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Autore	Matuttis Hans-Georg
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Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	UNDERSTANDING THE DISCRETE ELEMENT METHOD SIMULATION OF NON-SPHERICAL PARTICLES FOR GRANULARAND MULTI-BODY SYSTEMS; Copright; Contents; Exercises; About the Authors; Preface; Acknowledgements; List of Abbreviations; 1 Mechanics; 1.1 Degrees of freedom; 1.1.1 Particle mechanics and constraints; 1.1.2 From point particles to rigid bodies; 1.1.3 More context and terminology; 1.2 Dynamics of rectilinear degrees of freedom; 1.3 Dynamics of angular degrees of freedom; 1.3.1 Rotation in two dimensions; 1.3.2 Moment of inertia; 1.3.3 From two to three dimensions 1.3.4 Rotation matrix in three dimensions1.3.5 Three-dimensional moments of inertia; 1.3.6 Space-fixed and body-fixed coordinate systems andequations of motion; 1.3.7 Problems with Euler angles; 1.3.8 Rotations represented using complex numbers; 1.3.9 Quaternions; 1.3.10 Derivation of quaternion dynamics; 1.4 The phase space; 1.4.1 Qualitative discussion of the time dependence of linear

oscillations; 1.4.2 Resonance; 1.4.3 The flow in phase space; 1.5 Nonlinearities; 1.5.1 Harmonic balance; 1.5.2 Resonance in nonlinear systems; 1.5.3 Higher harmonics and frequency mixing
1.5.4 The van der Pol oscillator
1.6 From higher harmonics to chaos; 1.6.1 The bifurcation cascade; 1.6.2 The nonlinear frictional oscillator and Poincaré maps; 1.6.3 The route to chaos; 1.6.4 Boundary conditions and many-particle systems; 1.7 Stability and conservation laws; 1.7.1 Stability in statics; 1.7.2 Stability in dynamics; 1.7.3 Stable axes of rotation around the principal axis; 1.7.4 Noether's theorem and conservation laws; 1.8 Further reading; Exercises; References; 2 Numerical Integration of Ordinary Differential Equations; 2.1 Fundamentals of numerical analysis
2.1.1 Floating point numbers
2.1.2 Big-O notation; 2.1.3 Relative and absolute error; 2.1.4 Truncation error; 2.1.5 Local and global error; 2.1.6 Stability; 2.1.7 Stable integrators for unstable problems; 2.2 Numerical analysis for ordinary differential equations; 2.2.1 Variable notation and transformation of the order of a differential equation; 2.2.2 Differences in the simulation of atoms and molecules, as compared to macroscopic particles; 2.2.3 Truncation error for solutions of ordinary differential equations; 2.2.4 Fundamental approaches; 2.2.5 Explicit Euler method
2.2.6 Implicit Euler method
2.3 Runge-Kutta methods; 2.3.1 Adaptive step-size control; 2.3.2 Dense output and event location; 2.3.3 Partitioned Runge-Kutta methods; 2.4 Symplectic methods; 2.4.1 The classical Verlet method; 2.4.2 Velocity-Verlet methods; 2.4.3 Higher-order velocity-Verlet methods; 2.4.4 Pseudo-symplectic methods; 2.4.5 Order, accuracy and energy conservation; 2.4.6 Backward error analysis; 2.4.7 Case study: the harmonic oscillator with and without viscous damping; 2.5 Stiff problems; 2.5.1 Evaluating computational costs; 2.5.2 Stiff solutions and error as noise
2.5.3 Order reduction

Sommario/riassunto

Gives readers a more thorough understanding of DEM and equips researchers for independent work and an ability to judge methods related to simulation of polygonal particles. Introduces DEM from the fundamental concepts (theoretical mechanics and solid state physics), with 2D and 3D simulation methods for polygonal particles. Provides the fundamentals of coding discrete element method (DEM) requiring little advance knowledge of granular matter or numerical simulation. Highlights the numerical tricks and pitfalls that are usually only realized after years of
