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Sinopsis

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Markov chains are a fundamental class of stochastic processes. They are widely used to solve problems in a large number of domains such as operational research, computer science, communication networks and manufacturing systems. The success of Markov chains is mainly due to their simplicity of use, the large number of available theoretical results and the quality of algorithms developed for the numerical evaluation of many metrics of interest.

The author presents the theory of both discrete-time and continuous-time homogeneous Markov chains. He carefully examines the explosion phenomenon, the Kolmogorov equations, the convergence to equilibrium and the passage time distributions to a state and to a subset of states. These results are applied to birth-and-death processes. He then proposes a detailed study of the uniformization technique by means of Banach algebra. This technique is used for the transient analysis of several queuing systems.

Contents

1. Discrete-Time Markov Chains
2. Continuous-Time Markov Chains
3. Birth-and-Death Processes
4. Uniformization
5. Queues

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Bruno Sericola is a Senior Research Scientist at Inria Rennes - Bretagne Atlantique in France. His main research activity is in performance evaluation of computer and communication systems, dependability analysis of fault-tolerant systems and stochastic models.