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Book Reviews

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BOOK REVIEWS

R. Vinter: OPTIMAL CONTROL. Birkhäuser-Verlag, Boston-Basel-Berlin, 2000. ISBN 3-8176-4075-4, xv+507 pages, price USD 79.95.

In the book, many major developments in optimal control based on nonsmooth analysis in recent years are brought together in a form accessible to broader audience. Special attention is given to necessary conditions, but other topics are covered as well. The book consists of 13 chapters including some preparatory ones (Overview, Measurable Functions and Differential Inclusions, Variational Principles, Nonsmooth Analysis, Subdifferential Calculus, The Maximum Principle, The Extended Euler-Lagrange and Hamilton Conditions, Necessary Conditions for Free End-Time Problems, The Maximum Principle for State-Constrained Problems, Differential Inclusions with State Constraints, Regularity of Minimizers and Dynamic Programming), each of them being rather independent with its own Introduction and concluding Notes. It is worth noting that Chapter 1 provides a nice (and lengthy) overview in which analytical details are suppressed so that underlying ideas may be communicated more easily.

The book may be an essential resource for potential readers, experts in control and optimization as well as postgraduates and applied mathematicians, and it will be valued for its accessibility and clear exposition.

Bohdan Maslowski

N. Limnios, G. Oprisan: SEMI-MARKOV PROCESSES AND RELIABILITY. STATISTICS FOR INDUSTRY AND TECHNOLOGY. Birkhäuser-Verlag, Basel, 2001. ISBN 0-8176-4196-3, xii+222 pages, price DM 220.–.

The book presents an introductory and at the same time rather comprehensive treatment of semi-Markov processes and their applications to reliability theory. It also provides some general background (like measure theory, Markov processes and Laplace transform), which makes it accessible to a broader audience. The book is divided into six chapters (fundamentals and some examples are deferred to annexes). Chapter 1 presents mainly the basic notions and concepts in the field. In Chapter 2 Markov renewal processes via semi-Markov kernels are treated. Chapter 3 develops further the theory of semi-Markov processes and processes linked to them, while Chapter 4 is devoted to the case of discrete state space. In the last two chapters applications of semi-Markov processes to reliability theory and solutions to specific problems are given.

The book may be a useful tool for researchers and students interested in the theory of semi-Markov processes or its applications to reliability problems.

Bohdan Maslowski

V. Tuzlukov: SIGNAL DETECTION THEORY. Birkhäuser-Verlag, Boston, 2001. ISBN 0-8176-4152-1, xviii+725 pages, price EUR 120.–.

The book is devoted to a new generalized approach to signal detection theory, both general methods and experimental results with physical systems. It contains seven chapters. In the first one a brief description of the basic tenets of classical detection theory is given. The second chapter deals with modification of premises of classical theories, like the theoretical design of the decision-making rules with the purpose of determining the jointly sufficient statistics of the mean and variance of the likelihood function. Chapter three is focused on construction of generalized detectors for stochastic signals in various signal processing systems. The fourth chapter is devoted to the study of the possibility of using general detectors in signal processing systems in communications. General detectors for stochastic signals are constructed in a number of cases. The fifth chapter is concerned with a new method of estimation of the correlation functions for processes at the outputs of detectors. Chapter 6 contains an experimental study of general detectors carried out for powerful and weak signals. Finally, the last chapter deals with the definition of the type of signals, which may be used to ensure high resolution and noise immunity of complex signal processing systems based on the generalized approach.

The book may be useful for experts working in the variety of fields related to modern signal detection theory.

Bohdan Maslowski

Y. Sone: KINETIC THEORY AND FLUID DYNAMICS. Birkhäuser-Verlag, Basel, 2002. ISBN 0-8176-4284-6, xii+353 pages, price EUR 99.–.

This is a comprehensive study on the relationship between the classical (continuum) fluid dynamics and the kinetic theory. In particular, the incompleteness of classical fluid dynamics in describing the time evolution of real gases is also discussed.

The fluid dynamics equations are derived by the methods of asymptotic analysis from the Boltzmann system. All equations resulting from this process are classified with respect to their physical context. Applications are given in order to illustrate various interesting physical phenomena: the flows induced by temperature fields, evaporation and condensation problems, examples of the co-called ghost effect, and bifurcations of flows.

In general, many applications are discussed without a sophisticated mathematical apparatus not easily accessible to engineers. On the other hand, experimental work is examined to supplement the theory, and mathematicians will certainly benefit from clarity of definitions and precise physical description. Last but not least, the appendices collect key derivations and formulas important to the practitioner and not easily available in the literature.

The book is intended for theoretical physicists, applied mathematicians, engineers, and students in mathematics.

Eduard Feireisl