, and survivability in industrial process has stimulated significant research in fault diagnosis and fault tolerant control (FTC) field [1–5]. Fault tolerant controller is designed to handle emergency situations arising from actuator or sensor faults, guarantee system performance, and improve system reliability. In the FTC literature, different approaches have

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