

Feedback stabilization and adaptive stabilization of stochastic nonlinear systems by the control Lyapunov function.

ABSTRACT

Our aims of this paper are twofold: On one hand, we study the asymptotic stability in probability of stochastic differential system, when both the drift and diffusion terms are affine in the control. We derive sufficient conditions for the existence of control Lyapunov functions (CLFs) leading to the existence of stabilizing feedback laws which are smooth, except possibly at the equilibrium state. On the other hand, we consider the previous systems with an unknown constant parameters in the drift and introduce the concept of an adaptive CLF for stochastic system and use the stochastic version of Florchinger's control law to design an adaptive controller. In this framework, the problem of adaptive stabilization of nonlinear stochastic system is reduced to the problem of non-adaptive stabilization of a modified system.

Keyword: Stochastic differential systems; Control Lyapunov function; Globally asymptotically stable in probability; Feedback stabilization; Adaptive stabilization.