The Analysis of Complex Nonlinear Mechanical Systems: A Computer Algebra Assisted Approach (World Scientific Series on Nonlinear Science. Series a, Vol 17)

Martin Lesser

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The book covers the fundamentals of the mechanics of multibody systems, i.e., systems of interconnected rigid bodies. A geometric view is emphasized in which the techniques and algorithms are motivated by the picture of the rigid body system as a point in the multidimensional space of all possible configurations. The reader is introduced to computer algebra methods in the form of a system, called Sophia, which is implemented in the Maple symbolic manipulation system. The first chapter provides a motivational introduction to the basic principles and an introduction to Maple. Kinematics based on the idea of tangent vectors to the configuration manifold sets the stage for dynamical analysis. The latter ranges from the Lagrange and Gibbs-Appell to Kane's equations. Coverage includes nonholonomic systems and redundant variable methods. The computer algebra methods included enable the treatment of nontrivial mechanical systems and the development of efficient numerical codes for simulation.

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