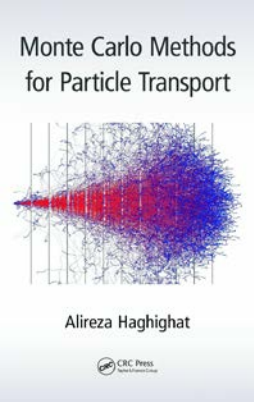
Monte Carlo Methods for Particle Transport



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This text presents Monte Carlo methods for simulating physical processes. Emphasizing different fundamental concepts, it uses simple particle transport theory to demonstrate various techniques and examine associated issues. Derived from the author's course for advanced science and engineering students, the first five chapters and the last chapter discuss fundamental topics for the Monte Carlo method, and remaining chapters discusses specifics of Monte Carlo particle transport. The book includes detailed derivations, application examples, and homework problems. It is also suitable for researchers who use Monte Carlo methods. Code is available for readers to use in the examples.

Key Features

- Describes random processes, variables, and numbers
- Gives a detailed discussion on pseudorandom number generators and related issues
- Presents an overview of the probability and statistics concepts underlying the Monte Carlo method
- Describes use of the Monte Carlo methods for solving integrals, and variance reduction techniques such as importance, correlation, and stratified sampling techniques
- Discusses geometry, sampling, tallying, and uncertainties related to the Monte Carlo method for particle transport
- Describes the Monte Carlo method for solving fixed-source and eigenvalue particle transport problems and related variance reduction techniques
- Covers vector and parallel computing and their application to particle transport Monte Carlo

Selected Contents

Random variables; Fundamental formulation of Monte Carlo (FFMC); Sampling techniques; Random number generation (RNG); Fundamentals of probability and statistics; Integrals and associated variance reduction Techniques; Fixed-Source Monte Carlo particle transport; Variance reduction techniques in particle transport; Tallying/Scoring particle flux, current and reaction rates; Representation of geometry and particle tracking; Methodologies for eigenvalue or criticality Monte Carlo particle Transport and related issues; Discussion on vector and parallel processing and their application to Monte Carlo particle transport.

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