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# ASYMPTOTIC STABILITY IN PROBABILITY OF STOCHASTIC REACTION DIFFUSION SYSTEMS

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**Abstract.** Due to the shortage of the corresponding Ito formula, Lyapunov direct method, as the most effective measure of studying the stability for ordinary differential systems and stochastic ordinary differential systems, has not been acted on the research of stochastic partial differential systems. In this paper, it is by making use of Lyapunov direct method that we present some effective criteria for the asymptotical stability in probability and global asymptotical stability in probability of Ito stochastic reaction diffusion systems. The obtained results are the extension of the conclusions of [10, 12].

**Keywords.** stochastic system, reaction diffusion equation, in probability, asymptotic stability, global asymptotic stability.

## 1 Introduction

The exact and strict mathematical formulation of stochastic systems was first put forward by Ito in 1951 and the stability of the trivial solution $x(0)$ for $\frac{dx}{dt} = f(x, t, y(t))$ was subsequently considered by Ka and Krasovskii[2] in 1960, where is a homogeneous finite Markov chain. Based on these achievements, Has'minskii[3] further generalized the past work in 1962, thereby the field of stability theory and its application on stochastic differential equations gradually started to spring up. Particularly, in 1981, the first monograph (Has'minskii[4]) about stability of stochastic differential equations came out, which brought quick developments with respect to the research and application of stochastic ordinary differential systems and stochastic differential functional systems (see e.g. Friedman[5], Mao[6]). Actually, it is not difficult to see that there exist many similarities in the following two processes: studying stability of stochastic differential equations and ordinary differential equations via the same technique of Lyapunov direct method. The difference is just that the derivative $\dot{V}(t, x(t))$along the solution of ordinary differential equations is substituted by $LV(t, x(t))$( Liao[7]). In virtue of this important discovery and Ito differential formula, many experts made a mass of contributions to the stability theory of stochastic ordinary differential equations in