

APPLICATIONS
OF MATHEMATICS

STOCHASTIC
MODELLING
AND APPLIED
PROBABILITY

24

Harold J. Kushner
Paul Dupuis

Numerical Methods for Stochastic Control Problems in Continuous Time

Second Edition



Springer

Numerical Methods For Stochastic Control Problems In Continuous Time

Harold Kushner



Numerical Methods For Stochastic Control Problems In Continuous Time:

Numerical Methods for Stochastic Control Problems in Continuous Time Harold J. Kushner, Paul Dupuis, 2001 The required background is surveyed and there is an extensive development of methods of approximation and computational algorithms The book is written on two levels algorithms and applications and mathematical proofs Thus the ideas should be very accessible to a broad audience **BOOK JACKET**

Numerical Methods for Stochastic Control Problems in Continuous Time Harold Kushner, Paul G. Dupuis, 2012-12-06 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

Numerical Methods for Stochastic Control Problems in Continuous Time Harold Kushner, Paul G. Dupuis, 2013-11-27 Changes in the second edition The second edition differs from the first in that there is a full development of problems where the variance of the diffusion term and the jump distribution can be controlled Also a great deal of new material concerning deterministic problems has been added including very efficient algorithms for a class of problems of wide current interest 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

Numerical Methods for Stochastic Control Problems in Continuous Time Harold Joseph Kushner, Paul Dupuis, 1992 Stochastic control is a very active area of research and this monograph written by two leading authorities in the field has been updated to reflect the latest developments It covers effective numerical methods for stochastic control problems in continuous time on two levels that of practice algorithms and applications and that of mathematical development It is broadly accessible for graduate students and researchers

Numerical Methods for Controlled Stochastic Delay Systems Harold Kushner, 2008-12-19 The Markov chain approximation methods are widely used for the numerical solution of nonlinear stochastic control problems in continuous time This book extends the methods to stochastic systems with delays The book is the first on the subject and will be of great interest to all those who work with stochastic delay equations and whose main interest is either in the use of the algorithms or in the mathematics An excellent resource for graduate students researchers and practitioners the work may be used as a graduate level textbook for a special topics course or seminar on numerical methods in stochastic control

Numerical Methods in Stochastic Control, 2002 The second edition of our book 4 on numerical methods in stochastic control has appeared The book and the methods contained therein are now the standard in the field It contains the most comprehensive development of numerical algorithms and associated convergence proofs for a large part of the current forms of stochastic control problems in continuous time The PI s algorithms and proof techniques are the algorithms of choice for the bulk of continuous time stochastic control problems In addition to the broad coverage of the first edition it gives numerical algorithms and proofs for problems where the variance term is controlled and for jump diffusions where the jump is controlled Important applications of jump control occur for example in communications theory Consider for example a system where a server divides its time between several queues whose input processes are bursty and the individual connections are subject to random breakdown or fading The control problem is the scheduling of the server and this must be done continuously A jump increase in the total system workload can occur when some connection breaks down or fades and the work in the available queues is less than the server can handle but customers continue to arrive at the unavailable queues so there is undesired idle time The control policy affects the jump sizes Traditional methods cannot handle such problems The standard use of the Poisson measure driven model is no longer adequate and a general theory is developed Additionally the book contains a thorough development of deterministic problems that arise in control and in the calculus of variations and includes discontinuous or unbounded dynamical terms with applications to image reconstruction large deviations and elsewhere The algorithms are about the fastest and most stable available and there are convergence proofs for all of them

Numerical Methods for Continuous-time, Continuous-state Stochastic Control Problems Claus Munk, Odense Universitet. Det Samfundsvidenskabelige Fakultet, Odense University, Department of Management, School of Business and Economics, 1997

Applied Stochastic Control of Jump Diffusions Bernt

Øksendal, Agnès Sulem, 2007-04-26 Here is a rigorous introduction to the most important and useful solution methods of various types of stochastic control problems for jump diffusions and its applications Discussion includes the dynamic programming method and the maximum principle method and their relationship The text emphasises real world applications primarily in finance Results are illustrated by examples with end of chapter exercises including complete solutions The 2nd edition adds a chapter on optimal control of stochastic partial differential equations driven by Lévy processes and a new section on optimal stopping with delayed information Basic knowledge of stochastic analysis measure theory and partial differential equations is assumed *Computation and Applied Mathematics*, 1997 *Modeling, Stochastic Control, Optimization, and Applications* George Yin, Qing Zhang, 2019-07-16 This volume collects papers based on invited talks given at the IMA workshop in Modeling Stochastic Control Optimization and Related Applications held at the Institute for Mathematics and Its Applications University of Minnesota during May and June 2018 There were four week long workshops during the conference They are 1 stochastic control computation methods and applications 2 queueing theory and networked systems 3 ecological and biological applications and 4 finance and economics applications For broader impacts researchers from different fields covering both theoretically oriented and application intensive areas were invited to participate in the conference It brought together researchers from multi disciplinary communities in applied mathematics applied probability engineering biology ecology and networked science to review and substantially update most recent progress As an archive this volume presents some of the highlights of the workshops and collect papers covering a broad range of topics

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Numerical Methods For Stochastic Control Problems In Continuous Time Introduction

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