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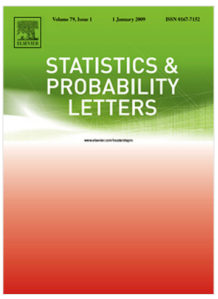


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# Robust Discrete-state-feedback Stabilization of Hybrid Stochastic Systems with Time-varying Delay Based on Razumikhin Technique

Yuyuan Li[a,b], Jianqiu Lu[c], Chunhai Kou[d,*], Xuerong Mao[c], Jiafeng Pan[c]

[a] *College of Information Science and Technology, Donghua University, Shanghai, 201620, China*
[b] *School of Electronic and Electrical Engineering, Shanghai University of Engineering Science, Shanghai, 201620, China*
[c] *Department of Mathematics and Statistics, University of Strathclyde, Glasgow G1 1XH, UK*
[d] *Department of Applied Mathematics, Donghua University, Shanghai 201620, China*

**Abstract**

This paper deals with the robust stabilization of continuous-time hybrid stochastic systems with time-varying delay by feedback controls based on discrete-time state observations. By employing the Razumikhin technique, delay-independent criteria to determine controllers and time lags are established just under a weaker condition that the time-varying delay should be a bounded function. Meanwhile, for the nondelay system, we obtain a better bound on the duration $\tau$ between two consecutive state observations. The new theory developed in this paper improves the existing results. Numerical examples are provided to demonstrate the effectiveness of our results.

*Keywords:* Hybrid stochastic systems, Time-varying delay, Robust stabilization, Discrete-time feedback control, Razumikhin technique

## 1. Introduction

Stochastic systems have received a lot of attention as stochastic modeling has played a more and more important role in many branches of science and engineering (see e.g. [1–4]). In practice, the structures and parameters of some stochastic systems may change abruptly due to random failures of components, sudden environment changes, etc. Hybrid stochastic differential equations (SDEs) (also known as SDEs with Markovian switching) have been employed to model such problems (see e.g. [5–7]). An area of particular interest in the study of hybrid SDEs is the automatic control, with subsequent emphasis being placed on the stability analysis. There is an intensive literature in the area (see e.g. [8–12]).

On the other hand, it has been recognized that time delay frequently occurs in various dynamic systems and, very often, it has an unstable effect and leads to poor performance of control systems. Stability and stabilization problems of hybrid stochastic time-delay systems have therefore attracted a lot of interest. A huge number of papers have appeared on these topics. For example, Mao [10] investigated the exponential stability for a class of linear hybrid stochastic delay interval systems. A robust state-feedback controller was designed in [13] to exponentially stabilize a class of bilinear continuous time-delay uncertain stochastic systems with Markovian jumping parameters. In [14], the robust stabilization problem of uncertain stochas-

*Corresponding author.
*Email address:* kouchunhai@dhu.edu.cn (Chunhai Kou )