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Robust and Adaptive Control - Eugene Lavretsky 2012-11-13

Robust and Adaptive Control shows the reader how to produce consistent and accurate controllers that operate in the presence of uncertainties and unforeseen events. Driven by aerospace applications the focus of the book is primarily on continuous-dynamical systems. The text is a three-part treatment, beginning with robust and optimal linear control methods and moving on to a self-contained presentation of the design and analysis of model reference adaptive control (MRAC) for nonlinear uncertain dynamical systems. Recent extensions and modifications to MRAC design are included, as are guidelines for combining robust optimal and MRAC controllers. Features of the text include: · case studies that demonstrate the benefits of robust and adaptive control for piloted, autonomous and experimental aerial platforms; · detailed background material for each chapter to motivate theoretical developments; · realistic examples and simulation data illustrating key features of the methods described; and · problem solutions for instructors and MATLAB® code

provided electronically. The theoretical content and practical applications reported address real-life aerospace problems, being based on numerous transitions of control-theoretic results into operational systems and airborne vehicles that are drawn from the authors' extensive professional experience with The Boeing Company. The systems covered are challenging, often open-loop unstable, with uncertainties in their dynamics, and thus requiring both persistently reliable control and the ability to track commands either from a pilot or a guidance computer. Readers are assumed to have a basic understanding of root locus, Bode diagrams, and Nyquist plots, as well as linear algebra, ordinary differential equations, and the use of state-space methods in analysis and modeling of dynamical systems. Robust and Adaptive Control is intended to methodically teach senior undergraduate and graduate students how to construct stable and predictable control algorithms for realistic industrial applications. Practicing engineers and academic researchers will also find the book of great instructional value. *Digital Signal Processing* - Lizhe Tan

2013-01-21

Digital Signal Processing, Second Edition enables electrical engineers and technicians in the fields of biomedical, computer, and electronics engineering to master the essential fundamentals of DSP principles and practice. Many instructive worked examples are used to illustrate the material, and the use of mathematics is minimized for easier grasp of concepts. As such, this title is also useful to undergraduates in electrical engineering, and as a reference for science students and practicing engineers. The book goes beyond DSP theory, to show implementation of algorithms in hardware and software. Additional topics covered include adaptive filtering with noise reduction and echo cancellations, speech compression, signal sampling, digital filter realizations, filter design, multimedia applications, over-sampling, etc. More advanced topics are also covered, such as adaptive filters, speech compression such as PCM, u-law, ADPCM, and multi-rate DSP and over-sampling ADC. New to this edition: MATLAB projects dealing with practical applications added throughout the book New chapter (chapter 13) covering sub-band coding and wavelet transforms, methods that have become popular in the DSP field New applications included in many chapters, including applications of DFT to seismic signals, electrocardiography data, and vibration signals All real-time C programs revised for the TMS320C6713 DSK Covers DSP principles with emphasis on communications and control applications Chapter objectives, worked examples, and end-of-chapter exercises aid the reader in grasping key concepts and solving related problems Website with MATLAB programs for simulation and C programs for real-time DSP

Stable Adaptive Control and Estimation for Nonlinear Systems - Jeffrey T. Spooner
2004-04-07

Includes a solution manual for problems. Provides MATLAB code for examples and solutions. Deals with robust systems in both theory and practice.

An Implementation of Adaptive Side

Lobe Cancellation in MATLAB - 2010

This report describes an implementation in MATLAB® of an adaptive side lobe canceller system, including a copy of the source code.

Learning for Adaptive and Reactive Robot Control - Aude Billard 2022-02-08

Methods by which robots can learn control laws that enable real-time reactivity using dynamical systems; with applications and exercises. This book presents a wealth of machine learning techniques to make the control of robots more flexible and safe when interacting with humans. It introduces a set of control laws that enable reactivity using dynamical systems, a widely used method for solving motion-planning problems in robotics. These control approaches can replan in milliseconds to adapt to new environmental constraints and offer safe and compliant control of forces in contact. The techniques offer theoretical advantages, including convergence to a goal, non-penetration of obstacles, and passivity. The coverage of learning begins with low-level control parameters and progresses to higher-level competencies composed of combinations of skills. Learning for Adaptive and Reactive Robot Control is designed for graduate-level courses in robotics, with chapters that proceed from fundamentals to more advanced content. Techniques covered include learning from demonstration, optimization, and reinforcement learning, and using dynamical systems in learning control laws, trajectory planning, and methods for compliant and force control . Features for teaching in each chapter: • applications, which range from arm manipulators to whole-body control of humanoid robots; • pencil-and-paper and programming exercises; • lecture videos, slides, and MATLAB code examples available on the author's website . • an eTextbook platform website offering protected material[EPS2] for instructors including solutions.

Sliding Mode Control Using MATLAB -

Jinkun Liu 2017-05-25

Sliding Mode Control Using MATLAB provides many sliding mode controller design

examples, along with simulation examples and MATLAB® programs. Following the review of sliding mode control, the book includes sliding mode control for continuous systems, robust adaptive sliding mode control, sliding mode control for underactuated systems, backstepping, and dynamic surface sliding mode control, sliding mode control based on filter and observer, sliding mode control for discrete systems, fuzzy sliding mode control, neural network sliding mode control, and sliding mode control for robot manipulators. The contents of each chapter are independent, providing readers with information they can use for their own needs. It is suitable for the readers who work on mechanical and electronic engineering, electrical automation engineering, etc., and can also be used as a teaching reference for universities. Provides many sliding mode controller design examples to help readers solve their research and design problems Includes various, implementable, robust sliding mode control design solutions from engineering applications Provides the simulation examples and MATLAB programs for each sliding mode control algorithm

Kernel Adaptive Filtering - Weifeng Liu
2011-09-20

Online learning from a signal processing perspective There is increased interest in kernel learning algorithms in neural networks and a growing need for nonlinear adaptive algorithms in advanced signal processing, communications, and controls. Kernel Adaptive Filtering is the first book to present a comprehensive, unifying introduction to online learning algorithms in reproducing kernel Hilbert spaces. Based on research being conducted in the Computational Neuro-Engineering Laboratory at the University of Florida and in the Cognitive Systems Laboratory at McMaster University, Ontario, Canada, this unique resource elevates the adaptive filtering theory to a new level, presenting a new design methodology of nonlinear adaptive filters. Covers the kernel least mean squares algorithm, kernel affine projection algorithms, the kernel recursive

least squares algorithm, the theory of Gaussian process regression, and the extended kernel recursive least squares algorithm Presents a powerful model-selection method called maximum marginal likelihood Addresses the principal bottleneck of kernel adaptive filters—their growing structure Features twelve computer-oriented experiments to reinforce the concepts, with MATLAB codes downloadable from the authors' Web site Concludes each chapter with a summary of the state of the art and potential future directions for original research Kernel Adaptive Filtering is ideal for engineers, computer scientists, and graduate students interested in nonlinear adaptive systems for online applications (applications where the data stream arrives one sample at a time and incremental optimal solutions are desirable). It is also a useful guide for those who look for nonlinear adaptive filtering methodologies to solve practical problems.

MATLAB Machine Learning Recipes -
Michael Paluszek 2019-01-31

Harness the power of MATLAB to resolve a wide range of machine learning challenges. This book provides a series of examples of technologies critical to machine learning. Each example solves a real-world problem. All code in MATLAB Machine Learning Recipes: A Problem-Solution Approach is executable. The toolbox that the code uses provides a complete set of functions needed to implement all aspects of machine learning. Authors Michael Paluszek and Stephanie Thomas show how all of these technologies allow the reader to build sophisticated applications to solve problems with pattern recognition, autonomous driving, expert systems, and much more. What you'll learn:How to write code for machine learning, adaptive control and estimation using MATLAB How these three areas complement each other How these three areas are needed for robust machine learning applications How to use MATLAB graphics and visualization tools for machine learning How to code real world examples in MATLAB for major applications of machine learning in big data Who is this book for: The

primary audiences are engineers, data scientists and students wanting a comprehensive and code cookbook rich in examples on machine learning using MATLAB.

Regularized Image Reconstruction in Parallel MRI with MATLAB - Joseph

Suresh Paul 2019-11-05

Regularization becomes an integral part of the reconstruction process in accelerated parallel magnetic resonance imaging (pMRI) due to the need for utilizing the most discriminative information in the form of parsimonious models to generate high quality images with reduced noise and artifacts. Apart from providing a detailed overview and implementation details of various pMRI reconstruction methods, Regularized image reconstruction in parallel MRI with MATLAB examples interprets regularized image reconstruction in pMRI as a means to effectively control the balance between two specific types of error signals to either improve the accuracy in estimation of missing samples, or speed up the estimation process. The first type corresponds to the modeling error between acquired and their estimated values. The second type arises due to the perturbation of k-space values in autocalibration methods or sparse approximation in the compressed sensing based reconstruction model. Features: Provides details for optimizing regularization parameters in each type of reconstruction. Presents comparison of regularization approaches for each type of pMRI reconstruction. Includes discussion of case studies using clinically acquired data. MATLAB codes are provided for each reconstruction type. Contains method-wise description of adapting regularization to optimize speed and accuracy. This book serves as a reference material for researchers and students involved in development of pMRI reconstruction methods. Industry practitioners concerned with how to apply regularization in pMRI reconstruction will find this book most useful.

Subband Adaptive Filtering - Kong-Aik Lee 2009-07-06

Subband adaptive filtering is rapidly becoming one of the most effective techniques for reducing computational complexity and improving the convergence rate of algorithms in adaptive signal processing applications. This book provides an introductory, yet extensive guide on the theory of various subband adaptive filtering techniques. For beginners, the authors discuss the basic principles that underlie the design and implementation of subband adaptive filters. For advanced readers, a comprehensive coverage of recent developments, such as multiband tap-weight adaptation, delayless architectures, and filter-bank design methods for reducing band-edge effects are included. Several analysis techniques and complexity evaluation are also introduced in this book to provide better understanding of subband adaptive filtering. This book bridges the gaps between the mixed-domain natures of subband adaptive filtering techniques and provides enough depth to the material augmented by many MATLAB® functions and examples. Key Features: Acts as a timely introduction for researchers, graduate students and engineers who want to design and deploy subband adaptive filters in their research and applications. Bridges the gaps between two distinct domains: adaptive filter theory and multirate signal processing. Uses a practical approach through MATLAB®-based source programs on the accompanying CD. Includes more than 100 M-files, allowing readers to modify the code for different algorithms and applications and to gain more insight into the theory and concepts of subband adaptive filters. Subband Adaptive Filtering is aimed primarily at practicing engineers, as well as senior undergraduate and graduate students. It will also be of interest to researchers, technical managers, and computer scientists.

Fundamentals of Adaptive Filtering - Ali H. Sayed 2003-06-13

This book is based on a graduate level course offered by the author at UCLA and has been classed tested there and at other universities over a number of years. This will

be the most comprehensive book on the market today providing instructors a wide choice in designing their courses. * Offers computer problems to illustrate real life applications for students and professionals alike * An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department. An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.

Adaptive Filter Equalization Analysis Using Embedded Matlab Code in Simulink - Philip T. Brant 2008

DSP for MATLAB and LabVIEW: LMS adaptive filtering - Forester W. Isen 2009

This book is Volume IV of the series DSP for MATLAB and LabVIEW. Volume IV is an introductory treatment of LMS Adaptive Filtering and applications, and covers cost functions, performance surfaces, coefficient perturbation to estimate the gradient, the LMS algorithm, response of the LMS algorithm to narrow-band signals, and various topologies such as ANC (Active Noise Cancelling) or system modeling, Noise Cancellation, Interference Cancellation, Echo Cancellation (with single- and dual-H topologies), and Inverse Filtering/Deconvolution. The entire series consists of four volumes that collectively cover basic digital signal processing in a practical and accessible manner, but which nonetheless include all essential foundation mathematics. As the series title implies, the scripts (of which there are more than 200) described in the text and supplied in code form (available via the internet at www.morganclaypool.com/page/isen) will run on both MATLAB and LabVIEW. The text for all volumes contains many examples, and many useful computational scripts, augmented by demonstration scripts and LabVIEW Virtual Instruments (VIs) that can be run to illustrate various signal processing concepts graphically on the user's computer screen. Volume I consists of four chapters that collectively set forth a brief overview of the field of digital signal

processing, useful signals and concepts (including convolution, recursion, difference equations, LTI systems, etc), conversion from the continuous to discrete domain and back (i.e., analog-to-digital and digital-to-analog conversion), aliasing, the Nyquist rate, normalized frequency, sample rate conversion and Mu-law compression, and signal processing principles including correlation, the correlation sequence, the Real DFT, correlation by convolution, matched filtering, simple FIR filters, and simple IIR filters. Chapter 4 of Volume I, in particular, provides an intuitive or "first principle" understanding of how digital filtering and frequency transforms work. Volume II provides detailed coverage of discrete frequency transforms, including a brief overview of common frequency transforms, both discrete and continuous, followed by detailed treatments of the Discrete Time Fourier Transform (DTFT), the z-Transform (including definition and properties, the inverse z-transform, frequency response via z-transform, and alternate filter realization topologies including Direct Form, Direct Form Transposed, Cascade Form, Parallel Form, and Lattice Form), and the Discrete Fourier Transform (DFT) (including Discrete Fourier Series, the DFT-IDFT pair, DFT of common signals, bin width, sampling duration, and sample rate, the FFT, the Goertzel Algorithm, Linear, Periodic, and Circular convolution, DFT Leakage, and computation of the Inverse DFT). Volume III covers digital filter design, including the specific topics of FIR design via windowed-ideal-lowpass filter, FIR highpass, bandpass, and bandstop filter design from windowed-ideal lowpass filters, FIR design using the transition-band-optimized Frequency Sampling technique (implemented by Inverse-DFT or Cosine/Sine Summation Formulas), design of equiripple FIRs of all standard types including Hilbert Transformers and Differentiators via the Remez Exchange Algorithm, design of Butterworth, Chebyshev (Types I and II), and Elliptic analog prototype lowpass filters, conversion of analog lowpass prototype filters to highpass, bandpass, and bandstop

filters, and conversion of analog filters to digital filters using the Impulse Invariance and Bilinear Transform techniques. Certain filter topologies specific to FIRs are also discussed, as are two simple FIR types, the Comb and Moving Average filters.

Model-Reference Adaptive Control -

Nhan T. Nguyen 2018-03-01

This textbook provides readers with a good working knowledge of adaptive control theory through applications. It is intended for students beginning masters or doctoral courses, and control practitioners wishing to get up to speed in the subject expeditiously. Readers are taught a wide variety of adaptive control techniques starting with simple methods and extending step-by-step to more complex ones. Stability proofs are provided for all adaptive control techniques without obfuscating reader understanding with excessive mathematics. The book begins with standard model-reference adaptive control (MRAC) for first-order, second-order, and multi-input, multi-output systems. Treatment of least-squares parameter estimation and its extension to MRAC follow, helping readers to gain a different perspective on MRAC. Function approximation with orthogonal polynomials and neural networks, and MRAC using neural networks are also covered.

Robustness issues connected with MRAC are discussed, helping the student to appreciate potential pitfalls of the technique. This appreciation is encouraged by drawing parallels between various aspects of robustness and linear time-invariant systems wherever relevant. Following on from the robustness problems is material covering robust adaptive control including standard methods and detailed exposition of recent advances, in particular, the author's work on optimal control modification.

Interesting properties of the new method are illustrated in the design of adaptive systems to meet stability margins. This method has been successfully flight-tested on research aircraft, one of various flight-control applications detailed towards the end of the book along with a hybrid adaptive flight control architecture that combines

direct MRAC with least-squares indirect adaptive control. In addition to the applications, understanding is encouraged by the use of end-of-chapter exercises and associated MATLAB® files. Readers will need no more than the standard mathematics for basic control theory such as differential equations and matrix algebra; the book covers the foundations of MRAC and the necessary mathematical preliminaries.

Optimal Networked Control Systems with MATLAB - Jagannathan Sarangapani 2018-09-03

Optimal Networked Control Systems with MATLAB® discusses optimal controller design in discrete time for networked control systems (NCS). The authors apply several powerful modern control techniques in discrete time to the design of intelligent controllers for such NCS. Detailed derivations, rigorous stability proofs, computer simulation examples, and downloadable MATLAB® codes are included for each case. The book begins by providing background on NCS, networked imperfections, dynamical systems, stability theory, and stochastic optimal adaptive controllers in discrete time for linear and nonlinear systems. It lays the foundation for reinforcement learning-based optimal adaptive controller use for finite and infinite horizons. The text then: Introduces quantization effects for linear and nonlinear NCS, describing the design of stochastic adaptive controllers for a class of linear and nonlinear systems Presents two-player zero-sum game-theoretic formulation for linear systems in input-output form enclosed by a communication network Addresses the stochastic optimal control of nonlinear NCS by using neuro dynamic programming Explores stochastic optimal design for nonlinear two-player zero-sum games under communication constraints Treats an event-sampled distributed NCS to minimize transmission of state and control signals within the feedback loop via the communication network Covers distributed joint optimal network scheduling and control design for wireless NCS, as well as the effect

of network protocols on the wireless NCS controller design. An ideal reference for graduate students, university researchers, and practicing engineers, *Optimal Networked Control Systems with MATLAB®* instills a solid understanding of neural network controllers and how to build them. *Radar Signal Analysis and Processing Using MATLAB* - Bassem R. Mahafza 2016-04-19 Offering radar-related software for the analysis and design of radar waveform and signal processing, *Radar Signal Analysis and Processing Using MATLAB®* provides a comprehensive source of theoretical and practical information on radar signals, signal analysis, and radar signal processing with companion MATLAB® code. After an overview of radar systems operation and design, the book reviews elements of signal theory relevant to radar detection and radar signal processing, along with random variables and processes. The author then presents the unique characteristic of the matched filter and develops a general formula for the output of the matched filter that is valid for any waveform. He analyzes several analog waveforms, including the linear frequency modulation pulse and stepped frequency waveforms, as well as unmodulated pulse-train, binary, polyphase, and frequency codes. The book explores radar target detection and pulse integration, emphasizing the constant false alarm rate. It also covers the stretch processor, the moving target indicator, radar Doppler processing, beamforming, and adaptive array processing. Using configurable MATLAB code, this book demonstrates how to apply signal processing to radar applications. It includes many examples and problems to illustrate the practical application of the theory.

Radar Systems Analysis and Design Using MATLAB - Bassem R. Mahafza 2016-04-19 Developed from the author's graduate-level courses, the first edition of this book filled the need for a comprehensive, self-contained, and hands-on treatment of radar systems analysis and design. It quickly became a bestseller and was widely adopted by many professors. The second

edition built on this successful format by rearranging and updating

Adaptive Filter Theory - Simon S. Haykin 1986

"Adaptive Filter Theory" looks at both the mathematical theory behind various linear adaptive filters with finite-duration impulse response (FIR) and the elements of supervised neural networks. Up-to-date and in-depth treatment of adaptive filters develops concepts in a unified and accessible manner. This highly successful book provides comprehensive coverage of adaptive filters in a highly readable and understandable fashion. Includes an extensive use of illustrative examples; and MATLAB experiments, which illustrate the practical realities and intricacies of adaptive filters, the codes for which can be downloaded from the Web. Covers a wide range of topics including Stochastic Processes, Wiener Filters, and Kalman Filters. For those interested in learning about adaptive filters and the theories behind them.

Adaptive Filtering - Paulo S R Diniz 2012-12-06

The field of Digital Signal Processing has developed so fast in the last two decades that it can be found in the graduate and undergraduate programs of most universities. This development is related to the growing available technologies for implementing digital signal processing algorithms. The tremendous growth of development in the digital signal processing area has turned some of its specialized areas into fields themselves. If accurate information of the signals to be processed is available, the designer can easily choose the most appropriate algorithm to process the signal. When dealing with signals whose statistical properties are unknown, fixed algorithms do not process these signals efficiently. The solution is to use an adaptive filter that automatically changes its characteristics by optimizing the internal parameters. The adaptive filtering algorithms are essential in many statistical signal processing applications. Although the field of adaptive signal processing has been

subject of research for over three decades, it was in the eighties that a major growth occurred in research and applications. Two main reasons can be credited to this growth, the availability of implementation tools and the appearance of early textbooks exposing the subject in an organized form. Presently, there is still a lot of activities going on in the area of adaptive filtering. In spite of that, the theoretical development in the linear-adaptive-filtering area reached a maturity that justifies a text treating the various methods in a unified way, emphasizing the algorithms that work well in practical implementation.

Robust Adaptive Dynamic Programming - Yu Jiang 2017-05-08

A comprehensive look at state-of-the-art ADP theory and real-world applications This book fills a gap in the literature by providing a theoretical framework for integrating techniques from adaptive dynamic programming (ADP) and modern nonlinear control to address data-driven optimal control design challenges arising from both parametric and dynamic uncertainties. Traditional model-based approaches leave much to be desired when addressing the challenges posed by the ever-increasing complexity of real-world engineering systems. An alternative which has received much interest in recent years are biologically-inspired approaches, primarily RADP. Despite their growing popularity worldwide, until now books on ADP have focused nearly exclusively on analysis and design, with scant consideration given to how it can be applied to address robustness issues, a new challenge arising from dynamic uncertainties encountered in common engineering problems. Robust Adaptive Dynamic Programming zeros in on the practical concerns of engineers. The authors develop RADP theory from linear systems to partially-linear, large-scale, and completely nonlinear systems. They provide in-depth coverage of state-of-the-art applications in power systems, supplemented with numerous real-world examples implemented in MATLAB. They also explore fascinating reverse engineering

topics, such how ADP theory can be applied to the study of the human brain and cognition. In addition, the book: Covers the latest developments in RADP theory and applications for solving a range of systems' complexity problems Explores multiple real-world implementations in power systems with illustrative examples backed up by reusable MATLAB code and Simulink block sets Provides an overview of nonlinear control, machine learning, and dynamic control Features discussions of novel applications for RADP theory, including an entire chapter on how it can be used as a computational mechanism of human movement control Robust Adaptive Dynamic Programming is both a valuable working resource and an intriguing exploration of contemporary ADP theory and applications for practicing engineers and advanced students in systems theory, control engineering, computer science, and applied mathematics.

Adaptive Filtering - Paulo S.R. Diniz 2013-03-14

Adaptive Filtering: Algorithms and Practical Implementation, Second Edition, presents a concise overview of adaptive filtering, covering as many algorithms as possible in a unified form that avoids repetition and simplifies notation. It is suitable as a textbook for senior undergraduate or first-year graduate courses in adaptive signal processing and adaptive filters. The philosophy of the presentation is to expose the material with a solid theoretical foundation, to concentrate on algorithms that really work in a finite-precision implementation, and to provide easy access to working algorithms. Hence, practicing engineers and scientists will also find the book to be an excellent reference. This second edition contains a substantial amount of new material: -Two new chapters on nonlinear and subband adaptive filtering; -Linearly constrained Wiener filters and LMS algorithms; -LMS algorithm behavior in fast adaptation; -Affine projection algorithms; - Derivation smoothing; -MATLAB codes for algorithms.

Adaptive Filtering and Change Detection -

Fredrik Gustafsson 2000-10-03

Adaptive filtering is a branch of digital signal processing which enables the selective enhancement of desired elements of a signal and the reduction of undesired elements. Change detection is another kind of adaptive filtering for non-stationary signals, and is the basic tool in fault detection and diagnosis. This text takes the unique approach that change detection is a natural extension of adaptive filtering, and the broad coverage encompasses both the mathematical tools needed for adaptive filtering and change detection and the applications of the technology. Real engineering applications covered include aircraft, automotive, communication systems, signal processing and automatic control problems. The unique integration of both theory and practical applications makes this book a valuable resource combining information otherwise only available in separate sources

Comprehensive coverage includes many examples and case studies to illustrate the ideas and show what can be achieved. Uniquely integrates applications to airborne, automotive and communications systems with the essential mathematical tools. Accompanying Matlab toolbox available on the web illustrating the main ideas and enabling the reader to do simulations using all the figures and numerical examples featured. This text would prove to be an essential reference for postgraduates and researchers studying digital signal processing as well as practising digital signal processing engineers.

Adaptive Moving Mesh Methods - Weizhang Huang 2010-10-26

This book is about adaptive mesh generation and moving mesh methods for the numerical solution of time-dependent partial differential equations. It presents a general framework and theory for adaptive mesh generation and gives a comprehensive treatment of moving mesh methods and their basic components, along with their application for a number of nontrivial physical problems. Many explicit examples with computed figures illustrate

the various methods and the effects of parameter choices for those methods. Graduate students, researchers and practitioners working in this area will benefit from this book.

Adaptive Resonance Theory Microchips

- Teresa Serrano-Gotarredona 2012-09-07

Adaptive Resonance Theory Microchips describes circuit strategies resulting in efficient and functional adaptive resonance theory (ART) hardware systems. While ART algorithms have been developed in software by their creators, this is the first book that addresses efficient VLSI design of ART systems. All systems described in the book have been designed and fabricated (or are nearing completion) as VLSI microchips in anticipation of the impending proliferation of ART applications to autonomous intelligent systems. To accommodate these systems, the book not only provides circuit design techniques, but also validates them through experimental measurements. The book also includes a chapter tutorially describing four ART architectures (ART1, ARTMAP, Fuzzy-ART and Fuzzy-ARTMAP) while providing easily understandable MATLAB code examples to implement these four algorithms in software. In addition, an entire chapter is devoted to other potential applications for real-time data clustering and category learning.

Intelligent Control Design and MATLAB Simulation - Jinkun Liu 2017-09-20

This book offers a comprehensive introduction to intelligent control system design, using MATLAB simulation to verify typical intelligent controller designs. It also uses real-world case studies that present the results of intelligent controller implementations to illustrate the successful application of the theory. Addressing the need for systematic design approaches to intelligent control system design using neural network and fuzzy-based techniques, the book introduces the concrete design method and MATLAB simulation of intelligent control strategies; offers a catalog of implementable intelligent control design methods for engineering applications; provides advanced intelligent

controller design methods and their stability analysis methods; and presents a sample simulation and Matlab program for each intelligent control algorithm. The main topics addressed are expert control, fuzzy logic control, adaptive fuzzy control, neural network control, adaptive neural control and intelligent optimization algorithms, providing several engineering application examples for each method.

Adaptive Inverse Control - Bernard Widrow
2012-08-21

This text blends the areas of adaptive inverse control and signal processing in a unique way, allowing engineers in both fields to share tools and techniques. Clearly and intuitively written, the book presents theory, but it emphasizes practical applications and common sense understanding. New enhancements to this edition include discussion questions and homework problems for each chapter. Content has been updated to reflect the latest information, and includes case studies, reference algorithms, historical background, and chapter summaries to help make the material clearer. This resource features downloadable answer keys, MATLAB code, and other student/instructor resources.

Optical Wireless Communications - Z. Ghassemlooy
2019-04-30

The 2nd Edition of *Optical Wireless Communications: System and Channel Modelling with MATLAB®* with additional new materials, is a self-contained volume that provides a concise and comprehensive coverage of the theory and technology of optical wireless communication systems (OWC). The delivery method makes the book appropriate for students studying at undergraduate and graduate levels as well as researchers and professional engineers working in the field of OWC. The book gives a detailed description of OWC, focusing mainly on the infrared and visible bands, for indoor and outdoor applications. A major attraction of the book is the inclusion of Matlab codes and simulations results as well as experimental test-beds for free space optics and visible light communication

systems. This valuable resource will aid the readers in understanding the concept, carrying out extensive analysis, simulations, implementation and evaluation of OWC links. This 2nd edition is structured into nine compact chapters that cover the main aspects of OWC systems: History, current state of the art and challenges Fundamental principles Optical source and detector and noise sources Modulation, equalization, diversity techniques Channel models and system performance analysis Visible light communications Terrestrial free space optics communications Relay-based free space optics communications Matlab codes. A number of Matlab based simulation codes are included in this 2nd edition to assist the readers in mastering the subject and most importantly to encourage them to write their own simulation codes and enhance their knowledge.

Simplified Robust Adaptive Detection and Beamforming for Wireless Communications - Ayman ElNashar
2018-08-20

This book presents an alternative and simplified approaches for the robust adaptive detection and beamforming in wireless communications. It adopts several systems models including DS/CDMA, OFDM/MIMO with antenna array, and general antenna arrays beamforming model. It presents and analyzes recently developed detection and beamforming algorithms with an emphasis on robustness. In addition, simplified and efficient robust adaptive detection and beamforming techniques are presented and compared with exiting techniques. Practical examples based on the above systems models are provided to exemplify the developed detectors and beamforming algorithms. Moreover, the developed techniques are implemented using MATLAB—and the relevant MATLAB scripts are provided to help the readers to develop and analyze the presented algorithms. *Simplified Robust Adaptive Detection and Beamforming for Wireless Communications* starts by introducing readers to adaptive signal processing and robust adaptive detection. It then goes on to

cover Wireless Systems Models. The robust adaptive detectors and beamformers are implemented using the well-known algorithms including LMS, RLS, IQRD-RLS, RSD, BSCMA, CG, and SD. The robust detection and beamforming are derived based on the existing detectors/beamformers including MOE, PLIC, LCCMA, LCMV, MVDR, BSCMA, and MBER. The adopted cost functions include MSE, BER, CM, MV, and SINR/SNR.

Digital Signal Processing with Examples in MATLAB - Samuel D. Stearns 2016-04-19

Based on fundamental principles from mathematics, linear systems, and signal analysis, digital signal processing (DSP) algorithms are useful for extracting information from signals collected all around us. Combined with today's powerful computing capabilities, they can be used in a wide range of application areas, including engineering, communicati

Adaptive Filtering Primer with MATLAB - Alexander D. Poularikas 2006-02-14

Because of the wide use of adaptive filtering in digital signal processing and, because most of the modern electronic devices include some type of an adaptive filter, a text that brings forth the fundamentals of this field was necessary. The material and the principles presented in this book are easily accessible to engineers, scientists, and students who would like to learn the fundamentals of this field and have a background at the bachelor level. Adaptive Filtering Primer with MATLAB® clearly explains the fundamentals of adaptive filtering supported by numerous examples and computer simulations. The authors introduce discrete-time signal processing, random variables and stochastic processes, the Wiener filter, properties of the error surface, the steepest descent method, and the least mean square (LMS) algorithm. They also supply many MATLAB® functions and m-files along with computer experiments to illustrate how to apply the concepts to real-world problems. The book includes problems along with hints, suggestions, and solutions for solving them. An appendix on matrix computations

completes the self-contained coverage. With applications across a wide range of areas, including radar, communications, control, medical instrumentation, and seismology, Adaptive Filtering Primer with MATLAB® is an ideal companion for quick reference and a perfect, concise introduction to the field.

Computational Statistics Handbook with MATLAB - Wendy L. Martinez

2001-09-26

Approaching computational statistics through its theoretical aspects can be daunting. Often intimidated or distracted by the theory, researchers and students can lose sight of the actual goals and applications of the subject. What they need are its key concepts, an understanding of its methods, experience with its implementation, and practice with

Towards Hybrid and Adaptive Computing - Anupam Shukla 2010-09-18

Soft Computing today is a very vast field whose extent is beyond measure. The boundaries of this magnificent field are spreading at an enormous rate making it possible to build computationally intelligent systems that can do virtually anything, even after considering the hostile practical limitations. Soft Computing, mainly comprising of Artificial Neural Networks, Evolutionary Computation, and Fuzzy Logic may itself be insufficient to cater to the needs of various kinds of complex problems. In such a scenario, we need to carry out amalgamation of same or different computing approaches, along with heuristics, to make fabulous systems for problem solving. There is further an attempt to make these computing systems as adaptable as possible, where the value of any parameter is set and continuously modified by the system itself. This book first presents the basic computing techniques, draws special attention towards their advantages and disadvantages, and then motivates their fusion, in a manner to maximize the advantages and minimize the disadvantages. Conceptualization is a key element of the book, where emphasis is on visualizing the dynamics going inside the technique of use, and hence noting the

shortcomings. A detailed description of different varieties of hybrid and adaptive computing systems is given, paying special attention towards conceptualization and motivation. Different evolutionary techniques are discussed that hold potential for generation of fairly complex systems. The complete book is supported by the application of these techniques to biometrics. This not only enables better understanding of the techniques with the added application base, it also opens new dimensions of possibilities how multiple biometric modalities can be fused together to make effective and scalable systems.

Adaptive Structures - Robert L. Clark
1998-03-31

Mechanical Engineering/Materials Science
An applications-oriented approach for engineers and advanced students Adaptive Structures covers the key concepts and practical issues involved in translating much of the theory of adaptive structures into successful, real-world hardware. Easily applied to a variety of application physics, the material emphasizes the integration of control strategies, transduction device dynamics, and spatial signal processing through novel sensing methods and actuator configurations (physical or transformed coordinates). The book contains essential models of adaptive structures and components to facilitate design approaches. The accompanying disk features script files, operating under MATLAB, which can be used to generate most of the results presented throughout the book and are invaluable to readers developing their own structural models. Topics include: * Fundamentals of structural dynamics; linear systems and signals; and signal processing and digital filters * The integration of spatial and temporal signal processing techniques * Transduction device dynamics and links between physical, modal, and wave domain models for structural dynamic analysis and control * An overview of classical controls * An application-oriented review of adaptive feedforward control and multivariable feedback control system architectures

Predictive Analytics using R - Jeffrey Strickland 2015-01-16

This book is about predictive analytics. Yet, each chapter could easily be handled by an entire volume of its own. So one might think of this a survey of predictive modeling. A predictive model is a statistical model or machine learning model used to predict future behavior based on past behavior. In order to use this book, one should have a basic understanding of mathematical statistics - it is an advanced book. Some theoretical foundations are laid out but not proven, but references are provided for additional coverage. Every chapter culminates in an example using R. R is a free software environment for statistical computing and graphics. You may download R, from a preferred CRAN mirror at <http://www.r-project.org/>. The book is organized so that statistical models are presented first (hopefully in a logical order), followed by machine learning models, and then applications: uplift modeling and time series. One could use this a textbook with problem solving in R-but there are no "by-hand" exercises.

Adaptive Filters - Behrouz Farhang-Boroujeny 2013-04-02

This second edition of Adaptive Filters: Theory and Applications has been updated throughout to reflect the latest developments in this field; notably an increased coverage given to the practical applications of the theory to illustrate the much broader range of adaptive filters applications developed in recent years. The book offers an easy to understand approach to the theory and application of adaptive filters by clearly illustrating how the theory explained in the early chapters of the book is modified for the various applications discussed in detail in later chapters. This integrated approach makes the book a valuable resource for graduate students; and the inclusion of more advanced applications including antenna arrays and wireless communications makes it a suitable technical reference for engineers, practitioners and researchers. Key features:

- Offers a thorough treatment of the theory

of adaptive signal processing; incorporating new material on transform domain, frequency domain, subband adaptive filters, acoustic echocancellation and active noise control. • Provides an in-depth study of applications which now includes extensive coverage of OFDM, MIMO and smart antennas. • Contains exercises and computer simulation problems at the end of each chapter. • Includes a new companion website hosting MATLAB® simulation programs which complement the theoretical analyses, enabling the reader to gain an in-depth understanding of the behaviours and properties of the various adaptive algorithms.

Adaptive Filtering - Alexander D. Poularikas
2017-12-19

Adaptive filters are used in many diverse applications, appearing in everything from military instruments to cellphones and home appliances. Adaptive Filtering:

Fundamentals of Least Mean Squares with MATLAB® covers the core concepts of this important field, focusing on a vital part of the statistical signal processing area—the least mean square (LMS) adaptive filter. This largely self-contained text: Discusses random variables, stochastic processes, vectors, matrices, determinants, discrete random signals, and probability distributions Explains how to find the eigenvalues and eigenvectors of a matrix and the properties of the error surfaces Explores the Wiener filter and its practical uses, details the steepest descent method, and develops the Newton's algorithm Addresses the basics of the LMS adaptive filter algorithm, considers LMS adaptive filter variants, and provides numerous examples Delivers a concise introduction to MATLAB®, supplying problems, computer experiments, and more than 110 functions and script files Featuring robust appendices complete with mathematical tables and formulas, Adaptive Filtering: Fundamentals of Least Mean Squares with MATLAB® clearly describes the key principles of adaptive filtering and effectively demonstrates how to apply them to solve real-world problems.

Adaptive Structures and Technology, Ninth International Conference - Nesbitt Hagood IV
1999-03-11

Digital Signal Processing - Rulph Chassaing
1998-11-16

A practical guide to using the TMS320C31 DSP Starter Kit With applications and demand for high-performing digital signal processors expanding rapidly, it is becoming increasingly important for today's students and practicing engineers to master real-time digital signal processing (DSP) techniques. Digital Signal Processing: Laboratory Experiments Using C and the TMS320C31 DSK offers users a practical—and economical—approach to understanding DSP principles, designs, and applications. Demonstrating Texas Instruments' (TI) state-of-the-art, low-priced DSP Starter Kit (DSK), this book clearly illustrates and integrates practical aspects of real-time DSP implementation techniques and complex DSP concepts into lab exercises and experiments. TI's TMS320C31 digital signal processor provides substantial performance benefits for designs that have floating-point capabilities supported by high-level language compilers. Most chapters begin with a theoretical discussion followed by representative examples. With numerous programming examples using TMS320C3x and C code included on disk, this easy-to-read text: * Covers DSK tools, the architecture, and instructions for the TMS320C31 processor * Illustrates input and output * Introduces the z-transform * Discusses finite impulse response (FIR) filters, including the effect of window functions * Covers infinite impulse response (IIR) filters * Discusses the development and implementation of the fast Fourier transform (FFT) * Examines utility of adaptive filters for different applications Bridging the gap between theory and application, this book furnishes a solid foundation for DSP lab or project design courses for students and serves as a welcome, practically oriented tutorial in the latest DSP techniques for working professionals.

Image Super-Resolution and Applications - Fathi E. Abd El-Samie
2012-12-15

This book is devoted to the issue of image super-resolution—obtaining high-resolution images from single or multiple low-resolution images. Although there are numerous algorithms available for image interpolation and super-resolution, there's been a need for a book that establishes a common thread between the two processes. Filling this need, *Image Super-Resolution and Applications* presents image interpolation as a building block in the super-resolution reconstruction process. Instead of approaching image interpolation as either a polynomial-based problem or an inverse problem, this book breaks the mold and compares and contrasts the two approaches. It presents two directions for image super-resolution: super-resolution with a priori information and blind super-resolution reconstruction of images. It also devotes chapters to the two complementary steps used to obtain high-resolution images: image registration and image fusion. Details techniques for color image interpolation and interpolation for pattern recognition Analyzes image interpolation as an inverse problem Presents image registration methodologies Considers image fusion and its application in image super resolution Includes simulation experiments along with the required MATLAB® code Supplying complete coverage of image-super resolution and its applications, the book illustrates applications for image interpolation and super-resolution in medical and satellite image processing. It uses MATLAB® programs to present various techniques, including polynomial image interpolation and adaptive polynomial image interpolation. MATLAB codes for most of the simulation experiments supplied in the book are included in the appendix.

Real-Time Digital Signal Processing - Sen M. Kuo 2013-08-05

Combines both the DSP principles and real-time implementations and applications, and now updated with the new eZdsp USB Stick, which is very low cost, portable and

widely employed at many DSP labs. Real-Time Digital Signal Processing introduces fundamental digital signal processing (DSP) principles and will be updated to include the latest DSP applications, introduce new software development tools and adjust the software design process to reflect the latest advances in the field. In the 3rd edition of the book, the key aspect of hands-on experiments will be enhanced to make the DSP principles more interesting and directly interact with the real-world applications. All of the programs will be carefully updated using the most recent version of software development tools and the new TMS320VC5505 eZdsp USB Stick for real-time experiments. Due to its lower cost and portability, the new software and hardware tools are now widely used in university labs and in commercial industrial companies to replace the older and more expensive generation. The new edition will have a renewed focus on real-time applications and will offer step-by-step hands-on experiments for a complete design cycle starting from floating-point C language program to fixed-point C implementation, code optimization using INTRINSICS, and mixed C-and-assembly programming on fixed-point DSP processors. This new methodology enables readers to concentrate on learning DSP fundamentals and innovative applications by relaxing the intensive programming efforts, namely, the traditional DSP assembly coding efforts. The book is organized into two parts; Part One introduces the digital signal processing principles and theories, and Part Two focuses on practical applications. The topics for the applications are the extensions of the theories in Part One with an emphasis placed on the hands-on experiments, systematic design and implementation approaches. The applications provided in the book are carefully chosen to reflect current advances of DSP that are of most relevance for the intended readership. Combines both the DSP principles and real-time implementations and applications using the new eZdsp USB Stick, which is very low cost,

portable and widely employed at many DSP labs is now used in the new edition. Places renewed emphasis on C-code experiments and reduces the exercises using assembly coding; effective use of C programming, fixed-point C code and INTRINSICS will become the main focus of the new edition. Updates to application areas to reflect latest advances such as speech coding techniques used for next generation networks (NGN), audio coding with surrounding sound, wideband speech codec (ITU G.722.2 Standard), fingerprint for image processing, and biomedical signal processing examples. Contains new addition of several projects that can be used as semester projects; as well as new many new real-time experiments using TI's binary libraries - the experiments are prepared with flexible

interface and modular for readers to adapt and modify to create other useful applications from the provided basic programs. Consists of more MATLAB experiments, such as filter design, algorithm evaluation, proto-typing for C-code architecture, and simulations to aid readers to learn DSP fundamentals. Includes supplementary material of program and data files for examples, applications, and experiments hosted on a companion website. A valuable resource for Postgraduate students enrolled on DSP courses focused on DSP implementation & applications as well as Senior undergraduates studying DSP; engineers and programmers who need to learn and use DSP principles and development tools for their projects.