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Algebraic Methods for Nonlinear Control Systems

Theory and Applications

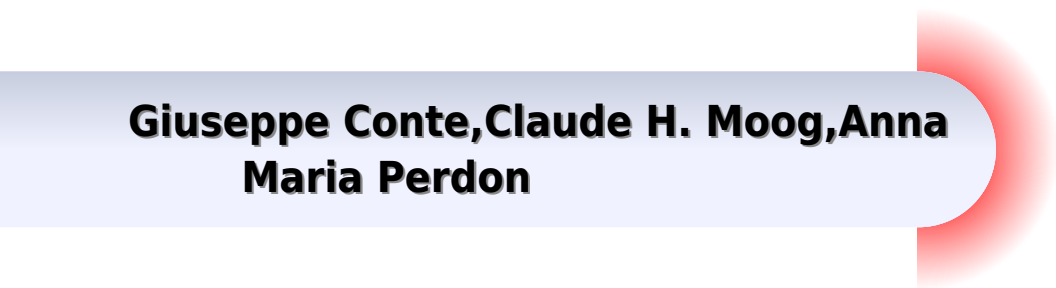
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Algebraic Methods For Nonlinear Control Systems Communications And Control Engineering

**Giuseppe Conte, Claude H. Moog, Anna
Maria Perdon**



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Algebraic Methods for Nonlinear Control Systems Giuseppe Conte, Claude H. Moog, Anna Maria Perdon, 2007-01-19 A self contained introduction to algebraic control for nonlinear systems suitable for researchers and graduate students *Algebraic Methods for Nonlinear Control Systems* develops a linear algebraic alternative to the usual differential geometric approach to nonlinear control using vector spaces over suitable fields of nonlinear functions It describes a range of results some of which can be derived using differential geometry but many of which cannot They include classical and generalized realization in the nonlinear context accessibility and observability recast for the linear algebraic setting discussion and solution of basic feedback problems results for dynamic and static state and output feedback Dynamic feedback and realization are shown to be dealt with and solved much more easily in the algebraic framework The second edition has been completely revised with new text examples and exercises it is divided into two parts necessary methodology and applications to control problems

Nonlinear Control Systems II Alberto Isidori, 1999-09-22 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** Alberto Isidori, 2013-04-17 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 **Symmetries and Semi-invariants in the Analysis of Nonlinear Systems** Laura

Menini, Antonio Tornambè, 2011-05-06 This book details the analysis of continuous and discrete time dynamical systems described by differential and difference equations respectively Differential geometry provides the tools for this such as first integrals or orbital symmetries together with normal forms of vector fields and of maps A crucial point of the analysis is linearization by state immersion The theory is developed for general nonlinear systems and specialized for the class of Hamiltonian systems By using the strong geometric structure of Hamiltonian systems the results proposed are stated in a different less complex and more easily comprehensible manner They are applied to physically motivated systems to demonstrate how much insight into known properties is gained using these techniques Various control systems applications

of the techniques are characterized including computation of the flow of nonlinear systems computation of semi invariants computation of Lyapunov functions for stability analysis and observer design

Observer Design for Nonlinear Dynamical Systems Driss Boutat,Gang Zheng,2021-07-02 This book presents a differential geometric method for designing nonlinear observers for multiple types of nonlinear systems including single and multiple outputs fully and partially observable systems and regular and singular dynamical systems It is an exposition of achievements in nonlinear observer normal forms The book begins by discussing linear systems introducing the concept of observability and observer design and then explains the difficulty of those problems for nonlinear systems After providing foundational information on the differential geometric method the text shows how to use the method to address observer design problems It presents methods for a variety of systems The authors employ worked examples to illustrate the ideas presented Observer Design for Nonlinear Dynamical Systems will be of interest to researchers graduate students and industrial professionals working with control of mechanical and dynamical systems

Nonlinear Control Systems Design 1989 A. Isidori,2014-05-23 In the last two decades the development of specific methodologies for the control of systems described by nonlinear mathematical models has attracted an ever increasing interest New breakthroughs have occurred which have aided the design of nonlinear control systems However there are still limitations which must be understood some of which were addressed at the IFAC Symposium in Capri The emphasis was on the methodological developments although a number of the papers were concerned with the presentation of applications of nonlinear design philosophies to actual control problems in chemical electrical and mechanical engineering

Dissipative Systems Analysis and Control Bernard Brogliato,Rogelio Lozano,Bernhard Maschke,Olav Egeland,2019-07-03 The third edition of the now standard Dissipative Systems Analysis and Control presents a revised and expanded treatment of dissipative systems theory constituting a self contained advanced introduction for graduate students researchers and practising engineers It examines linear nonlinear and nonsmooth systems with many examples in each chapter occasional infinite dimensional examples are also included Throughout emphasis is placed on the use of the dissipative properties of a system for the design of stable and robust feedback control laws or state observers The theory is substantiated by experimental results and by reference to its application in illustrative physical cases Lagrangian systems passivity based and adaptive controllers are covered thoroughly The third edition is substantially updated to accommodate new material within the existing chapter structure The additions include the introduction of negative imaginary transfer functions the design of stable state observers that use passivity as a tool for their stability analysis a new section on robust set valued control of uncertain Lagrangian systems extended section on discrete time systems especially the preservation of dissipativity after discretization a thorough treatment of nonsmooth set valued Lur e systems well posedness and stability an extended chapter on the Kalman Yakubovich Popov Lemma and over 1000 references

Nonholonomic Mechanics and Control A.M. Bloch,2008-02-03 Our goal in this book is to explore some of the

connections between control theory and geometric mechanics that is we link control theory with a geometric view of classical mechanics in both its Lagrangian and Hamiltonian formulations and in particular with the theory of mechanical systems subject to motion constraints This synthesis of topics is appropriate since there is a particularly rich connection between mechanics and nonlinear control theory While an introduction to many important aspects of the mechanics of nonholonomically constrained systems may be found in such sources as the monograph of Neimark and Fufaev 1972 the geometric view as well as the control theory of such systems remains largely scattered through various research journals Our aim is to provide a unified treatment of nonlinear control theory and constrained mechanical systems that will incorporate material that has not yet made its way into texts and monographs

Mechanics has traditionally described the behavior of free and interacting particles and bodies the interaction being described by potential forces It encompasses the Lagrangian and Hamiltonian pictures and in its modern form relies heavily on the tools of differential geometry see for example Abraham and Marsden 1978 and Arnold 1989 From our own point of view our papers Bloch Krishnaprasad Marsden and Murray 1996 Bloch and Crouch 1995 and Baillieul 1998 have been particularly influential in the formulations presented in this book Control Theory and Nonholonomic Systems Control theory is the theory of prescribing motion for dynamical systems rather than describing their observed behavior Nonlinear Control Systems II Alberto Isidori, 2012-10-21 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

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