<<现代动力系统理论导论>>

图书基本信息

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内容概要

this book provides the first self-contained comprehensive exposition of the theory of dynamical systems as a core mathematical discipline closely intertwined with most of the main areas of mathematics. the authors introduce and rigorously develop the theory while providing researchers interested in applications with fundamental tools and paradigms.

the book begins with a discussion of several elementary but fundamental examples. these are used to formulate a program for the general study of asymptotic properties and to introduce the principal theoretical concepts and methods. the main theme of the second part of the book is the interplay between local analysis near individual orbits and the global complexity of the orbit structure. the third and fourth parts develop in depth the theories of !ow-dimensional dynamical systems and hyperbolic dynamical systems.

the book is aimed at students and researchers in mathematics at all levels from ad-vanced undergraduate up. scientists and engineers working in applied dynamics, non-linear science, and chaos will also find many fresh insights in this concrete and clear presentation. it contains more than four hundred systematic exercises.

作者简介

编者：(美国)卡托克 (Katok A.)

书籍目录

2. examples of calculation of topological entropy
isometries; gradient flows; expanding maps; shifts and topological markov chains; the hyperbolic toral automorphism; finiteness of entropy of lipschitz maps; expansive maps
3. recurrence properties
4.statistical behavior of orbits and introduction to ergodic theory
1. asymptotic distribution and statistical behavior of orbits
asymptotic distribution, invariant measures; existence of invariant measures;the birkhoff ergodic theorem; existence of symptotic distribution; ergod-icity and unique ergodicity; statistical behavior and recurrence; measure-theoretic somorphism and factors
2. examples of ergodicity; mixing
rotations; extensions of rotations; expanding maps; mixing; hyperbolic total automorphisms; symbolic systems
3. measure-theoretic entropy
entropy and conditional entropy of partitions; entropy of a measure-preserving transformation; properties of entropy
4. examples of calculation of measure-theoretic entropy
rotations and translations; expanding maps; bernoulli and markov measures;hyperbolic total automorphisms
5. the variational principle
5.systems with smooth invar1ant measures and more examples
1. existence of smooth invariant measures
the smooth measure class; the perron-frobenius operator and divergence;criteria for existence of smooth invariant measures; absolutely continuous invariant measures for expanding maps; the moser theorem
2. examples of newtonian systems
the newton equation; free particle motion on the torus; the mathematical pendulum; central forces
3. lagrangian mechanics
uniqueness in the configuration space; the lagrange equation; lagrangian systems; geodesic flows; the legendre transform
4. examples of geodesic flows
manifolds with many symmetries; the sphere and the toms; isometrics of the hyperbolic plane; geodesics of the hyperbolic plane; compact factors; the dynamics of the geodesic flow on compact hyperbolic surfaces
5. hamiltonian systems
symplectic geometry; cotangent bundles; hamiltonian vector fields and flows;poisson brackets; integrable systems
6. contact systems
hamiltonian systems preserving a 1-form; contact forms
7. algebraic dynamics: homogeneous and afline systems
part 2local analysis and orbit growth

6.local hyperbolic theory and its applications
1. introduction
2. stable and unstable manifolds
hyperbolic periodic orbits; exponential splitting; the hadamard-perron the-orem; proof of the hadamard-perron theorem; the inclination lemma
3. local stability of a hyperbolic periodic point
the hartman-grobman theorem; local structural stability
4. hyperbolic sets
definition and invariant cones; stable and unstable manifolds; closing lemma and periodic orbits; locally maximal hyperbolic sets
5. homoclinic points and horseshoes
general horseshoes; homoclinic points; horseshoes near homoclinic poi
6. local smooth linearization and normal forms
jets, formal power series, and smooth equivalence; general formal analysis; the hyperbolic smooth case
7.transversality and genericity
1. generic properties of dynamical systems
residual sets and sets of first category; hyperbolicity and genericity
2. genericity of systems with hyperbolic periodic points
transverse fixed points; the kupka-smale theorem
3. nontransversality and bifurcations
structurally stable bifurcations; hopf bifurcations
4. the theorem of artin and mazur
8.orbitgrowtharisingfromtopology
1. topological and fundamental-group entropies
2. a survey of degree theory
motivation; the degree of circle maps; two definitions of degree for smooth maps; the topological definition of degree
3. degree and topological entropy
4. index theory for an isolated fixed point
5. the role of smoothness: the shub-sullivan theorem
6. the lefschetz fixed-point formula and applications
7. nielsen theory and periodic points for toral maps
9.variational aspects of dynamics
1. critical points of functions, morse theory, and dynamics
2. the billiard problem
3. twist maps
definition and examples; the generating function; extensions; birkhoff peri-odic orbits; global minimality of birkhoff periodic orbits
4. variational description of lagrangian systems
5. local theory and the exponential map
6. minimal geodesics

7. minimal geodesics on compact surfaces
part 3low-dimensional phenomena
10. introduction: what is low-dimensional dynamics?
motivation; the intermediate value property and conformality; vet
low-dimensional and low-dimensional systems; areas of
!ow-dimensional dynamics
11.homeomorphismsofthecircle
1. rotation number
2. the poincare classification
rational rotation number; irrational rotation number; orbit types
and mea-surable classification
12. circle diffeomorphisms
1. the denjoy theorem
2. the denjoy example
3. local analytic conjugacies for diophantine rotation number
4. invariant measures and regularity of conjugacies
5. an example with singular conjugacy
6. fast-approximation methods
conjugacies of intermediate regularity; smooth cocycles with wild
cobound-aries
7. ergodicity with respect to lebesgue measure
13. twist maps
1. the regularity lemma
2. existence of aubry-mather sets and homoclinic orbits
aubry-mather sets; invariant circles and regions of
instability
3. action functionals, minimal and ordered orbits
minimal action; minimal orbits; average action and minimal
measures; stable sets for aubry-mather sets
4. orbits homoclinic to aubry-mather sets
5. nonexisience of invariant circles and localization of
aubry-mather sets
14.flowsonsurfacesandrelateddynamicalsystems
1. poincare-bendixson theory
the poincare-bendixson theorem; existence of transversals
2. fixed-point-free flows on the torus
global transversals; area-preserving flows
3. minimal sets
4. new phenomena
the cherry flow; linear flow on the octagon
5. interval exchange transformations
definitions and rigid intervals; coding; structure of orbit
closures; invariant measures; minimal nonuniquely ergodic interval
exchanges
6. application to flows and billiards
classification of orbits; parallel flows and billiards in
polygons

the livschitz theorem; smooth invariant measures for anosov diffeomor-phisms; time change and orbit equivalence for hyperbolic flows; equivalence of torus extensions
20.equilibriumstatesandsmoothinvariantmeasures
1. bowen measure
2. pressure and the variational principle
3. uniqueness and classification of equilibrium states
uniqueness of equilibrium states; classification of equilibrium states
4. smooth invariant measures
properties of smooth invariant measures; smooth classification of anosov dif-feomorphisms on the torus; smooth classification of contact anosov flows on 3-manifolds
5. margulis measure
6. multiplicative asymptotic for growth of periodic points
local product flow boxes; the multiplicative asymptotic of orbit growth supplement
s. dynamical systems with nonuniformly hyperbolic behavior
byanatolekatokandleonardomendoza
1. introduction
2. lyapunov exponents
cocycles over dynamical systems; examples of cocycles; the multiplicative ergodic theorem; osedelec-pesin e-reduction theorem; the rue!!e inequality
3. regular neighborhoods
existence of regular neighborhoods; hyperbolic points, admissible manifolds, and the graph transform
4. hyperbolic measures
preliminaries; the closing lemma; the shadowing lemma; pseudo-markov covers; the livschitz theorem
5. entropy and dynamics of hyperbolic measures
hyperbolic measures and hyperbolic periodic points; continuous measures and transverse homoclinic points; the spectral decomposition theorem; entropy,horseshoes, and periodic points for hyperbolic measures
appendix
a. background material
1. basic topology
topological spaces; homotopy theory; metric spaces
2. functional analysis
3. differentiable manifolds
differentiable manifolds; tensor bundles; exterior calculus; transversality
4. differential geometry
5. topology and geometry of surfaces
6. measure theory
basic notions; measure and topology

章节摘录

版权页：插图：The purpose of tlus chapter is to introduce the variational approach to dy-namics, that is, to show how interesting orbits in some dynamical systemscan be found as special critical points of functionals defined on appropriateauxiliary spaces of potential orbits. This idea goes back to the variational prin-ciples in dassical mechanics （Maupertuis, d'Alembert, Lagrange, etc.）. rfheclassical continuous-time case presents certain difficulties related to infinite-dimensionality of the spaces of potential orbits. In order to demonstrate theessential features of this approach and to avoid those difficulties we start inSection 2 with a model geometric problem describing the motion of a pointmass inside a convex domain. Then we consider in Section 3 a more generalclass of area-preserving two-dimensional dynamical systems, twist maps, whichpossesses the essential features of that example, but covers many other inter-esting situations. The main result there is Theorem 9.3.7, which guarantees existence of in,fin,itely 'many periodic orbits with a special behavior for any twist map. At least as important as that result itself is the machinery involving theaction functional （9.3.7） for the periodic problem, which will be extended inChapter 13 to give results about nonperiodic orbits. Furthermore, after de- veloping the necessary local theory, the approach can then be refined to studycontinuous-time systems as well, although we only carry out the program forgeodesic flows, where the action functional has a particularly clear geometricinterpretation. An important ingredient here is to reduce the global problem to a finite-dimensional one by considering "broken geodesics" （cf. the proof ofTheorem 9.5.8）. We concentrate our attention in Sections 6 and 7 on describ- ing the invariant set consisting of globally minimal geodesics, that is, geodesics which on the universal cover are length-minimizing segments between any two of their points. There are two principal conclusions: Theorem 9.6.7 connects the geometrical complexity of the manifold measured by the growth of the volume of balls on the universal cover with the dynamical complexity of the geodesic flow measured by the topological entropy.

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