

## EXPONENTIAL STABILIZATION OF STOCHASTIC DELAY SYSTEMS USING SLIDING MODE CONTROLLERS

Lirong Huang and Feiqi Deng

College of Automation Science and Engineering  
South China University of Technology, Guangzhou 510640, China  
lrhuang@scut.edu.cn

**Abstract.** Sliding mode control has proven to be an effective robust control strategy with various attractive advantages. Over the recent years, sliding mode control for stochastic systems has been reported in some studies (see, e.g., [8], [11] and references therein). However, relatively little is known about the exponential stabilization. This paper deals with the problem of robust exponential stabilization of stochastic delay systems using sliding mode controllers. Furthermore, to avoid the idealization of discontinuous controllers, continuous controllers are synthesized to force the state trajectories of the system to a reduced-order sliding mode dynamics that is mean-square exponentially stable and the rate of exponential convergence of the states driven toward the switching surface can be designed.

**Keywords.** stochastic systems; time delay; exponential stabilization; sliding mode control; mean-square stable.

**AMS (MOS) subject classification:** This is optional. But please supply them whenever possible.

### 1 Introduction

Since its early appearance in the 1950s, sliding mode control has proven to be an effective robust control strategy with various attractive advantages such as fast response, good transient performance and robustness with respect to uncertainties (see, e.g., [3]). For stochastic modeling has played an important role in many branches of science and engineering (see [1], [6] and [8]), over the recent years, sliding mode control for stochastic systems has been reported in some studies, e.g., [8] and references therein. Since time delay is encountered in many real-life systems and often recognized the cause for instability and poor performance, the problem of sliding mode control for stochastic delay systems has received attention (see, [8], [11] and references therein). For instance, [8] studied variable structure control for stochastic delay systems in subreachability sense; [11] investigated robust integral sliding mode control for uncertain stochastic systems with delay. However, relatively little is known about the exponential stabilization of the systems using sliding mode