<<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

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isometries; gradient flows; expanding maps; shifts and topological markov chains; the hyperbolic toral automorphism; finiteness of entropy of lipschitz maps; expansive maps
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byanatolekatokandleonardomendoza
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2. functional analysis
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4. differential geometry
5. topology and geometry of surfaces
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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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