Lyapunov
Functions in
Differential Games

V. I. Zhukovskiy

Lyapunov Functions In Differential Games

C.T. Leonides

Lyapunov Functions In Differential Games:

   Lyapunov Functions in Differential Games Vladislav I Zhukovskiy,2003-01-16 A major step in differential games is determining an explicit form of the strategies of players who follow a certain optimality principle To do this the associated modification of Bellman dynamic programming problems has to be solved for some differential games this could be Lyapunov functions whose arsenal has been supplied by stability theory This approach which combines dynamic programming and the Lyapunov function method leads to coefficient criteria or ratios of the game math model parameters with which optimal strategies of the players not only exist but their analytical form can be specified In this book coefficient criteria are derived for numerous new and relevant problems in the theory of linear quadratic multi player differential games Those criteria apply when the players formulate their strategies independently non co operative games and use non Nash equilibria or when the game model recognizes noise perturbation and other uncertainties of which only their ranges are known differential games under uncertainty This text is useful for researchers engineers and students of applied mathematics control theory and the engineering sciences   **Non-cooperative Stochastic Differential Game Theory of Generalized Markov Jump Linear Systems** Cheng-ke Zhang,Huai-nian Zhu,Hai-ying Zhou,Ning Bin,2016-09-02 This book systematically studies the stochastic non cooperative differential game theory of generalized linear Markov jump systems and its application in the field of finance and insurance The book is an in depth research book of the continuous time and discrete time linear quadratic stochastic differential game in order to establish a relatively complete framework of dynamic non cooperative differential game theory It uses the method of dynamic programming principle and Riccati equation and derives it into all kinds of existence conditions and calculating method of the equilibrium strategies of dynamic non cooperative differential game Based on the game theory method this book studies the corresponding robust control problem especially the existence condition and design method of the optimal robust control strategy The book discusses the theoretical results and its applications in the risk control option pricing and the optimal investment problem in the field of finance and insurance enriching the achievements of differential game research This book can be used as a reference book for non cooperative differential game study for graduate students majored in economic management science and engineering of institutions of higher learning

   Differential Games and Applications Tamer Başar,Pierre Bernhard,1989 This volume contains fifteen articles on the topic of differential and dynamic games focusing on both theory and applications It covers a variety of areas and presents recent developments on topics of current interest It should be useful to researchers in differential and dynamic games systems and control operations research and mathematical economics   **Pursuit-Evasion Differential Games** Y. Yavin,M. Pachter,2014-06-28 Twenty papers are devoted to the treatment of a wide spectrum of problems in the theory and applications of dynamic games with the emphasis on pursuit evasion differential games The problem of capturability is thoroughly investigated also the problem of noise corrupted state measurements Attention is given to aerial combat problems

and their attendant modelling issues such as variable speed of the combatants the three dimensionality of physical space and the combat problem i e problems related to role determination **Dynamics, Bifurcations and Control** Fritz Colonius,Lars Grüne,2003-07-01 This volume originates from the Third Nonlinear Control Workshop namics Bifurcations and Control held in Kloster Irsee April 1 3 2001 As the preceding workshops held in Paris 2000 and in Ghent 1999 it was organized within the framework of Nonlinear Control Network funded by the European Union http www supelec fr lss NCN The papers in this volume center around those control problems where phenomena and methods from dynamical systems theory play a dominant role Despite the large variety of techniques and methods present in the c tributions a rough subdivision can be given into three areas Bifurcation problems stabilization and robustness and global dynamics of control s tems A large part of the fascination in nonlinear control stems from the fact that is deeply rooted in engineering and mathematics alike The contributions to this volume reflect this double nature of nonlinear control We would like to take this opportunity to thank all the contributors and the referees for their careful work Furthermore it is our pleasure to thank Franchise Lamnabhi Lagarrigue the coordinator of our network for her s port in organizing the workshop and the proceedings and for the tremendous efforts she puts into this network bringing the cooperation between the d ferent groups to a new level In particular the exchange and the active p ticipation of young scientists also reflected in the Pedagogical Schools within the Network is an asset for the field of nonlinear control **The Berge Equilibrium: A Game-Theoretic Framework for the Golden Rule of Ethics** Mindia E. Salukvadze,Vladislav I. Zhukovskiy,2020-02-18 The goal of this book is to elaborate on the main principles of the theory of the Berge equilibrium by answering the following two questions What are the basic properties of the Berge equilibrium Does the Berge equilibrium exist and how can it be calculated The Golden Rule of ethics which appears in Christianity Judaism Islam Buddhism Confucianism and other world religions states the following Behave towards others as you would like them to behave towards you In any game each party of conflict seeks to maximize some payoff Therefore for each player the Golden Rule is implemented through the maximization of his her payoff by all other players which matches well with the concept of the Berge equilibrium The approach presented here will be of particular interest to researchers including undergraduates and graduates and economists focused on decision making under complex conflict conditions The peaceful resolution of conflicts is the cornerstone of the approach as a matter of fact the Golden Rule precludes military clashes and violence In turn the new approach requires new methods in particular the existence problems are reduced to saddle point design for the Germeier convolution of payoff functions with further transition to mixed strategies in accordance with the standard procedure employed by E Borel J von Neumann J Nash and their followers Moreover this new approach has proven to be efficient and fruitful with regard to a range of other important problems in mathematical game theory which are considered in the Appendix **Dichotomies and Stability in Nonautonomous Linear Systems** Yu. A. Mitropolsky,A.M. Samoilenko,V.L. Kulik,2002-10-10 Linear nonautonomous equations arise as

mathematical models in mechanics chemistry and biology The investigation of bounded solutions to systems of differential equations involves some important and challenging problems of perturbation theory for invariant toroidal manifolds This monograph is a detailed study of the application of Lyapunov func **Generalized Solutions of First Order PDEs** Andrei I. Subbotin,2013-06-29 Hamilton Jacobi equations and other types of partial differential equa tions of the first order are dealt with in many branches of mathematics mechanics and physics These equations are usually nonlinear and func tions vital for the considered problems are not smooth enough to satisfy these equations in the classical sense An example of such a situation can be provided by the value function of a differential game or an optimal control problem It is known that at the points of differentiability this function satisfies the corresponding Hamilton Jacobi Isaacs Bellman equation On the other hand it is well known that the value function is as a rule not everywhere differentiable and therefore is not a classical global solution Thus in this case as in many others where first order PDE s are used there arises necessity to introduce a notion of generalized solution and to develop theory and methods for constructing these solutions In the 50s 70s problems that involve nonsmooth solutions of first order PDE s were considered by Bakhvalov Evans Fleming Gel fand Godunov Hopf Kuznetzov Ladyzhenskaya Lax Oleinik Rozhdestven ski1 Samarskii Tikhonov and other mathematicians Among the inves tigations of this period we should mention the results of S N Kruzhkov which were obtained for Hamilton Jacobi equation with convex Hamilto nian A review of the investigations of this period is beyond the limits of the present book A sufficiently complete bibliography can be found in 58 126 128 141 Control and Dynamic Systems V35: Advances in Control Mechanics Part 2 of 2 C.T. Leonides,2012-12-02 Advances in Control Mechanics is based on a National Science Foundation Sponsored Workshop on Control Mechanics i e control system development using analytical methods of mechanics and active control of mechanical systems Publication of the presentations at this workshop in this Academic Press series has made it possible to expand them into a format which will facilitate the study and utilization of their significant results by working professionals and research workers on the international scene This book comprises 13 chapters with the first focusing on recursive Lyapunov functions particularly their properties and linear systems Succeeding chapters tackle topics such as the Lyapunov functional approach to uncertain systems governed by functional differential equations with finite time lag and stabilizing discrete control laws for Hamiltonian systems Other chapters cover component model reduction in canonical correlation coordinates controlling a flexible plate to mimic a rigid one the modal stability of imperfect cyclic systems and simultaneous stabilization via low order controllers The remaining chapters discuss the use of Liapunov techniques for collision avoidance of robot arms avoidance control of a two point mechanical system coordination controllers for multi arm manipulators MRAC techniques with application to robot manipulators optimal preview controllers based upon explicit trajectory models and analysis of a robot dragline for mining This book will be of interest to practitioners in the fields of engineering and aeronautics **Handbook of Stochastic Analysis and Applications** D. Kannan,V. Lakshmikantham,2001-10-23 An introduction to general theories of

stochastic processes and modern martingale theory The volume focuses on consistency stability and contractivity under geometric invariance in numerical analysis and discusses problems related to implementation simulation variable step size algorithms and random number generation **Dynamic Incentives for Optimal Control of Competitive Power Systems** Kölsch, Lukas,2022-10-11 This work presents a real time dynamic pricing framework for future electricity markets Deduced by first principles analysis of physical economic and communication constraints within the power system the proposed feedback control mechanism ensures both closed loop system stability and economic efficiency at any given time The resulting price signals are able to incentivize competitive market participants to eliminate spatio temporal shortages in power supply quickly and purposively **Nonlinear and Optimal Control Systems** Thomas L. Vincent,Walter J. Grantham,1997-06-23 Designed for one semester introductory senior or graduate level course the authors provide the student with an introduction of analysis techniques used in the design of nonlinear and optimal feedback control systems There is special emphasis on the fundamental topics of stability controllability and optimality and on the corresponding geometry associated with these topics Each chapter contains several examples and a variety of exercises Hybrid Systems: Computation and Control Freek Wiedijk,Oded Maler,Amir Pnueli,2003-07-01 This volume contains the proceedings of the Sixth Workshop on Hybrid Systems Computation and Control HSCC 2003 which was held in Prague during April 3 5 2003 The Hybrid Systems workshops attract researchers interested in the modeling analysis control and implementation of systems which involve the interaction of both discrete and continuous state dynamics The newest results and latest developments in hybrid system models formal methods for analysis and control computational tools as well as new applications and examples are presented at these annual meetings The Sixth Workshop continued the series of workshops held in Grenoble France HART 97 Berkeley California USA HSCC 98 Nijmegen The Neth lands HSCC 99 Pittsburgh Pennsylvania USA HSCC 2000 Rome Italy HSCC 2001 and Stanford California USA HSCC 2002 Proceedings of these workshops have been published by Springer Verlag in the Lecture Notes in C puter Science LNCS series This year we assembled a technical program committee with a broad expertise in formal methods in computer science control theory applied mathematics and arti cial intelligence We received a set of 75 high quality submitted papers After detailed review and discussion of these papers by the program committee 36 papers were accepted for presentation at the workshop and the nal versions of these papers appear in this volume *Hybrid Systems: Computation and Control* Oded Maler,Amir Pnueli,2003-03-18 This book constitues the refereed proceedings of the 6th International Workshop on Hybrid Systems Computation and Control HSCC 2003 held in Prague Czech Republic in April 2003 The 36 revised full papers presented were carefully reviewed and selected from 75 submissions All current issues in hybrid systems are addressed including formal methods for analysis and control computational tools as well as innovative applications in various fields such as automotive control the immune system electrical circuits operating systems and human brains *H -Control Theory* Edoardo

Mosca,Luciano Pandolfi,2006-11-14 The fundamental problem in control engineering is to provide robust performance to uncertain plants H control theory began in the early eighties as an attempt to lay down rigorous foundations on the classical robust control requirements It now turns out that H control theory is at the crossroads of several important directions of research space or polynomial approach to control and classical interpolation theory harmonic analysis and operator theory minimax LQ stochastic control and integral equations The book presents the underlying fundamental ideas problems and advances through the pen of leading contributors to the field for graduate students and researchers in both engineering and mathematics From the Contents C Foias Commutant Lifting Techniques for Computing Optimal H Controllers B A Francis Lectures on H Control and Sampled Data Systems J W Helton Two Topics in Systems Engineering Frequency Domain Design and Nonlinear System H Kwakernaak The Polynomial Approach to H Optimal Regulation J B Pearson A Short Course in l Optimal Control **Set-Theoretic Methods in Control** Franco Blanchini,Stefano Miani,2015-07-02 The second edition of this monograph describes the set theoretic approach for the control and analysis of dynamic systems both from a theoretical and practical standpoint This approach is linked to fundamental control problems such as Lyapunov stability analysis and stabilization optimal control control under constraints persistent disturbance rejection and uncertain systems analysis and synthesis Completely self contained this book provides a solid foundation of mathematical techniques and applications extensive references to the relevant literature and numerous avenues for further theoretical study All the material from the first edition has been updated to reflect the most recent developments in the field and a new chapter on switching systems has been added Each chapter contains examples case studies and exercises to allow for a better understanding of theoretical concepts by practical application The mathematical language is kept to the minimum level necessary for the adequate formulation and statement of the main concepts yet allowing for a detailed exposition of the numerical algorithms for the solution of the proposed problems Set Theoretic Methods in Control will appeal to both researchers and practitioners in control engineering and applied mathematics It is also well suited as a textbook for graduate students in these areas Praise for the First Edition This is an excellent book full of new ideas and collecting a lot of diverse material related to set theoretic methods It can be recommended to a wide control community audience B T Polyak Mathematical Reviews This book is an outstanding monograph of a recent research trend in control It reflects the vast experience of the authors as well as their noticeable contributions to the development of this field It is highly recommended to PhD students and researchers working in control engineering or applied mathematics The material can also be used for graduate courses in these areas Octavian Pastravanu Zentralblatt MATH **Asymptotic Behavior of Dynamical and Control Systems Under Perturbation and Discretization** Lars Grüne,2002 This text provides an approach to the study of perturbation and discretizion effects on the long time behaviour of dynamical and control systems It analyzes the impact of time and space discretizations on asymptotically stable attracting sets attractors and asumptotically controllable sets **Asymptotic Behavior of Dynamical**

and Control Systems under Pertubation and Discretization Lars Grüne,2004-10-19 This book provides an approach to the study of perturbation and discretization effects on the long time behavior of dynamical and control systems It analyzes the impact of time and space discretizations on asymptotically stable attracting sets attractors asumptotically controllable sets and their respective domains of attractions and reachable sets Combining robust stability concepts from nonlinear control theory techniques from optimal control and differential games and methods from nonsmooth analysis both qualitative and quantitative results are obtained and new algorithms are developed analyzed and illustrated by examples   Library of Congress Subject Headings Library of Congress,Library of Congress. Office for Subject Cataloging Policy,2006

   Intelligent Renewable Energy Systems Gerasimos Rigatos,2016-08-06 Focused on renewable energy systems and the development of information and communication technologies ICTs for their integration in smart grids this book presents recent advances and methods that help to ensure that power generation from renewable sources remains stable that power losses are minimized and that the reliable functioning of these power generation units is maintained The book highlights key topics and technologies for renewable energy systems including the intelligent control of power generators power electronics that connect renewable power generation units to the grid and fault diagnosis for power generators and power electronics In particular the following topics are addressed Modeling and control of power generators PMSGs DFIGs Modeling and control of power electronics converters inverters Modeling and fault diagnosis of the transmission and distribution Grid and Modelling and control of distributed power generation units interconnected synchronous generators or photovoltaic units Because of the above coverage members of the wider engineering community will find that the nonlinear control and estimation methods presented provide essential insights into the functioning of renewable energy power systems while the academic community will find the book a valuable textbook for undergraduate or graduate courses on renewable energy systems

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Lyapunov Functions In Differential Games Introduction

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