1. Record Nr. UNINA9910455562003321

Autore	Cushman Richard H. <1942->
Titolo	Geometry of nonholonomically constrained systems [[electronic resource] /] / Richard Cushman, Hans Duistermaat, Jedrzej Sniatycki
Pubbl/distr/stampa	Singapore ; ; Hackensack, NJ, : World Scientific, c2010
ISBN	1-282-76167-6 9786612761676 981-4289-49-3
Descrizione fisica	1 online resource (421 p.)
Collana	Advanced series in nonlinear dynamics ; ; v. 26
Altri autori (Persone)	DuistermaatJ. J <1942-> (Johannes Jisse) SniatyckiJedrzej
Disciplina	516.3/6
Soggetti	Nonholonomic dynamical systems Geometry, Differential Rigidity (Geometry) Caratheodory measure Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references (p. 387-393) and index.
Nota di contenuto	Contents; Acknowledgments; Foreword; 1. Nonholonomically constrained motions; 1.1 Newton's equations; 1.2 Constraints; 1.3 Lagrange-d'Alembert equations; 1.4 Lagrange derivative in a trivialization; 1.5 Hamilton-d'Alembert equations; 1.6 Distributional Hamiltonian formulation; 1.6.1 The symplectic distribution (H,); 1.6.2 H and in a trivialization; 1.6.3 Distributional Hamiltonian vector field; 1.7 Almost Poisson brackets; 1.7.1 Hamilton's equations; 1.7.2 Nonholonomic Dirac brackets; 1.8 Momenta and momentum equation; 1.8.1 Momentum functions; 1.8.2 Momentum equations 1.8.3 Homogeneous functions1.8.4 Momenta as coordinates; 1.9 Projection principle; 1.10 Accessible sets; 1.11 Constants of motion; 1.12 Notes; 2. Group actions and orbit spaces; 2.1 Group actions; 2.2 Orbit spaces; 2.3 Isotropy and orbit types; 2.3.1 Isotropy types; 2.3.2 Orbit types; 2.3.3 When the action is proper; 2.3.4 Stratification on by orbit types; 2.4 Smooth structure on an orbit space; 2.4.1 Differential structure; 2.4.2 The orbit space as a differential space; 2.5

Subcartesian spaces; 2.6 Stratification of the orbit space by orbit types; 2.6.1 Orbit types in an orbit space
2.6.2 Stratification of an orbit space2.6.3 Minimality of S; 2.7 Derivations and vector fields on a differential space; 2.8 Vector fields on a stratified differential space; 2.9 Vector fields on an orbit space; 2.10 Tangent objects to an orbit space; 2.10.1 Stratified tangent bundle; 2.10.2 Zariski tangent bundle; 2.10.3 Tangent cone; 2.10.4 Tangent wedge; 2.11 Notes; 3. Symmetry and reductio; 3.1 Dynamical systems with symmetry; 3.1.1 Invariant vector fields; 3.1.2 Reduction of symmetry; 3.1.3 Reduction for or a free and proper G-action; 3.1.4 Reduction of a nonfree, proper G-action
3.2 Nonholonomic singular reduction for a proper action3.3 Nonholonomic reduction for a free and proper action; 3.4 Chaplygin systems; 3.5 Orbit types and reduction; 3.6 Conservation laws; 3.6.1 Momentum map; 3.6.2 Gauge momenta; 3.7 Lifted actions and the momentum equation; 3.7.1 Lifted actions; 3.7.2 Momentum equation; 3.8 Notes; 4.Reconstruction, relative equilibria and relative periodic orbits; 4.1 Reconstruction; 4.1.1 Reconstruction for proper free actions; 4.1.2 Reconstruction for nonfree proper actions; 4.1.3 Application to nonholonomic systems; 4.2 Relative equilibria
4.2.1 Basic properties4.2.2 Quasiperiodic relative equilibria; 4.2.3 Runaway relative equilibria; 4.2.4 Relative equilibria when the action is not free; 4.2.5 Other relative equilibria in a G-orbit; 4.2.5.1 When the G-action is free; 4.2.5.2 When the G-action is not free; 4.2.6 Smooth families of quasiperiodic relative equilibria; 4.2.6.1 Elliptic, regular, and stably elliptic elements of g; 4.2.6.2 When the G-action is free and proper; 4.2.6.3 When the G-action is proper but not free; 4.3 Relative periodic orbits; 4.3.1 Basic properties; 4.3.2 Quasiperiodic relative periodic orbits
4.3.3 Runaway relative period orbits

Sommario/riassunto

This book gives a modern differential geometric treatment of linearly nonholonomically constrained systems. It discusses in detail what is meant by symmetry of such a system and gives a general theory of how to reduce such a symmetry using the concept of a differential space and the almost Poisson bracket structure of its algebra of smooth functions. The above theory is applied to the concrete example of Caratheodory's sleigh and the convex rolling rigid body. The qualitative behavior of the motion of the rolling disk is treated exhaustively and in detail. In particular, it classifies all mot