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ON MOMENT ANALYSIS OF STOCHASTIC DIFFERENTIAL EQUATIONS WITH RANDOM STRUCTURE

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Abstract. This paper investigate a possibility of analysis of generalized Fokker-Planck equations using generalized moment method. It is shown that the moment method can be directly generalized from that used for ordinary Fokker-Planck equations, while the cumulant equations cannot be directly generalized to analyse processes with random structure. An approximation based on small perturbation theory has been developed for a case of low and high intensity of switching. A number of analytical examples are developed for the case of a system with two identifiable structures.

Keywords. Markov process, random structure, Fokker-Planck, modelling.

AMS (MOS) subject classification: This is optional. But please supply them whenever possible.

1 Introduction

Markov processes with random structure form a subclass of mixed Markov processes. They can be characterized by significant changes of their local probability density considered at different time instants. Changes of the local PDF appear at random. It is assumed here that the number of possible states (*i.e.* number of different PDF) is finite and is described by a discrete component ϑ with possible states θ_1, $i = 1, \cdots, M$. Changes in the properties of the Markov process with random structure can be attributed to changes in the state of this discrete component. In each state the process can be either continuous or discrete, locally stationary in a strict or a wide sense, *etc.* A comprehensive description of such processes can be found in [14], while most of the notations in this paper are consisted with that published as the first part in a previous issue of this journal [27].

While a comprehensive treatment can be achieved using the Fokker-Planck or Kolmogorov-Feller approach [14,27], it rarely produces analytical results. Even numerically it is often difficult to deal with system of partial differential equations which result from such a strategy. Therefore, it is often acceptable to obtain and solve equations for a few lower order moments,