Fundamentals Of Economic Model Predictive Control

This book uses systemic thinking and applies it to the study of financial crises. It systematically presents how the systemic yoyo model, its thinking logic, and its methodology can be employed as a common playground and intuition to the study of money, international finance, and economic reforms. This book establishes theoretical backings for why some of the most employed interferences of the market and empirical experiences actually work. It has become urgent for economists and policy makers to understand how international speculative capital affects the economic security of various nations. By looking at the issues of monetary movement around the world, this book shows that there are clearly visible patterns behind the flows of capital, and that there are a uniform language and logic of reasoning that can be powerfully employed in the studies of international finance As shown in this book, many of the conclusions drawn on the basis of these visible patterns, language, and logic of thinking can be practically applied to produce tangible economic benefits. Currency Wars: Offense and Defense through Systemic Thinking is divided into six parts. The first part addresses issues related to systemic modeling of economic entities and processes and explains how a few policy changes can adjust the performance of the extremely complex economy. Part II of the book investigates the problem of how instabilities lead to opportunities for currency attacks, the positive and negative effects of foreign capital, and how international capital flows can cause disturbances of various degrees on a nation’s economic security. Part III examines how a currency war is initiated, why currency conflicts and wars are inevitable, and a specific way of how

currency attacks can take place. In Part IV, the book shows how one nation can potential defend itself by manipulating exchange rate of its currency, how the nation under siege can protect itself against financial attacks by using strategies based on the technique of feedback, and develops a more general approach of self-defense. Part V focuses on issues related to the cleanup of the disastrous aftermath of currency attacks through using policies and reforms. Finally the book concludes in Part VI as it analyzes specific real-life cases and addresses the ultimate problem of whether or not currency wars can be avoided all together.

Economic Model Predictive ControlTheory, Formulations and Chemical Process ApplicationsSpringer

This book is a printed edition of the Special Issue "Real-Time Optimization" that was published in Processes

Get an in-depth look at the nursing profession! Conceptual Foundations: The Bridge to Professional Nursing Practice, 7th Edition gives you the foundation you need to prepare for becoming a professional nurse. Expert educator Elizabeth E. Friberg assembles the best minds of nursing for a unique in-depth look at the profession's major theories, practices, and principles. Complete with two new chapters, this seventh edition has been fully revised throughout with content that challenges you to think critically and conceptually. In addition, new Evolve resources means you can do more online than ever before! Case studies throughout the text provide you with opportunities to develop your analytical skills. Objectives at the beginning of each chapter provide a framework for study. Profile in Practice scenarios at the beginning of each chapter introduce real-life situations that accompany the professional behaviors covered in the text. Key points at the end of each chapter reinforce learning objectives and help you to focus on important information. Critical reflective exercises at the end of each chapter help you use and apply

what you have learned. Chapter Introduction explains the approach and summary of the chapter content. Key terms presented in italics and definitions embedded in the text make it easier to understand. NEW! Two all-new chapters bring you the latest information on end of life/palliative care and resilience and compassionate care. NEW! Emphasis on professional role development includes focus within the Interdisciplinary team. NEW! Updated information about the Affordable Care Act includes coverage of the current legal and policy environment. NEW! Extensive revision of Pathways of Nursing Education chapter reflects current focus on Academic Progression

This text introduces the fundamental techniques for controlling dead-time processes from simple monovariable to complex multivariable cases. Dead-time-process-control problems are studied using classical proportional-integral-differential (PID) control for the simpler examples and dead-time-compensator (DTC) and model predictive control (MPC) methods for progressively more complex ones. Downloadable MATLAB® code makes the examples and ideas more convenient and simpler.

ical) and to self-fulfilling currency crisis, respectively. Research stressing the former approach was pioneered by Krugman (1979) and Flood and Garber (1984). According to this line of research, the failure of governments to adopt domestic monetary and fiscal policies consistent with their stated exchange rate targets leads to a gradual diminution of reserves and eventually a stock adjustment that depletes reserves suddenly in one attack (Sachs, Tornell, and Velasco, 1996, page 47). The result is either a devaluation of the exchange rate or a switch to floating. Subsequent work of this genre has specified a number of other channels, in addition to that involving inconsistent and unsustainable monetary and fiscal policies, that can precipitate an attack: 1. Inconsistency

between external and internal objectives. The stances of monetary and fiscal policies may be consistent with the authorities' exchange rate target, but domestic economic indicators (such as the unemployment rate) may be inconsistent with internal balance, resulting in pressures on the authorities to relax macroeconomic policies. Private agents, aware of this inconsistency, perceive an opportunity for profits from a currency devaluation and precipitate an attack. 2. Contagion effects. Prior to an attack on another currency (say that of country B), the market may view a country's (say, country A's) exchange rate as consistent with economic fundamentals and, thus, sustainable.

This book is a printed edition of the Special Issue "New Directions on Model Predictive Control" that was published in Mathematics

Recent developments in model-predictive control promise remarkable opportunities for designing multi-input, multi-output control systems and improving the control of single-input, single-output systems. This volume provides a definitive survey of the latest model-predictive control methods available to engineers and scientists today. The initial set of chapters present various methods for managing uncertainty in systems, including stochastic model-predictive control. With the advent of affordable and fast computation, control engineers now need to think about using “computationally intensive controls,” so the second part of this book addresses the solution of optimization problems in “real” time for model-predictive control. The theory and applications of control theory often influence each other, so the last section of Handbook of Model Predictive Control rounds out the book with representative applications to automobiles, healthcare, robotics, and finance. The chapters in this volume will be useful to working engineers, scientists, and mathematicians, as well as students and faculty

interested in the progression of control theory. Future developments in MPC will no doubt build from concepts demonstrated in this book and anyone with an interest in MPC will find fruitful information and suggestions for additional reading.

This comprehensive handbook covers a wide variety of quantitative methods used for research in public administration, public policy, and nonprofit management, including theory-building and testing, increasing the readers awareness and command of analytical tools critical to the resolution of complex problems. Providing bibliographic citations and over 370 tables, equations, and drawings, the book compares the function of quantitative techniques in past and present public administration literature and practices, furnishes information for visualizing, planning, and implementing research projects, and explores potential applications of quantitative public administration.

This book is a comprehensive introduction to model predictive control (MPC), including its basic principles and algorithms, system analysis and design methods, strategy developments and practical applications. The main contents of the book include an overview of the development trajectory and basic principles of MPC, typical MPC algorithms, quantitative analysis of classical MPC systems, design and tuning methods for MPC parameters, constrained multivariable MPC algorithms and online optimization decomposition methods. Readers will then progress to more advanced topics such as nonlinear MPC and its related algorithms, the diversification development of MPC with respect to control structures and optimization strategies, and robust MPC. Finally, applications of MPC and its generalization to optimization-based dynamic problems other than control will be discussed. Systematically introduces fundamental concepts, basic algorithms, and applications of MPC Includes a comprehensive overview of

MPC development, emphasizing recent advances and modern approaches Features numerous MPC models and structures, based on rigorous research Based on the best-selling Chinese edition, which is a key text in China Predictive Control: Fundamentals and Developments is written for advanced undergraduate and graduate students and researchers specializing in control technologies. It is also a useful reference for industry professionals, engineers, and technicians specializing in advanced optimization control technology.

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This book addresses several problems related to automated valuation methodologies (AVM). Following the non-agency mortgage crisis, it offers a variety of approaches to improve the efficiency and quality of an automated valuation methodology (AVM) dealing with emerging problems and different contexts. Spatial issue, evolution of AVM standards, multilevel models, fuzzy and rough set applications and quantitative methods to define comparables are just some of the topics discussed.

This book presents a bold, engaging and updated history of economics--the dramatic story of how the great economic thinkers built today's rigorous social science. Noted financial writer and economist Mark Skousen has revised this popular work, now in its third edition. This comprehensive, yet accessible introduction to the major economic philosophers of the past 225 years begins with Adam Smith and continues through the present day. The text examines the contributions made by each individual to our understanding of the role of the economist, the science of economics, and economic theory. Boxes in each chapter highlight little-known and entertaining facts about the economists' personal lives that

had an influence on their work.

The highly prized ability to make financial plans with some certainty about the future comes from the core fields of economics. In recent years the availability of more data, analytical tools of greater precision, and ex post studies of business decisions have increased demand for information about economic forecasting. Volumes 2A and 2B, which follows Nobel laureate Clive Granger's Volume 1 (2006), concentrate on two major subjects. Volume 2A covers innovations in methodologies, specifically macroforecasting and forecasting financial variables. Volume 2B investigates commercial applications, with sections on forecasters' objectives and methodologies. Experts provide surveys of a large range of literature scattered across applied and theoretical statistics journals as well as econometrics and empirical economics journals. The Handbook of Economic Forecasting Volumes 2A and 2B provide a unique compilation of chapters giving a coherent overview of forecasting theory and applications in one place and with up-to-date accounts of all major conceptual issues. Focuses on innovation in economic forecasting via industry applications Presents coherent summaries of subjects in economic forecasting that stretch from methodologies to applications Makes details about economic forecasting accessible to scholars in fields outside economics

A typical design procedure for model predictive control or control performance monitoring consists of: 1. identification of a parametric or nonparametric model; 2. derivation of the output predictor from the model; 3. design of the control law or calculation of performance indices according to the predictor. Both design problems need an explicit model form and both require this three-step design procedure. Can this design procedure be simplified? Can an explicit model be avoided? With these questions in mind, the authors eliminate

the first and second step of the above design procedure, a “data-driven” approach in the sense that no traditional parametric models are used; hence, the intermediate subspace matrices, which are obtained from the process data and otherwise identified as a first step in the subspace identification methods, are used directly for the designs. Without using an explicit model, the design procedure is simplified and the modelling error caused by parameterization is eliminated.

After all the research on agricultural risk to date, the treatment of risk in agricultural research is far from harmonious. Many competing risk models have been proposed. Some new methodologies are largely untested. Some of the leading empirical methodologies in agricultural economic research are poorly suited for problems with aggregate data where risk averse behavior is less likely to be important. This book is intended to (i) define the current state of the literature on agricultural risk research, (ii) provide a critical evaluation of economic risk research on agriculture to date and (iii) set a research agenda that will meet future needs and prospects. This type of research promises to become of increasing importance because agricultural policy in the United States and elsewhere has decidedly shifted from explicit income support objectives to risk-related motivations of helping farmers deal with risk. Beginning with the 1996 Farm Bill, the primary set of policy instruments from U.S. agriculture has shifted from target prices and set aside acreage to agricultural crop insurance. Because this book is intended to have specific implications for U.S. agricultural policy, it has a decidedly domestic scope, but clearly many of the issues have application abroad. For each of the papers and topics included in this volume, individuals have been selected to give the strongest and broadest possible treatment of each facet of the problem. The result is this comprehensive

reference book on the economics of agricultural risk.

In this thesis, we develop a novel framework for model predictive control (MPC) which combines the concepts of robust MPC and economic MPC. The goal of this thesis is to develop and analyze MPC schemes for nonlinear discrete-time systems which explicitly consider the influence of disturbances on arbitrary performance criteria. Instead of regarding the two aspects separately, we propose robust economic MPC approaches that integrate information which is available about the disturbance directly into the economic framework. In more detail, we develop three concepts which differ in which information about the disturbance is used and how this information is taken into account. Furthermore, we provide a thorough theoretical analysis for each of the three approaches. To this end, we present results on the asymptotic average performance as well as on optimal operating regimes. Optimal operating regimes are closely related to the notion of dissipativity, which is therefore analyzed for the presented concepts. Under suitable assumptions, results on necessity and sufficiency of dissipativity for optimal steady-state operation are established for all three robust economic MPC concepts. A detailed discussion is provided which compares the different performance statements derived for the approaches as well as the respective notions of dissipativity.

"In the preface to this impressive and well-produced book, the editors state that their aim is not to describe a new surgical specialty, since most surgeons will soon need to be "geriatric surgeons," but to assemble a comprehensive account that will allow "all providers of healthcare to the elderly to understand the issues involved in choosing surgery as a treatment option for their patients." This is a useful book that deserves to do well. I hope that the editors and their publisher will have the stamina to make this the first of several editions, as it is clear

that updated information about surgery in the elderly will be required to keep pace with this important field." NEJM Book Review

This book constitutes the thoroughly refereed post-proceedings of the 9th International Conference on Adaptive and Natural Computing Algorithms, ICANNGA 2009, held in Kuopio, Finland, in April 2009. The 63 revised full papers presented were carefully reviewed and selected from a total of 112 submissions. The papers are organized in topical sections on neutral networks, evolutionary computation, learning, soft computing, bioinformatics as well as applications.

This book constitutes the refereed proceedings of the 13th International Conference on Artificial Intelligence: Methodology, Systems, and Applications, AIMSA 2008, held in Varna, Bulgaria in September 2008. The 30 revised full papers presented together with the 10 posters were carefully reviewed and selected from 109 submissions. The papers are organized in topical sections on agents; natural language processing and text analysis; machine learning and information retrieval; knowledge representation and reasoning; constraints, heuristics and search; applications; posters.

In this book the author develops a new approach to uncertainty in economics, which calls for a fundamental change in the methodology of economics. It provides a comprehensive overview and critical appraisal of the economic theory of uncertainty and shows that uncertainty was originally conceptualized both as an epistemic and an ontological problem. As a result of the economic professions' attempt to become acknowledged as a science, the more problematic aspect of ontological uncertainty has been neglected and the subjective probability approach to uncertainty became dominant in economic theory. A careful

analysis of ontological theories of uncertainty explains the blindness of modern economics to economic phenomena such as instability, slumps or excessive booms. Based on these findings the author develops a new approach that legitimizes a New Uncertainty Paradigm in economics.

This volume represents a contribution to the philosophy of economics with a distinctive point of view -- the contributors have selected particular areas of economics and have probed these areas for the philosophical and methodological issues that they raise. The primary essays are written by philosophers concentrating on philosophical issues that arise at the level of the everyday theoretical practice of working economists. Commentary essays are provided by working economists responding to the philosophical arguments from the standpoint of their own disciplines. The volume thus represents something of an `experiment' in the philosophy of science, striving as it does to explore methodological issues across two research communities. The purpose of the volume is very specific: to stimulate a discussion of the epistemology and methodology of economics that works at the level of detail of existing `best practice' in economics today. The contributors have designed their contributions to stimulate productive conversation between philosophers and economists on topics in the methodology of economics.

Over the past few years significant progress has been achieved in the field of nonlinear model predictive control (NMPC), also referred to as receding horizon control or moving horizon control. More than 250 papers have been published in 2006 in ISI Journals. With this book we want to bring together the contributions of a diverse group of internationally well recognized researchers and industrial practitioners, to critically assess the current status of the NMPC field and to discuss future directions and needs. The book consists of selected papers presented at the

International Workshop on Assessment an Future Directions of Nonlinear Model Predictive Control that took place from September 5 to 9, 2008, in Pavia, Italy.

Presenting a comprehensive analysis of the use of alternative sources of energy and technologies to produce fuels and power, this book describes the energy value chain from harvesting the raw material, (i.e solar, wind, biomass or shale gas) followed by analysis of the processing steps into power, fuels and/or chemicals and finally the distribution of the products. Featuring an examination of the techno-economic processes and integration opportunities which can add value to by-products or promote the use of different sources of energy within the same facility, this book looks at the tools that can make this integration possible as well as utilising a real world case study. The case study of the operation of “El hierro” island is used as an example of the current effort towards more efficient use of the resources available. Tackling head on the open challenges of the supply, the variability of the source and its prediction, the description of novel processes that are being developed and evaluated for their transformation as well as how we can distribute them to the consumer and how we can integrate the new chemicals, fuels and power within the current system and infrastructure, the book takes a process based perspective with such an approach able to help us in the use and integration of these sources of energy and novel technologies.

Modern engineering processes and tasks are highly complex, multi- and interdisciplinary, requiring the cooperative effort of different specialists from engineering, mathematics, computer science and even social sciences. Optimization methodologies are fundamental instruments to tackle this complexity, giving the possibility to unite synergistically team members’

inputs and thus decisively contribute to solving new engineering technological challenges. With this context in mind, the main goal of Engineering Optimization 2014 is to unite engineers, applied mathematicians, computer and other applied scientists working on research, development and practical application of optimization methods applied to all engineering disciplines, in a common scientific forum to present, analyze and discuss the latest developments in this area. Engineering Optimization 2014 contains the edited papers presented at the 4th International Conference on Engineering Optimization (ENGOPT2014, Lisbon, Portugal, 8-11 September 2014). ENGOPT2014 is the fourth edition of the biennial “International Conference on Engineering Optimization”. The first conference took place in 2008 in Rio de Janeiro, the second in Lisbon in 2010 and the third in Rio de Janeiro in 2012. The contributing papers are organized around the following major themes: - Numerical Optimization Techniques - Design Optimization and Inverse Problems - Effi cient Analysis and Reanalysis Techniques - Sensitivity Analysis - Industrial Applications - Topology Optimization For Structural Static and Dynamic Failures - Optimization in Oil and Gas Industries - New Advances in Derivative-Free Optimization Methods for Engineering Optimization - Optimization Methods in Biomechanics and Biomedical Engineering - Optimization of Laminated Composite Materials - Inverse Problems in Engineering Engineering Optimization 2014 will be of great interest to engineers and academics in engineering, mathematics and computer science.

Economic Modeling Using Artificial Intelligence Methods examines the application of artificial intelligence methods to model economic data. Traditionally, economic modeling has been modeled in the linear domain where the principles of superposition are valid. The application of artificial intelligence for economic modeling allows for a flexible multi-order non-linear modeling. In addition, game theory has largely been applied in economic modeling. However, the inherent limitation of game theory when dealing with many player games encourages the use of multi-agent systems for modeling economic phenomena. The artificial intelligence techniques used to model economic data include: multi-layer perceptron neural networks radial basis functions support vector machines rough sets genetic algorithm particle swarm optimization simulated annealing multi-agent system incremental learning fuzzy networks Signal processing techniques are explored to analyze economic data, and these techniques are the time domain methods, time-frequency domain methods and fractals dimension approaches. Interesting economic problems such as causality versus correlation, simulating the stock market, modeling and controling inflation, option pricing, modeling economic growth as well as portfolio optimization are examined. The relationship between economic dependency and interstate conflict is explored, and knowledge on how economics is useful to foster peace – and vice versa – is investigated. Economic Modeling Using Artificial Intelligence Methods deals with the issue of causality in the non-linear domain and applies the automatic relevance determination, the

evidence framework, Bayesian approach and Granger causality to understand causality and correlation. Economic Modeling Using Artificial Intelligence Methods makes an important contribution to the area of econometrics, and is a valuable source of reference for graduate students, researchers and financial practitioners.

This book presents general methods for the design of economic model predictive control (EMPC) systems for broad classes of nonlinear systems that address key theoretical and practical considerations including recursive feasibility, closed-loop stability, closed-loop performance, and computational efficiency. Specifically, the book proposes: Lyapunov-based EMPC methods for nonlinear systems; two-tier EMPC architectures that are highly computationally efficient; and EMPC schemes handling explicitly uncertainty, time-varying cost functions, time-delays and multiple-time-scale dynamics. The proposed methods employ a variety of tools ranging from nonlinear systems analysis, through Lyapunov-based control techniques to nonlinear dynamic optimization. The applicability and performance of the proposed methods are demonstrated through a number of chemical process examples. The book presents state-of-the-art methods for the design of economic model predictive control systems for chemical processes.In addition to being mathematically rigorous, these methods accommodate key practical issues, for example, direct optimization of process economics, time-varying economic cost functions and computational efficiency. Numerous comments and remarks providing

fundamental understanding of the merging of process economics and feedback control into a single framework are included. A control engineer can easily tailor the many detailed examples of industrial relevance given within the text to a specific application. The authors present a rich collection of new research topics and references to significant recent work making Economic Model Predictive Control an important source of information and inspiration for academics and graduate students researching the area and for process engineers interested in applying its ideas.

"A timely treatment of the modeling and advanced control of the most promising fuel cell technology - SOFC (solid oxide fuel cells) - from cell to system levelDynamic Modeling and Predictive Control in Solid Oxide Fuel Cells: Delivers comprehensive coverage of SOFC dynamic models and modeling approach from first principles, bringing together many aspects of SOFC technology in one book for the first time Provides parameters for all models developed for easy reference and reproducing of the results Discusses lumped model and distributed model from cell level to system level Applications to the state-of-the-art unscented Kalman filter, model predictive control, and monitoring techniques to SOFC systems Uses NMPC, which is well understood by both industry and academia Essential reading for Graduate students and researchers in the area of fuel cells, process systems engineering, control systems engineering, process control and electrochemical engineering"--

In this thesis, we study model predictive control (MPC)

schemes for control tasks which go beyond the classical objective of setpoint stabilization. In particular, we consider two classes of such control problems, namely distributed MPC for cooperative control in networks of multiple interconnected systems, and economic MPC, where the main focus is on the optimization of some general performance criterion which is possibly related to the economics of a system. The contributions of this thesis are to analyze various systems theoretic properties occurring in these type of control problems, and to develop distributed and economic MPC schemes with certain desired (closed-loop) guarantees. To be more precise, in the field of distributed MPC we propose different algorithms which are suitable for general cooperative control tasks in networks of interacting systems. We show that the developed distributed MPC frameworks are such that the desired cooperative goal is achieved, while coupling constraints between the systems are satisfied. Furthermore, we discuss implementation and scalability issues for the derived algorithms, as well as the necessary communication requirements between the systems. In the field of economic MPC, the contributions of this thesis are threefold. Firstly, we analyze a crucial dissipativity condition, in particular its necessity for optimal steady-state operation of a system and its robustness with respect to parameter changes. Secondly, we develop economic MPC schemes which also take average constraints into account. Thirdly, we propose an economic MPC framework with self-tuning terminal cost and a generalized terminal constraint, and we show how

self-tuning update rules for the terminal weight can be derived such that desirable closed-loop performance bounds can be established.

This paper attempts to merge the concepts and theoretical frameworks of the disciplines of Anthropology and Economics, and attempts to create a new sub-field in Economics called 'Anthropological Economics' which is mired in Anthropological concepts and principles and seeks to maximize not only human welfare and happiness but also wealth maximization across cultures, while considering both the psychic unity of man, universal human needs and culture-specific factors. Thus, Anthropological Economics is expected to be inter-related to other disciplines of Economics, but remain complementary to them i.e., it is not expected that it will intrude into other sub-fields of economics, replace them, or override their principles in any way. It will therefore draw upon other aspects of economic theory, and enrich them suitably. It is therefore expected that all aspects of Economic theory will be taken into consideration for policy formulation and decision-making, including those of Anthropological economics, and independent, context-specific judgment will always be applied. The new proposed field of Anthropological Economics proposes to take the idea of Human Welfare to its logical conclusion by extending the work already carried out in various sub-disciplines of economics, and integrating it more tightly with various concepts in Anthropology. Many new tools and techniques are therefore, proposed as a part of this paper, and we believe these will suitably enrich the field of Economics as well. While many attempts have been

made in the past to integrate the fields of Anthropology and Economics, we hope this endeavour will take this exercise to a much higher level, by creating a new generation of “Anthroeconomists”. We also hope it will eventually help move mainstream economics away from Neo-classical approaches to Anthropological and human-centric approaches.

first industrial application of MPC was in 1973. A key motivation was to provide better performance than could be obtained with the widely-used PID controller whilst making it easy to replace the PID controller unit or module with his new algorithm. It was the advent of digital control technology and the use of software control algorithms that made this replacement easier and more acceptable to process engineers. A decade of industrial practice with PFC was reported in the archival literature by Jacques Richalet et al. in 1978 in an important seminal Automatica paper. Around this time, Cutler and Ramaker published the dynamic matrix control algorithm that also used knowledge of future reference signals to determine a sequence of control signal adjustment. Thus, the theoretical and practical development of predictive control methods was underway and subsequent developments included those of generalized predictive control, and the whole armoury of MPC methods. Jacques Richalet’s approach to PFC was to seek an algorithm that was: • easy to understand; • easy to install; • easy to tune and optimise. He sought a new modular control algorithm that could be readily used by the control-technician engineer or the control-instrument engineer. It goes without saying that this objective also

forms a good market strategy.

This book considers the cultural legacy of the Keynesian Revolution in economics. It assesses the impact of Keynes and Keynesian thinking upon economics and policy, as well as the response of the Chicago and Austrian schools, and the legacy of all three in shaping economic life. The book is a call to restore economics to its roots in moral and cultural knowledge, reminding us that human beings are more than consumers. The Keynesian Revolution taught us that we should be happy if we are prosperous, but instead we feel hollow and morally anxious – our economy feels empty. Drawing on paradigms from earlier historical periods while affirming modern market systems, this book encourages a return to a view of human beings as persons with the right and responsibility to discover, and do, the things in life that are intrinsically good and enduring. Because in the long run, the legacy of our choices will continue long after "we're all dead."

In this thesis, we introduce the novel concept of relaxed barrier function based model predictive control and present a comprehensive theoretical and algorithmic framework for the design, analysis, and implementation of relaxed barrier function based MPC approaches. Instead of treating the underlying optimization as an idealized static map, a key motive of the MPC results and algorithms presented in this thesis is to study the interconnected dynamics of controlled plant and iterative optimization algorithm in an integrated barrier function based framework

and to analyze the resulting overall closed-loop system both from a systems theoretic and algorithmic perspective. One of the presented main results is a novel class of barrier function based anytime MPC algorithms that guarantee important properties of the closed-loop system independently of the number of optimization algorithm iterations that are performed at each sampling step. The obtained theoretical results are illustrated by various numerical examples and benchmark tests as well as by an experimental case study in which the proposed class of barrier function based MPC algorithms is applied to the predictive control of a self-driving car.

This book provides an overview of the nonlinear model predictive control (NMPC) concept for application to innovative combustion engines. Readers can use this book to become more expert in advanced combustion engine control and to develop and implement their own NMPC algorithms to solve challenging control tasks in the field. The significance of the advantages and relevancy for practice is demonstrated by real-world engine and vehicle application examples. The author provides an overview of fundamental engine control systems, and addresses emerging control problems, showing how they can be solved with NMPC. The implementation of NMPC involves various development steps, including: reduced-order

modeling of the process; analysis of system dynamics; formulation of the optimization problem; and real-time feasible numerical solution of the optimization problem. Readers will see the entire process of these steps, from the fundamentals to several innovative applications. The application examples highlight the actual difficulties and advantages when implementing NMPC for engine control applications. Nonlinear Model Predictive Control of Combustion Engines targets engineers and researchers in academia and industry working in the field of engine control. The book is laid out in a structured and easy-to-read manner, supported by code examples in MATLAB®/Simulink®, thus expanding its readership to students and academics who would like to understand the fundamental concepts of NMPC. Advances in Industrial Control reports and encourages the transfer of technology in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control.
Boylan and O'Gorman inject a fresh empiricist voice into the recent debates in economic methodology.... praise the book for its careful scholarship, its intellectual novelty and its familiarity with existing methodological literature." D. Wade Hands, University of Puget Sound, USA

Smart Economic Decision-Making in a Complex World is a fresh and reality-based perspective on decision-making with significant implications for analysis, self-understanding and policy. The book examines the conditions under which smart people generate outcomes that improve their place of work, their household and society. Within this work, the curious reader will find interesting open questions on many fascinating areas of current economic debate, including, the role of realistic assumptions robust model building, understanding how and when non-neoclassical behavior is best practice, why the assumption of smart decision-makers is best to understand and explain our economies and societies, and under what conditions individuals can make the best possible choices for themselves and society at large. Additional sections cover when and how efficiency is achieved, why inefficiencies can persist, when and how consumer welfare is maximized, and what benchmarks should be used to determine efficiency and rationality. Makes the case for 'smart and rational' decision-making as a context-dependent rational process that is framed by socio-cultural environment and conditioned by institutional capacities Explains how incorporation of the 'smart' decision-maker concept into economic thought improves our understanding of how, why and when people generate certain outcomes Explores how economic efficiency can be achieved, individual

preferences realized, and social welfare maximized through the use of 'smart and rational' approaches The book shows how the operation of renewable-energy microgrids can be facilitated by the use of model predictive control (MPC). It gives readers a wide overview of control methods for microgrid operation at all levels, ranging from quality of service, to integration in the electricity market. MPC-based solutions are provided for the main control issues related to energy management and optimal operation of microgrids. The authors present MPC techniques for case studies that include different renewable sources – mainly photovoltaic and wind – as well as hybrid storage using batteries, hydrogen and supercapacitors. Experimental results for a pilot-scale microgrid are also presented, as well as simulations of scheduling in the electricity market and integration of electric and hybrid vehicles into the microgrid. in order to replicate the examples provided in the book and to develop and validate control algorithms on existing or projected microgrids. Model Predictive Control of Microgrids will interest researchers and practitioners, enabling them to keep abreast of a rapidly developing field. The text will also help to guide graduate students through processes from the conception and initial design of a microgrid through its implementation to the optimization of microgrid management. Advances in Industrial Control reports and

encourages the transfer of technology in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control.
Piderit explores the failures of mainstream economics and proposes an alternative grounded in natural law. His assessment is grounded in the Christian higher law tradition which assumes that objective standards known to human reason should govern society and individuals. This book demonstrates both the reasonableness of a distinguished ethical tradition and its capacity to address a wide range of ethical issues, economic as well as personal and social. Piderit emphasizes that natural law theory underlies the U.S. Constitution and informs Catholic, Protestant, and Jewish worship today.