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Hybrid Systems, Optimal Control and Hybrid Vehicles - Thomas J. Böhme 2017-02-01 This book assembles new methods showing the automotive engineer for the first time how hybrid vehicle configurations can be modeled as systems with discrete and continuous controls. These hybrid systems describe naturally and compactly the networks of embedded systems which use elements such as integrators, hysteresis, state-machines and logical rules to describe the evolution of continuous and discrete dynamics and arise inevitably when modeling hybrid electric vehicles. They can throw light on systems which may otherwise be too complex or recondite. Hybrid Systems, Optimal Control and Hybrid Vehicles shows the reader how to formulate and solve control problems which satisfy multiple objectives which may be arbitrary and complex with contradictory influences on fuel consumption, emissions and drivability. The text introduces industrial engineers, postgraduates and researchers to the theory of hybrid optimal control problems. A series of novel algorithmic developments provides tools for solving engineering problems of growing complexity in the field of hybrid vehicles. Important topics of real relevance rarely found in text books and research publications—switching costs, sensitivity of discrete decisions and there impact on fuel savings, etc.—are discussed and supported with practical applications. These demonstrate the contribution of optimal hybrid control in predictive energy management, advanced powertrain calibration, and the optimization of vehicle configuration with respect to fuel economy, lowest emissions and smoothest drivability. Numerical issues such as computing resources, simplifications and stability are treated to enable readers to assess such complex systems. To help industrial engineers and managers with project decision-making, solutions for many important problems in hybrid vehicle control are provided in terms of

requirements, benefits and risks.

Applications of Optimal Control Theory to Computer Controller Design - William S. Widnall 1968

Foundations of Dynamic Economic Analysis - Michael R. Caputo 2005-01-10
Foundations of Dynamic Economic Analysis presents a modern and thorough exposition of the fundamental mathematical formalism used to study optimal control theory, i.e., continuous time dynamic economic processes, and to interpret dynamic economic behavior. The style of presentation, with its continual emphasis on the economic interpretation of mathematics and models, distinguishes it from several other excellent texts on the subject. This approach is aided dramatically by introducing the dynamic envelope theorem and the method of comparative dynamics early in the exposition. Accordingly, motivated and economically revealing proofs of the transversality conditions come about by use of the dynamic envelope theorem. Furthermore, such sequencing of the material naturally leads to the development of the primal-dual method of comparative dynamics and dynamic duality theory, two modern approaches used to tease out the empirical content of optimal control models. The stylistic approach ultimately draws attention to the empirical richness of optimal control theory, a feature missing in virtually all other textbooks of this type.

Optimal Control Theory with Applications in Economics - Thomas A. Weber 2016

Modeling and Optimization in Space Engineering - Giorgio Fasano 2012-10-23
This volume presents a selection of advanced case studies that address a substantial range of issues and challenges arising in space engineering. The contributing authors are well-recognized researchers and practitioners in space engineering and in applied optimization.

The key mathematical modeling and numerical solution aspects of each application case study are presented in sufficient detail. Classic and more recent space engineering problems – including cargo accommodation and object placement, flight control of satellites, integrated design and trajectory optimization, interplanetary transfers with deep space manoeuvres, low energy transfers, magnetic cleanliness modeling, propulsion system design, sensor system placement, systems engineering, space traffic logistics, and trajectory optimization – are discussed. Novel points of view related to computational global optimization and optimal control, and to multidisciplinary design optimization are also given proper emphasis. A particular attention is paid also to scenarios expected in the context of future interplanetary explorations. Modeling and Optimization in Space Engineering will benefit researchers and practitioners working on space engineering applications. Academics, graduate and post-graduate students in the fields of aerospace and other engineering, applied mathematics, operations research and optimal control will also find the book useful, since it discusses a range of advanced model development and solution techniques and tools in the context of real-world applications and new challenges.

Optimal Control Theory and Static Optimization in Economics - Daniel Léonard 1992-01-31 Optimal control theory is a technique being used increasingly by academic economists to study problems involving optimal decisions in a multi-period framework. This textbook is designed to make the difficult subject of optimal control theory easily accessible to economists while at the same time maintaining rigour. Economic intuitions are emphasized, and examples and problem sets covering a wide range of applications in economics are provided to assist in the learning process. Theorems are clearly stated and their proofs are carefully explained.

The development of the text is gradual and fully integrated, beginning with simple formulations and progressing to advanced topics such as control parameters, jumps in state variables, and bounded state space. For greater economy and elegance, optimal control theory is introduced directly, without recourse to the calculus of variations. The connection with the latter and with dynamic programming is explained in a separate chapter. A second purpose of the book is to draw the parallel between optimal control theory and static optimization. Chapter 1 provides an extensive treatment of constrained and unconstrained maximization, with emphasis on economic insight and applications. Starting from basic concepts, it derives and explains important results, including the envelope theorem and the method of comparative statics. This chapter may be used for a course in static optimization. The book is largely self-contained. No previous knowledge of differential equations is required.

Applied Control - S. G. Tzafestas 1993-04-29
This book provides a representative set of modern methodologies and applications, including new topics in the field, discussing a wide range of issues and treating them in depth. The book describes analytical processes for fault diagnosis of automatic control systems, examines modern sensors and actuators as well as measurement techniques, considers multidimensional feedback control and image restoration procedures, among other topics.

Control and Mechatronics - Bodgan Wilamowski 2018-10-08
The Industrial Electronics Handbook, Second Edition combines traditional and newer, more specialized knowledge that will help industrial electronics engineers develop practical solutions for the design and implementation of high-power applications. Embracing the broad technological scope of the field, this collection explores fundamental areas, including analog and digital circuits, electronics, electromagnetic machines,

signal processing, and industrial control and communications systems. It also facilitates the use of intelligent systems—such as neural networks, fuzzy systems, and evolutionary methods—in terms of a hierarchical structure that makes factory control and supervision more efficient by addressing the needs of all production components. Enhancing its value, this fully updated collection presents research and global trends as published in the IEEE Transactions on Industrial Electronics Journal, one of the largest and most respected publications in the field. Control and Mechatronics presents concepts of control theory in a way that makes them easily understandable and practically useful for engineers or students working with control system applications. Focusing more on practical applications than on mathematics, this book avoids typical theorems and proofs and instead uses plain language and useful examples to: Concentrate on control system analysis and design, comparing various techniques Cover estimation, observation, and identification of the objects to be controlled—to ensure accurate system models before production Explore the various aspects of robotics and mechatronics Other volumes in the set: Fundamentals of Industrial Electronics Power Electronics and Motor Drives Industrial Communication Systems Intelligent Systems

Theory and Applications of Dynamic Games - Elena Parilina 2022-11-23 This textbook provides a comprehensive overview of noncooperative and cooperative dynamic games involving uncertain parameter values, with the stochastic process being described by an event tree. Primarily intended for graduate students of economics, management science and engineering, the book is self-contained, as it defines and illustrates all relevant concepts originally introduced in static games before extending them to a dynamic framework. It subsequently addresses the

sustainability of cooperative contracts over time and introduces a range of mechanisms to help avoid such agreements breaking down before reaching maturity. To illustrate the concepts discussed, the book provides various examples of how dynamic games played over event trees can be applied to environmental economics, management science, and engineering.

Stochastic Linear-Quadratic Optimal Control Theory: Open-Loop and Closed-Loop Solutions - Jingrui Sun 2020-06-29
This book gathers the most essential results, including recent ones, on linear-quadratic optimal control problems, which represent an important aspect of stochastic control. It presents the results in the context of finite and infinite horizon problems, and discusses a number of new and interesting issues. Further, it precisely identifies, for the first time, the interconnections between three well-known, relevant issues – the existence of optimal controls, solvability of the optimality system, and solvability of the associated Riccati equation. Although the content is largely self-contained, readers should have a basic grasp of linear algebra, functional analysis and stochastic ordinary differential equations. The book is mainly intended for senior undergraduate and graduate students majoring in applied mathematics who are interested in stochastic control theory. However, it will also appeal to researchers in other related areas, such as engineering, management, finance/economics and the social sciences.

Optimal Control Applied to Biological Models - Suzanne Lenhart 2007-05-07
From economics and business to the biological sciences to physics and engineering, professionals successfully use the powerful mathematical tool of optimal control to make management and strategy decisions. Optimal Control Applied to Biological Models thoroughly develops the mathematical aspects of optimal control theory and provides insight into the

application of this theory to biological models. Focusing on mathematical concepts, the book first examines the most basic problem for continuous time ordinary differential equations (ODEs) before discussing more complicated problems, such as variations of the initial conditions, imposed bounds on the control, multiple states and controls, linear dependence on the control, and free terminal time. In addition, the authors introduce the optimal control of discrete systems and of partial differential equations (PDEs). Featuring a user-friendly interface, the book contains fourteen interactive sections of various applications, including immunology and epidemic disease models, management decisions in harvesting, and resource allocation models. It also develops the underlying numerical methods of the applications and includes the MATLAB® codes on which the applications are based. Requiring only basic knowledge of multivariable calculus, simple ODEs, and mathematical models, this text shows how to adjust controls in biological systems in order to achieve proper outcomes.

The Koopman Operator in Systems and Control - Alexandre Mauroy 2020-02-22
This book provides a broad overview of state-of-the-art research at the intersection of the Koopman operator theory and control theory. It also reviews novel theoretical results obtained and efficient numerical methods developed within the framework of Koopman operator theory. The contributions discuss the latest findings and techniques in several areas of control theory, including model predictive control, optimal control, observer design, systems identification and structural analysis of controlled systems, addressing both theoretical and numerical aspects and presenting open research directions, as well as detailed numerical schemes and data-driven methods. Each contribution addresses a specific problem. After a brief introduction of the Koopman operator framework, including basic notions and

definitions, the book explores numerical methods, such as the dynamic mode decomposition (DMD) algorithm and Arnoldi-based methods, which are used to represent the operator in a finite-dimensional basis and to compute its spectral properties from data. The main body of the book is divided into three parts: theoretical results and numerical techniques for observer design, synthesis analysis, stability analysis, parameter estimation, and identification; data-driven techniques based on DMD, which extract the spectral properties of the Koopman operator from data for the structural analysis of controlled systems; and Koopman operator techniques with specific applications in systems and control, which range from heat transfer analysis to robot control. A useful reference resource on the Koopman operator theory for control theorists and practitioners, the book is also of interest to graduate students, researchers, and engineers looking for an introduction to a novel and comprehensive approach to systems and control, from pure theory to data-driven methods.

A Primer on the Calculus of Variations and Optimal Control Theory - Mike Mesterton-Gibbons 2009
The calculus of variations is used to find functions that optimize quantities expressed in terms of integrals. Optimal control theory seeks to find functions that minimize cost integrals for systems described by differential equations. This book is an introduction to both the classical theory of the calculus of variations and the more modern developments of optimal control theory from the perspective of an applied mathematician. It focuses on understanding concepts and how to apply them. The range of potential applications is broad: the calculus of variations and optimal control theory have been widely used in numerous ways in biology, criminology, economics, engineering, finance, management science, and physics. Applications

described in this book include cancer chemotherapy, navigational control, and renewable resource harvesting. The prerequisites for the book are modest: the standard calculus sequence, a first course on ordinary differential equations, and some facility with the use of mathematical software. It is suitable for an undergraduate or beginning graduate course, or for self study. It provides excellent preparation for more advanced books and courses on the calculus of variations and optimal control theory.

Structural Dynamics and Resilience in Supply Chain Risk Management - Dmitry Ivanov 2017-11-07
This book offers an introduction to structural dynamics, ripple effect and resilience in supply chain disruption risk management for larger audiences. In the management section, without relying heavily on mathematical derivations, the book offers state-of-the-art concepts and methods to tackle supply chain disruption risks

and designing resilient supply chains in a simple, predictable format to make it easy to understand for students and professionals with both management and engineering background. In the technical section, the book constitutes structural dynamics control methods for supply chain management. Real-life problems are modelled and solved with the help of mathematical programming, discrete-event simulation, optimal control theory, and fuzzy logic. The book derives practical recommendations for management decision-making with disruption risk in the following areas: How to estimate the impact of possible disruptions on performance in the pro-active stage? How to generate efficient and effective stabilization and recovery policies? When does one failure trigger an adjacent set of failures? Which supply chain structures are particular sensitive to ripple effect? How to measure the disruption risks in the supply chain?
Optimal Control Theory - Suresh P. Sethi

2022-01-03
This new 4th edition offers an introduction to optimal control theory and its diverse applications in management science and economics. It introduces students to the concept of the maximum principle in continuous (as well as discrete) time by combining dynamic programming and Kuhn-Tucker theory. While some mathematical background is needed, the emphasis of the book is not on mathematical rigor, but on modeling realistic situations encountered in business and economics. It applies optimal control theory to the functional areas of management including finance, production and marketing, as well as the economics of growth and of natural resources. In addition, it features material on stochastic Nash and Stackelberg differential games and an adverse selection model in the principal-agent framework. Exercises are included in each chapter, while the answers to selected exercises help deepen readers' understanding of the material covered. Also included are appendices of supplementary material on the solution of differential equations, the calculus of variations and its ties to the maximum principle, and special topics including the Kalman filter, certainty equivalence, singular control, a global saddle point theorem, Sethi-Skiba points, and distributed parameter systems. Optimal control methods are used to determine optimal ways to control a dynamic system. The theoretical work in this field serves as the foundation for the book, in which the author applies it to business management problems developed from his own research and classroom instruction. The new edition has been refined and updated, making it a valuable resource for graduate courses on applied optimal control theory, but also for financial and industrial engineers, economists, and operational researchers interested in applying dynamic optimization in their fields.

Optimal Control Systems - D. Subbaram Naidu 2018-10-03

The theory of optimal control systems has grown and flourished since the 1960's. Many texts, written on varying levels of sophistication, have been published on the subject. Yet even those purportedly designed for beginners in the field are often riddled with complex theorems, and many treatments fail to include topics that are essential to a thorough grounding in the various aspects of and approaches to optimal control. Optimal Control Systems provides a comprehensive but accessible treatment of the subject with just the right degree of mathematical rigor to be complete but practical. It provides a solid bridge between "traditional" optimization using the calculus of variations and what is called "modern" optimal control. It also treats both continuous-time and discrete-time optimal control systems, giving students a firm grasp on both methods. Among this book's most outstanding features is a summary table that accompanies each topic or problem and includes a statement of the problem with a step-by-step solution. Students will also gain valuable experience in using industry-standard MATLAB and SIMULINK software, including the Control System and Symbolic Math Toolboxes. Diverse applications across fields from power engineering to medicine make a foundation in optimal control systems an essential part of an engineer's background. This clear, streamlined presentation is ideal for a graduate level course on control systems and as a quick reference for working engineers.

Controlled Markov Processes and Viscosity Solutions - Wendell H. Fleming 2006-02-04 This book is an introduction to optimal stochastic control for continuous time Markov processes and the theory of viscosity solutions. It covers dynamic programming for deterministic optimal control problems, as well as to the corresponding theory of viscosity solutions. New chapters in this second edition introduce the role of stochastic optimal control in portfolio optimization and in pricing derivatives in

incomplete markets and two-controller, zero-sum differential games.

Optimal Control and Dynamic Games -
Christophe Deissenberg 2008-11-01 Optimal Control and Dynamic Games has been edited to honor the outstanding contributions of Professor Suresh Sethi in the fields of Applied Optimal Control. Professor Sethi is internationally one of the foremost experts in this field. He is, among others, co-author of the popular textbook "Sethi and Thompson: Optimal Control Theory: Applications to Management Science and Economics". The book consists of a collection of essays by some of the best known scientists in the field, covering diverse aspects of applications of optimal control and dynamic games to problems in Finance, Management Science, Economics, and Operations Research. In doing so, it provides both a state-of-the-art overview over recent developments in the field, and a reference work covering the wide variety of contemporary questions that can be addressed with optimal control tools, and demonstrates the fruitfulness of the methodology.

Adaptive Stochastic Optimization Techniques with Applications - James A.
Momoh 2015-12-02 Adaptive Stochastic Optimization Techniques with Applications provides a single, convenient source for state-of-the-art information on optimization techniques used to solve problems with adaptive, dynamic, and stochastic features. Presenting modern advances in static and dynamic optimization, decision analysis, intelligent systems, evolutionary pro
Uncertain Optimal Control - Yuanguo Zhu 2018-08-29 This book introduces the theory and applications of uncertain optimal control, and establishes two types of models including expected value uncertain optimal control and optimistic value uncertain optimal control. These models, which have continuous-time forms and discrete-time

forms, make use of dynamic programming. The uncertain optimal control theory relates to equations of optimality, uncertain bang-bang optimal control, optimal control with switched uncertain system, and optimal control for uncertain system with time-delay. Uncertain optimal control has applications in portfolio selection, engineering, and games. The book is a useful resource for researchers, engineers, and students in the fields of mathematics, cybernetics, operations research, industrial engineering, artificial intelligence, economics, and management science.

Calculus of Variations and Optimal Control Theory - Daniel Liberzon 2011-12-19 This textbook offers a concise yet rigorous introduction to calculus of variations and optimal control theory, and is a self-contained resource for graduate students in engineering, applied mathematics, and related subjects. Designed specifically for a one-semester course, the book begins with calculus of variations, preparing the ground for optimal control. It then gives a complete proof of the maximum principle and covers key topics such as the Hamilton-Jacobi-Bellman theory of dynamic programming and linear-quadratic optimal control. Calculus of Variations and Optimal Control Theory also traces the historical development of the subject and features numerous exercises, notes and references at the end of each chapter, and suggestions for further study. Offers a concise yet rigorous introduction Requires limited background in control theory or advanced mathematics Provides a complete proof of the maximum principle Uses consistent notation in the exposition of classical and modern topics Traces the historical development of the subject Solutions manual (available only to teachers) Leading universities that have adopted this book include: University of Illinois at Urbana-Champaign ECE 553: Optimum Control Systems Georgia Institute of Technology ECE 6553: Optimal Control and Optimization University of

Pennsylvania ESE 680: Optimal Control Theory University of Notre Dame EE 60565: Optimal Control

Optimal Control Applied to Biological Models - Suzanne Lenhart 2007-05-07
From economics and business to the biological sciences to physics and engineering, professionals successfully use the powerful mathematical tool of optimal control to make management and strategy decisions. Optimal Control Applied to Biological Models thoroughly develops the mathematical aspects of optimal control theory and provides insight into the application of this theory to biological models. Focusing on mathematical concepts, the book first examines the most basic problem for continuous time ordinary differential equations (ODEs) before discussing more complicated problems, such as variations of the initial conditions, imposed bounds on the control, multiple states and controls, linear dependence on the control, and free terminal time. In addition, the authors introduce the optimal control of discrete systems and of partial differential equations (PDEs). Featuring a user-friendly interface, the book contains fourteen interactive sections of various applications, including immunology and epidemic disease models, management decisions in harvesting, and resource allocation models. It also develops the underlying numerical methods of the applications and includes the MATLAB® codes on which the applications are based. Requiring only basic knowledge of multivariable calculus, simple ODEs, and mathematical models, this text shows how to adjust controls in biological systems in order to achieve proper outcomes.

Optimization in Control Applications - Guillermo Valencia-Palomo 2019-01-10
This book is a printed edition of the Special Issue "Optimization in Control Applications" that was published in MCA

Differential Games in Marketing - Steffen Jørgensen 2012-12-06

Game theory has proven useful to represent and conceptualize problems of conflict and cooperation in a formal way, and to predict the outcome of such situations. Differential games are dynamic games that are particularly designed to study systems where observations and decisions are made in real time. The book conveys to the reader the state of the art of research in marketing applications of differential game theory. This research started about 25 years ago and the literature has now reached an extent and a maturity that makes it natural to take stock. The book deals with differential games in advertising, pricing, and marketing channels, as well as with marketing-production and pricing-advertising interfaces. It provides also a tutorial on main concepts in differential games.

Handbook of Reinforcement Learning and Control - Kyriakos G. Vamvoudakis 2021-06-23 This handbook presents state-of-the-art research in reinforcement learning, focusing on its applications in the control and game theory of dynamic systems and future directions for related research and technology. The contributions gathered in this book deal with challenges faced when using learning and adaptation methods to solve academic and industrial problems, such as optimization in dynamic environments with single and multiple agents, convergence and performance analysis, and online implementation. They explore means by which these difficulties can be solved, and cover a wide range of related topics including: deep learning; artificial intelligence; applications of game theory; mixed modality learning; and multi-agent reinforcement learning. Practicing engineers and scholars in the field of machine learning, game theory, and autonomous control will find the Handbook of Reinforcement Learning and Control to be thought-provoking, instructive and informative.

Dynamic Optimization, Second Edition - Morton I. Kamien 2013-04-17

Since its initial publication, this text has defined courses in dynamic optimization taught to economics and management science students. The two-part treatment covers the calculus of variations and optimal control. 1998 edition.

Modeling Paradigms and Analysis of Disease Transmission Models - Abba B. Gumel 2010
This volume stems from two DIMACS activities, the U.S.-Africa Advanced Study Institute and the DIMACS Workshop, both on Mathematical Modeling of Infectious Diseases in Africa, held in South Africa in the summer of 2007. It contains both tutorial papers and research papers. Students and researchers should find the papers on modeling and analyzing certain diseases currently affecting Africa very informative. In particular, they can learn basic principles of disease modeling and stability from the tutorial papers where continuous and discrete time models, optimal control, and stochastic features are introduced.

Mathematical Control Theory - Eduardo D. Sontag 2013-11-21
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.

Application of Optimal Control Theory to Enhanced Oil Recovery - W. Fred Ramirez 1987-01-01

In recent years, enhanced oil recovery techniques have received much attention in the oil industry. Enhanced oil recovery methods can be divided into three major categories: thermal processes which include steam flooding, steam stimulation, and in-situ combustion; chemical processes which include surfactant-polymer injection, polymer flooding, and caustic flooding; and miscible displacement processes which include miscible hydrocarbon displacement, carbon dioxide injection of large amounts of rather expensive fluids into oil bearing reservoir formations. Commercial application of any enhanced oil recovery process relies upon economic projections that show a decent return on the investment. Because of high chemical costs, it is important to optimize enhanced oil recovery processes to provide the greatest recovery at the lowest chemical injection cost. The aim of this book is to develop an optimal control theory for the determination of operating strategies that maximize the economic attractiveness of enhanced oil recovery processes. The determination of optimal control histories or operating strategies is one of the key elements in the successful usage of new enhanced oil recovery techniques. The information contained in the book will therefore be both interesting and useful to all those working in petroleum engineering, petroleum management and chemical engineering.

Proceedings of the 4th International Conference on Electrical Engineering and Control Applications - Sofiane Bououden 2020-09-29

This book gathers papers presented during the 4th International Conference on Electrical Engineering and Control Applications. It covers new control system models, troubleshooting tips

and complex system requirements, such as increased speed, precision and remote capabilities. Additionally, the papers discuss not only the engineering aspects of signal processing and various practical issues in the broad field of information transmission, but also novel technologies for communication networks and modern antenna design. This book is intended for researchers, engineers and advanced postgraduate students in the fields of control and electrical engineering, computer science and signal processing, as well as mechanical and chemical engineering.

Calculus of Variations and Optimal Control Theory - Daniel Liberzon 2012
This textbook offers a concise yet rigorous introduction to calculus of variations and optimal control theory, and is a self-contained resource for graduate students in engineering, applied mathematics, and related subjects. Designed specifically for a one-semester course, the book begins with calculus of variations, preparing the ground for optimal control. It then gives a complete proof of the maximum principle and covers key topics such as the Hamilton-Jacobi-Bellman theory of dynamic programming and linear-quadratic optimal control. Calculus of Variations and Optimal Control Theory also traces the historical development of the subject and features numerous exercises, notes and references at the end of each chapter, and suggestions for further study. Offers a concise yet rigorous introduction Requires limited background in control theory or advanced mathematics Provides a complete proof of the maximum principle Uses consistent notation in the exposition of classical and modern topics Traces the historical development of the subject Solutions manual (available only to teachers) Leading universities that have adopted this book include: University of Illinois at Urbana-Champaign ECE 553: Optimum Control Systems Georgia Institute of Technology ECE 6553: Optimal Control and Optimization University of

Pennsylvania ESE 680: Optimal Control Theory University of Notre Dame EE 60565: Optimal Control

Optimal Control Theory - Zhongjing Ma 2021 This book focuses on how to implement optimal control problems via the variational method. It studies how to implement the extrema of functional by applying the variational method and covers the extrema of functional with different boundary conditions, involving multiple functions and with certain constraints etc. It gives the necessary and sufficient condition for the (continuous-time) optimal control solution via the variational method, solves the optimal control problems with different boundary conditions, analyzes the linear quadratic regulator & tracking problems respectively in detail, and provides the solution of optimal control problems with state constraints by applying the Pontryagin's minimum principle which is developed based upon the calculus of variations. And the developed results are applied to implement several classes of popular optimal control problems and say minimum-time, minimum-fuel and minimum-energy problems and so on. As another key branch of optimal control methods, it also presents how to solve the optimal control problems via dynamic programming and discusses the relationship between the variational method and dynamic programming for comparison. Concerning the system involving individual agents, it is also worth to study how to implement the decentralized solution for the underlying optimal control problems in the framework of differential games. The equilibrium is implemented by applying both Pontryagin's minimum principle and dynamic programming. The book also analyzes the discrete-time version for all the above materials as well since the discrete-time optimal control problems are very popular in many fields.
Proceedings of Seventh International Conference on Bio-Inspired Computing: Theories

and Applications (BIC-TA 2012) - Jagdish C. Bansal 2012-12-04
The book is a collection of high quality peer reviewed research papers presented in Seventh International Conference on Bio-Inspired Computing (BIC-TA 2012) held at ABV-IIITM Gwalior, India. These research papers provide the latest developments in the broad area of "Computational Intelligence". The book discusses wide variety of industrial, engineering and scientific applications of nature/bio-inspired computing and presents invited papers from the inventors/originators of novel computational techniques.

Optimal Control Theory - Suresh P. Sethi 2005-09-06
Optimal control methods are used to determine optimal ways to control a dynamic system. The theoretical work in this field serves as a foundation for the book, which the authors have applied to business management problems developed from their research and classroom instruction. Sethi and Thompson have provided management science and economics communities with a thoroughly revised edition of their classic text on Optimal Control Theory. The new edition has been completely refined with careful attention to the text and graphic material presentation. Chapters cover a range of topics including finance, production and inventory problems, marketing problems, machine maintenance and replacement, problems of optimal consumption of natural resources, and applications of control theory to economics. The book contains new results that were not available when the first edition was published, as well as an expansion of the material on stochastic optimal control theory.

Stochastic Processes, Optimization, and Control Theory: Applications in Financial Engineering, Queueing Networks, and Manufacturing Systems - Houmin Yan 2006-09-10
This edited volume contains 16 research articles.

It presents recent and pressing issues in stochastic processes, control theory, differential games, optimization, and their applications in finance, manufacturing, queueing networks, and climate control. One of the salient features is that the book is highly multi-disciplinary. The book is dedicated to Professor Suresh Sethi on the occasion of his 60th birthday, in view of his distinguished career.

Dynamic Systems And Control With Applications - Ahmed Nasir Uddin 2006-08-29
In recent years significant applications of systems and control theory have been witnessed in diversed areas such as physical sciences, social sciences, engineering, management and finance. In particular the most interesting applications have taken place in areas such as aerospace, buildings and space structure, suspension bridges, artificial heart, chemotherapy, power system, hydrodynamics and computer communication networks. There are many prominent areas of systems and control theory that include systems governed by linear and nonlinear ordinary differential equations, systems governed by partial differential equations including their stochastic counter parts and, above all, systems governed by abstract differential and functional differential equations and inclusions on Banach spaces, including their stochastic counterparts. The objective of this book is to present a small segment of theory and applications of systems and control governed by ordinary differential equations and inclusions. It is expected that any reader who has absorbed the materials presented here would have no difficulty to reach the core of current research.

Differential Games in Industrial Economics - Luca Lambertini 2018-04-26
A comprehensive and self-contained exposition of the applications of optimal control and differential game theory to industrial organisation and trade.

Optimization And Optimal Control - Panos M

Pardalos 2003-09-25
This volume gives the latest advances in optimization and optimal control which are the main part of applied mathematics. It covers various topics of optimization, optimal control and operations research.

Optimal Control of Nonlinear Processes - Dieter Grass 2008-07-24
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 Pontryagin's 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.

Differential Games in Economics and Management Science - Engelbert J. Dockner 2000-11-16
A comprehensive, self-contained survey of the theory and applications of differential games, one of the most commonly used tools for modelling and analysing economics and management problems which are characterised by both multiperiod and strategic decision making. Although no prior knowledge of game theory is required, a basic knowledge of linear algebra, ordinary differential equations, mathematical programming and probability theory is necessary. Part One presents the theory of differential games, starting with the basic concepts of game theory and going on to cover control theoretic models, Markovian equilibria with simultaneous play, differential games with hierarchical play, trigger strategy equilibria, differential games with special

structures, and stochastic differential games. Part Two offers applications to capital accumulation games, industrial organization and oligopoly games, marketing, resources and environmental economics.