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LAGRANGIAN AND HAMILTONIAN METHODS FOR NONLINEAR CONTROL

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PERGAMON

Lagrangian And Hamiltonian Methods In Nonlinear Control 2003 Workshop

Boris Miller, Evgeny Rubinovich



Lagrangian And Hamiltonian Methods In Nonlinear Control 2003 Workshop:

Lagrangian and Hamiltonian Methods for Nonlinear Control 2003 A Astolfi, Francisco Gordillo, A J Van Der Schaft, 2003-10-07 This is the second of a series of IFAC Workshops initiated in 2000 The first one chaired and organized by Profs N Leonard and R Ortega was held in Princeton in March 2000 This proceedings volume looks at the role played by Lagrangian and Hamiltonian methods in disciplines such as classical mechanics quantum mechanics fluid dynamics electrodynamics celestial mechanics and how such methods can be practically applied in the control community Presents and illustrates new approaches to nonlinear control that exploit the Lagrangian and Hamiltonian structure of the system to be controlled Highlights the important role of Lagrangian and Hamiltonian Structures as design methods Lagrangian and Hamiltonian Methods For Nonlinear Control 2006 Francesco Bullo, Kenji Fujimoto, 2007-10-06 *Lagrangian and Hamiltonian Methods for Nonlinear Control*, 2004 **Control of Interactive Robotic Interfaces** Cristian Secchi, Stefano Stramigioli, Cesare Fantuzzi, 2007-02-15 This monograph deals with energy based control of interactive robotic interfaces The port Hamiltonian framework is exploited both for modeling and controlling interactive robotic interfaces The book provides an energy oriented analysis and control synthesis of interactive robotic interfaces from a single robot to multi robot systems for interacting with real and virtual possibly unstructured environments **Advances in Control Theory and Applications** Claudio Bonivento, Alberto Isidori, Lorenzo Marconi, Carlo Rossi, 2007-06-04 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 **Current Trends in Nonlinear Systems and Control** Laura Menini, Luca Zaccarian, Chaouki T. Abdallah, 2006-09-13 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 Turi 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 The 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 both experts in the control field and young researchers who seek a more intuitive understanding of these relevant topics in the field Hybrid Systems: Computation and Control Rajeev Alur, 2004-03-12 This book constitutes the refereed proceedings of the 7th International Workshop on Hybrid Systems Computation and Control HSCC 2004 held in Philadelphia PA USA in March 2004 The 43 revised full papers presented

together with an invited article were carefully reviewed and selected from 117 submissions The papers address all current issues in hybrid systems such as tools for analysis and verification control and optimization modeling and engineering applications and emerging topics in programming language support and implementation a special focus is on the interplay between biomolecular networks systems biology formal methods and control of hybrid systems [2nd Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control](#) International Federation of Automatic Control,2003 **L2-Gain and Passivity Techniques in Nonlinear Control** Arjan van der Schaft,2016-12-04 This standard text gives a unified treatment of passivity and L2 gain theory for nonlinear state space systems preceded by a compact treatment of classical passivity and small gain theorems for nonlinear input output maps The synthesis between passivity and L2 gain theory is provided by the theory of dissipative systems Specifically the small gain and passivity theorems and their implications for nonlinear stability and stabilization are discussed from this standpoint The connection between L2 gain and passivity via scattering is detailed Feedback equivalence to a passive system and resulting stabilization strategies are discussed The passivity concepts are enriched by a generalised Hamiltonian formalism emphasising the close relations with physical modeling and control by interconnection and leading to novel control methodologies going beyond passivity The potential of L2 gain techniques in nonlinear control including a theory of all pass factorizations of nonlinear systems and of parametrization of stabilizing controllers is demonstrated The nonlinear H infinity optimal control problem is also treated and the book concludes with a geometric analysis of the solution sets of Hamilton Jacobi inequalities and their relation with Riccati inequalities for the linearization L2 Gain and Passivity Techniques in Nonlinear Control third edition is thoroughly updated revised reorganized and expanded Among the changes readers will find updated and extended coverage of dissipative systems theory substantial new material regarding converse passivity theorems and incremental shifted passivity coverage of recent developments on networks of passive systems with examples a completely overhauled and succinct introduction to modeling and control of port Hamiltonian systems followed by an exposition of port Hamiltonian formulation of physical network dynamics updated treatment of all pass factorization of nonlinear systems The book provides graduate students and researchers in systems and control with a compact presentation of a fundamental and rapidly developing area of nonlinear control theory illustrated by a broad range of relevant examples stemming from different application areas

Optimization of Dynamical Systems with Impulse Controls and Shocks Boris Miller,Evgeny Rubinovich,2024-09-19 This text explores the state of the art in the rapidly developing theory of impulse control and introduces the theory of singular space time transformations a new method for studying shock mechanical systems Two approaches in the theory of impulse control are presented The first more traditional approach defines the impulsive action as a discontinuity of phase coordinates depending on the current time the state preceding the action and its magnitude The second requires the use of modern methods for describing dynamical systems differential equations with measures The impulse is treated as an

idealization of a very short action of high magnitude which produces an almost abrupt change of phase coordinates The relation between these two approaches is also discussed and several applications both traditional and emerging are considered This text is intended for graduate students and researchers in control engineering and optimal control theory for dynamical systems Readers are assumed to be familiar with the theory of ODEs optimal control and functional analysis though an appendix is included that covers many of the necessary mathematical concepts

Modeling and Control of Complex Physical Systems Vincent Duindam, Alessandro Macchelli, Stefano Stramigioli, Herman Bruyninckx, 2009-10-15

Energy exchange is a major foundation of the dynamics of physical systems and hence in the study of complex multi domain systems methodologies that explicitly describe the topology of energy exchanges are instrumental in structuring the modeling and the computation of the system s dynamics and its control This book is the outcome of the European Project Geoplex FP5 IST 2001 34166 that studied and extended such system modeling and control methodologies This unique book starts from the basic concept of port based modeling and extends it to port Hamiltonian systems This generic paradigm is applied to various physical domains showing its power and unifying flexibility for real multi domain systems

Intelligent Engineering Systems and Computational Cybernetics J.A. Tenreiro Machado, Béla Pátkai, Imre J. Rudas, 2008-12-18

Engineering practice often has to deal with complex systems of multiple variable and multiple parameter models almost always with strong non linear coupling The conventional analytical techniques based approaches for describing and predicting the behaviour of such systems in many cases are doomed to failure from the outset even in the phase of the construction of a more or less appropriate mathematical model These approaches normally are too categorical in the sense that in the name of modelling accuracy they try to describe all the structural details of the real physical system to be modelled This can significantly increase the intricacy of the model and may result in a enormous computational burden without achieving considerable improvement of the solution The best paradigm exemplifying this situation may be the classic perturbation theory the less significant the achievable correction the more work has to be invested to obtain it A further important component of machine intelligence is a kind of structural uniformity giving room and possibility to model arbitrary particular details a priori not specified and unknown This idea is similar to the ready to wear industry which introduced products which can be slightly modified later on in contrast to tailor made creations aiming at maximum accuracy from the beginning These subsequent corrections can be carried out by machines automatically This learning ability is a key element of machine intelligence The past decade confirmed that the view of typical components of the present soft computing as fuzzy logic neural computing evolutionary computation and probabilistic reasoning are of complementary nature and that the best results can be applied by their combined application Today the two complementary branches of Machine Intelligence that is Artificial Intelligence and Computational Intelligence serve as the basis of Intelligent Engineering Systems The huge number of scientific results published in Journal and conference proceedings worldwide substantiates this statement The present

book contains several articles taking different viewpoints in the field of intelligent systems *Advanced Dynamics and Control of Structures and Machines* Hans Irschik, Kurt Schlacher, 2014-05-04 This book intended for people in engineering and fundamental sciences presents an integrated mathematical methodology for advanced dynamics and control of structures and machines ranging from the derivation of models up to the control synthesis problem This point of view is particularly useful as the physical insight and the associated structural properties related e g to the Lagrangian or Hamiltonian framework can be advantageously utilized To this end up to date results in disciplines like continuum mechanics analytical mechanics thermodynamics and electrodynamics are presented exploiting the differential geometric properties with the basic notions of this coordinate free approach revisited in an own chapter In order to illustrate the proposed methodologies several industrial applications e g the derivation of exact solutions for the deformation compensation by shaped actuation in elastic bodies or the coordination of rigid and flexible joint robots are discussed *Mathematical Control Theory I* M. Kanat Camlibel, A. Agung Julius, Ramkrishna Pasumathy, Jacqueliën M.A. Scherpen, 2015-07-15 This treatment of modern topics related to mathematical systems theory forms the proceedings of a workshop Mathematical Systems Theory From Behaviors to Nonlinear Control held at the University of Groningen in July 2015 The workshop celebrated the work of Professors Arjan van der Schaft and Harry Trentelman honouring their 60th Birthdays The first volume of this two volume work covers a variety of topics related to nonlinear and hybrid control systems After giving a detailed account of the state of the art in the related topic each chapter presents new results and discusses new directions As such this volume provides a broad picture of the theory of nonlinear and hybrid control systems for scientists and engineers with an interest in the interdisciplinary field of systems and control theory The reader will benefit from the expert participants ideas on exciting new approaches to control and system theory and their predictions of future directions for the subject that were discussed at the workshop *Proceedings of the Third World Conference on Structural Control* Fabio Casciati, 2003-03-14 Organized by the International Association for Structural Control IASC and sponsored by the European Association for the Control of Structures EACS the recent world conference on structural control 3WCSC brought together engineers scientists architects builders and other practitioners interested in the general fields of active hybrid and passive vibration control health monitoring and damage detection intelligent smart materials and systems Applications included buildings bridges space structures and civil infrastructures under the action of dynamic environments earthquake wind traffic and man made loads It provided a valuable forum for the discussion of the most pressing concerns in structural control and its related topics The conference covered a wide range of topics including active and semi active control devices passive control devices control algorithms for linear and non linear systems modeling and identification of structural systems sensors health monitoring and damage detection benchmark test of building and bridges innovative materials for structural control applications to aerospace structures applications to bridges applications to critical structures external dynamic force

characteristics and controllability issues implications of severe ground motions wind forces codes for structural control and so forth Such comprehensive treatment of the most innovative developments in structural control will make these volumes an informative reference for all researchers and engineers interested in this area Proceedings of the US Europe Workshop On Sensors and Smart Structures Technology Como and Somma Lombardo Italy In the last few years significant progress has been made in the area of sensing technology and structural health monitoring condition assessment in the US and Europe Innovative concepts involving new hardware algorithms and software have been proposed There have also been several full scale trial implementations of densely sensor instrumented infrastructures and health monitoring systems as well as case studies on bridges in Europe and in the US Much can be learnt through US European collaboration in the area of experimental verification on small medium large and full scale projects Moreover a common framework for expanded future joint research can be developed on the increased understanding achieved through mutual learning This workshop consisted of seminar sessions on several themes which included innovative sensing hardware advances in wireless technology and damage detection characterization and condition assessment methodologies In addition there were several workshop sessions devoted to summarizing the status of the sensors and smart structures technologies in these topics identifying the compelling research issues and formulating an action plan with recommendations for development and implementation through

possible collaborative research projects and sharing of scientific data **SIAM Journal on Control and Optimization** Society for Industrial and Applied Mathematics, 2005 Multi-point Interaction with Real and Virtual Objects Federico Barbagli, Domenico Prattichizzo, Kenneth Salisbury, 2005-07-07 The problem of robotic and virtual interaction with physical objects has been the subject of research for many years in both the robotic manipulation and haptics communities Both communities have focused much attention on human touch based perception and manipulation modelling contact between real or virtual hands and objects or mechanism design However as a whole these problems have not yet been addressed from a unified perspective This edited book is the outcome of a well attended workshop which brought together leading scholars from various branches of the robotics virtual reality and human studies communities during the 2004 IEEE International Conference on Robotics and Automation It covers some of the most challenging problems on the forefront of today's research on physical interaction with real and virtual objects with special emphasis on modelling contacts between objects grasp planning algorithms haptic perception and advanced design of hands devices and interfaces *Geometric Control of Mechanical Systems* Francesco Bullo, Andrew D. Lewis, 2019-06-12 The primary emphasis of this book is the modeling analysis and control of mechanical systems The methods and results presented can be applied to a large class of mechanical control systems including applications in robotics autonomous vehicle control and multi body systems The book is unique in that it presents a unified rather than an inclusive treatment of control theory for mechanical systems A distinctive feature of the presentation is its reliance on techniques from differential and Riemannian geometry The book contains extensive

examples and exercises and will be suitable for a growing number of courses in this area. It begins with the detailed mathematical background proceeding through innovative approaches to physical modeling analysis and design techniques. Numerous examples illustrate the proposed methods and results while the many exercises test basic knowledge and introduce topics not covered in the main body of the text. The audience of this book consists of two groups. The first group is comprised of graduate students in engineering or mathematical sciences who wish to learn the basics of geometric mechanics, nonlinear control theory and control theory for mechanical systems. Readers will be able to immediately begin exploring the research literature on these subjects. The second group consists of researchers in mechanics and control theory. Nonlinear control theoreticians will find explicit links between concepts in geometric mechanics and nonlinear control theory. Researchers in mechanics will find an overview of topics in control theory that have relevance to mechanics.

Hybrid Systems: Computation and Control Rupak Majumdar, Paulo Tabuada, 2009-03-27. This book constitutes the refereed proceedings of the 12th International Conference on Hybrid Systems Computation and Control HSCC 2009 held in San Francisco CA USA in April 2009. The 30 revised full papers and 10 revised short papers presented were carefully reviewed and selected from numerous submissions for inclusion in the book. The papers focus on research in embedded reactive systems involving the interplay between symbolic discrete and continuous dynamical behaviors and feature the latest developments of applications and theoretical advancements in the analysis design control optimization and implementation of hybrid systems.

Proceedings of the IUTAM Symposium on Nonlinear Dynamics for Design of Mechanical Systems Across Different Length/Time Scales Hiroshi Yabuno, Walter Lacarbonara, Balakumar Balachandran, Alexander Fidlin, Giuseppe Rega, Masaharu Kuroda, Shinichi Maruyama, 2025-01-07. This book presents insights from the IUTAM Symposium on Nonlinear Dynamics for Design of Mechanical Systems Across Different Length Time Scales. It covers a diverse array of topics including applications of parametric amplification and self excitation as well as the design and analysis of devices and systems that harness geometric and material nonlinearities. The book features chapters on nonlinear energy transfer eigenfrequency detection through subharmonic and superharmonic resonances and the innovative use of nonlinear mode localization. The authors explore dynamic stabilization under high frequency excitation, the utilization of multimode interactions and nonlinear normal modes and the application of nonlinear resonance and bifurcation in creating ultrasensitive sensors and high performance actuators. This book provides a comprehensive record of the symposium's discussions representing a collective effort to expand our understanding of nonlinear phenomena and its potential to reshape the landscape of mechanical system design.

This book delves into Lagrangian And Hamiltonian Methods In Nonlinear Control 2003 Workshop. Lagrangian And Hamiltonian Methods In Nonlinear Control 2003 Workshop is an essential topic that needs to be grasped by everyone, ranging from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Lagrangian And Hamiltonian Methods In Nonlinear Control 2003 Workshop, encompassing both the fundamentals and more intricate discussions.

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