

Digital Control Systems Edition Vol 1 Fundame

Control technology permeates every aspect of our lives. We rely on them to perform a wide variety of tasks without giving much thought to the origins of the technology or how it became such an important part of our lives. Control System Applications covers the uses of control systems, both in the common and in the uncommon areas of our lives. From the everyday to the unusual, it's all here. From process control to human-in-the-loop control, this book provides illustrations and examples of how these systems are applied. Each chapter contains an introduction to the application, a section defining terms and references, and a section on further readings that help you understand and use the techniques in your work environment. Highly readable and comprehensive, Control System Applications explores the uses of control systems. It illustrates the diversity of control systems and provides examples of how the theory can be applied to specific practical problems. It contains information about aspects of control that are not fully captured by the theory, such as techniques for protecting against controller failure and the role of cost and complexity in specifying controller designs.

Digital controllers are part of nearly all modern personal, industrial, and transportation systems. Every senior or graduate student of electrical, chemical or mechanical engineering should therefore be familiar with the basic theory of digital controllers. This new text covers the fundamental principles and applications of digital control engineering, with emphasis on engineering design. Fadali and Visioli cover analysis and design of digitally controlled systems and describe applications of digital controls in a wide range of fields. With worked examples and Matlab applications in every chapter and many end-of-chapter assignments, this text provides both theory and practice for those coming to digital control engineering for the first time, whether as a student or practicing engineer. Extensive Use of computational tools: Matlab sections at end of each chapter show how to implement concepts from the chapter Frees the student from the drudgery of mundane calculations and allows him to consider more subtle aspects of control system analysis and design An engineering approach to digital controls: emphasis throughout the book is on design of control systems. Mathematics is used to help explain concepts, but throughout the text discussion is tied to design and implementation. For example coverage of analog controls in chapter 5 is not simply a review, but is used to show how analog control systems map to digital control systems Review of Background Material: contains review material to aid understanding of digital control analysis and design. Examples include discussion of discrete-time systems in time domain and frequency domain (reviewed from linear systems course) and root locus design in s-domain and z-domain (reviewed from feedback control course) Inclusion of Advanced Topics In addition to the basic topics required for a one semester senior/graduate class, the text includes some advanced material to make it suitable for an introductory graduate level class or for two quarters at the senior/graduate level. Examples of optional topics are state-space methods, which may receive brief coverage in a one semester course, and nonlinear discrete-time systems Minimal Mathematics Prerequisites The mathematics background required for understanding most of the book is based on what can be reasonably expected from the average electrical, chemical or mechanical engineering senior. This background includes three semesters of calculus, differential equations and basic linear algebra. Some texts on digital control require more

Digital Control Systems Volume 1: Fundamentals, Deterministic Control Springer

Includes: Digital signals and systems. Digital controllers for process control applications.

Design of digital controllers. Control of time delay systems. State-space concepts. System

identification. Introduction to discrete optimal control. Multivariable control. Adaptive control.

Computer aided design for industrial control systems. Reliability and redundancy in

microprocessor controllers. Software and hardware aspects of industrial controller

implementations. Application of distributed digital control algorithms to power stations. An expert system for process control.

The extraordinary development of digital computers (microprocessors, microcontrollers) and their extensive use in control systems in all fields of applications has brought about important changes in the design of control systems. Their performance and their low cost make them suitable for use in control systems of various kinds which demand far better capabilities and performances than those provided by analog controllers. However, in order really to take advantage of the capabilities of microprocessors, it is not enough to reproduce the behavior of analog (PID) controllers. One needs to implement specific and high-performance model based control techniques developed for computer-controlled systems (techniques that have been extensively tested in practice). In this context identification of a plant dynamic model from data is a fundamental step in the design of the control system. The book takes into account the fact that the association of books with software and on-line material is radically changing the teaching methods of the control discipline. Despite its interactive character, computer-aided control design software requires the understanding of a number of concepts in order to be used efficiently. The use of software for illustrating the various concepts and algorithms helps understanding and rapidly gives a feeling of the various phenomena.

This well-known book is an introduction to the field of digital, sampled-data control. It treats the field in depth and can be used for courses and for self study. The second edition has been completely revised and expanded with new results. The work now appears in two volumes, with Volume 2 to be published in 1989. The volumes form a unit and take the reader systematically from fundamentals to problems of real applications. The work is directed towards students of electrical and mechanical engineering, computer science (especially with a specialization on automation and control engineering), and other fields like biology, economics, space mathematics and physics. It is also directed to engineers and scientists concerned with solving concrete problems.

Intelligent Control techniques are becoming important tools in both academia and industry. Methodologies developed in the field of soft-computing, such as neural networks, fuzzy systems and evolutionary computation, can lead to accommodation of more complex processes, improved performance and considerable time savings and cost reductions. Intelligent Control Systems using Computational Intelligence Techniques details the application of these tools to the field of control systems. Each chapter gives an overview of current approaches in the topic covered, with a set of the most important references in the field, and then details the author's approach, examining both the theory and practical applications.

Provides broad insights into problems of coding control algorithms on a DSP platform. - Includes a set of Simulink simulation files (source codes) which permits readers to envisage the effects of control solutions on the overall motion control system. -bridges the gap between control analysis and industrial practice.

Introduction to state-space methods covers feedback control; state-space representation of dynamic systems and dynamics of linear systems; frequency-domain analysis; controllability and observability; shaping the dynamic response; more. 1986 edition.

Time-Lag Control Systems

The definitive guide to advanced control system design Advanced Modern Control System Theory and Design offers the most comprehensive treatment of advanced control systems available today. Superbly organized and easy to use, this book is designed for an advanced course and is a companion volume to the introductory text, Modern Control System Theory and Design, Second Edition (or any other introductory

book on control systems). In addition, it can serve as an excellent text for practicing control system engineers who need to learn more advanced control systems techniques in order to perform their tasks. Advanced Modern Control Systems Theory and Design briefly reviews introductory control system analysis concepts and then presents the methods for designing linear control systems using single-degree and two-degrees-of-freedom compensation techniques. The very important subjects of modern control system design using state-space, pole placement, Ackermann's formula, estimation, robust control, and H_∞ techniques are then presented. The following crucial subjects are then covered in the presentation: * Digital Control System Analysis and Design-extends the continuous concepts presented to discrete systems * Nonlinear Control System Design-extends the linear concepts presented to nonlinear systems * Introduction to Optimal Control Theory and Its Applications-presents such key topics as dynamic programming and the maximum principle, as well as applications to the space attitude control problem and the lunar soft-landing problem * Control System Design Examples: Complete Case Studies-presents the complete case studies of five control system design examples that illustrate practical design projects Other notable features of this volume are: * Free MATLAB software containing problem solutions which can be retrieved from the Mathworks, Inc. anonymous FTP server at <ftp://ftp.mathworks.com/pub/books/advshinners> * MATLAB programs and a tutorial on the use of MATLAB incorporated directly into the text * An extensive set of worked-out, illustrative solutions added in dedicated sections at the end of chapters * End-of-chapter problems-one-third with answers to facilitate self-study * A solutions manual containing solutions to the remaining two-thirds of the problems available from the Wiley editorial department.

This Encyclopedia of Control Systems, Robotics, and Automation is a component of the global Encyclopedia of Life Support Systems EOLSS, which is an integrated compendium of twenty one Encyclopedias. This 22-volume set contains 240 chapters, each of size 5000-30000 words, with perspectives, applications and extensive illustrations. It is the only publication of its kind carrying state-of-the-art knowledge in the fields of Control Systems, Robotics, and Automation and is aimed, by virtue of the several applications, at the following five major target audiences: University and College Students, Educators, Professional Practitioners, Research Personnel and Policy Analysts, Managers, and Decision Makers and NGOs.

This comprehensive book deals with motion estimation for autonomous systems from a biological, algorithmic and digital perspective. An algorithm, which is based on the optical flow constraint equation, is described in detail.

Market_Desc: " Engineering and postgraduate students in control engineering and electronic engineering." Practicing control systems engineers and researchers in this field." Engineers needing to learn digital control Special Features: " Developed from three existing lecture courses on digital control, systems identification and intermediate process control" Includes numerous examples, problems, solutions and Matlab code." Highlights the advantages of the polynomial approach." Assumes little or no prior knowledge of analogue control." Offers a very thorough treatment of the z-transform and frequency-domain analysis." Includes a thorough treatment of identification." Attempts the tuning of PID controllers using model-based control techniques." Concludes each chapter with a 2018 problems' section.The distinguishing feature of the

Indian edition of this book is the accompanying CD which contains:- A ten minute video introduction to the book, using slides- Set of chapter wise presentation slides for teachers with animation- Set of slides for students, with four slides on one page- Matlab code, in zip format and also as individual files, arranged in a directory structure- Scilab code in the same format as the Matlab code- Scilab software, using which one can install Scilab- Spoken tutorial on Scilab that explains how to install Scilab About The Book: This book is about the design of digital controllers. An attempt has been made to present digital control from scratch. The book is organized into five parts. The first deals with modeling, the second concerned with the topic of signal processing, the third devoted to identification of plants from measurements, fourth section looks at the transfer function approach to control design and the last section is devoted to state space techniques for control design. The topics of observers, Kalman filter and combined controller and observer have also been included.

This volume features computational tools that can be applied directly and are explained with simple calculations, plus an emphasis on control system principles and ideas. Includes worked examples, MATLAB macros, and solutions manual.

Signal processing in digital control - Models of digital control devices and systems - Design of digital control algorithms - Control system analysis using state variable methods - Variable analysis of digital control systems - Pole-placement design and state observers - Lyapunov stability analysis - Linear quadratic optimal control - Nonlinear control systems - Neural networks for control - Fuzzy control.

Provides unified coverage of the principles and methods of various disciplines' approaches to prediction and control of processes expressed by discrete-time models, especially adaptive prediction, for students, researchers, and practitioners in the field. Chapters on methods of adaptive prediction for linear and non-linear processes, such as input-output model based prediction and Kalman filter predictors, avoid complex mathematical symbols and expressions, and contain examples and case studies. Includes introductory material on process models and parameter estimation, plus reference appendices and data sets. Annotation copyright by Book News, Inc., Portland, OR

This unique book presents an analytical uniform design methodology of continuous-time or discrete-time nonlinear control system design which guarantees desired transient performances in the presence of plant parameter variations and unknown external disturbances. All results are illustrated with numerical simulations, their practical importance is highlighted, and they may be used for real-time control system design in robotics, mechatronics, chemical reactors, electrical and electro-mechanical systems as well as aircraft control systems. The book is easy reading and is suitable for teaching.

This book covers the most important issues from classical and robust control, deterministic and stochastic control, system identification, and adaptive and iterative control strategies. It covers most of the known control system methodologies using a new base, the Youla parameterization (YP). This concept is introduced and extended for TDOF control loops. The Keviczky-Banyasz parameterization (KP) method developed for closed loop systems is also presented. The book is valuable for those who want to see through the jungle of available methods by using a unified approach, and for those who want to prepare computer code with a given algorithm. Provides comprehensive coverage of the most widely used control system methodologies The first book to use the Youla parameterization (YP) as a common base for comparison and algorithm development Compares YP and Keviczky-Banyasz (KB) parameterization to help you write your own computer algorithms

For introductory graduate courses in coding for telecommunications engineering, digital communications. This introductory text on error control coding focuses on key implementation

issues and performance analysis with applications valuable to both mathematicians and engineers.

This book provides an introductory text which will enable the reader to both appreciate the essential characteristics of stepping motor systems and understand how these characteristics are being exploited in the continuing development of new motors, drives and controllers. Containing a fundamental treatment of modern trends in digital control systems, this book presents modern digital control techniques so that the reader may handle digital design and implementation problems.

Praise for Previous Volumes "This book will be a useful reference to control engineers and researchers. The papers contained cover well the recent advances in the field of modern control theory." -IEEE GROUP CORRESPONDANCE "This book will help all those researchers who valiantly try to keep abreast of what is new in the theory and practice of optimal control." -CONTROL

This book presents a detailed examination of the estimation techniques and problems in dynamic systems. Containing several illustrations and computer programs, the book promotes a better understanding of system modelling and parameter estimation.

Parameter estimation involves observation of a dynamic system to develop mathematical models that represent the system dynamics. With the increasing use of high speed digital computers, elegant and innovative techniques like filter error method, H^∞ and artificial neural networks are finding more and more use in parameter estimation problems. The material is presented in an accessible manner and enables the user to implement and execute the programs and, therefore, gain first-hand experience of the estimation progress.

This comprehensive text on control systems is designed for undergraduate students pursuing courses in electronics and communication engineering, electrical and electronics engineering, telecommunication engineering, electronics and instrumentation engineering, mechanical engineering, and biomedical engineering. Appropriate for self-study, the book will also be useful for AMIE and IETE students. Written in a student-friendly readable manner, the book, now in its Second Edition, explains the basic fundamentals and concepts of control systems in a clearly understandable form. It is a balanced survey of theory aimed to provide the students with an in-depth insight into system behaviour and control of continuous-time control systems. All the solved and unsolved problems in this book are classroom tested, designed to illustrate the topics in a clear and thorough way. **NEW TO THIS EDITION**• One new chapter on Digital control systems• Complete answers with figures• Root locus plots and Nyquist plots redrawn as per MATLAB output• MATLAB programs at the end of each chapter• Glossary at the end of chapters **KEY FEATURES**• Includes several fully worked-out examples to help students master the concepts involved. • Provides short questions with answers at the end of each chapter to help students prepare for exams confidently. • Offers fill in the blanks and objective type questions with answers at the end of each chapter to quiz students on key learning points. • Gives chapter-end review questions and problems to assist students in reinforcing their knowledge. Solution Manual is available for adopting faculty.

Fifteen contributions provide an up-to-date treatment of issues in system modeling, system analysis, design and synthesis methods, and nonlinear systems. Coverage includes the application of multidimensional Laplace transforms to the modeling of

nonlinear elements, a survey of customized computer algebra modeling programs for multibody dynamical systems, robust control of linear systems using a new linear programming approach, the development and testing of a new branch-and-bound algorithm for global optimization using symbolic algebra techniques, and dynamic sliding mode control design using symbolic algebra tools.

An essential core text, this volume develops theoretical foundations and explains how control systems work in real industrial situations. Several case histories assist students in visualizing applications. 1992 edition.

A look at the analysis and design of discrete-time control systems which provides a gradual development of the theory by emphasizing basic concepts and avoiding highly mathematical arguments.

This work presents traditional methods and current techniques of incorporating the computer into closed-loop dynamic systems control, combining conventional transfer function design and state variable concepts. Digital Control Designer - an award-winning software program which permits the solution of highly complex problems - is available on the CR

Model Predictive Control of Wind Energy Conversion Systems addresses the predictive control strategy that has emerged as a promising digital control tool within the field of power electronics, variable-speed motor drives, and energy conversion systems. The authors provide a comprehensive analysis on the model predictive control of power converters employed in a wide variety of variable-speed wind energy conversion systems (WECS). The contents of this book includes an overview of wind energy system configurations, power converters for variable-speed WECS, digital control techniques, MPC, modeling of power converters and wind generators for MPC design. Other topics include the mapping of continuous-time models to discrete-time models by various exact, approximate, and quasi-exact discretization methods, modeling and control of wind turbine grid-side two-level and multilevel voltage source converters. The authors also focus on the MPC of several power converter configurations for full variable-speed permanent magnet synchronous generator based WECS, squirrel-cage induction generator based WECS, and semi-variable-speed doubly fed induction generator based WECS. Furthermore, this book: Analyzes a wide variety of practical WECS, illustrating important concepts with case studies, simulations, and experimental results Provides a step-by-step design procedure for the development of predictive control schemes for various WECS configurations Describes continuous- and discrete-time modeling of wind generators and power converters, weighting factor selection, discretization methods, and extrapolation techniques Presents useful material for other power electronic applications such as variable-speed motor drives, power quality conditioners, electric vehicles, photovoltaic energy systems, distributed generation, and high-voltage direct current transmission. Explores S-Function Builder programming in MATLAB environment to implement various MPC strategies through the companion website Reflecting the latest technologies in the field, Model Predictive Control of Wind Energy Conversion Systems is a valuable reference for academic researchers, practicing engineers, and other professionals. It can also be used as a textbook for graduate-level and advanced undergraduate courses.

“Reliability and Risk Issues in Large Scale Safety-critical Digital Control Systems” provides a comprehensive coverage of reliability issues and their corresponding

countermeasures in the field of large-scale digital control systems, from the hardware and software in digital systems to the human operators who supervise the overall process of large-scale systems. Unlike other books which examine theories and issues in individual fields, this book reviews important problems and countermeasures across the fields of software reliability, software verification and validation, digital systems, human factors engineering and human reliability analysis. Divided into four sections dealing with software reliability, digital system reliability, human reliability and human operators in large-scale digital systems, the book offers insights from professional researchers in each specialized field in a diverse yet unified approach.

The great advances made in large-scale integration of semiconductors and the resulting cost-effective digital processors and data storage devices determine the present development of automation. The application of digital techniques to process automation started in about 1960, when the first process computer was installed. From about 1970 process computers with cathodic ray tube display have become standard equipment for larger automation systems. Until about 1980 the annual increase of process computers was about 20 to 30%. The cost of hardware has already then shown a tendency to decrease, whereas the relative cost of user software has tended to increase. Because of the high total cost the first phase of digital process automation is characterized by the centralization of many functions in a single (though sometimes in several) process computer. Application was mainly restricted to medium and large processes. Because of the far-reaching consequences of a breakdown in the central computer parallel standby computers or parallel back-up systems had to be provided. This meant a substantial increase in cost. The tendency to overload the capacity and software problems caused further difficulties. In 1971 the first microprocessors were marketed which, together with large-scale integrated semiconductor memory units and input/output modules, can be assembled into cost-effective microcomputers. These microcomputers differ from process computers in fewer but higher integrated modules and in the adaptability of their hardware and software to specialized, less comprehensive tasks.

It emphasizes throughout the high performance, reliability, and reduced cost of modern digital sensors, control devices, microprocessors, computer memory, and other electronic components.

Praise for the Series: "This book will be a useful reference to control engineers and researchers. The papers contained cover well the recent advances in the field of modern control theory." --IEEE Group Correspondence "This book will help all those researchers who valiantly try to keep abreast of what is new in the theory and practice of optimal control." --Control

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