Control Of Linear And Nonlinear Systems Gbv

Very Good,No Highlights or Markup,all pages are intact.
This textbook on the differential geometric approach to nonlinear control grew out of a set of lecture notes , which were prepared for a course on nonlinear system theory , given by us for the first time during the fall semester of 1988 . The audience consisted mostly of graduate students , taking part in the Dutch national Graduate Program on Systems and Control . The aim of this course is to give a general introduction to modern nonlinear control theory (with an emphasis on the differential geometric approach), as well as to provide students specializing in nonlinear control theory with a firm starting point for doing research in this area . One of our primary objectives was to give a self-contained treatment of all the topics to be included. Since the literature on nonlinear geometric control theory is rapidly expanding this forced us to limit ourselves in the choice of topics . The task of selecting topics was further aggravated by the continual shift in emphasis in the nonlinear control literature over the last years . Therefore, we decided to concentrate on some rather solid and clear-cut achievements of modern nonlinear control , which can be expected to be of remaining interest in the near future. Needless to say, there is also a personal bias in the topics we have finally selected.
This application-oriented monograph focuses on a novel and complex type of control systems. Written on an engineering level, including fundamentals, advanced methods and applications, the book applies techniques originating from new methods such as artificial intelligence, fuzzy logic, neural networks etc.
Designed for one-semester introductory senior-or graduate-level course, the authors provide the student with an introduction of analysis techniques used in the design of nonlinear and optimal feedback control systems. There is special emphasis on the fundamental topics of stability, controllability, and optimality, and on the corresponding geometry associated with these topics. Each chapter contains several examples and a variety of exercises.
Quantitative Feedback Design of Linear and Nonlinear Control Systems
Feedback Control
Robust Nonlinear Control Design
Linear, Time-varying Approximations to Nonlinear Dynamical Systems
with Applications in Control and Optimization
A Classical Approach

This volume is an outgrowth of the workshop "Applications of Advanced Control Theory to Robotics and Automation," organized in honor of the 70th birthdays of Petar V. Kokotovic and Salvatore Nicosia. Both Petar and Turi have carried out distinguished work in the control community, and have long been recognized as mentors as well as experts and pioneers in the field of automatic control, covering many topics in control theory and several different applications. The variety of their research is reflected in this book, which includes contributions ranging from mathematics to laboratory experiments.Main topics covered include:* Observer design for time-delay systems, nonlinear systems, and identification for different classes of systems* Lyapunov tools for linear differential inclusions, control of constrained systems, and finite-time stability concepts* New studies of robot manipulators, parameter identification, and different control problems for mobile robots* Applications of modern control techniques to port-controlled Hamiltonian systems, different classes of vehicles, and web handling systems* Applications of the max-plus algebra to system-order reduction; optimal machine scheduling problems; and inventory control with cooperation between retailers* Control of linear and nonlinear networked control systems: deterministic and stochastic approachesThe scope of the work is very broad, and although each chapter is self-contained, the book has been organized into thematically related chapters, which in some cases suggest to the reader a convenient reading sequence. The great variety of topics covered and the almost tutorial writing style used by many of the authors will make this book suitable for experts, as well as young researchers who seek a more intuitive understanding of these relevant topics in the field.
This book examines control of nonlinear systems. Coverage ranges from mathematical system theory to practical industrial control applications. The author offers web-based videos illustrating some dynamical aspects and case studies in simulation.
Provides complete coverage of both the Lyapunov and Input-Output stability theories, ina readable, concise manner. * Supplies an introduction to the popular backstepping approach to nonlinear control design * Gives a thorough discussion of the concept of input-to-state stability * Includes a discussion of the fundamentals of feedback linearization and related results. * Details complete coverage of the fundamentals of dissipative system's theory and its application in the so-called L2gain control prooblem, for the first time in an introductory level textbook. * Contains a thorough discussion of nonlinear observers, a very important problem, not commonly encountered in textbooksat this level. *An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.
"Traditionally, optimal control of dynamical systems with known system dynamics is obtained in a backward-in-time and offline manner either by using Riccati or Hamilton-Jacobi-Bellman (HJB) equation. In contrast, in this dissertation, finite-horizon optimal regulation has been investigated for both linear and nonlinear systems in a forward-in-time manner when system dynamics are uncertain. Value and policy iterations are not used while the value function (or Q-function for linear systems) and control input are updated once a sampling interval consistent with standard adaptive control. First, the optimal adaptive control of linear discrete-time systems with unknown system dynamics is presented in Paper I by using Q-learning and Bellman equation while satisfying the terminal constraint. A novel update law that uses history information of the cost to go is derived. Paper II considers the design of the linear quadratic regulator in the presence of state and input quantization. Quantization errors are eliminated via a dynamic quantizer design and the parameter update law is redesigned from Paper I. Furthermore, an optimal adaptive state feedback controller is developed in Paper III for the general nonlinear discrete-time systems in affine form without the knowledge of system dynamics. In Paper IV, a NN-based observer is proposed to reconstruct the state vector and identify the dynamics so that the control scheme from Paper III is extended to output feedback. Finally, the optimal regulation of quantized nonlinear systems with input constraint is considered in Paper V by introducing a non-quadratic cost functional. Closed-loop stability is demonstrated for all the controller designs developed in this dissertation by using Lyapunov analysis while all the proposed schemes function in an online and forward-in-time manner so that they are practically viable"--Abstract, page iv.
The Linear Treatment of Nonlinear Problems
Feedback Control of Linear and Nonlinear Systems
In Honor of Petar Kokotovic and Turi Nicosia
State-Space and Lyapunov Techniques
Analysis, Control and Application
Nonlinear Control Systems and Power System Dynamics

The following topics are dealt with: nonlinearity: dynamic systems; describing function method; phase plane

portrait; linearisation ;nonlinear second-order system linearisation; envelope methods; Limit cycles; relaxation oscillations; Lienard's equation; gradient systems and system decomposition.
The purpose of this book is to present a self-contained description of the fun damentals of the theory of nonlinear control systems, with special emphasis on the differential geometric approach. The book is intended as a graduate text as weil 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 teach ing 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.
This text emphasizes classical methods and presents essential analytical tools and strategies for the construction and development of improved design methods in nonlinear control. It offers engineering procedures for the frequency domain, as well as solved examples for clear understanding of control applications in the industrial, electrical, proce
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.
Optimal Control of Nonlinear Processes
Nonlinear and Optimal Control Systems
Nonlinear Systems
An LMI Approach

Proceedings of the Joint Workshop on Feedback and Synthesis of Linear and Nonlinear Systems, Bielefeld/Rom
There has been significant interest for designing flight controllers for small-scale unmanned helicopters. Such helicopters preserve all the physical attributes of their full-scale counterparts, being at the same time more agile and dexterous. This book presents a comprehensive and well justified analysis for designing flight controllers for small-scale unmanned helicopters guarantying flight stability and tracking accuracy. The design of the flight controller is a critical and integral part for developing an autonomous helicopter platform. Helicopters are underactuated, highly nonlinear systems with significant dynamic coupling that needs to be considered and accounted for during controller design and implementation. Most reliable mathematical tools for analysis of control systems relate to modern control theory. Modern control techniques are model-based since the controller architecture depends on the dynamic representation of the system to be controlled. Therefore, the flight controller design problem is tightly connected with the helicopter modeling. This book provides a step-by-step methodology for designing, evaluating and implementing efficient flight controllers for small-scale helicopters. Design issues that are analytically covered include: • An illustrative presentation of both linear and nonlinear models of ordinary differential equations representing the helicopter dynamics. A detailed presentation of the helicopter equations of motion is given for the derivation of both model types. In addition, an insightful presentation of the main rotor's mechanism, aerodynamics and dynamics is also provided. Both model types are of low complexity, physically meaningful and capable of encapsulating the dynamic behavior of a large class of small-scale helicopters. • An illustrative and rigorous derivation of mathematical control algorithms based on both the linear and nonlinear representation of the helicopter dynamics. Flight controller designs guarantee that the tracking objectives of the helicopter's inertial position (or velocity) and heading are achieved. Each controller is carefully constructed by considering the small-scale helicopter's physical flight capabilities. Concepts of advanced stability analysis are used to improve the efficiency and reduce the complexity of the flight control system. Controller designs are derived in both continuous time and discrete time covering discretization issues, which emerge from the implementation of the control algorithm using microprocessors. • Presentation of the most powerful, practical and efficient methods for extracting the helicopter model parameters based on input/output responses, collected by the measurement instruments. This topic is of particular importance for real-life implementation of the control algorithms. This book is suitable for students and researches interested in the development and the mathematical derivation of flight controllers for small-scale helicopters. Background knowledge in modern control is required.
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.
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.

Nonlinear Optimal Control Theory presents a deep, wide-ranging introduction to the mathematical theory of the optimal control of processes governed by ordinary differential equations and certain types of differential equations with memory. Many examples illustrate the mathematical issues that need to be addressed when using optimal control techniques in diverse areas. Drawing on classroom-tested material from Purdue University and North Carolina State University, the book gives a unified account of bounded state problems governed by ordinary, integrodifferential, and delay systems. It also discusses Hamilton-Jacobi theory. By providing a sufficient and rigorous treatment of finite dimensional control problems, the book equips readers with the foundation to deal with other types of control problems, such as those governed by stochastic differential equations, partial differential equations, and differential games.

Analysis, Stability, and Control

Applied Nonlinear Control

Perspectives in the Theory and its Applications

Linear System Theory and Design

Non-linear Control for Underactuated Mechanical Systems

With Applications in Drugs, Corruption, and Terror

This monograph summarizes the recent achievements made in the field of iterative learning control. The book is self-contained in theoretical analysis and can be used as a reference or textbook for a graduate level course as well as for self-study. It opens a new avenue towards a new paradigm in deterministic learning control theory accompanied by detailed examples.

This monograph presents recent advances in differential flatness theory and analyzes its use for nonlinear control and estimation. It shows how differential flatness theory can provide solutions to complicated control problems, such as those appearing in highly nonlinear multivariable systems and distributed-parameter systems. Furthermore, it shows that differential flatness theory makes it possible to perform filtering and state estimation for a wide class of nonlinear dynamical systems and provides several descriptive test cases. The book focuses on the design of nonlinear adaptive controllers and nonlinear filters, using exact linearization based on differential flatness theory. The adaptive controllers obtained can be applied to a wide class of nonlinear systems with unknown dynamics, and assure reliable functioning of the control loop under uncertainty and varying operating conditions. The filters obtained outperform other nonlinear filters in terms of accuracy of estimation and computation speed. The book presents a series of application examples to confirm the efficiency of the proposed nonlinear filtering and adaptive control schemes for various electromechanical systems. These include: · industrial robots; · mobile robots and autonomous vehicles; · electric power generation; · electric motors and actuators; · power electronics; · internal combustion engines; · distributed-parameter systems; and · communication systems. Differential Flatness Approaches to Nonlinear Control and Filtering will be a useful reference for academic researchers studying advanced problems in nonlinear control and nonlinear dynamics, and for engineers working on control applications in electromechanical systems.

LINEAR and NONLINEAR INSTABILITIES in MECHANICAL SYSTEMS An in-depth insight into nonlinear analysis and control As mechanical systems become lighter, faster, and more flexible, various nonlinear instability phenomena can occur in practical systems. The fundamental knowledge of nonlinear analysis and control is essential to engineers for analysing and controlling nonlinear instability phenomena. This book bridges the gap between the mathematical expressions of nonlinear dynamics and the corresponding practical phenomena. Linear and Nonlinear Instabilities in Mechanical Systems: Analysis, Control and Application provides a detailed and informed insight into the fundamental methods for analysis and control for nonlinear instabilities from the practical point of view. Key features: Refers to the behaviours of practical mechanical systems such as aircraft, railway vehicle, robot manipulator, micro/nano sensor Enhances the rigorous and practical understanding of mathematical methods from an engineering point of view The theoretical results obtained by nonlinear analysis are interpreted by using accompanying videos on the real nonlinear behaviors of nonlinear mechanical systems Linear and Nonlinear Instabilities in Mechanical Systems is an essential textbook for students on engineering courses, and can also be used for self-study or reference by engineers.

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 Dynamical Systems and Control

Advanced Topics in Nonlinear Control Systems

Nonlinear and Optimal Control Theory

EPSRC Summer School

Mathematical Methods for Robust and Nonlinear Control

A Flatness-based Approach

The development of computer software for nonlinear control systems has provided many benefits for teaching, research, and the development of control systems design. MATLAB is considered the dominant software platforms for linear and nonlinear control systems analysis. This book provides an easy way to learn nonlinear control systems such as feedback linearization technique and Sliding mode control (Structure variable control) which are one of the most used techniques in nonlinear control dynamical systems; therefore teachers-students and researchers are all in need to handle such techniques; and since they are too difficult for them to handle such nonlinear controllers especially for a more complicated systems such as induction motor, satellite, and vehicles dynamical models. Thus, this document it is an excellent resource for learning the principle of feedback linearization and sliding mode techniques in an easy and simple way: Provides a briefs description of the feedback linearization and sliding mode control strategies Includes a simple method on how to determine the right and appropriate controller (P-PI-PID) for feedback linearization control strategy. A Symbolic MATLAB Based function for finding the feedback linearization and sliding mode controllers are developed and tested using several examples. A simple method for finding the approximate sliding mode

controller parameters is introduced Where the program used to construct the nonlinear controller uses symbolic computations; such that the user should provide the program with the necessary functions f(x), g(x) and h(x) using the symbolic library.

The underlying theory on which much modern robust and nonlinear control is based can be difficult to grasp. This volume is a collection of lecture notes presented by experts in advanced control engineering. The book is designed to provide a better grounding in the theory underlying several important areas of control. It is hoped the book will help the reader to apply otherwise abstruse ideas of nonlinear control in a variety of real systems.

Linear, Time-varying Approximations to Nonlinear Dynamical Systems introduces a new technique for analysing and controlling nonlinear systems. This method is general and requires only very mild conditions on the system nonlinearities, setting it apart from other techniques such as those - well-known - based on differential geometry. The authors cover many aspects of nonlinear systems including stability theory, control design and extensions to distributed parameter systems. Many of the classical and modern control design methods which can be applied to linear, time-varying systems can be extended to nonlinear systems by this technique. The implementation of the control is therefore simple and can be done with well-established classical methods. Many aspects of nonlinear systems, such as spectral theory which is important for the generalisation of frequency domain methods, can be approached by this method.

Quantitative Feedback Design of Linear and Nonlinear Control SystemsSpringer Science & Business Media

A Lyapunov-Based Approach

Current Trends in Nonlinear Systems and Control

Linear and Nonlinear Control of Small-Scale Unmanned Helicopters

Nonlinear Control Systems

Essentials of Nonlinear Control Theory

Applications to Electromechanical Systems

This softcover book summarizes Lyapunov design techniques for nonlinear systems and raises important issues concerning large-signal robustness and performance. The authors have been the first to address some of these issues, and they report their findings in this text. The researcher who wishes to enter the field of robust nonlinear control could use this book as a source of new research topics. For those already active in the field, the book may serve as a reference to a recent body of significant work. Finally, the design engineer faced with a nonlinear control problem will benefit from the techniques presented here.

Nonlinear Dynamical Systems and Control presents and develops an extensive treatment of stability analysis and control design of nonlinear dynamical systems, with an emphasis on Lyapunov-based methods. Dynamical system theory lies at the heart of mathematical sciences and engineering. The application of dynamical systems has crossed interdisciplinary boundaries from chemistry to biochemistry to chemical kinetics, from medicine to biology to population genetics, from economics to sociology to psychology, and from physics to mechanics to engineering. The increasingly complex nature of engineering systems requiring feedback control to obtain a desired system behavior also gives rise to dynamical systems. Wassim Haddad and VijaySekhar Chellaboina provide an exhaustive treatment of nonlinear systems theory and control using the highest standards of exposition and rigor. This graduate-level textbook goes well beyond standard treatments by developing Lyapunov stability theory, partial stability, boundedness, input-to-state stability, input-output stability, finite-time stability, semistability, stability of sets and periodic orbits, and stability theorems via vector Lyapunov functions. A complete and thorough treatment of dissipativity theory, absolute stability theory, stability of feedback systems, optimal control, disturbance rejection control, and robust control for nonlinear dynamical systems is also given. This book is an indispensable resource for applied mathematicians, dynamical systems theorists, control theorists, and engineers.

Although the problem of nonlinear controller design is as old as that of linear controller design, the systematic design methods framed in response are more sparse. Given the range and complexity of nonlinear systems, effective new methods of control design are therefore of significant importance. Dynamic Surface Control of Uncertain Nonlinear Systems provides a theoretically rigorous and practical introduction to nonlinear control design. The convex optimization approach applied to good effect in linear systems is extended to the nonlinear case using the new dynamic surface control (DSC) algorithm developed by the authors. A variety of problems – DSC design, output feedback, input saturation and fault-tolerant control among them – are considered. The inclusion of applications material demonstrates the real significance of the DSC algorithm, which is robust and easy to use, for nonlinear systems with uncertainty in automotive and robotics. Written for the researcher and graduate student of nonlinear control theory, this book will provide the applied mathematician and engineer alike with a set of powerful tools for nonlinear control design. It will also be of interest to practitioners working with a mechatronic systems in aerospace, manufacturing and automotive and robotics, milieux.

Uses simple and efficient methods to develop results and design procedures, thus creating a non-exhaustive approach to presenting the material; Enables the reader to employ the results to carry out design. Thus, most results are discussed with an eye toward numerical computation; All design procedures in the text can be carried out using any software package that includes singular-value decomposition, and the solution of linear algebraic equations and the Lyapunov equation; All examples are developed for numerical computation and are illustrated using MATLAB, the most widely available software package.

Analysis and Control of Nonlinear Systems

Linear and Nonlinear Iterative Learning Control

Linear and Nonlinear Instabilities in Mechanical Systems

Finite-horizon Optimal Control of Linear and a Class of Nonlinear Systems

Control and Optimization

Intelligent Observer and Control Design for Nonlinear Systems

Dynamic optimization is rocket science and more. This volume teaches researchers and students alike to harness the modern theory of dynamic optimization to solve practical problems. These problems not only cover those in space flight, but also in emerging social applications such as the control of drugs, corruption, and terror. This volume is designed to be a lively introduction to the mathematics and a bridge to these hot topics in the economics of crime for current scholars. The authors celebrate Pontryagins Maximum Principle that crowning intellectual achievement of human understanding. The rich theory explored here is complemented by numerical methods available through a companion web site.

This book presents methods to study the controllability and the stabilization of nonlinear control systems in finite and infinite dimensions. The emphasis is put on specific phenomena due to nonlinearities. In particular, many examples are given where nonlinearities turn out to be essential to get controllability or stabilization. Various methods are presented to study the controllability or to construct stabilizing feedback laws. The power of these methods is illustrated by numerous examples coming from such areas as celestial mechanics, fluid mechanics, and quantum mechanics. The book is addressed to graduate students in mathematics or control theory, and to mathematicians or engineers with an interest in nonlinear control systems governed by ordinary or partial differential equations.

Ch. 1. Generalized Hamiltonian systems / D. Cheng -- ch. 2. Continuous finite-time control / T. P. Leung and Y. Hong -- ch. 3. Local stabilization of nonlinear systems by dynamic output feedback / P. Chen and H. Qin -- ch. 4. Hybrid control for global stabilization of a class of systems / J. Zhao -- ch. 5. Robust and adaptive control of nonholonomic mechanical systems with applications to mobile robots / Y. M. Hu and W. Huo -- ch. 6. Introduction to chaos control and anti-control / G. Chen ... [et al.].

This book is a tribute to Prof. Alberto Isidori on the occasion of his 65th birthday. Prof. Isidoris 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.

Lectures given at the C.I.M.E. Summer School held in Cetraro, Italy, June 19-29, 2004

Nonlinear Control and Filtering Using Differential Flatness Approaches

Analysis and Design

Linear and Nonlinear Multivariable Feedback Control

Nonlinear Dynamical Control Systems

Dynamic Surface Control of Uncertain Nonlinear Systems

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.

"Linear and Nonlinear Multivariable Feedback Control presents a highly original, unified control theory of both linear and nonlinear multivariable (also known as multi-input multi-output (MIMO)) feedback systems as a straightforward extension of classical control theory. It shows how the classical engineering methods look in the multidimensional case and how practising engineers or researchers can apply them to the analysis and design of linear and nonlinear MIMO systems."--BOOK JACKET.

This book deals with the application of modern control theory to some important underactuated mechanical systems, from the inverted pendulum to the helicopter model. It will help readers gain experience in the modelling of mechanical systems and familiarize with new control methods for non-linear systems.

Quantitative Feedback Design of Linear and Nonlinear Control Systems is a self-contained book dealing with the theory and practice of Quantitative Feedback Theory (QFT). The author presents feedback synthesis techniques for single-input single-output, multi-input multi-output linear time-invariant and nonlinear plants based on the QFT method. Included are design details and graphs which do not appear in the literature, which will enable engineers and researchers to understand QFT in greater depth. Engineers will be able to apply QFT and the

design techniques to many applications, such as flight and chemical plant control, robotics, space, vehicle and military industries, and numerous other uses. All of the examples were implemented using Matlab® Version 5.3; the script file can be found at the author's Web site. QFT results in efficient designs because it synthesizes a controller for the exact amount of plant uncertainty, disturbances and required specifications. Quantitative Feedback Design of Linear and Nonlinear Control Systems is a pioneering work that illuminates QFT, making the theory - and practice - come alive.

Control and Nonlinearity

Analysis and Design of Nonlinear Control Systems

In Honor of Alberto Isidori

Linear, Nonlinear and Robust Techniques and Design with Industrial Applications

Nonlinear Control Systems using MATLAB®

Nonlinear Optimal Control Theory

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.

Linear and Non-Linear System Theory focuses on the basics of linear and non-linear systems, optimal control and optimal estimation with an objective to understand the basics of state space approach linear and non-linear systems and its analysis thereof. Divided into eight chapters, materials cover an introduction to the advanced topics in the field of linear and non-linear systems, optimal control and estimation supported by mathematical tools, detailed case studies and numerical and exercise problems. This book is aimed at senior undergraduate and graduate students in electrical, instrumentation, electronics, chemical, control engineering and other allied branches of engineering. Features Covers both linear and non-linear system theory Explores state feedback control and state estimator concepts Discusses non-linear systems and phase plane analysis Includes non-linear system stability and bifurcation behaviour Elaborates optimal control and estimation

This book develops the understanding and skills needed to be able to tackle original control problems. The general approach to a given control problem is to try the simplest tentative solution first and, when this is insufficient, to explain why and use a more sophisticated alternative to remedy the deficiency and achieve satisfactory performance. This pattern of working gives readers a full understanding of different controllers and teaches them to make an informed choice between traditional controllers and more advanced modern alternatives in meeting the needs of a particular plant. Attention is focused on the time domain, covering model-based linear and nonlinear forms of control together with robust control based on sliding modes and the use of state observers such as disturbance estimation. Feedback Control is self-contained, paying much attention to explanations of underlying concepts, with detailed mathematical derivations being employed where necessary. Ample use is made of diagrams to aid these conceptual explanations and the subject matter is enlivened by continual use of examples and problems derived from real control applications. Readers' learning is further enhanced by experimenting with the fully-commented MATLAB®/Simulink® simulation environment made accessible at insert URL here to produce simulations relevant to all of the topics covered in the text. A solutions manual for use by instructors adopting the book can also be downloaded from insert URL here. Feedback Control is suitable as a main textbook for graduate and final-year undergraduate courses containing control modules; knowledge of ordinary linear differential equations, Laplace transforms, transfer functions, poles and zeros, root locus and elementary frequency response analysis, and elementary feedback control is required. It is also a useful reference source on control design methods for engineers practicing in industry and for academic control researchers.

Essays on Control

Linear and Non-Linear System Theory