Sufficient Conditions for Exponential Stability of Stochastic Differential Equations with Non Trivial Solutions

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Abstract : Exponential stability of stochastic differential equations with non trivial solutions is provided in terms of Lyapunov functions. The main result of this paper establishes that, under certain hypotheses for the dynamics f(.) and g(.), practical exponential stability in probability at the small neighborhood of the origin is equivalent to the existence of an appropriate Lyapunov function. Indeed, we establish exponential stability of stochastic differential equation when almost all the state trajectories are bounded and approach a sufficiently small neighborhood of the origin. We derive sufficient conditions for exponential stability of stochastic differential equations. Finally, we give a numerical example illustrating our results.
Keywords : exponential stability in probability, stochastic differential equations, Lyapunov technique, Ito's formula
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