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Cooperative Localization and Navigation - Chao Gao 2019-08-21
This book captures the latest results and techniques for cooperative localization and navigation drawn from a broad array of disciplines. It provides the reader with a generic and comprehensive view of modeling, strategies, and state estimation methodologies in that fields. It discusses the most recent research and novel advances in that direction, exploring the design of algorithms and architectures, benefits, and challenging aspects, as well as a potential broad array of disciplines, including wireless communication, indoor localization, robotics, emergency rescue, motion analysis, etc.

Fundamentals of Aerospace Navigation and Guidance - Pierre T. Kabamba 2014-08-29
This text covers fundamentals in navigation of modern aerospace vehicles. It is an excellent resource for both graduate students and practicing engineers.

A Linear Systems Primer - Panos J. Antsaklis 2007-12-03
Based on a streamlined presentation of the authors' successful work Linear Systems, this textbook provides an introduction to systems theory with an emphasis on control. Initial chapters present necessary mathematical background material for a fundamental understanding of the dynamical behavior of systems. Each chapter includes helpful chapter descriptions and guidelines for the reader, as well as summaries, notes, references, and exercises at the end. The emphasis throughout is on time-invariant systems, both continuous- and discrete-time.

Advances in Communication Systems and Networks - J. Jayakumari 2020-06-13
This book presents the selected peer-reviewed papers from the International Conference on Communication Systems and Networks (ComNet) 2019. Highlighting the latest findings, ideas, developments and applications in all areas of advanced communication systems and networking, it covers a variety of topics, including next-generation wireless technologies such as 5G, new hardware platforms, antenna design, applications of artificial intelligence (AI), signal processing and optimization techniques. Given its scope, this book can be useful for beginners, researchers and professionals working in wireless communication and networks, and other allied fields.

Linear System Theory - Wilson J. Rugh 1996
Linear System Theory, Second Edition, outlines the basic theory of linear systems in a unified, accessible, and careful manner, with parallel, independent treatment of continuous-time and discrete-time linear systems.

Linear Systems - Thomas Kailath 1998

Nonlinear Model Predictive Control - Lalo Magni 2009-05-25
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.

Analysis and Synthesis of Reset Control Systems - Christophe Prieur 2018-12-27
A reset controller is a linear controller whose output is reset to zero whenever its input and output satisfy an appropriate algebraic relationship. It has widespread industrial applications and is used in many modern day control systems. This monograph provides a comprehensive survey into three parts. Part I provides an historical literature review and presents some fundamental results. Part II deals with nonplanar reset systems and covers several reset rules that may be used to augment high-order controllers for plants of any order. It also provides several simulation studies showing that reset control strategies may allow to attain better performance with respect to the optimal ones obtained by classical continuous-time controllers. Part III focuses on planar systems and reports on a nontrivial generalization of the basic mechanisms emerging in Clegg integrators and First Order Reset Elements (FORE). Relevant case studies emerging in the automotive field are included. This monograph gives an in-depth assessment of the state-of-the-art and provides the reader with a starting point for further research into the increasingly important topic of Reset Control Systems.

An Introduction to Hybrid Dynamical Systems - Arjan J. van der Schaft 2007-10-03
This book is about dynamical systems that are "hybrid" in the sense that they contain both continuous and discrete state variables. Recently there has been increased research interest in the study of the interaction between discrete and continuous dynamics. The present volume provides a first attempt in book form to bring together concepts and methods dealing with hybrid systems from various areas, and to look at these from a unified perspective. The authors have chosen a mode of exposition that is largely based on illustrative examples rather than on the abstract theorem-proof format because the systematic study of hybrid systems is still in its infancy. The examples are taken from many different application areas, ranging from power converters to communication protocols and from chaos to mathematical finance. Subjects covered include the following: definition of hybrid systems; description formats; existence and uniqueness of solutions; special subclasses (variable-structure systems, complementarity systems); reachability and verification; stability and stabilizability; control design methods. The book will be of interest to scientists from a wide range of disciplines including: computer science, control theory, dynamical system theory, systems modeling and simulation, and operations research.

Noncooperative Game Theory - João P. Hespanha 2017-06-13
Noncooperative Game Theory is aimed at students interested in using game theory as a design methodology for solving problems in engineering and computer science. João Hespanha shows that such design challenges can be analyzed through game theoretical perspectives that help to pinpoint each problem's essence: Who are the players? What are their goals? Will the solution to "the game" solve the original design problem? Using the fundamentals of game theory, Hespanha explores these issues and more. The use of game theory in technology design is a recent development arising from the intrinsic limitations of classical optimization-based designs. In optimization, one attempts to find values for parameters that minimize suitably defined criteria—such as monetary cost, energy consumption, or heat generated. However, in most engineering applications, there is always some uncertainty as to how the selected parameters will affect the final objective. Through a sequential and easy-to-understand discussion, Hespanha examines how to make sure that the selection leads to acceptable performance, even in the presence of uncertainty—the unforgiving variable that can wreck engineering designs. Hespanha looks at

such standard topics as zero-sum, non-zero-sum, and dynamics games and includes a MATLAB guide to coding. Noncooperative Game Theory offers students a fresh way of approaching engineering and computer science applications. An introduction to game theory applications for students of engineering and computer science Materials presented sequentially and in an easy-to-understand fashion Topics explore zero-sum, non-zero-sum, and dynamics games MATLAB commands are included

Flight Test System Identification - Roger Larsson 2019-05-15
With the demand for more advanced fighter aircraft, relying on unstable flight mechanical characteristics to gain flight performance, more focus has been put on model-based system engineering to help with the design work. The flight control system design is one important part that relies on this modeling. Therefore, it has become more important to develop flight mechanical models that are highly accurate in the whole flight envelope. For today's modern fighter aircraft, the basic flight mechanical characteristics change between linear and nonlinear as well as stable and unstable as an effect of the desired capability of advanced maneuvering at subsonic, transonic and supersonic speeds. This thesis combines the subject of system identification, which is the art of building mathematical models of dynamical systems based on measurements, with aeronautical engineering in order to find methods for identifying flight mechanical characteristics. Here, some challenging aeronautical identification problems, estimating model parameters from flight-testing, are treated. Two aspects are considered. The first is online identification during flight-testing with the intent to aid the engineers in the analysis process when looking at the flight mechanical characteristics. This will also ensure that enough information is available in the resulting test data for post-flight analysis. Here, a frequency domain method is used. An existing method has been developed further by including an Instrumental Variable approach to take care of noisy data including atmospheric turbulence and by a sensor-fusion step to handle varying excitation during an experiment. The method treats linear systems that can be both stable and unstable working under feedback control. An experiment has been performed on a radio-controlled demonstrator aircraft. For this, multisine input signals have been designed and the results show that it is possible to perform more time-efficient flight-testing compared with standard input signals. The other aspect is post-flight identification of nonlinear characteristics. Here the properties of a parameterized observer approach, using a prediction-error method, are investigated. This approach is compared with four other methods for some test cases. It is shown that this parameterized observer approach is the most robust one with respect to noise disturbances and initial offsets. Another attractive property is that no user parameters have to be tuned by the engineers in order to get the best performance. All methods in this thesis have been validated on simulated data where the system is known, and have also been tested on real flight test data. Both of the investigated approaches show promising results.

Languages and Tools for Hybrid Systems Design - Luca P. Carloni 2006
Languages and Tools for Hybrid Systems Design is intended to equip researchers, application developers and managers with key references and resource material for the successful development of hybrid systems

Control Theory and Systems Biology - Pablo A. Iglesias 2010
A survey of how engineering techniques from control and systems theory can be used to help biologists understand the behavior of cellular systems.

Linear Systems - Panos J. Antsaklis 2006-11-24
"There are three words that characterize this work: thoroughness, completeness and clarity. The authors are congratulated for taking the time to write an excellent linear systems textbook!" —IEEE Transactions on Automatic Control Linear systems theory plays a broad and fundamental role in electrical, mechanical, chemical and aerospace engineering, communications, and signal processing. A thorough introduction to systems theory with emphasis on control is presented in this self-contained textbook, written for a challenging one-semester graduate course. A solutions manual is available to instructors upon adoption of the text. The book's flexible coverage and self-contained presentation also make it an excellent reference guide or self-study manual. For a treatment of linear systems that focuses primarily on the time-invariant case using streamlined presentation of the material with less formal and more intuitive proofs, please see the authors' companion book entitled A Linear Systems Primer.

Matrix Analysis for Scientists and Engineers - Alan J. Laub 2005-01-01
"Prerequisites for using this text are knowledge of calculus and some previous exposure to matrices and

linear algebra, including, for example, a basic knowledge of determinants, singularity of matrices, eigenvalues and eigenvectors, and positive definite matrices. There are exercises at the end of each chapter."--BOOK JACKET.

Data-Driven Science and Engineering - Steven L. Brunton 2019-02-28
Data-driven discovery is revolutionizing the modeling, prediction, and control of complex systems. This textbook brings together machine learning, engineering mathematics, and mathematical physics to integrate modeling and control of dynamical systems with modern methods in data science. It highlights many of the recent advances in scientific computing that enable data-driven methods to be applied to a diverse range of complex systems, such as turbulence, the brain, climate, epidemiology, finance, robotics, and autonomy. Aimed at advanced undergraduate and beginning graduate students in the engineering and physical sciences, the text presents a range of topics and methods from introductory to state of the art.

Switching in Systems and Control - Daniel Liberzon 2012-12-06
The theory of switched systems is related to the study of hybrid systems, which has gained attention from control theorists, computer scientists, and practicing engineers. This book examines switched systems from a control-theoretic perspective, focusing on stability analysis and control synthesis of systems that combine continuous dynamics with switching events. It includes a vast bibliography and a section of technical and historical notes.

Solutions Manual to Linear Systems Theory - João P. Hespanha 2009-10-01

Advances in Discrete-Time Sliding Mode Control - Ahmadreza Argha 2018-06-14
The focus of this book is on the design of a specific control strategy using digital computers. This control strategy referred to as Sliding Mode Control (SMC), has its roots in (continuous-time) relay control. This book aims to explain recent investigations' output in the field of discrete-time sliding mode control (DSMC). The book starts by explaining a new robust LMI-based (state-feedback and observer-based output-feedback) DSMC including a new scheme for sparsely distributed control. It includes a novel event-driven control mechanism, called actuator-based event-driven scheme, using a synchronized-rate biofeedback system for heart rate regulation during cycle-ergometer. Key Features: Focuses on LMI-based SMC (sliding mode control) for uncertain discrete-time system using novel nonlinear components in the control law Makes reader understand the techniques of designing a discrete controller based on the flexible sliding functions Proposes new algorithms for sparsifying control and observer network through multi-objective optimization frameworks Discusses a framework for the design of SMC for two-dimensional systems along with analyzing the controllability of two-dimensional systems Discusses novel schemes for sparsifying the control network

Electronic Systems and Intelligent Computing - Pradeep Kumar Mallick 2020-09-22
This book presents selected, high-quality research papers from the International Conference on Electronic Systems and Intelligent Computing (ESIC 2020), held at NIT Yupia, Arunachal Pradesh, India, on 2 – 4 March 2020. Discussing the latest challenges and solutions in the field of smart computing, cyber-physical systems and intelligent technologies, it includes papers based on original theoretical, practical and experimental simulations, developments, applications, measurements, and testing. The applications and solutions featured provide valuable reference material for future product development.

Principles of Cyber-Physical Systems - Rajeev Alur 2015-04-24
A foundational text that offers a rigorous introduction to the principles of design, specification, modeling, and analysis of cyber-physical systems. A cyber-physical system consists of a collection of computing devices communicating with one another and interacting with the physical world via sensors and actuators in a feedback loop. Increasingly, such systems are everywhere, from smart buildings to medical devices to automobiles. This textbook offers a rigorous and comprehensive introduction to the principles of design, specification, modeling, and analysis of cyber-physical systems. The book draws on a diverse set of subdisciplines, including model-based design, concurrency theory, distributed algorithms, formal methods of specification and verification, control theory, real-time systems, and hybrid systems, explaining the core ideas from each that are relevant to system design and analysis. The book explains how formal models provide mathematical abstractions to manage the complexity of a system design. It covers both

synchronous and asynchronous models for concurrent computation, continuous-time models for dynamical systems, and hybrid systems for integrating discrete and continuous evolution. The role of correctness requirements in the design of reliable systems is illustrated with a range of specification formalisms and the associated techniques for formal verification. The topics include safety and liveness requirements, temporal logic, model checking, deductive verification, stability analysis of linear systems, and real-time scheduling algorithms. Principles of modeling, specification, and analysis are illustrated by constructing solutions to representative design problems from distributed algorithms, network protocols, control design, and robotics. This book provides the rapidly expanding field of cyber-physical systems with a long-needed foundational text by an established authority. It is suitable for classroom use or as a reference for professionals.

Linear State-Space Control Systems - Robert L. Williams, II 2007-02-09
The book blends readability and accessibility common to undergraduate control systems texts with the mathematical rigor necessary to form a solid theoretical foundation. Appendices cover linear algebra and provide a Matlab overivew and files. The reviewers pointed out that this is an ambitious project but one that will pay off because of the lack of good up-to-date textbooks in the area.

Modern Multivariate Statistical Techniques - Alan J. Izenman 2009-03-02
This is the first book on multivariate analysis to look at large data sets which describes the state of the art in analyzing such data. Material such as database management systems is included that has never appeared in statistics books before.

Proceedings of International Conference on Frontiers in Computing and Systems - Debotosh Bhattacharjee 2020-11-23
This book gathers outstanding research papers presented at the International Conference on Frontiers in Computing and Systems (COMSYS 2020), held on January 13–15, 2019 at Jalpaiguri Government Engineering College, West Bengal, India and jointly organized by the Department of Computer Science & Engineering and Department of Electronics & Communication Engineering. The book presents the latest research and results in various fields of machine learning, computational intelligence, VLSI, networks and systems, computational biology, and security, making it a rich source of reference material for academia and industry alike.

Model Free Adaptive Control - Zhongsheng Hou 2013-09-24
Model Free Adaptive Control: Theory and Applications summarizes theory and applications of model-free adaptive control (MFAC). MFAC is a novel adaptive control method for the unknown discrete-time nonlinear systems with time-varying parameters and time-varying structure, and the design and analysis of MFAC merely depend on the measured input and output data of the controlled plant, which makes it more applicable for many practical plants. This book covers new concepts, including pseudo partial derivative, pseudo gradient, pseudo Jacobian matrix, and generalized Lipschitz conditions, etc.; dynamic linearization approaches for nonlinear systems, such as compact-form dynamic linearization, partial-form dynamic linearization, and full-form dynamic linearization; a series of control system design methods, including MFAC prototype, model-free adaptive predictive control, model-free adaptive iterative learning control, and the corresponding stability analysis and typical applications in practice. In addition, some other important issues related to MFAC are also discussed. They are the MFAC for complex connected systems, the modularized controller designs between MFAC and other control methods, the robustness of MFAC, and the symmetric similarity for adaptive control system design. The book is written for researchers who are interested in control theory and control engineering, senior undergraduates and graduated students in engineering and applied sciences, as well as professional engineers in process control.

The Calculus of Variations and Optimal Control - George Leitmann 2013-06-29
When the Tyrian princess Dido landed on the North African shore of the Mediterranean sea she was welcomed by a local chieftain. He offered her all the land that she could enclose between the shoreline and a rope of knotted cowhide. While the legend does not tell us, we may assume that Princess Dido arrived at the correct solution by stretching the rope into the shape of a circular arc and thereby maximized the area of the land upon which she was to found Carthage. This story of the founding of Carthage is apocryphal. Nonetheless it is probably the first account of a problem of the kind that inspired an entire mathematical

discipline, the calculus of variations and its extensions such as the theory of optimal control. This book is intended to present an introductory treatment of the calculus of variations in Part I and of optimal control theory in Part II. The discussion in Part I is restricted to the simplest problem of the calculus of variations. The topic is entirely classical; all of the basic theory had been developed before the turn of the century. Consequently the material comes from many sources; however, those most useful to me have been the books of Oskar Bolza and of George M. Ewing. Part II is devoted to the elementary aspects of the modern extension of the calculus of variations, the theory of optimal control of dynamical systems.

Game Theory with Engineering Applications - Dario Bauso 2016-02-29
Engineering systems are highly distributed collective systems that have humans in the loop. Engineering systems emphasize the potential of control and games beyond traditional applications. Game theory can be used to design incentives to obtain socially desirable behaviors on the part of the players, for example, a change in the consumption patterns on the part of the ?prosumers? (producers-consumers) or better redistribution of traffic. This unique book addresses the foundations of game theory, with an emphasis on the physical intuition behind the concepts, an analysis of design techniques, and a discussion of new trends in the study of cooperation and competition in large complex distributed systems.?

Handbook of Hybrid Systems Control - Jan Lunze 2009-10-15
Sets out core theory and reviews new methods and applications to show how hybrid systems can be modelled and understood.

Human Hand Function - Lynette A. Jones 2006-04-20
Surveying normal hand function in health individuals, this book presents a conceptual framework for analysing what is known about it. It organises human-hand research on a continuum that ranges from activities that are sensory to those with a strong motor component. It is useful for researchers in neuroscience, cognitive science, and gerontology.

Stochastic Hybrid Systems - Christos G. Cassandras 2018-10-03
Because they incorporate both time- and event-driven dynamics, stochastic hybrid systems (SHS) have become ubiquitous in a variety of fields, from mathematical finance to biological processes to communication networks to engineering. Comprehensively integrating numerous cutting-edge studies, Stochastic Hybrid Systems presents a captivating treatment of some of the most ambitious types of dynamic systems. Cohesively edited by leading experts in the field, the book introduces the theoretical basics, computational methods, and applications of SHS. It first discusses the underlying principles behind SHS and the main design limitations of SHS. Building on these fundamentals, the authoritative contributors present methods for computer calculations that apply SHS analysis and synthesis techniques in practice. The book concludes with examples of systems encountered in a wide range of application areas, including molecular biology, communication networks, and air traffic management. It also explains how to resolve practical problems associated with these systems. Stochastic Hybrid Systems achieves an ideal balance between a theoretical treatment of SHS and practical considerations. The book skillfully explores the interaction of physical processes with computerized equipment in an uncertain environment, enabling a better understanding of sophisticated as well as everyday devices and processes.

Bio-Inspired Innovation and National Security - National Defense University 2010-10-01
Despite the vital importance of the emerging area of biotechnology and its role in defense planning and policymaking, no definitive book has been written on the topic for the defense policymaker, the military student, and the private-sector bioscientist interested in the "emerging opportunities market" of national security. This edited volume is intended to help close this gap and provide the necessary backdrop for thinking strategically about biology in defense planning and policymaking. This volume is about applications of the biological sciences, here called "biologically inspired innovations," to the military. Rather than treating biology as a series of threats to be dealt with, such innovations generally approach the biological sciences as a set of opportunities for the military to gain strategic advantage over adversaries. These opportunities rangefrom looking at everything from genes to brains, from enhancing human performance to creating renewable energy, from sensing the environment around us to harnessing its power.

Pursuit-Evasion Differential Games - Y. Yavin 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'.

Quad Rotorcraft Control - Luis Rodolfo García Carrillo 2012-08-12
Quad Rotorcraft Control develops original control methods for the navigation and hovering flight of an autonomous mini-quad-rotor robotic helicopter. These methods use an imaging system and a combination of inertial and altitude sensors to localize and guide the movement of the unmanned aerial vehicle relative to its immediate environment. The history, classification and applications of UAVs are introduced, followed by a description of modelling techniques for quad-rotors and the experimental platform itself. A control strategy for the improvement of attitude stabilization in quad-rotors is then proposed and tested in real-time experiments. The strategy, based on the use low-cost components and with experimentally-established robustness, avoids drift in the UAV's angular position by the addition of an internal control loop to each electronic speed controller ensuring that, during hovering flight, all four motors turn at almost the same speed. The quad-rotor's Euler angles being very close to the origin, other sensors like GPS or image-sensing equipment can be incorporated to perform autonomous positioning or trajectory-tracking tasks. Two vision-based strategies, each designed to deal with a specific kind of mission, are introduced and separately tested. The first stabilizes the quad-rotor over a landing pad on the ground; it extracts the 3-dimensional position using homography estimation and derives translational velocity by optical flow calculation. The second combines colour-extraction and line-detection algorithms to control the quad-rotor's 3-dimensional position and achieves forward velocity regulation during a road-following task. In order to estimate the translational-dynamical characteristics of the quad-rotor (relative position and translational velocity) as they evolve within a building or other unstructured, GPS-deprived environment, imaging, inertial and altitude sensors are combined in a state observer. The text give the reader a current view of the problems encountered in UAV control, specifically those relating to quad-rotor flying machines and it will interest researchers and graduate students working in that field. The vision-based control strategies presented help the reader to a better understanding of how an imaging system can be used to obtain the information required for performance of the hovering and navigation tasks ubiquitous in rotored UAV operation.

Calculus of Variations and Optimal Control Theory - Daniel Liberzon 2012
This textbook offers a concise yet rigorous introduction to calculus of variations and optimal control theory, and is a self-contained resource for graduate students in engineering, applied mathematics, and related subjects. Designed specifically for a one-semester course, the book begins with calculus of variations, preparing the ground for optimal control. It then gives a complete proof of the maximum principle and covers key topics such as the Hamilton-Jacobi-Bellman theory of dynamic programming and linear-quadratic optimal control. Calculus of Variations and Optimal Control Theory also traces the historical development of the subject and features numerous exercises, notes and references at the end of each chapter, and suggestions for further study. Offers a concise yet rigorous introduction Requires limited background in control theory or advanced mathematics Provides a complete proof of the maximum principle Uses consistent notation in the exposition of classical and modern topics Traces the historical development of the subject Solutions manual (available only to teachers) Leading universities that have adopted this book include: University of Illinois at Urbana-Champaign ECE 553: Optimum Control Systems Georgia Institute of Technology ECE 6553: Optimal Control and Optimization University of Pennsylvania ESE 680: Optimal Control Theory University of Notre Dame EE 60565: Optimal Control

Linear System Theory and Design - Chi-Tsong Chen 1984
Uses simple and efficient methods to develop results and design procedures, thus creating a non-exhaustive approach to presenting the material; Enables the reader to employ the results to carry out design. Thus, most results are discussed with an eye toward numerical computation; All design procedures in the text can be carried out using any software package that includes singular-value decomposition, and the solution of linear algebraic equations and the Lyapunov equation; All examples are developed for numerical computation and are illustrated using MATLAB, the most widely available software package.

Handbook of Model Checking - Edmund M. Clarke 2018-05-18
Model checking is a computer-assisted method for the analysis of dynamical systems that can be modeled by state-transition systems. Drawing from research traditions in mathematical logic, programming languages, hardware design, and theoretical computer science, model checking is now widely used for the verification of hardware and software in industry. The editors and authors of this handbook are among the world's leading researchers in this domain, and the 32 contributed chapters present a thorough view of the origin, theory, and application of model checking. In particular, the editors classify the advances in this domain and the chapters of the handbook in terms of two recurrent themes that have driven much of the research agenda: the algorithmic challenge, that is, designing model-checking algorithms that scale to real-life problems; and the modeling challenge, that is, extending the formalism beyond Kripke structures and temporal logic. The book will be valuable for researchers and graduate students engaged with the development of formal methods and verification tools.

Modern Control Theory - William L. Brogan 1982

Linear Systems Theory - João P. Hespanha 2018-02-13
A fully updated textbook on linear systems theory Linear systems theory is the cornerstone of control theory and a well-established discipline that focuses on linear differential equations from the perspective of control and estimation. This updated second edition of Linear Systems Theory covers the subject's key topics in a unique lecture-style format, making the book easy to use for instructors and students. João Hespanha looks at system representation, stability, controllability and state feedback, observability and state estimation, and realization theory. He provides the background for advanced modern control design techniques and feedback linearization and examines advanced foundational topics, such as multivariable poles and zeros and LQG/LQR. The textbook presents only the most essential mathematical derivations and places comments, discussion, and terminology in sidebars so that readers can follow the core material easily and without distraction. Annotated proofs with sidebars explain the techniques of proof construction, including contradiction, contraposition, cycles of implications to prove equivalence, and the difference between necessity and sufficiency. Annotated theoretical developments also use sidebars to discuss relevant commands available in MATLAB, allowing students to understand these tools. This second edition contains a large number of new practice exercises with solutions. Based on typical problems, these exercises guide students to succinct and precise answers, helping to clarify issues and consolidate knowledge. The book's balanced chapters can each be covered in approximately two hours of lecture time, simplifying course planning and student review. Easy-to-use textbook in unique lecture-style format Sidebars explain topics in further detail Annotated proofs and discussions of MATLAB commands Balanced chapters can each be taught in two hours of course lecture New practice exercises with solutions included

Building Software for Simulation - James J. Nutaro 2011-03-23
Fundamentals of Turbulent and Multiphase Combustion Detailed coverage of advanced combustion topics from the author of Principles of combustion, Second Edition Turbulence, turbulent combustion, and multiphase reacting flows have become major research topics in recent decades due to their application across diverse fields, including energy, environment, propulsion, transportation, industrial safety, and nanotechnology. Most of the knowledge accumulated from this research has never been published in book form—until now. Fundamentals of Turbulent and Multiphase Combustion presents up-to-date, integrated coverage of the fundamentals of turbulence, combustion, and multiphase phenomena along with useful experimental techniques, including non-intrusive, laser-based measurement techniques, providing a firm background in both contemporary and classical approaches. Beginning with two full chapters on laminar premixed and non-premixed flames, this book takes a multiphase approach, beginning with more common topics and moving on to higher-level applications. In addition, Fundamentals of Turbulent and Multiphase Combustion: Addresses seven basic topical areas in combustion and multiphase flows, including laminar premixed and non-premixed flames, theory of turbulence, turbulent premixed and non-premixed flames, and multiphase flows Covers spray atomization and combustion, solid-propellant combustion, homogeneous propellants, nitramines, reacting boundary-layer flows, single energetic particle combustion, and granular

bed combustion Provides experimental setups and results whenever appropriate Supported with a large number of examples and problems as well as a solutions manual, Fundamentals of Turbulent and Multiphase Combustion is an important resource for professional engineers and researchers as well as graduate students in mechanical, chemical, and aerospace engineering.

Knowledge of the Pragmatici - Thomas Duve 2020
Knowledge of the pragmatici analyses pragmatic normative literature in colonial Ibero-America. It explores the circulation and the functions of these media in the Iberian peninsula, New Spain, Peru, New Granada and Brazil.