Optimal Control Problems Arising in Forest Management
This book collects some recent developments in stochastic control theory with applications to financial mathematics. We first address standard stochastic control problems from the viewpoint of the recently developed weak dynamic programming principle. A special emphasis is put on the regularity issues and, in particular, on the behavior of the value function near the boundary. We then provide a quick review of the main tools from viscosity solutions which allow to overcome all regularity problems. We next address the class of stochastic target problems which extends in a nontrivial way the standard stochastic control problems. Here the theory of viscosity solutions plays a crucial role in the derivation of the dynamic programming equation as the infinitesimal counterpart of the corresponding geometric dynamic programming equation. The various developments of this theory have been stimulated by applications in finance and by relevant connections with geometric flows. Namely, the second order extension was motivated by illiquidity modeling, and the controlled loss version was introduced following the problem of quantile hedging. The third part specializes to an overview of Backward stochastic differential equations, and their extensions to the quadratic case.

Problems and Solutions in Project Management and Control
This book collects some recent developments in stochastic control theory with applications to financial mathematics. We first address standard stochastic control problems from the viewpoint of the recently developed weak dynamic programming principle. A special emphasis is put on the regularity issues and, in particular, on the behavior of the value function near the boundary. We then provide a quick review of the main tools from viscosity solutions which allow to overcome all regularity problems. We next address the class of stochastic target problems which extends in a nontrivial way the standard stochastic control problems. Here the theory of viscosity solutions plays a crucial role in the derivation of the dynamic programming equation as the infinitesimal counterpart of the corresponding geometric dynamic programming equation. The various developments of this theory have been stimulated by applications in finance and by relevant connections with geometric flows. Namely, the second order extension was motivated by illiquidity modeling, and the controlled loss version was introduced following the problem of quantile hedging. The third part specializes to an overview of Backward stochastic differential equations, and their extensions to the quadratic case.

Numerical Methods for Stochastic Control Problems in Continuous Time
This book is the solution manual for Problems in Engineering Noise Control by the same author. The solutions are very detailed and comprehensive and extend a number of concepts with approximately 270 problems which have a total of 650 separate parts.

Vector-Valued Optimization Problems in Control Theory
Solved Problems in Dynamical Systems and Control Using a practical approach that includes only necessary theoretical background, this book focuses on applied problems that motivate readers and help them understand the concepts of automatic control. The text covers servomechanisms, hydraulics, thermal control, mechanical systems, and electric circuits. It explains the modeling process, introduces the problem solution, and discusses derived results. Presented solutions are based directly on math formulas, which are provided in extensive tables throughout the text. This enables readers to develop the ability to quickly solve practical problems on control systems.

Proceedings of the Berkeley-Ames Conference on Nonlinear Problems in Control and Fluid Dynamics
This book presents a compilation of over 200 numerical problems and solutions that students can use to learn, practice and master the
Inventory Control and Management concepts. Intended as a companion to any of the standard textbooks in Inventory Control and Management and written in simple language, it illustrates very clearly the steps students need to follow in order to solve a given problem. It also explains which solution methodologies can be used under which circumstances. Offering an ideal one-stop resource for mid-level engineering and business students who have taken Inventory Management or a related subject as an elective, this book is the only one students will ever need to prepare and gain confidence for their examinations in this subject.

On the Numerical Solution of Nonlinear and Hybrid Optimal Control Problems This monograph deals with control problems of discrete-time dynamical systems which include linear and nonlinear input/output relations. In its present second enlarged edition the control problems of linear and non-linear dynamical systems will be solved as algebraically as possible. Adaptive control problems are newly proposed and solved for dynamical systems which satisfy the time-invariant condition. The monograph provides new results and their extensions which can also be more applicable for nonlinear dynamical systems. A new method which produces manipulated inputs is presented in the sense of state control and output control. To present the effectiveness of the method, many numerical examples of control problems are provided as well.

Problems & Solutions of Control Systems (With Essential Theory), 5e

Real Control Problems - No Solutions Yet? IEE Colloquium on This title examines the structure of approximate solutions of optimal control problems considered on subintervals of a real line. Specifically at the properties of approximate solutions which are independent of the length of the interval. The results illustrated in this book look into the so-called turnpike property of optimal control problems. The author generalizes the results of the turnpike property by considering a class of optimal control problems which is identified with the corresponding complete metric space of objective functions. This establishes the turnpike property for any element in a set that is in a countable intersection which is open everywhere dense sets in the space of integrands; meaning that the turnpike property holds for most optimal control problems. Mathematicians working in optimal control and the calculus of variations and graduate students will find this book useful and valuable due to its presentation of solutions to a number of difficult problems in optimal control and presentation of new approaches, techniques and methods.

Unsolved Problems in Mathematical Systems and Control Theory Excerpt from Unix for Real-Time Control: Problems and Solutions We also describe how some of these problems were solved in the sage operating system, a small system. Specifically designed for such control applications. Although sage is not a unix system, it has many similarities, and hence many of the solutions can be applied to unix. About the Publisher Forgotten Books publishes hundreds of thousands of rare and classic books. Find more at www.forgottenbooks.com This book is a reproduction of an important historical work. Forgotten Books uses state-of-the-art technology to digitally reconstruct the work, preserving the original format whilst repairing imperfections present in the aged copy. In rare cases, an imperfection in the original, such as a blemish or missing page, may be replicated in our edition. We do, however, repair the vast majority of imperfections successfully; any imperfections that remain are intentionally left to preserve the state of such historical works.

Variational and Optimal Control Problems on Unbounded Domains This book is concerned with numerical methods for stochastic control and optimal stochastic control problems. The random process models of the controlled or uncontrolled stochastic systems are either diffusions or jump diffusions. Stochastic control is a very active area of research and new problem formulations and sometimes surprising applications appear regularly. We have chosen forms of the models which cover the great bulk of the formulations of the continuous time stochastic control problems which have appeared to date. The standard formats are covered, but much emphasis is given to the newer and less well known formulations. The controlled process might be either stopped or absorbed on leaving a constraint set or upon first hitting a target set, or it might be reflected or "projected" from the boundary of a constraining set. In some of the more recent applications of the reflecting boundary problem, for example the so-called heavy traffic approximation problems, the directions of reflection are actually discontinuous. In general, the control might be representable as a bounded function or it might be of the so-called impulsive or singular control types. Both the "drift" and the "variance" might be controlled. The cost functions might be any of the standard types: Discounted, stopped on first exit from a set, finite time, optimal stopping, average cost per unit time over the infinite time interval, and so forth.

Unix for Real-time Control

Unix for Real-Time Control The objective of this book is to provide a collection of solved problems on control systems, with an emphasis on practical problems. System functionality is described, the modeling process is explained, the problem solution is introduced, and the derived results are discussed. Each chapter ends with a discussion on applying MATLAB®, LabVIEW, and/or Comprehensive Control to the previously introduced concepts. The aim of the book is to help an average reader understand the concepts of control systems through problems and applications. The solutions are based directly on math formulas given in extensive tables throughout the text.

Problems and Solutions of Control Systems

Control System Problems This text provides problems and solutions of the basic control system concepts. It gives a broad and in-depth overview of solving control system problems. There are sixteen chapters in the book. Chapter 1 introduces the reader to automatic control systems. Chapters 2 to 12 contain problems involving feedback control theory and the
frequency domain tools of control system design. Problems on non-linear systems and state space analysis are solved in chapters 13 and 14 respectively. Chapter 15 covers the discrete control system concept. The MATLAB based control system design toolbox and the solutions to the problems programmed in MATLAB environment are discussed in chapter 16. This book will be useful for all engineering disciplines that have control system courses in their curriculum. The topics included can be covered in two academic semesters. The main objective of the book is to enable the students to clearly understand the method of solving control system problems.

Optimal Stochastic Control, Stochastic Target Problems, and Backward SDE This book is devoted to one of the fastest developing fields in modern control theory - the so-called H-infinity optimal control theory. Based mostly on recent work by the authors, the book is written on a good mathematical level. Many results in it are original.

Problems & Solutions Of Control Systems (with Essential Theory), 4e This book provides clear presentations of more than sixty important unsolved problems in mathematical systems and control theory. Each of the problems included here is proposed by a leading expert and set forth in an accessible manner. Covering a wide range of areas, the book will be an ideal reference for anyone interested in the latest developments in the field, including specialists in applied mathematics, engineering, and computer science. The book consists of ten parts representing various problem areas, and each chapter sets forth a different problem presented by a researcher in the particular area and in the same way: description of the problem, motivation and history, available results, and bibliography. It aims not only to encourage work on the included problems but also to suggest new ones and generate fresh research. The reader will be able to submit solutions for possible inclusion on an online version of the book to be updated quarterly on the Princeton University Press website, and thus also be able to access solutions, updated information, and partial solutions as they are developed.

Problems & Solutions In Control System Engineering This work presents a collection of exercises on dynamical systems, modelling and control for university students in the areas of engineering, applied, mathematics, biomathematics, and physics. It includes solved problems on fractional calculus and simple tools for nonlinear systems which are not found in any similar book.

Solutions to Example Problems in Engineering Noise Control In the development of optimal control, the complexity of the systems to which it is applied has increased significantly, becoming an issue in scientific computing. In order to carry out model-reduction on these systems, the authors of this work have developed a method based on asymptotic analysis. Moving from abstract explanations to examples and applications with a focus on structural network problems, they aim at combining techniques of homogenization and approximation. Optimal Control Problems for Partial Differential Equations on Reticulated Domains is an excellent reference tool for graduate students, researchers, and practitioners in mathematics and areas of engineering involving reticulated domains.

Control System Problems This book is devoted to the study of optimal control problems arising in forest management, an important and fascinating topic in mathematical economics studied by many researchers over the years. The volume studies the forest management problem by analyzing a class of optimal control problems that contains it and showing the existence of optimal solutions over infinite horizon. It also studies the structure of approximate solutions on finite intervals and their turnpike properties, as well as the stability of the turnpike phenomenon and the structure of approximate solutions on finite intervals in the regions close to the end points. The book is intended for mathematicians interested in the optimization theory, optimal control and their applications to the economic theory.

Problems & Solutions In Control System Engineering Vector-Valued Optimization Problems in Control Theory

Well Control Problems and Solutions An algorithm for solving Dantzig's generalized programming formulation of continuous-time linear-system optimal control problems is developed. Dantzig's work is extended to include continuous-time versions of quadratic loss criteria and minimum fuel problems. New results in parametric linear and quadratic programming problems, where the parameter dependence is non-linear, are derived with internal schemes to avoid cycling due to degeneracy. Finite switching results in the completely linear system, including the minimum fuel and minimal time problems, are presented without assuming Pontryagin's general position principal or uniqueness properties. The procedure initially finds a feasible and admissible solution to the continuous-time problem without using discrete approximations. The algorithm continues to converge monotonically to the optimal solution while remaining feasible and, at each stage, provides a bound on the value of the loss function for termination purposes. This procedure is well suited for systems with a relatively high number of state variables and control inputs for which discrete time linear or quadratic programming models become too large. (Author).

Real Control Problems This book is devoted to the study of classes of optimal control problems arising in economic growth theory, related to the Robinson-Solow-Srinivasan (RSS) model. The model was introduced in the 1960s by economists Joan Robinson, Robert Solow, and Thirukodikaval Nilakanta Srinivasan and was further studied by Robinson, Nobuo Okishio, and Joseph Stiglitz. Since then, the study of the RSS model has become an important element of economic dynamics. In this book, two large general classes of optimal control problems, both of them containing the RSS model as a particular case, are presented for study. For these two classes, a turnpike theory is developed and the existence of solutions to the corresponding infinite horizon optimal control problems is established. The book contains 9 chapters. Chapter 1 discusses turnpike properties for some optimal control problems that are known in the literature, including problems corresponding to the RSS model. The first class of optimal control problems is studied in Chaps. 2-6. In Chap. 2, infinite horizon optimal control problems with nonautonomous optimality criteria are considered. The utility functions,
which determine the optimality criterion, are nonconcave. This class of models contains the RSS model as a particular case. The stability of the turnpike phenomenon of the one-dimensional nonautonomous concave RSS model is analyzed in Chap. 3. The following chapter takes up the study of a class of autonomous nonconcave optimal control problems, a subclass of problems considered in Chap. 2. The equivalence of the turnpike property and the asymptotic turnpike property, as well as the stability of the turnpike phenomenon, is established. Turnpike conditions and the stability of the turnpike phenomenon for nonautonomous problems are examined in Chap. 5, with Chap. 6 devoted to the study of the turnpike properties for the one-dimensional nonautonomous nonconcave RSS model. The utility functions, which determine the optimality criterion, are nonconcave. The class of RSS models is identified with a complete metric space of utility functions. Using the Baire category approach, the turnpike phenomenon is shown to hold for most of the models. Chapter 7 begins the study of the second large class of autonomous optimal control problems, and turnpike conditions are established. The stability of the turnpike phenomenon for this class of problems is investigated further in Chaps. 8 and 9.

Optimal Control Problems for Partial Differential Equations on Reticulated Domains

Control Problems of Discrete-Time Dynamical Systems

Solutions to Problems in Applied Optimal Control This book intends to provide a number of worked exercises to aid students in overcoming the difficulties faced in the study and analysis of automatic control systems engineering with the help of step by step illustrations.

Optimal Control Problems Related to the Robinson-Solow-Srinivasan Model This book provides an introduction to representative nonrelativistic quantum control problems and their theoretical analysis and solution via modern computational techniques. The quantum theory framework is based on the Schrödinger picture, and the optimization theory, which focuses on functional spaces, is based on the Lagrange formalism. The computational techniques represent recent developments that have resulted from combining modern numerical techniques for quantum evolutionary equations with sophisticated optimization schemes. Both finite and infinite-dimensional models are discussed, including the three-level Lambda system arising in quantum optics, multispin systems in NMR, a charged particle in a well potential, Bose-Einstein condensates, multiparticle spin systems, and multiparticle models in the time-dependent density functional framework. This self-contained book covers the formulation, analysis, and numerical solution of quantum control problems and bridges scientific computing, optimal control and exact controllability, optimization with differential models, and the sciences and engineering that require quantum control methods.

Fuzzy Dynamic Equations, Dynamic Inclusions, and Optimal Control Problems on Time Scales

Regularization Methods for Ill-Posed Optimal Control Problems

Generalized Programming Solution of Continuous-time Linear-system Optimal Control Problems Ill-posed optimization problems appear in a wide range of mathematical applications, and their numerical solution requires the use of appropriate regularization techniques. In order to understand these techniques, a thorough analysis is inevitable. The main subject of this book are quadratic optimal control problems subject to elliptic linear or semi-linear partial differential equations. Depending on the structure of the differential equation, different regularization techniques are employed, and their analysis leads to novel results such as rate of convergence estimates.

Structure of Approximate Solutions of Optimal Control Problems Information Control Problems in Manufacturing 2006 contains the Proceedings of the 12th IFAC Symposium on Information Control Problems in Manufacturing (INCOM'2006). This symposium took place in Saint Etienne, France, on May 17-19 2006. INCOM is a tri-annual event of symposia series organized by IFAC and it is promoted by the IFAC Technical Committee on Manufacturing Plant Control. The purpose of the symposium INCOM’2006 was to offer a forum to present the state-of-the-art in international research and development work, with special emphasis on the applications of optimisation methods, automation and IT technologies in the control of manufacturing plants and the entire supply chain within the enterprise. The symposium stressed the scientific challenges and issues, covering the whole product and processes life cycle, from the design through the manufacturing and maintenance, to the distribution and service. INCOM’2006 Technical Program also included a special event on Innovative Engineering Techniques in Healthcare Delivery. The application of engineering and IT methods in medicine is a rapidly growing field with many opportunities for innovation. The Proceedings are composed of 3 volumes: Volume 1 - Information Systems, Control & Interoperability Volume 2 - Industrial Engineering Volume 3 - Operational Research * 3-volume set, containing 362 carefully reviewed and selected papers * presenting the state-of-the-art in international research and development in Information Control problems in Manufacturing

Problems & Solutions in Inventory Management

Optimal Stochastic Control, Stochastic Target Problems, and Backward SDE This book is devoted to one of the fastest developing fields in modern control theory - the so-called H-infinity optimal control theory. The book can be used for a second or third year graduate level course in the subject, and researchers working in the area will find the book useful as a standard reference. Based mostly on recent work of the authors, the book is written on a good mathematical level. Many results in it are original, interesting, and inspirational. The topic is central to modern control and hence this definitive book is highly recommended to anyone who wishes to catch up with important theoretical developments in
applied mathematics and control.

Formulation and Numerical Solution of Quantum Control Problems Using a practical approach that includes only necessary theoretical background, this book focuses on applied problems that motivate readers and help them understand the concepts of automatic control. The text covers servomechanisms, hydraulics, thermal control, mechanical systems, and electric circuits. It explains the modeling process, introduces the problem solution, and discusses derived results. Presented solutions are based directly on math formulas, which are provided in extensive tables throughout the text. This enables readers to develop the ability to quickly solve practical problems on control systems.

H-Infinity Optimal Control and Related Minimax Design Problems Individual turnpike results are of great interest due to their numerous applications in engineering and in economic theory; in this book the study is focused on new results of turnpike phenomenon in linear optimal control problems. The book is intended for engineers as well as for mathematicians interested in the calculus of variations, optimal control and in applied functional analysis. Two large classes of problems are studied in more depth. The first class studied in Chapter 2 consists of linear control problems with periodic nonsmooth convex integrands. Chapters 3-5 consist of linear control problems with autonomous convex smooth integrands. Chapter 6 discusses a turnpike property for dynamic zero-sum games with linear constraints. Chapter 7 examines genericity results. In Chapter 8, the description of structure of variational problems with extended-valued integrands is obtained. Chapter 9 ends the exposition with a study of turnpike phenomenon for dynamic games with extended value integrands.

H∞ Optimal Control and Related Minimax Design Problems

Turnpike Theory of Continuous-Time Linear Optimal Control Problems

Information Control Problems in Manufacturing 2006 The theory of dynamic equations has many interesting applications in control theory, mathematical economics, mathematical biology, engineering and technology. In some cases, there exists uncertainty, ambiguity, or vague factors in such problems, and fuzzy theory and interval analysis are powerful tools for modeling these equations on time scales. The aim of this book is to present a systematic account of recent developments; describe the current state of the useful theory; show the essential unity achieved in the theory fuzzy dynamic equations, dynamic inclusions and optimal control problems on time scales; and initiate several new extensions to other types of fuzzy dynamic systems and dynamic inclusions. The material is presented in a highly readable, mathematically solid format. Many practical problems are illustrated, displaying a wide variety of solution techniques. The book is primarily intended for senior undergraduate students and beginning graduate students of engineering and science courses. Students in mathematical and physical sciences will find many sections of direct relevance.

Digital Control Systems This volume contains the proceedings of the workshop on Variational and Optimal Control Problems on Unbounded Domains, held in memory of Arie Leizarowitz, from January 9-12, 2012, in Haifa, Israel. The workshop brought together a select group of worldwide experts in optimal control theory and the calculus of variations, working on problems on unbounded domains. The papers in this volume cover many different areas of optimal control and its applications. Topics include needle variations in infinite-horizon optimal control, Lyapunov stability with some extensions, small noise large time asymptotics for the normalized Feynman-Kac semigroup, linear-quadratic optimal control problems with state delays, time-optimal control of wafer stage positioning, second order optimality conditions in optimal control, state and time transformations of infinite horizon problems, turnpike properties of dynamic zero-sum games, and an infinite-horizon variational problem on an infinite strip. This book is co-published with Bar-Ilan University (Ramat-Gan, Israel).

Problems and Solutions in Control Systems

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