Optimal Control Theory: Applications To Management Science

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.

Optimal Control Theory-Suresh P. Sethi 2018-11-28 This fully revised 3rd edition offers an
introduction to optimal control theory and its diverse applications in management science and economics. It brings to students the concept of the maximum principle in continuous, as well as discrete, time by using 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 faced in business and economics. The book exploits optimal control theory to the functional areas of management including finance, production and marketing and to economics of growth and of natural resources. In addition, this new edition features materials on stochastic Nash and Stackelberg differential games and an adverse selection model in the principal-agent framework. The book provides exercises for each chapter and answers to selected exercises to help deepen the understanding of the material presented. Also included are appendices comprised of supplementary material on the solution of differential equations, the calculus of variations and its relationships 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 a foundation for the book, which the author has applied to business management problems developed from his research and classroom instruction. The new edition has been completely refined and brought up to date. Ultimately this should continue to be a valuable resource for graduate courses on applied optimal control theory, but also for financial and industrial engineers, economists, and operational researchers concerned with the application of dynamic optimization in their fields.

Optimal Control Theory with Applications in Economics-Thomas A. Weber 2011 A rigorous introduction to optimal control theory, with an emphasis on applications in economics. This book bridges optimal control theory and economics, discussing ordinary differential equations, optimal control, game theory, and mechanism design in one volume. Technically rigorous and largely self-contained, it provides an introduction to the use of optimal control theory for deterministic continuous-time systems in economics. The theory of ordinary differential equations (ODEs) is the backbone of the theory developed in the book, and chapter 2 offers a detailed review of basic concepts in the theory of ODEs, including the solution of systems of linear ODEs, state-space analysis, potential functions, and stability analysis. Following this, the book covers the main results of optimal control theory, in particular necessary and sufficient optimality conditions; game theory, with an emphasis on differential games; and the application of control-theoretic concepts to the design of economic mechanisms. Appendixes provide a mathematical review and full solutions to all end-of-chapter problems. The material is presented at three levels: single-person decision making; games, in which a group of decision makers interact strategically; and mechanism design, which is concerned with a designer's creation of an environment in which players interact to maximize the designer's objective. The book focuses on applications; the problems are an integral part of the text. It is intended for use as a textbook or reference for graduate students, teachers, and researchers interested in applications of control theory beyond its classical use in economic growth. The book will also appeal to readers interested in a modeling approach to certain practical problems involving dynamic continuous-time models.

Optimal control theory-Suresh P. Sethi 1981


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 and Static Optimization in Economics-Daniel Léonard 1992-01-31 This textbook is designed to make the difficult subject of optimal control theory accessible to economists while maintaining rigour.

Optimal Control Theory with Economic Applications-A. Seierstad 1987-02-15 This book serves not only as an introduction, but also as an advanced text and reference source in the field of deterministic optimal control systems governed by ordinary differential equations. It also includes an introduction to the classical calculus of variations. An important feature of the book is the inclusion of a large number of examples, in which the theory is applied to a wide variety of economics problems. The presentation of simple models helps illuminate pertinent qualitative and analytic points, useful when confronted with a more complex reality. These models cover: economic growth in both open and closed economies, exploitation of (non-) renewable resources, pollution control, behaviour of firms, and differential games. A great emphasis on precision pervades the book, setting it apart from the bulk of literature in this area. The rigorous techniques presented should help the reader avoid errors which often recur in the application of control theory within economics.

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.

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.
Optimal Control Theory for Applications - David G. Hull

The published material represents the outgrowth of teaching analytical optimization to aerospace engineering graduate students. To make the material available to the widest audience, the prerequisites are limited to calculus and differential equations. It is also a book about the mathematical aspects of optimal control theory. It was developed in an engineering environment from material learned by the author while applying it to the solution of engineering problems. One goal of the book is to help engineering graduate students learn the fundamentals which are needed to apply the methods to engineering problems. The examples are from geometry and elementary dynamical systems so that they can be understood by all engineering students. Another goal of this text is to unify optimization by using the differential of calculus to create the Taylor series expansions needed to derive the optimality conditions of optimal control theory.

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

1968

Optimal Control - William W. Hager

February 27 - March 1, 1997, the conference Optimal Control: The ory, Algorithms, and Applications took place at the University of Florida, hosted by the Center for Applied Optimization. The conference brought together researchers from universities, industry, and government laboratories in the United States, Germany, Italy, France, Canada, and Sweden. There were forty-five invited talks, including seven talks by students. The conference was sponsored by the National Science Foundation and endorsed by the SIAM Activity Group on Control and Systems Theory, the Mathematical Programming Society, the International Federation for Information Processing (IFIP), and the International Association for Mathematics and Computers in Simulation (IMACS). Since its inception in the 1940s and 1950s, Optimal Control has been closely connected to industrial applications, starting with aerospace. The program for the Gainesville conference, which reflected the rich cross-disciplinary flavor of the field, included aerospace applications as well as both novel and emerging applications to superconductors, diffractive optics, non linear optics, structural analysis, bioreactors, corrosion detection, acoustic flow, process design in chemical engineering, hydroelectric power plants, sterilization of canned foods, robotics, and thermoelastic plates and shells. The three days of the conference were organized around the three conference themes, theory, algorithms, and applications. This book is a collection of the papers presented at the Gainesville conference. We would like to thank the sponsors and participants of the conference, the authors, the referees, and the publisher for making this volume possible.

Global Methods in Optimal Control Theory - Vadim Krotov

1995-10-13

This work describes all basic equations and inequalities that form the necessary and sufficient optimality conditions of variational calculus and the theory of optimal control. Subjects addressed include developments in the investigation of optimality conditions, new classes of solutions, analytical and computation methods, and applications.

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.

**Optimal Control and Dynamic Games** by Christophe Deissenberg 2006-03-30

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.

**Optimal Control Applied to Biological Models** by 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.

**Introduction to Optimal Control Theory** by Jack Macki 2012-12-06

This monograph is an introduction to optimal control theory for systems governed by vector ordinary differential equations. It is not intended as a state-of-the-art handbook for researchers. We have tried to keep two types of reader in mind: (1) mathematicians, graduate students, and advanced undergraduates in mathematics who want a concise introduction to a field which contains nontrivial interesting applications of mathematics (for example, weak convergence, convexity, and the theory of ordinary differential equations); (2) economists, applied scientists, and engineers who want to understand some of the mathematical foundations of optimal control theory. In general, we have emphasized motivation and explanation, avoiding the "definition-axiom-theorem-proof" approach. We make use of a large number of examples, especially one simple canonical example which we carry through the entire book. In proving theorems, we often just prove the simplest case, then state the more general results which can be proved. Many of the more difficult topics are discussed in the "Notes" sections.
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at the end of chapters and several major proofs are in the Appendices. We feel that a solid understanding of basic facts is best attained by at first avoiding excessive generality. We have not tried to give an exhaustive list of references, preferring to refer the reader to existing books or papers with extensive bibliographies. References are given by author's name and the year of publication, e.g., Waltman [1974].

Optimal Control of Partial Differential Equations - Fredi Tröltzsch 2010

“Optimal control theory is concerned with finding control functions that minimize cost functions for systems described by differential equations. The methods have found widespread applications in aeronautics, mechanical engineering, the life sciences, and many other disciplines. This book focuses on optimal control problems where the state equation is an elliptic or parabolic partial differential equation. Included are topics such as the existence of optimal solutions, necessary optimality conditions and adjoint equations, second-order sufficient conditions, and main principles of selected numerical techniques.

It also contains a survey on the Karush-Kuhn-Tucker theory of nonlinear programming in Banach spaces. The exposition begins with control problems with linear equations, quadratic cost functions and control constraints. To make the book self-contained, basic facts on weak solutions of elliptic and parabolic equations are introduced. Principles of functional analysis are introduced and explained as they are needed. Many simple examples illustrate the theory and its hidden difficulties.

This start to the book makes it fairly self-contained and suitable for advanced undergraduates or beginning graduate students. Advanced control problems for nonlinear partial differential equations are also discussed. As prerequisites, results on boundedness and continuity of solutions to semilinear elliptic and parabolic equations are addressed. These topics are not yet readily available in books on PDEs, making the exposition also interesting for researchers. Alongside the main theme of the analysis of problems of optimal control, Tröltzsch also discusses numerical techniques. The exposition is confined to brief introductions into the basic ideas in order to give the reader an impression of how the theory can be realized numerically. After reading this book, the reader will be familiar with the main principles of the numerical analysis of PDE-constrained optimization.”--Publisher's description.

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.

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.

Applications of Optimal Control Theory in Management Science and Economics - Suresh Pal Sethi 1971

Primer on Optimal Control Theory - Jason L. Speyer 2010

The performance of a process -- for example, how an aircraft consumes fuel -- can be enhanced when the most effective controls and
operating points for the process are determined. This holds true for many physical, economic, biomedical, manufacturing, and engineering processes whose behavior can often be influenced by altering certain parameters or controls to optimize some desired property or output.

**Optimal Control Theory with Aerospace Applications**-Joseph Z. Ben-Asher 2010 Optimal control theory is a mathematical optimization method with important applications in the aerospace industry.

**Optimal Control from Theory to Computer Programs**-Viorel Arnăutu 2013-04-17 The aim of this book is to present the mathematical theory and the know-how to make computer programs for the numerical approximation of Optimal Control of PDE’s. The computer programs are presented in a straightforward generic language. As a consequence they are well structured, clearly explained and can be translated easily into any high level programming language. Applications and corresponding numerical tests are also given and discussed. To our knowledge, this is the first book to put together mathematics and computer programs for Optimal Control in order to bridge the gap between mathematical abstract algorithms and concrete numerical ones. The text is addressed to students and graduates in Mathematics, Mechanics, Applied Mathematics, Numerical Software, Information Technology and Engineering. It can also be used for Master and Ph.D. programs.

**Optimal Control with Aerospace Applications**-James M Longuski 2013-11-04 Want to know not just what makes rockets go up but how to do it optimally? Optimal control theory has become such an important field in aerospace engineering that no graduate student or practicing engineer can afford to be without a working knowledge of it. This is the first book that begins from scratch to teach the reader the basic principles of the calculus of variations, develop the necessary conditions step-by-step, and introduce the elementary computational techniques of optimal control. This book, with problems and an online solution manual, provides the graduate-level reader with enough introductory knowledge so that he or she can not only read the literature and study the next level textbook but can also apply the theory to find optimal solutions in practice. No more is needed than the usual background of an undergraduate engineering, science, or mathematics program: namely calculus, differential equations, and numerical integration. Although finding optimal solutions for these problems is a complex process involving the calculus of variations, the authors carefully lay out step-by-step the most important theorems and concepts. Numerous examples are worked to demonstrate how to apply the theories to everything from classical problems (e.g., crossing a river in minimum time) to engineering problems (e.g., minimum-fuel launch of a satellite). Throughout the book use is made of the time-optimal launch of a satellite into orbit as an important case study with detailed analysis of two examples: launch from the Moon and launch from Earth. For launching into the field of optimal solutions, look no further!

**Optimal Control**-Frank L. Lewis 2012-02-01 A NEW EDITION OF THE CLASSIC TEXT ON OPTIMAL CONTROL THEORY As a superb introductory text and an indispensable reference, this new edition of Optimal Control will serve the needs of both the professional engineer and the advanced student in mechanical, electrical, and aerospace engineering. Its coverage encompasses all the fundamental topics as well as the major changes that have occurred in recent years. An abundance of computer simulations using MATLAB and relevant Toolboxes is included to give the reader the actual experience of applying the theory to real-world situations. Major topics covered include: Static Optimization Optimal Control of Discrete-Time Systems Optimal Control of Continuous-Time Systems The Tracking Problem and Other LQR Extensions Final-Time-Free and Constrained Input Control Dynamic Programming Optimal Control for Polynomial Systems Output
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

An Introduction to Optimal Control Problems in Life Sciences and Economics - Sebastian Aniţa 2011-05-05

Combining control theory and modeling, this textbook introduces and builds on methods for simulating and tackling concrete problems in a variety of applied sciences. Emphasizing "learning by doing," the authors focus on examples and applications to real-world problems. An elementary presentation of advanced concepts, proofs to introduce new ideas, and carefully presented MATLAB® programs help foster an understanding of the basics, but also lead the way to new, independent research. With minimal prerequisites and exercises in each chapter, this work serves as an excellent textbook and reference for graduate and advanced undergraduate students, researchers, and practitioners in mathematics, physics, engineering, computer science, as well as biology, biotechnology, economics, and finance.

A Relaxation-Based Approach to Optimal Control of Hybrid and Switched Systems - Vadim Azhmyakov 2019-02-14

A Relaxation Based Approach to Optimal Control of Hybrid and Switched Systems proposes a unified approach to effective and numerically tractable relaxation schemes for optimal control problems of hybrid and switched systems. The book gives an overview of the existing (conventional and newly developed) relaxation techniques associated with the conventional systems described by ordinary differential equations. Next, it constructs a self-contained relaxation theory for optimal control processes governed by various types (sub-classes) of general hybrid and switched systems. It contains all mathematical tools necessary for an adequate understanding and using of the sophisticated relaxation techniques. In addition, readers will find many practically oriented optimal control problems related to the new class of dynamic systems. All in all, the book follows engineering and numerical concepts. However, it can also be considered as a mathematical compendium that contains the necessary formal results and important algorithms related to the modern relaxation theory. Illustrates the use of the relaxation approaches in engineering optimization Presents application of the relaxation methods in computational schemes for a
Optimal Control Theory: Applications To Management Science

Applied Optimal Control Theory of Distributed Systems - K.A. Lurie 2013-11-21 This book represents an extended and substantially revised version of my earlier book, Optimal Control in Problems of Mathematical Physics, originally published in Russian in 1975. About 60% of the text has been completely revised and major additions have been included which have produced a practically new text. My aim was to modernize the presentation but also to preserve the original results, some of which are little known to a Western reader. The idea of composites, which is the core of the modern theory of optimization, was initiated in the early seventies. The reader will find here its implementation in the problem of optimal conductivity distribution in an MHD-generator channel flow. Since then it has emerged into an extensive theory which is undergoing a continuous development. The book does not pretend to be a textbook, neither does it offer a systematic presentation of the theory. Rather, it reflects a concept which I consider as fundamental in the modern approach to optimization of distributed systems. Bibliographical notes, though extensive, do not pretend to be exhaustive as well. My thanks are due to Professor Jean-Louis Armand and Professor Wolf Stadler whose friendly assistance in translating and polishing the text was so valuable. I am indebted to Mrs. Kathleen Durand and Mrs. Colleen Lewis for the hard job of typing large portions of the manuscript.

Optimal Control Theory - Zhongjing Ma

Control Theory and Related Topics - Shanjian Tang 2007 Xunjing Li (1935 - Co 2003) was a pioneer in control theory in China. He was known in the Chinese community of applied mathematics, and in the global community of optimal control theory of distributed parameter systems. He has made important contributions to the optimal control theory of distributed parameter systems, in particular regarding the first-order necessary conditions (Pontryagin-type maximum principle) for optimal control of nonlinear infinite-dimensional systems. He directed the Seminar of Control Theory at Fudan towards stochastic control theory in 1980s, and mathematical finance in 1990s, which has led to several important subsequent developments in both closely interactive fields. These remarkable efforts in scientific research and education, among others, gave birth to the so-called OC Fudan School. This proceedings volume includes a collection of original research papers or reviews authored or co-authored by Xunjing Li's former students, postdoctoral fellows, and mentored scholars in the areas of control theory, dynamic systems, mathematical finance, and stochastic analysis, among others. Sample Chapter(s). Part 1: A Tribute in Memory of Professor Xunjing Li on His Seventieth Birthday (112 KB). Contents: Stochastic Control, Mathematical Finance, and Backward Stochastic Differential Equations: Axiomatic Characteristics for Solutions of Reflected Backward Stochastic Differential Equations (X Bao & S Tang); A Linear Quadratic Optimal Control Problem for Stochastic Volterra Integral Equations (S Chen & J Yong); Stochastic Control and BSDEs with Quadratic Growth (M Fuhrman et al.); Unique Continuation and Observability for Stochastic Parabolic Equations and Beyond (X Zhang); Deterministic Control Systems: Some Counterexamples in Existence Theory of Optimal Control (H Lou); A Generalized Framework for Global Output Feedback Stabilization of Inherently Nonlinear Systems with Uncertainties (J Polendo & C Qian); On Finite-Time Stabilization of a Class of Nonsmoothly Stabilizable Systems (B Yang & W Lin); Dynamics and Optimal Control of Partial Differential Equations: Optimal Control of Quasilinear Elliptic Obstacle Problems (Q Chen & Y Ye); Controllability of a Nonlinear Degenerate Parabolic
Numerical Methods for Optimal Control Problems - Maurizio Falcone 2019-01-26 This work presents recent mathematical methods in the area of optimal control with a particular emphasis on the computational aspects and applications. Optimal control theory concerns the determination of control strategies for complex dynamical systems, in order to optimize some measure of their performance. Started in the 60's under the pressure of the "space race" between the US and the former USSR, the field now has a far wider scope, and embraces a variety of areas ranging from process control to traffic flow optimization, renewable resources exploitation and management of financial markets. These emerging applications require more and more efficient numerical methods for their solution, a very difficult task due the huge number of variables. The chapters of this volume give an up-to-date presentation of several recent methods in this area including fast dynamic programming algorithms, model predictive control and max-plus techniques. This book is addressed to researchers, graduate students and applied scientists working in the area of control problems, differential games and their applications.

Nonsmooth Optimization - Marko M Mäkelä 1992-05-07 This book is a self-contained elementary study for nonsmooth analysis and optimization, and their use in solution of nonsmooth optimal control problems. The first part of the book is concerned with nonsmooth differential calculus containing necessary tools for nonsmooth optimization. The second part is devoted to the methods of nonsmooth optimization and their development. A proximal bundle method for nonsmooth nonconvex optimization subject to nonsmooth constraints is constructed. In the last part nonsmooth optimization is applied to problems arising from optimal control of systems covered by partial differential equations. Several practical problems, like process control and optimal shape design problems are considered. Contents: Part I: Nonsmooth Analysis:IntroductionConvex AnalysisNonsmooth Differential TheoryNonsmooth GeometryNonsmooth Optimization TheoryPart II: Nonconvex Constrained OptimizationNumerical ExperimentsPart III: Nonsmooth Optimal Control:PreliminariesDistributed Parameter Control Problems Optimal Shape DesignBoundary Control for Stefan Type Problems Readership: Applied mathematicians, mathematicians, operations researchers, engineers, economists and mathematical physicists. keywords:Nonsmooth Optimization;Nondifferentiable Programming;Bundle Methods;Convex Analysis;Nonconvexity;Subgradients;Tangent and Normal Cones;Optimal Control;Optimal Shape Design;Continuous Casting

Introductory Optimization Dynamics - P.N.V. Tu 2013-11-11 Optimal Control theory has been increasingly used in Economi- and Management Science in the last fifteen years or so. It is now commonplace, even at textbook level. It has been applied to a great many areas of Economics and Management Science, such as Optimal Growth, Optimal Population, Pollution control, Natural Resources, Bioeconomics, Education, International Trade, Monopoly, Oligopoly and Duopoly, Urban and Regional Economics, Arms Race control, Business Finance, Inventory Planning, Marketing, Maintenance and Replacement policy and many others. It is a powerful tool of dynamic optimization. There is no doubt social sciences students should be familiar with this tool, if not for their own research, at least for reading the literature. These Lecture Notes attempt to provide a plain exposition of Optimal Control Theory, with a number of economic examples and applications designed mainly to illustrate the various techniques and point out the wide range of possible applications rather than to treat exhaustively any area of economic theory or policy. Chapters 2, 3
and 4 are devoted to the Calculus of Variations, Chapter 5 develops Optimal Control theory from the Variational approach, Chapter 6 deals with the problems of constrained state and control variables, Chapter 7, with Linear Control models and Chapter 8, with stabilization models. Discrete systems are discussed in Chapter 9 and Sensitivity analysis in Chapter 10. Chapter 11 presents a wide range of Economics and Management Science applications.


The Robust Maximum Principle-Vladimir G. Boltyanski 2011-11-06 Covering some of the key areas of optimal control theory (OCT), a rapidly expanding field, the authors use new methods to set out a version of OCT’s more refined ‘maximum principle.’ The results obtained have applications in production planning, reinsurance-dividend management, multi-model sliding mode control, and multi-model differential games. This book explores material that will be of great interest to post-graduate students, researchers, and practitioners in applied mathematics and engineering, particularly in the area of systems and control.

Optimal Control Theory: Applications To Management Science

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