This book is written to teach students and practitioners the theory behind the mathematical models and techniques required for physics-based animation. It does not teach the basic principles of animation, but rather demonstrates how to transform theoretical techniques into practical skills. It details how the mathematical models are derived from physical and mathematical principles, and explains how these mathematical models are solved in an efficient, robust, and stable manner with a computer. This impressive and comprehensive volume covers all the issues involved in physics-based animation, including collision detection, geometry, mechanics, differential equations, matrices, quaternions, and more. There is excellent coverage of collision detection algorithms and a detailed overview of a physics system. In addition, numerous examples are provided along with detailed pseudo code for most of the algorithms. This book is ideal for students of animation, researchers in the field, and professionals working in the games and movie industries. Topics Covered: * The Kinematics: Articulated Figures, Forward and Inverse Kinematics, Motion Interpolation * Multibody Animation: Particle Systems, Continuum Models with Finite Differences, the Finite Element Method, Computational Fluid Dynamics * Collision Detection: Broad and Narrow Phase Collision Detection, Contact Determination, Bounding Volume Hierarchies, Feature- and Volume-Based Algorithms

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