Grundlehren der mathematischen Wissenschaften 260 A Series of Comprehensive Studies in Mathematics

M.I. Freidlin A.D. Wentzell

Random Perturbations of Dynamical Systems



Random Perturbations Of Dynamical Systems

Elke M. Hennig

Random Perturbations Of Dynamical Systems:

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for a given initial point and a time scale is identical to the idea of metastability that the stochastic resonance is a manifestation of metastability and that the theory of this effect is a part of the large deviation theory The reader will also find new comments on the notion of quasi potential that the authors introduced more than forty years ago and new references to recent papers in which the proofs of some conjectures included in previous editions have been obtained Apart from the above mentioned changes the main innovations in the 3rd edition concern the averaging principle A new Section on deterministic perturbations of one degree of freedom systems was added in Chapter 8 It is shown there that pure deterministic perturbations of an oscillator may lead to a stochastic in a certain sense long time behavior of the system if the corresponding Hamiltonian has saddle points The usefulness of a joint consideration of classical theory of deterministic perturbations together with stochastic perturbations is illustrated in this section Also a new Chapter 9 has been inserted in which deterministic and stochastic perturbations of systems with many degrees of freedom are considered Because of the resonances stochastic regularization in this case is even more important **Random Perturbations of Dynamical Systems** Yuri Kifer, 2012-05-27 Mathematicians often face the question to which extent mathematical models describe processes of the real world These models are derived from experimental data hence they describe real phenomena only approximately Thus a mathematical approach must begin with choosing properties which are not very sensitive to small changes in the model and so may be viewed as properties of the real process In particular this concerns real processes which can be described by means of ordinary differential equations By this reason different notions of stability played an important role in the qualitative theory of ordinary differential equations commonly known nowdays as the theory of dynamical systems Since physical processes are usually affected by an enormous number of small external fluctuations whose resulting action would be natural to consider as random the stability of dynamical systems with respect to random perturbations comes into the picture There are differences between the study of stability properties of single trajectories i e the Lyapunov stability and the global stability of dynamical systems The stochastic Lyapunov stability was dealt with in Hasminskii Has In this book we are concerned mainly with questions of global stability in the presence of noise which can be described as recovering parameters of dynamical systems from the study of their random perturbations. The parameters which is possible to obtain in this way can be considered as stable under random perturbations and so having physical sense 1 Our set up is the following

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