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ROBUST FINITE-TIME STABILIZATION OF UNCERTAIN FUZZY JUMP SYSTEMS

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Abstract. *The robust finite-time stabilization problem is studied for a class of stochastic fuzzy Markov jump systems with parameters uncertainties. By means of Takagi-Sugeno fuzzy models, the overall closed-loop fuzzy dynamics are constructed through selected membership functions. Based on the stochastic Lyapunov-Krasovskii functional approach, a new robust finite-time stabilization condition is established for such fuzzy jump systems. The robust finite-time stabilization criterion is formulated in the form of linear matrix inequalities. Simulation examples are included to demonstrate the potential of the proposed results.*

Keywords: Markov jump systems, Uncertainties, Takagi-Sugeno fuzzy models, Finite-time stabilization, Linear matrix inequalities

1. **Introduction.** Dynamic systems with Markov jump parameters have been an active research topic since the pioneering work on quadratic control of linear jump systems in the early 1960s. This class of systems involves both time-evolving and event-driven mechanisms, and may be employed to model a variety of physical systems, which may experience abrupt changes in structures and parameters due to, for instance, sudden environment changes, subsystem switching, system noises and executor faults, etc. For more results on this topic, we refer readers to [1-8] and the references therein.

It is now worth pointing out that the stability, stabilizability and control performance mentioned above concern the desired behavior of the controlled dynamics over an infinite-time interval and it always deals with the asymptotic property of system trajectories. But in some practical processes, a Lyapunov asymptotically stable system over an infinite-time interval does not mean that it has good transient characteristics, for instance, biochemistry reaction system, robot control system and communication network system, etc. Furthermore, the main attention in these dynamics may be related to the behavior over a fixed finite-time interval. Therefore, we need to check the unacceptable values to see whether the system states remain within the prescribed bound in a fixed finite-time interval or not. To discuss this transient performance of control dynamics, literatures on finite-time stability (or short-time stability [9]) have attracted particular interests of researchers. Comparing with classical Lyapunov stability, finite-time stability concerns the stability of a system over a finite-time interval and plays an important part in the study of systems' transient behavior. For more results on this topic, we refer readers to [10-15] and the references therein. Towards each case above, it is worth noticing that Doroto et. al [10] started a new and prolific trend in the area of using linear matrix inequalities (LMIs) [16] techniques. However, more details are related to linear control dynamic systems, and very few literatures consider finite-time interval problem for Markov switching stochastic