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ASYMPTOTIC BEHAVIOR ANALYSIS OF STOCHASTIC DELAY SYSTEMS WITH GENERAL DECAY RATE

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Abstract. This paper main analyzes the almost sure practical stability with respect to a part of the variables with general decay rate of nonlinear stochastic differential delay equations (SDDEs). Our crucial techniques include the Lyapunov functions, inequality technique and the stochastic analysis theory. Finally, we present an example to show the effectiveness of the obtained results.

1. Introduction

We may experience a time–delay in numerous real–world systems, including biology, medical, economics, industrial, and power systems. We use delay differential equations (DDEs) to characterize delayed systems, see [1,9,10]. In the case when delay differential equations are impacted by external noises, stochastic delay differential equations (SDDEs) were produced. Such systems explain real–world systems whose future depends on current and previous states. The stability of SDDEs has become a very prevalent theme of recent research in Mathematics and its applications. The corresponding study of the stability properties of solutions has received a lot of attention during the last decades. There are many papers in the literature devoted to studying the stability of SDDEs and so on, we refer to [4,11–15] and references therein.

Some systems cannot be proven to fulfill stability properties with respect to all the unknown variables of the system. It is crucial in some situations to analyze if it is still possible to confirm some stability criteria with respect to some of the variables in the problem which is called stability with respect to a part of the variables or partial stability.

In different cases stability criteria can be excessively stringent to fulfill. So, the concept of stability with respect to part of the variables (i.e., partial stability) has been

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