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ALMOST SURE CONVERGENCE RESULT OF STOCHASTIC PARABOLIC PARTIAL DIFFERENTIAL EQUATIONS

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Abstract. In this paper, almost sure convergence is investigated for solution process of Itô-Doob-type stochastic parabolic partial differential equations. Almost-sure convergence theorems are established in the context of vector Lyapunov-like functions and comparison theorems for parabolic partial differential equations . Furthermore, an example is provided to illustrate the significance of the derived result and characterize the effects of the environmental perturbations on almost sure convergence of the solution process of such systems.

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1 Introduction

In the past few years there has been an increasing interest in the study of distributed systems of partial differential equations[4, 6, 7]. Stability analysis of such systems are also studied [3,4]. Because of the presence of the stochastic component which represents the random environmental disturbances it is essential to study both the stability and convergence of the solution processes. Comparison theorems along with vector-Lyapunov functions [5] have been used successfully to establish both the stability and the convergence in various modes of the solution processes of systems with jump Markovian structural perturbations [1, 2, 3]. In this paper, we employ the concept of Lyapunov-like functions together with the comparison theorems developed in previous studies[1, 2, 3] to establish a very general almost-sure convergence theorem for stochastic parabolic partial differential systems of the Itô-Doob-type.

This paper is arranged as follows, in section 2, we formulate the problem and list the almost sure convergence definitions together with the vector Lyapunov comparison theorems. In section 3, we develop a very general random convergence theorem and its variants for the system. In Section 4, an example is presented to illustrate the significance of the results developed in this paper.