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SUCCESSIVE APPROXIMATIONS TO SOLUTIONS OF STOCHASTIC FUNCTIONAL DIFFERENTIAL EQUATIONS

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Abstract. In this paper, we shall study retarded stochastic functional differential equations of Ito type in a Hilbert space. We give sufficient conditions for the local and global existence of solutions without the assumption of Lipschitz and linear growth conditions on the drift and diffusion coefficients. Our method involves a combination of successive approximations and a comparison theorem.

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1. Introduction

We consider the following stochastic functional differential equation of the Ito type with finite memory

$$\mathrm{dx(t) = f(t, \pi_t x)dt + g(t, \pi_t x)dw(t),\ t > t_0 \geq 0;}$$

$$\mathrm{x(t) = \phi(t),\ t\epsilon\,[t_0 - T, t_0]\,,\ 0 \leq T < \infty} \tag{1}$$

where $\pi_t x = \{x(t-T+s) : 0 \leq s \leq T\}$.

It is well known that the stochastic differential equations arise naturally as mathematical models in physical, biological, medical and engineering sciences. Frequently, the future state of such systems depends not only on the present state, but also on its past history (delay term) leading to equations of the form (1).

The existence problem for a more general Cauchy problem for the stochastic differential equations with heredity was studied by Rodkina [8] with non-Lipschitz and linear growth conditions and a finite-dimensional controlled system of the form (1) was considered by Govindan and Joshi [2] by the method of bounded integral contractor (see Padgett [7]). Note that when there is no delay (that is, T=0), equation (1) reduces to the classical stochastic differential equation of Ito. Recently, Taniguchi [10] gave a very general non-lipschitz and non-linear growth conditions for the existence and uniqueness of a solution in finite dimensions in the latter case, that is, when T=0. All these works studied the existence problem under entirely different sets of