
Zbl 0868.62069**Dufo, Marie****Random iterative models. Transl. from the French by Stephen S. Wilson.**
(English)

Applications of Mathematics. 34. Berlin: Springer. xv, 385 p. DM 128.00; öS 934.40; sFr. 113.00 (1997). ISBN 3-540-57100-0/hbk

The original French edition of this book was published by Masson in 1990; see the review Zbl 0703.62084. The present translation is based on a reworked text for some subjects treated. It collects, explains and analyses discrete-time models appearing from random algorithms and infinite-horizon control with emphasis on: rate of convergence, stabilization, controllability, excitation, identification, tracking and optimal control. The main models are: Autoregressive models, AR (X; Functional; Conditionally Heteroscedastic), ARMA(X) and Markov chain models.

Part I presents background on sequential statistics, stochastic algorithms, martingales, recursive methods (Chapter 1), convergence in distribution and the AR(1) model (Chapter 2) as introductory mathematical foundations of automatic control. Although this model provides the essential link between the remaining three parts II-IV of this book, brief examples in highly specific industrial problems (regression, satellite communication, learning, artificial neural network) are given in Chapter 3 of Part I. Part II (linear models) develops ideas of AR(1) to ARMA(X) for the problems: causality and excitation (Chapter 4); identification and tracking (Chapter 5).

As usual, linear algebra and the Lyapunov function method are still indispensable tools for treating the subjects in Part II, optimal control for ARX(1,1) (Chapter 7: nonlinear identification and control), stable AR (functional) models (Chapter 6: stability), in Part III (nonlinear models), controlled Markov chains (Chapter 9: learning), and in Part IV (Markov models). Chapter 8 in Part IV is devoted to the general theory of the recurrence of Markov chains. The principle of large deviations as well as random iterative models in image processing and simulation are not dealt with here.

The bibliography includes 31 pages with 612 references and is divided into the subjects: Probability and statistics, algebra, ODE and numerical analysis, martingales and laws of large numbers, recursive algorithms, linear models, nonlinear models and identification, Markov chains and controlled Markov chains. Moreover, based on the bibliography and auxiliary material, each section ends with a paragraph: Resources/For Further Information, consisting of bibliographical notes and comments.

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Keywords : regression; autoregressive models; ARMA; causality; stabilization; tracking; Robbins-Monro algorithm; bibliography; discrete-time models; infinite-horizon control; rate of convergence; controllability; excitation; identification; Markov chain models; sequential statistics; stochastic algorithms; martingales; recursive methods; convergence in distribution; examples; Lyapunov function method; controlled Markov chains; recurrence of Markov chains

Classification :

*62M10 Time series, etc. (statistics)

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