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FEEDBACK STABILIZATION FOR NONLINEAR AFFINE STOCHASTIC SYSTEMS

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Abstract. *This paper studies the state feedback stabilization of nonlinear affine stochastic systems. Sufficient conditions for the local and global asymptotic stabilization in probability are presented by means of Hamilton-Jacobi inequalities. As corollaries, some previous results are improved. For a class of nonlinear stochastic perturbed systems, the output feedback stabilization problem is also considered. One example is given to show the validity of our main results.*
Keywords: Asymptotic stability in probability, Hamilton-Jacobi inequality, Feedback stabilization, Linear matrix inequality

1. **Introduction.** Stochastic stability for Itô systems has been studied for a few decades; see [1-5] for the discussion of stochastic Lyapunov stability and [6] for the work of Lyapunov exponent of linear stochastic systems. For a stochastic control system, stochastic stabilization is a problem that should be first considered in the system analysis and design. It should be noted that the study on stochastic stabilization has received a great deal of attention and has become a popular research issue in recent years; see [7-15]. How to stabilize an unstable stochastic system via state or output feedback is without doubt a very valuable topic in practice. [8, 9, 14] discussed the mean square stabilization of linear stochastic control systems. In recent years, the stabilization of nonlinear stochastic systems has been studied extensively. By means of a positive symmetric solution of a class of generalized algebraic Riccati equations (GAREs), one can construct a quadratic Lyapunov function to present some sufficient conditions for local stabilization of bilinear or general nonlinear stochastic systems with state-dependent noise [7, 11]. By combining the stochastic Lyapunov technique with stochastic version of LaSalle's invariance principle [3], the global stabilization of affine stochastic systems was also discussed based on the assumption that the unforced systems are stable in probability [12], and the H_∞ stabilization was studied in [13]. For the case when the system state is not completely available, [15] first initiated the study on output feedback stabilization of a class of nonlinear stochastic