

1. Record Nr.	UNINA9910780810503321
Autore	Ginoux Jean-Marc
Titolo	Differential geometry applied to dynamical systems [[electronic resource] /] / Jean-Marc Ginoux
Pubbl/distr/stampa	New Jersey, : World Scientific, c2009
ISBN	1-282-44268-6 9786612442681 981-4277-15-0
Descrizione fisica	1 online resource (341 p.)
Collana	World Scientific series on nonlinear science. Series A, Monographs and treatises, , 1793-1010 ; ; v. 66
Disciplina	519
Soggetti	Dynamics Geometry, Differential
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 and index.
Nota di contenuto	Preface; Acknowledgments; Contents; List of Figures; List of Examples; Dynamical Systems; 1. Differential Equations; 1.1 Galileo's pendulum; 1.2 D'Alembert transformation; 1.3 From differential equations to dynamical systems; 2. Dynamical Systems; 2.1 State space - phase space; 2.2 Definition; 2.3 Existence and uniqueness; 2.4 Flow, fixed points and null-clines; 2.5 Stability theorems; 2.5.1 Linearized system; 2.5.2 Hartman-Grobman linearization theorem; 2.5.3 Liapouno. stability theorem; 2.6 Phase portraits of dynamical systems; 2.6.1 Two-dimensional systems; 2.6.2 Three-dimensional systems 2.7 Various types of dynamical systems2.7.1 Linear and nonlinear dynamical systems; 2.7.2 Homogeneous dynamical systems; 2.7.3 Polynomial dynamical systems; 2.7.4 Singularly perturbed systems; 2.7.5 Slow-Fast dynamical systems; 2.8 Two-dimensional dynamical systems; 2.8.1 Poincare index; 2.8.2 Poincare contact theory; 2.8.3 Poincare limit cycle; 2.8.4 Poincare-Bendixson Theorem; 2.9 High-dimensional dynamical systems; 2.9.1 Attractors; 2.9.2 Strange attractors; 2.9.3 First integrals and Lie derivative; 2.10 Hamiltonian and integrable systems; 2.10.1 Hamiltonian dynamical systems 2.10.2 Integrable system2.10.3 K.A.M. Theorem; 3. Invariant Sets; 3.1 Manifold; 3.1.1 Definition; 3.1.2 Existence; 3.2 Invariant sets; 3.2.1

Global invariance; 3.2.2 Local invariance; 4. Local Bifurcations; 4.1 CenterManifold Theorem; 4.1.1 Center manifold theorem for flows; 4.1.2 Center manifold approximation; 4.1.3 Center manifold depending upon a parameter; 4.2 Normal FormTheorem.; 4.3 Local Bifurcations of Codimension 1; 4.3.1 Saddle-node bifurcation; 4.3.2 Transcritical bifurcation; 4.3.3 Pitchfork bifurcation; 4.3.4 Hopf bifurcation; 5. Slow-Fast Dynamical Systems; 5.1 Introduction
5.2 Geometric Singular Perturbation Theory5.2.1 Assumptions; 5.2.2 Invariance; 5.2.3 Slow invariant manifold; 5.3 Slow-fast dynamical systems - Singularly perturbed systems; 5.3.1 Singularly perturbed systems; 5.3.2 Slow-fast autonomous dynamical systems; 6. Integrability; 6.1 Integrability conditions, integrating factor, multiplier; 6.1.1 Two-dimensional dynamical systems; 6.1.2 Three-dimensional dynamical systems; 6.2 First integrals - Jacobi's last multiplier theorem; 6.2.1 First integrals; 6.2.2 Jacobi's last multiplier theorem; 6.3 Darboux theory of integrability
6.3.1 Algebraic particular integral - General integral6.3.2 General integral; 6.3.3 Multiplier; 6.3.4 Algebraic particular integral and fixed points; 6.3.5 Homogeneous polynomial dynamical systems of degree m; 6.3.6 Homogeneous polynomial dynamical systems of degree two; 6.3.7 Planar polynomial dynamical systems; Differential Geometry; 7. Differential Geometry; 7.1 Concept of curves - Kinematics vector functions; 7.1.1 Trajectory curve; 7.1.2 Instantaneous velocity vector; 7.1.3 Instantaneous acceleration vector; 7.2 Gram-Schmidt process - Generalized Fr enet moving frame
7.2.1 Gram-Schmidt process

Sommario/riassunto

This book aims to present a new approach called Flow Curvature Method that applies Differential Geometry to Dynamical Systems. Hence, for a trajectory curve, an integral of any n-dimensional dynamical system as a curve in Euclidean n-space, the curvature of the trajectory - or the flow - may be analytically computed. Then, the location of the points where the curvature of the flow vanishes defines a manifold called flow curvature manifold. Such a manifold being defined from the time derivatives of the velocity vector field, contains information about the dynamics of the system, hence identify
