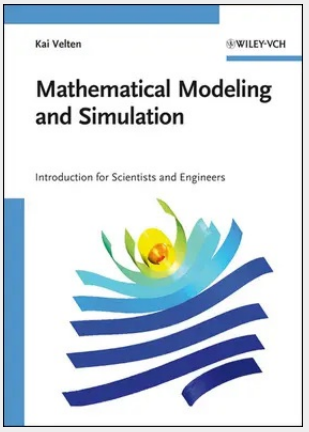
Velten

Mathematical Modeling and Simulation

Introduction for Scientists and Engineers



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This concise and clear introduction to the topic requires only basic knowledge of calculus and linear algebra - all other concepts and ideas are developed in the course of the book. Lucidly written so as to appeal to undergraduates and practitioners alike, it enables readers to set up simple mathematical models on their own and to interpret their results and those of others critically. To achieve this, many examples have been chosen from various fields, such as biology, ecology, economics, medicine, agricultural, chemical, electrical, mechanical and process engineering, which are subsequently discussed in detail.

Based on the author`s modeling and simulation experience in science and engineering and as a consultant, the book answers such basic questions as: What is a mathematical model? What types of models do exist? Which model is appropriate for a particular problem? What are simulation, parameter estimation, and validation?

The book relies exclusively upon open-source software which is available to everybody free of charge. The entire book software - including 3D CFD and structural mechanics simulation software - can be used based on a free CAELinux-Live-DVD that is available in the Internet (works on most machines and operating systems).

Um dieses Buch zu verstehen, müssen Sie lediglich Grundkenntnisse der Integral- und Differenzialrechnung und der linearen Algebra mitbringen. Der Autor erklärt auch für Einsteiger und Studenten unterer Semester verständlich, wie man einfache mathematische Modelle formuliert, auswählt, anwendet und die Resultate kritisch analysiert.
Dies wird anhand von Beispielen aus vielen Disziplinen wie Biologie, Ökologie, Wirtschaft, Medizin, Landwirtschaft, Chemie, Elektrotechnik, Prozesstechnik und Maschinenbau erläutert, wobei neben elementaren statistischen Modellen, Regressionsmethoden und neuronalen Netzen auch Modelle in Form gewöhnlicher und partieller Differentialgleichungen detailliert behandelt werden. Das Buch stützt sich ausschließlich auf Open-Source-Software. Die gesamte Buchsoftware - einschließlich 3D-CFD- und 3D-Strukturmechanik-Simulationssoftware - kann auf Grundlage einer kostenlosen, im Internet erhältlichen CAELinux-Live-DVD genutzt werden.

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