Nonlinear Control Systems Isidori

The Reaction Wheel Pendulum
Nonlinear Control Systems and Power System Dynamics
Nonlinear Control Systems Design 1989
Analysis and Design of Nonlinear Control Systems
Control Theory Tutorial
Nonlinear Dynamical Control Systems
L2 - Gain and Passivity Techniques in Nonlinear Control
Nonlinear Systems
Sampled-Data Models for Linear and Nonlinear Systems
Linear Controller Design
Nonlinear Control Engineering
Lectures in Feedback Design for Multivariable Systems
Essays on Control
Nonlinear and Optimal Control Theory
Nonlinear Output Regulation
Applied Nonlinear Control
Control and Observer Design for Nonlinear Finite and Infinite Dimensional Systems
Algebraic Methods for Nonlinear Control Systems
Stability of Nonlinear Control Systems
Nonlinear Control Systems Design 1995
Nonlinear Observers and Applications
Nonlinear Systems Analysis
Feedback Systems
Nonlinear and Adaptive Control Systems
Nonlinear Control Systems Design 1992
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Nonlinear Control Systems
High-Gain Observers in Nonlinear Feedback Control
Analysis and Design of Nonlinear Control Systems
Nonlinear and Optimal Control Systems
Robust Autonomous Guidance
Robust Nonlinear Control Design
Nonlinear Control Systems II
Nonlinear Control Systems
Topics in Control Theory
Mathematical Control Theory
Advances in Control Theory and Applications
Nonlinear System Identification
Analysis and Design of Nonlinear Control Systems
Nonlinear Control Systems II

KENNEDI BECKER

The Reaction Wheel Pendulum Wiley-Interscience
This volume deals with controllability and observability properties of nonlinear systems, as well as various ways to obtain input-output representations. The emphasis is on fundamental notions as (controlled) invariant distributions and submanifolds, together with algorithms to compute the required feedbacks.
Nonlinear Control Systems and Power System Dynamics Springer Science & Business Media
Nonlinear Output Regulation: Theory and Applications provides a comprehensive and in-depth treatment of the nonlinear output regulation problem. It contains up-to-date research results and algorithms and tools for approaching and solving the output regulation problem and related problems, such as robust stabilization of nonlinear systems. Output regulation is a general mathematical formulation of many control problems encountered in daily life including cruise control of automobiles, landing and takeoff of aircraft, manipulation of robot arms, orbiting of satellites, and speed regulation of motors. The book provides a self-contained treatment starting with an introduction to the linear output regulation problem and a review of the fundamental nonlinear control theory. The author's presentation strikes a balance between the theoretical foundation of the problem and the practical applications of the theory. The book is accompanied by many examples,

including practical case studies with numerical simulations based on MATLAB/SIMULINK. Audience: graduate students, professors, and researchers in applied mathematics, electrical engineering, mechanical engineering, and aerospace engineering. The book can be used in a graduate-level control systems course as well as by control design engineers in industry.

Nonlinear Control Systems Design 1989 Elsevier

Stability of Nonlinear Control Systems

Analysis and Design of Nonlinear Control Systems Springer Science & Business Media

The lectures gathered in this volume present some of the different aspects of Mathematical Control Theory. Adopting the point of view of Geometric Control Theory and of Nonlinear Control Theory, the lectures focus on some aspects of the Optimization and Control of nonlinear, not necessarily smooth, dynamical systems. Specifically, three of the five lectures discuss respectively: logic-based switching control, sliding mode control and the input to the state stability paradigm for the control and stability of nonlinear systems. The remaining two lectures are devoted to Optimal Control: one investigates the connections between Optimal Control Theory, Dynamical Systems and Differential Geometry, while the second presents a very general version, in a non-smooth context, of the Pontryagin Maximum Principle. The arguments of the whole volume are self-contained and are directed to everyone working in Control Theory. They offer a sound presentation of the methods employed in the control and optimization of nonlinear dynamical systems.

Control Theory Tutorial Elsevier

This volume represents most aspects of the rich and growing field of nonlinear control. These proceedings contain 78 papers, including six plenary lectures, striking a balance between theory and applications. Subjects covered include feedback stabilization, nonlinear and adaptive control of electromechanical systems, nonholonomic systems. Generalized state space systems, algebraic computing in nonlinear systems theory, decoupling, linearization and model-matching and robust control are also covered.

Nonlinear Dynamical Control Systems SIAM

Sampled-data Models for Linear and Nonlinear Systems provides a fresh new look at a subject with which many researchers may think themselves familiar. Rather than emphasising the differences between sampled-data and continuous-time systems, the authors proceed from the premise that, with modern sampling rates being as high as they are, it is becoming more appropriate to emphasise connections and similarities. The text is driven by three motives: · the ubiquity of computers in modern control and signal-processing equipment means that sampling of systems that really evolve continuously is unavoidable; · although superficially straightforward, sampling can easily produce erroneous results when not treated properly; and · the need for a thorough understanding of many aspects of sampling among researchers and engineers dealing with applications to which they are central. The authors tackle many misconceptions which, although appearing reasonable at first sight, are in fact either partially or completely erroneous. They also deal with

linear and nonlinear, deterministic and stochastic cases. The impact of the ideas presented on several standard problems in signals and systems is illustrated using a number of applications. Academic researchers and graduate students in systems, control and signal processing will find the ideas presented in Sampled-data Models for Linear and Nonlinear Systems to be a useful manual for dealing with sampled-data systems, clearing away mistaken ideas and bringing the subject thoroughly up to date. Researchers in statistics and economics will also derive benefit from the reworking of ideas relating a model derived from data sampling to an original continuous system.

L2 - Gain and Passivity Techniques in Nonlinear Control Elsevier

This book is a tribute to Prof. Alberto Isidori on the occasion of his 65th birthday. Prof. Isidori’s proli?c, pioneering and high-impact research activity has spanned over 35 years. Throughout his career, Prof. Isidori has developed ground-breaking results, has initiated researchdirections and has contributed towardsthe foundationofnonlinear controltheory.In addition,his dedication to explain intricate issues and di?cult concepts in a simple and rigorous way and to motivate young researchers has been instrumental to the intellectual growth of the nonlinear control community worldwide. The volume collects 27 contributions written by a total of 52 researchers. The principal author of each contribution has been selected among the - searchers who have worked with Prof. Isidori, have in?uenced his research activity, or have had the privilege and honour of being his PhD students. The contributions address a signi?cant number of control topics, including th- retical issues, advanced applications, emerging control directions and tutorial works. The diversity of the areas covered, the number of contributors and their international standing provide evidence of the impact of Prof. Isidori in the control and systems theory communities. The book has been divided into six parts: System Analysis, Optimization Methods, Feedback Design, Regulation, Geometric Methods and Asymptotic Analysis, re?ecting important control areas which have been strongly in-enced and, in some cases, pioneered by Prof. Isidori.

Nonlinear Systems Springer Science & Business Media

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Sampled-Data Models for Linear and Nonlinear Systems Springer Science & Business Media

Geared primarily to an audience consisting of mathematically advanced undergraduate or beginning graduate students, this text may additionally be used by engineering students interested in a rigorous, proof-oriented systems course that goes beyond the classical frequency-domain material and more applied courses. The minimal mathematical background required is a working knowledge of linear algebra and differential equations. The book covers what constitutes the common core of control theory and is unique in its emphasis on foundational aspects. While covering a wide range of topics written in a standard theorem/proof style, it also develops the necessary techniques from scratch. In this second edition, new chapters and sections have been added, dealing with time optimal control of linear systems, variational and numerical approaches to nonlinear control, nonlinear controllability via Lie-algebraic methods, and controllability of recurrent nets and of linear systems with bounded controls.

Linear Controller Design SIAM

One of the key concerns in modern control theory is the design of steering strategies. The implementation of such strategies is done by a regulator. Presented here is a self-contained introduction to the mathematical background of this type of regulator design. The topics selected address the matter of greatest interest to the control community, at present, namely, when the design objective is the reduction of the influence of exogeneous disturbances upon the output of the system. In a first scenario the disturbance signal is regarded as a deterministic time series with known dynamics but unknown parameters. The design objective is then the asymptotic disturbance compensation. In a second scenario, no information about the disturbance signal is available apart from some bounds. Here, in an H-approach, control strategies are worked out which will prove efficient for all such disturbances. The intention of this book is to present ideas and methods on such a level that the beginning graduate student will be able to follow current research. New results are included, especially for nonlinear control systems, and as a service to the reader, an extensive appendix presents topics from linear algebra, invariant manifolds and calculus of variations, information which is hardly to be found in standard textbooks. Contents: Introduction • The problem of output regulation • Introduction • Problem statement • Output regulation via full information • Output regulation via full error feedback • A particular case • Well-posedness and robustness • The construction of a robust regulator • Disturbance attenuation via H-methods • Introduction • Problem statement • A characterization of the L2-gain of a linear system • Disturbance attenuation via full information • Disturbance attenuation via

measured feedback • Full information regulators • Problem statement • Time-dependent control strategies • Examples • Time-independent control strategies • The local case • Nonlinear observers • Problem statement • Time-dependent observers • Error feedback regulators • Examples • Nonlinear H-techniques • Introduction • Construction of the saddle-point • The local scenario • Disturbance attenuation via linearization • Matrix equations • Linear matrix equations • Algebraic Riccati equations • Invariant manifolds • Existence theorem • Outflowing manifolds • Asymptotic phase • Convergence for T 1 • A special case • Dichotomies and Lyapunov functions • Hamilton-Jacobi-Bellman-Isaacs equation • Introduction • Method of characteristics • The equation of Isaacs • The Hamiltonian version of Isaacs' equation • Bibliography

Nonlinear Control Engineering Springer Science & Business Media

In this work, the authors present a global perspective on the methods available for analysis and design of non-linear control systems and detail specific applications. They provide a tutorial exposition of the major non-linear systems analysis techniques followed by a discussion of available non-linear design methods.

Lectures in Feedback Design for Multivariable Systems Springer Science & Business Media

This is a self-contained introduction to algebraic control for nonlinear systems suitable for researchers and graduate students. It is the first book dealing with the linear-algebraic approach to nonlinear control systems in such a detailed and extensive fashion. It provides a complementary approach to the more traditional differential geometry and deals more easily with several important characteristics of nonlinear systems.

Essays on Control Springer Science & Business Media

The purpose of this book is to present a self-contained description of the fundamentals of the theory of nonlinear control systems, with special emphasis on the differential geometric approach. The book is intended as a graduate text as well as a reference to scientists and engineers involved in the analysis and design of feedback systems. The first version of this book was written in 1983, while I was teaching at the Department of Systems Science and Mathematics at Washington University in St. Louis. This new edition integrates my subsequent teaching experience gained at the University of Illinois in Urbana-Champaign in 1987, at the Carl Cranz Gesellschaft in Oberpfaffenhofen in 1987, at the University of California in Berkeley in 1988. In addition to a major rearrangement of the last two Chapters of the first version, this new edition incorporates two additional Chapters at a more elementary level and an exposition of some relevant research findings which have occurred since 1985. In the past few years differential geometry has proved to be an effective means of analysis and design of nonlinear control systems as it was in the past for the Laplace transform, complex variable theory and linear algebra in relation to linear systems. Synthesis problems of longstanding interest like disturbance decoupling, noninteracting control, output regulation, and the shaping of the input-output response, can be dealt with relative ease, on the basis of mathematical concepts that can be easily acquired by a control scientist.

Nonlinear and Optimal Control Theory

Springer Science & Business Media
An adaptive system for linear systems with unknown parameters is a nonlinear system. The analysis of such adaptive systems requires similar techniques to analyse nonlinear systems. Therefore it is natural to treat adaptive control as a part of nonlinear control systems. Nonlinear and Adaptive Control Systems treats nonlinear control and adaptive controlin a unified framework, presenting the major results at a moderate mathematical level, suitable for MSc students and engineers with undergraduate degrees. Topics covered include introduction to nonlinear systems; state space models; describing functions forcommon nonlinear components; stability theory; feedback linearization; adaptive control; nonlinear observer design; backstepping design; disturbance rejection and output regulation; and control applications, including harmonic estimation and rejection inpower distribution systems, observer and control design for circadian rhythms, and discrete-time implementation of continuous-timenonlinear control laws.
Nonlinear Output Regulation Springer Nature
There has been much excitement over the emergence of new mathematical techniques for the analysis and control of nonlinear systems. In addition, great technological advances have bolstered the impact of analytic advances and produced many new problems and applications which are nonlinear in an essential way. This book lays out in a concise mathematical framework the tools and methods of analysis which underlie this diversity of applications.
Applied Nonlinear Control SIAM
This volume is the outcome of the first CASY workshop on "Advances in Control Theory and Applications" which was held at University of Bologna on May 22-26, 2006. It consists of selected contributions by some of the invited speakers and contains recent results in control. The volume is intended for engineers, researchers, and students in control engineering.
Control and Observer Design for Nonlinear Finite and Infinite Dimensional Systems Academic Press
This open access Brief introduces the basic principles of control theory in a concise self-study guide. It complements the classic texts by emphasizing the simple conceptual unity of the subject. A novice can quickly see how and why the different parts fit together. The concepts build slowly and naturally one after another, until the reader soon has a view of the whole. Each concept is illustrated by detailed examples and graphics. The full software code for each example is available, providing the basis for experimenting with various assumptions, learning how to write programs for control analysis, and setting the stage for future research projects. The topics focus on robustness, design trade-offs, and optimality. Most of the book develops classical linear theory. The last part of the book considers robustness with respect to nonlinearity and explicitly nonlinear extensions, as well as advanced topics such as adaptive control and model predictive control. New students, as well as scientists from other backgrounds who want a concise and easy-to-grasp coverage of control theory, will benefit from the emphasis on concepts and broad understanding of the various approaches. Electronic codes for this title can be

Algebraic Methods for Nonlinear Control Systems Springer Science & Business Media

This book contains the text of the plenary lectures and the mini-courses of the European Control Conference (ECC'93) held in Groningen, the Netherlands, June 2S-July 1, 1993. However, the book is not your usu al conference proceedings. Instead, the authors took this occasion to take a broad overview of the field of control and discuss its development both from a theoretical as well as from an engineering perpective. The first essay is by the key-note speaker ofthe conference, A.G.J. Mac Farlane. It consists of a non-technical discussion of information processing and knowledge acquisition as the key features of control engineering tech nology. The next six articles are accounts of the plenary addresses. The contribution by R.W. Brockett concerns a mathematical framework for modelling motion control, a central question in robotics and vision. In the paper by M. Morari the engineering and the economic relevance of chemical process control are considered, in particular statistical quality control and the control of systems with constraints. The article by A.C.P.M. Backx is written from an industrial perspec tive. The author is director of an engineering consulting firm involved in the design of industrial control equipment. Specifically, the possibility of obtaining high performance and reliable controllers by modelling, identifi cation, and optimizing industrial processes is discussed.

Stability of Nonlinear Control Systems John Wiley & Sons

This eagerly awaited follow-up to Nonlinear Control Systems incorporates recent advances in the design of feedback laws, for the purpose of globally stabilizing nonlinear systems via state or output feedback. The author is one of the most prominent researchers in the field.

Nonlinear Control Systems Design 1995 Springer Science & Business Media

Nonlinear Control Systems and Power System Dynamics presents a comprehensive description of nonlinear control of electric power systems using nonlinear control theory, which is developed by the differential geometric approach and nonlinear robust control method. This book explains in detail the concepts, theorems and algorithms in nonlinear control theory, illustrated by step-by-step examples. In addition, all the mathematical formulation involved in deriving the nonlinear control laws of power systems are sufficiently presented. Considerations and cautions involved in applying nonlinear control theory to practical engineering control designs are discussed and special attention is given to the implementation of nonlinear control laws using microprocessors. Nonlinear Control Systems and Power System Dynamics serves as a text for advanced level courses and is an excellent reference for engineers and researchers who are interested in the application of modern nonlinear control theory to practical engineering control designs.