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DELAY-DEPENDENT ROBUST STABILIZATION FOR UNCERTAIN STOCHASTIC FUZZY SYSTEM WITH TIME-VARYING DELAYS

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Abstract. *The delay-dependent robust stochastic stabilization problem of stochastic T-S fuzzy delay systems with both norm bounded uncertainty and convex polyhedral uncertainty is considered. A delay-dependent robust stochastic stability criterion is given in terms of linear matrix inequalities (LMIs) by using the Lyapunov-Krasovskii functional method and Ito's formula, based on this criterion, a robust state-feedback controller resulting closed-loop system robustly asymptotically stable in mean square is developed in term of linear matrix inequality (LMI). Finally, a design example illustrates the effectiveness of the proposed method.*
Keywords: Delay-dependent, Robust stabilization, Uncertain, Fuzzy control, Time-varying delays

1. **Introduction.** The stochastic systems expressed by Ito-Type stochastic differential equations have received much attention [1,4-7,10,11,13,16,20-23], and various results on stability analysis, H_∞ controller design and H_∞ filter design of stochastic systems have been developed. Stochastic model are widely used to model nonlinear processes in signal and image processing, as well as communication systems [12,14]. It has proved that a class of nonlinear stochastic systems can be approximated by the T-S fuzzy model, thus, we can deal with the problem of nonlinear stochastic systems based on the fuzzy logic approach. Recently, the problem of stochastic T-S fuzzy system has attracted many researchers' interest, a lot of literature extended T-S fuzzy model approach to stochastic nonlinear system [8,15].

As is well known now, time delay and system uncertainty are commonly encountered and are often the sources of instability [9], therefore, more and more authors began to study the fuzzy stochastic system with delay and uncertainty. [19] proposed a sufficient condition in the format of linear matrix inequalities (LMIs), such that for all admissible parameter uncertainties, the overall fuzzy system is stochastically exponentially stable in the mean square, independent of the time delay. [18] studied a guaranteed cost control problem of uncertain stochastic T-S fuzzy systems with time delay by representing this class of stochastic fuzzy systems in the descriptor form. [25] analyzed delay-dependent stability of the time-delay stochastic fuzzy systems, and the time delays are assumed to appear in both the state and the control input.