Book Announcements

Lyapunov-Based Control of Robotic Systems
by AMAN BEHAL, WARREN DIXON, DARREN M. DAWSON, and BIN XIAN

This book aims to describe possible frameworks for setting up nonlinear control design problems that must be solved in the context of robots attempting to understand, interact with, and manipulate their environments using a Lyapunov-based nonlinear control design as the framework. The book is intended for students and researchers interested in controlling robotic systems.

Distributed Control of Robotic Networks—A Mathematical Approach to Motion Coordination Algorithms
by FRANCESCO BULLO, JORGES CORTES, and SONIA MARTINEZ

This book introduces tools for understanding coordination algorithms, determining their correctness, and assessing their complexity. A formal model is presented for robotic networks that incorporates communication, sensing, control, and processing capabilities. The book is aimed at graduate students and researchers interested in robot control.

Intelligent Control Systems with an Introduction to System of Systems Engineering
by THRISHANTHA NANAYAKKARA, FERAT SAHIN, and MO JAMSHIDI

The authors of this book define systems of systems (SoS) to be "super systems composed of other elements that themselves are independent complex operational systems interacting among themselves to achieve a common goal." The aim of the book is to discuss fundamentals in the areas of dynamic systems, control, neuroscience, soft computing, signal processing, and systems integration that potentially form the core of the field of SoS.

Deterministic Learning Theory for Identification, Recognition, and Control
by CONG WANG and DAVID J. HILL

This book is aimed at researchers with backgrounds in dynamic systems and control and for use in an advanced graduate-level course. The main subjects cover knowledge acquisition, representation, and utilization in unknown nonlinear dynamic processes using a deterministic framework. This model of information processing, known as deterministic learning, is developed and used for problems of nonlinear system identification, dynamic pattern recognition, and control of nonlinear processes.

Advances in Robotics Research: Theory, Implementation, Application
by TORSTEN KROGER and FRIEDRICH M. WAHL, Editors

This edited volume contains 31 papers that were presented at the German Workshop on Robotics, held at the Technische Universität Carolus-Wilhelmina zu Braunschweig on June 9–10, 2009.
Aspects of Soft Computing, Intelligent Robotics and Control
by JANOR FODOR and JANUSZ KACPRZYK, Editors

This volume is a collection of 15 papers on aspects of soft computing and its applications. The volume is organized into three parts. Part I contains four papers on soft computing, Part II contains five papers on intelligent robotics, and Part III contains six papers on intelligent controls.

Control Theoretic Splines—Optimal Control, Statistics, and Path Planning
by MAGNUS EGERSTEDT and CLYDE MARTIN

This book shows how concepts of smoothing and interpolating splines are connected to control-theoretic concepts of optimization using vector spaces. In particular, the book demonstrates the connection between splines and linear control theory. The book is intended as a reference for students and professionals in a wide range of control-related areas that require the construction of curves from raw data.

An Operator Perspective on Signals and Systems
by ARTHUR E. FRAZHO and WISUWAT BHOSR

In this monograph, operator techniques are combined with state-space methods to solve factorization, spectral estimation, and interpolation problems arising in control and signal processing. Both theory and algorithms, with some Matlab code, are presented. The approach is geometric, and it is assumed that the reader is familiar with linear algebra and basic concepts from operator theory.

Nonnegative and Compartmental Dynamical Systems
by WASSIM M. HADDAD, VIJAYSEKHAR CHELLABOINA, and QING HUI

This book is intended as a resource for individuals interested in nonnegative and compartmental systems, which arise in a wide range of areas, including biomedicine, epidemiology, telecommunications, and power systems. The goal of this book is a comprehensive treatment of solution properties, Lyapunov stability analysis, dissipativity theory, and optimal and adaptive control. Continuous-time, discrete time, and hybrid versions of these systems are considered.

Optimal Reference Shaping for Dynamical Systems: Theory and Applications
by TARUNRAJ SINGH

This book provides an approach to the theory and numerical techniques that can be used to shape control systems inputs for achieving precise control when modeling uncertainties exist. A frequency domain approach is taken to the essentially open-loop problem of shaping the reference input to dynamical systems whose responses are characterized by lightly damped modes. The book is intended as a supplement to an undergraduate feedback control course or as a text for an introductory graduate course on the subject.

Continuous-time Stochastic Control and Optimization with Financial Applications
by HUYEN PHAM

This book deals with stochastic optimization problems applied to finance. The book covers various existing methods, namely, dynamic programming, viscosity solutions, backward stochastic differential equations, and martingale duality methods. The theory is discussed in the context of recent developments in the field and is illustrated with examples in finance, such as portfolio allocation, option hedging, real options, and optimal investment. The book is
Continuous-time Stochastic Control and Optimization with Financial Applications

by Huyễn Pham

This book is intended for graduate students and researchers in mathematical finance and will also benefit applied mathematicians interested in financial applications and practitioners wishing to know more about the use of stochastic optimization methods in finance.

Detection and Diagnosis of Stiction in Control Loops: State of the Art and Advanced Methods

by MOHIEDDINE JELALI and BIAO HUANG, Editors

This book is a collection of contributions from several researchers involved in automatic detection and diagnosis of static friction (stiction) in control loops where the process is manipulated by valves. Control performance modeling is important to proper control of industrial processes, and stiction is a main contributor to poor performance in industrial control loops. The book aims to provide researchers and practicing engineers with a survey of the state-of-the-art in this area of control engineering.

Flying Insects and Robots

by DARIO FLOREANO, JEAN-CHRISTOPHE ZUFFEREY, MANDYAM V. SRINIVASAN, and CHARLIE ELLINGTON, Editors

This edited volume contains contributions from biologists and engineers in the cross-disciplinary field of flying robots. The book examines the mechanics, technology, and intelligence of insects and insectoids. After introductory-level overviews of flight control in insects, dedicated chapters focus on the development of autonomous flying systems using biological principles to sense their surroundings and autonomously navigate. A significant part of the book is dedicated to the mechanics and control of flapping wings both in insects and artificial systems. Finally, hybrid locomotion, energy harvesting, and manufacturing of small flying robots are covered. This book is aimed at academic and industrial researchers engaged with theory and engineering in the domains of aerial robotics, artificial intelligence, and entomology.

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Control of Complex Systems: Structural Constraints and Uncertainty

by ALEKSANDAR ZECEVIC and DRAGOSLAV D. SILJAK

The focus of this book is on control design under information structure constraints, with a particular emphasis on large-scale systems. It addresses the main issues and provides several applications that illustrate potential design methods, most of which are based on linear matrix inequalities. The book is aimed at practicing engineers, researchers, and students working in control systems.

Dynamics of Gambling: Origins of Randomness in Mechanical Systems

by JAROSLAW STRZALKO, JULIUSZ GRABSKI, PRZEMYSLAW PERLIKOWSKI, ANDRZEJ STEFANSKI, and TOMASZ KAPITANIAK

This book discusses the dynamics of mechanical randomizers such as coin tossing, die throw, and roulette. It provides a general analysis of random effects in mechanical engineering systems, addresses inherent questions concerning the nature of randomness, and gives tips for gamblers and the gaming industry.
Visual Perception for Manipulation and Imitation in Humanoid Robots  
by PEDRAM AZAD

This monograph is a reprinted version, with modification, of the author’s dissertation. The book deals with visual perception for the intended applications, manipulation, and imitation supporting higher-level cognition. In particular, stereo-based methods and systems for object recognition and 6DOF pose estimation as well as for markerless human motion capture are presented.

Model-Based Control: Bridging Rigorous Theory and Advanced Technology  
by PAUL M.J. VAN den HOF, CARSTEN SCHERER, and PETER S.C. HEUBERGER, Editors

This edited volume is a collection of 12 papers on the general topic of model-based control, organized into three parts. Part I contains four papers on the fundamental aspects of control. Part II contains four papers that bridge theoretical developments with technologically advanced applications. Part III contains four papers that are devoted to applications in motion control and process engineering.

Nonlinear Vibration with Control: For Flexible and Adaptive Structures  
by DAVID WAGG and SIMON NEILD

This book deals with nonlinear multimodal structural vibration problems that arise in a broad range of applications from spacecraft to microelectromechanical systems. The emphasis is on showing how vibration suppression, that is, active damping, can be applied to such systems. The aim is to introduce the main concepts of nonlinear vibration to students, researchers, and practitioners who have an understanding of linear vibration and control but no specialized knowledge of nonlinear techniques.

From System Complexity to Emergent Properties  
by AZIZ-ALAOUI and C. BERTELLE, Editors

This edited volume highlights complexity modeling through dynamical or behavioral systems. The book is a collection of 18 papers, organized into five parts. Part I contains five papers on the concepts for complexity modeling. Part II contains four papers on geographically complex systems modeling. Part III contains three papers on dynamical artificial or natural complex networks. Part IV contains two papers on transport and traffic flow, and Part V contains four papers on decision support systems.

Mathematical Methods in Robust Control of Discrete-Time Linear Stochastic Systems  
by VASILE DRAGAN, TOADER MOROZAN, and ADRIAN-MIHAIL STOICA

This monograph gives recent results on the control of linear discrete-time stochastic systems subject to both multiplicative white noise and Markovian jumping. The book presents solutions to various theoretical and practical problems associated with these systems, including stability analysis, optimal control, robust stabilization, estimation, and filtering. The book is aimed at graduate students and researchers interested in stochastic modeling and control.

Modeling and Control of Hydrosystems  
by XAVIER LITRICO and VINCENT FROMION

The focus of this book is on the management of hydrosystems, particularly on surface water flows. Building on...
a detailed analysis of open-channel flow modeling, the book constructs control-design methodologies based on a frequency-domain approach. The methods developed in the book are validated on several canals of various dimensions, from experimental laboratory canals to a large-scale irrigation canal. The book is intended for automatic control researchers or engineers and environmental hydraulics researchers.

On-Line Trajectory Generation in Robotic Systems—Basic Concepts for Instantaneous Reactions to Unforeseen (Sensor) Events
by TORSTEN KROGER

This monograph describes an online trajectory-generation algorithm that deals with the problem of allowing a robot in an arbitrary state of motion to calculate a trajectory that permits instantaneous reaction, that is, within one control cycle, to unforeseen sensor events.

Optimal Observation for Cyber-physical Systems: A Fisher-information-matrix-based approach
by ZHEN SONG, YANGQUAN CHEN, CHELLURY RAM SASTRY, and NAZIF CIHAN TAS

Cyber-physical systems are distinguished from embedded systems by their design as networks of interacting elements rather than as isolated devices. Based on the theory of optimal experimental design, this book presents a Fisher information matrix approach to observation problems involving wireless sensor networks. The book is aimed at researchers and engineers interested in observation problems involving wireless networks.

Recent Advances in Intelligent Control Systems
by WEN YU, Editor

This edited volume is a collection of papers that are organized into four parts according to the style of control employed, namely, fuzzy control, neural control, fuzzy neural control, and intelligent control. The book is intended for researchers, graduate students, and practicing engineers in the fields of automatic control, automation, computer science, artificial intelligence, and mechatronics.

Rescue Robotics: DDT Project on Robots and Systems for Urban Search and Rescue
by SATOSHI TADOKORO, Editor

This edited volume discusses the development and testing under the DDT project of various robotic systems and technologies such as serpentine robots, tracked vehicles, intelligent human interface, and data processing, as well as analyzing and verifying the results of the experiments. The DDT project is a Japanese government-sponsored project to develop robotics technologies for disaster response, especially urban search and rescue in large-scale earthquakes. This book will be of interest to robotics and disaster-response researchers, students, and emergency-response personnel.