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PARTIAL STABILITY ANALYSIS OF STOCHASTIC SYSTEMS VIA GAMIDOV'S INEQUALITY

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Abstract. Lyapunov's method is one of the most effective tools for analyzing the stability of stochastic systems, and several authors have employed Lyapunov techniques to investigate partial practical stability of stochastic differential equations (SDEs). In this paper, we adopt a different approach and primarily investigate the global almost sure partial practical exponential stability of SDEs by exploiting the explicit representation of their solutions. By applying generalized integral inequalities of Gronwall type, particularly inequalities of Gamidov type, we derive sufficient conditions that ensure the almost sure partial practical exponential stability of the considered systems. In addition, we establish general sufficient conditions for local partial practical exponential stability. Finally, two illustrative examples are presented to demonstrate the applicability of the theoretical results and the effectiveness of the proposed approach.

1. Introduction

Stochastic systems have been used to describe motion laws in the real world. Their edge is that they take into account the uncertainty of the environment. Stochastic differential equations are widely used in different fields such as physics, control engineering, mechanics, financial market, economics, etc. Since stability is a necessary property of stochastic systems, that's why it has always been an interesting research axis. There are many works in the literature devoted to studying the problem of the stability of stochastic differential equations, we refer to see [10, 11, 13–16] and references therein.

In different cases, stochastic differential equations may not satisfy sufficient conditions for the stability of solutions, it suffices to study partial stability. Though, it is crucial to find some of the variables in equations that admit stability, this problem is called

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