



Stochastic Processes, Estimation, and Control: The Entropy Approach

George N. Saridis

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The first new introduction to stochastic processes in 20 years incorporates a modern, innovative approach to estimation and control theory

Stochastic Processes, Estimation, and Control: The Entropy Approach provides a comprehensive, up-to-date introduction to stochastic processes, together with a concise review of probability and system theory. Serving both as a text for graduate courses in control and systems engineering and as a guide for the practicing engineer and researcher, the book applies the most recent advances in stochastic and probabilistic processes to such areas as communications systems and robotics technology.

Highlights of this outstanding text:

- Uses the thermodynamic principle of entropy as a tool with which to measure and analyze uncertainty in systems—a feature unique to this text
- Covers basic material on stochastic processes, parameter and state estimation and control with a novel approach that does not require advanced mathematics
- Introduces an original approach to the design of nonlinear stochastic control that converges sequentially to the optimal—a practical method that will be particularly appealing to the practicing engineer
- Reformulates the stochastic estimation and control problem from a global point of view and introduces entropy as the entity that defines control theory as an energy product—a groundbreaking approach

Since the early 18th century, scientists have devised probability measures to help them describe uncertain phenomena and approximate the actual laws of nature. It was not until the advent of the computer, however, that stochastic processes have made it possible to approximate the uncertainty inherent in large complex systems. The miracles of space exploration, modern defense systems, and artificial intelligence are just a few of the dramatic advances that have come about due to the ability of the modern digital computer to perform massive probabilistic calculations.

In this, the first introductory book on stochastic processes in twenty years, leading theoretician George Saridis provides a modern innovative approach that applies the most recent advances in probabilistic processes to such areas as communications and robotics technology.

Stochastic Processes, Estimation, and Control: The Entropy Approach is designed as a text for graduate courses in dynamic programming and stochastic control, stochastic processes, or applied probability in the engineering or mathematical/computational science departments, and as a guide for the practicing engineer and researcher. It offers a lucid discussion of parameter estimation based on least square techniques, an in-depth investigation of the estimation of the states of a stochastic linear and nonlinear dynamic system, and a modified derivation of the linear-quadratic Gaussian optimal control problem. Professor Saridis's presentation of estimation and control theory is thorough, but avoids the use of advanced mathematics. A new theory of approximation of the optimal solution for nonlinear stochastic systems is presented as a general engineering tool, and the whole area of stochastic processes, estimation, and control is recast using entropy as a measure.

Stochastic Processes, Estimation, and Control: The Entropy Approach is the first book to apply the

thermodynamic principle of entropy to the measurement and analysis of uncertainty in systems. Its new reformulation takes an important first step toward a unified approach to the theory of intelligent machines, where artificial intelligence and system theory come together.

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