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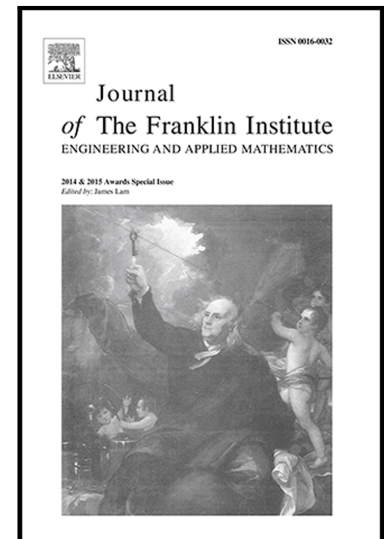
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Finite-time adaptive control for a class of switched stochastic uncertain nonlinear systems

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Abstract This paper addresses the problem of global finite-time adaptive control for a class of switched stochastic uncertain nonlinear systems under arbitrary switchings. By applying the delicate introduction of coordinate transformations and adding a power integrator technique, an adaptive controller is constructed to guarantee that the system state is regulated to the origin almost surely in a finite time while maintaining the boundedness of the resulting closed-loop systems in probability. Two examples are given to illustrate the effectiveness of the proposed control scheme.

Key words: Finite-time stability; Switched stochastic nonlinear systems; Adding a power integrator; Adaptive control.

1 Introduction

In this paper, we consider the problem of global finite-time adaptive control for a class of switched stochastic nonlinear systems

$$\begin{aligned} dx_1 &= x_2^{p_{1,\sigma(t)}} dt + f_{1,\sigma(t)}(\bar{x}_1, \theta) dt + g_{1,\sigma(t)}^T(\bar{x}_1, \theta) d\omega, \\ dx_2 &= x_3^{p_{2,\sigma(t)}} dt + f_{2,\sigma(t)}(\bar{x}_2, \theta) dt + g_{2,\sigma(t)}^T(\bar{x}_2, \theta) d\omega, \\ &\vdots \\ dx_n &= u^{p_{n,\sigma(t)}} dt + f_{n,\sigma(t)}(x, \theta) dt + g_{n,\sigma(t)}^T(x, \theta) d\omega \end{aligned} \quad (1)$$

where $x = (x_1, \dots, x_n)^T \in \mathbb{R}^n$ and $u \in \mathbb{R}$ are the system state and control input respectively. $\bar{x}_i = (x_1, \dots, x_i)^T$, $i = 1, \dots, n$. $\sigma(t)$ is the switching signal taking its values in a finite set $M = \{1, \dots, m\}$ and m is the number of subsystems. ω is an r -dimensional standard Wiener process defined on the complete probability space $(\Omega, \mathcal{F}, P)$ with Ω being a sample space, $\mathcal{F}$ being a σ -field and P being a probability measure. $\theta \in \mathbb{R}^s$ is a vector of uncertain parameters with integer

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