Noise Theory Of Linear And Nonlinear Circuits

In the mathematical treatment of many problems which arise in physics, economics, engineering, management, etc., the researcher frequently faces two major difficulties: infinite dimensionality and randomness of the evolution process. Infinite dimensionality occurs when the evolution in time of a process is accompanied by a space-like dependence; for example, spatial distribution of the temperature for a heat-conductor, spatial dependence of the time-varying displacement of a membrane subject to external forces, etc. Randomness is intrinsic to the mathematical formulation of many phenomena, such as fluctuation in the stock market, or noise in communication networks. Control theory of distributed parameter systems and stochastic systems focuses on physical phenomena which are governed by partial differential equations, delay-differential equations, integral differential equations, etc., and stochastic differential equations of various types. This has been a fertile field of research with over 40 years of history, which continues to be very active under the thrust of new emerging applications. Among the subjects covered are: Control of distributed parameter systems; Stochastic control; Applications in finance/insurance/manufacturing; Adapted control; Numerical approximation . It is essential reading for applied mathematicians, control theorists, economic/financial analysts and engineers.

Learn the basics of white noise theory with White Noise

Distribution Theory. This book covers the mathematical foundation and key applications of white noise theory without requiring advanced knowledge in this area. This instructive text specifically focuses on relevant application topics such as integral kernel operators, Fourier transforms, Laplacian operators, white noise integration, Feynman integrals, and positive generalized functions. Extremely well-written by one of the field's leading researchers, White Noise Distribution Theory is destined to become the definitive introductory resource on this challenging topic.

Linear prediction theory has had a profound impact in the field of digital signal processing. Although the theory dates back to the early 1940s, its influence can still be seen in applications today. The theory is based on very elegant mathematics and leads to many beautiful insights into statistical signal processing. Although prediction is only a part of the more general topics of linear estimation, filtering, and smoothing, this book focuses on linear prediction. This has enabled detailed discussion of a number of issues that are normally not found in texts. For example, the theory of vector linear prediction is explained in considerable detail and so is the theory of line spectral processes. This focus and its small size make the book different from many excellent texts which cover the topic, including a few that are actually dedicated to linear prediction. There are several examples and computer-based demonstrations of the theory. Applications are mentioned wherever appropriate, but the focus is not on the detailed development of these applications. The writing style is meant to be suitable for self-study as well as for classroom use at the senior and first-year graduate levels. The text is self-contained for readers with introductory exposure to signal processing, random processes, and the theory of matrices, and a historical perspective and detailed outline are given in the first chapter. Table of Contents: Introduction / The Optimal Linear Prediction Problem / Levinson's Recursion / Lattice Structures for Linear Prediction / Autoregressive Modeling / Prediction Error Bound and Spectral Flatness / Line Spectral Processes / Linear Prediction Theory for Vector Processes / Appendix A: Linear Estimation of Random Variables / B: Proof of a Property of Autocorrelations / C: Stability of the Inverse Filter / Recursion Satisfied by AR Autocorrelations

Control Theory for Linear Systems deals with the mathematical theory of feedback control of linear systems. It treats a wide range of control synthesis problems for linear state space systems with inputs and outputs. The book provides a treatment of these problems using state space methods, often with a geometric flavour. Its subject matter ranges from controllability and observability, stabilization, disturbance decoupling, and tracking and regulation, to linear quadratic regulation, H2 and H-infinity control, and robust stabilization. Each chapter of the book contains a series of exercises, intended to increase the reader's understanding of the material. Often, these exercises generalize and extend the material treated in the regular text.

Digital signal processing plays a central role in the development of modern communication and information processing systems. The theory and application of signal processing is concerned with the identification, modelling and utilisation of patterns and structures in a signal process. The observation signals are often distorted, incomplete and noisy and therefore noise reduction, the removal of channel distortion, and replacement of lost samples are important parts of a signal processing system. The fourth edition of Advanced Digital Signal Processing and Noise Reduction updates and extends the chapters in the previous edition and includes two new chapters on MIMO systems, Correlation and Eigen analysis and independent component analysis. The wide range of topics covered in this book include Wiener filters, echo cancellation, channel equalisation, spectral estimation, detection and removal of impulsive and transient noise, interpolation of missing data segments, speech enhancement and noise/interference in mobile communication environments. This book provides a coherent and structured presentation of the theory and applications of statistical signal processing and noise reduction methods. Two new chapters on MIMO systems, correlation and Eigen analysis and independent component analysis Comprehensive coverage of advanced digital signal processing and noise reduction methods for communication and information processing systems Examples and applications in signal and information extraction from noisy data Comprehensive but accessible coverage of signal processing theory including probability models, Bayesian inference, hidden Markov models, adaptive filters and Linear prediction models Advanced Digital Signal Processing and Noise Reduction is an invaluable text for postgraduates, senior undergraduates and researchers in the fields of digital signal processing, telecommunications and statistical data analysis. It will also be of interest to professional engineers in telecommunications and audio and signal processing industries and network planners and implementers in mobile and wireless communication communities.

Noise Theory of Linear and Nonlinear CircuitsWiley

In this book, we study theoretical and practical aspects of computing methods for mathematical modelling of nonlinear systems. A number of computing techniques are considered, such as methods of operator approximation with any given accuracy; operator interpolation techniques including a non-Lagrange interpolation; methods of system representation subject to constraints associated with concepts of causality, memory and stationarity; methods of system representation with an accuracy that is the best within a given class of models; methods of covariance matrix estimation; methods for low-rank matrix approximations; hybrid methods based on a combination of iterative procedures and best operator approximation; and methods for information compression and filtering under condition that a filter model should satisfy restrictions associated with causality and different types of memory. As a result, the book represents a blend of new methods in general computational analysis, and specific, but also generic, techniques for study of systems theory ant its particular branches, such as optimal filtering and

information compression. - Best operator approximation, - Non-Lagrange interpolation, - Generic Karhunen-Loeve transform - Generalised low-rank matrix approximation - Optimal data compression - Optimal nonlinear filtering
A collection of different lectures presented by experts in the field of nonlinear science provides the reader with contemporary, cutting-edge, research works that bridge the gap between theory and device realizations of nonlinear phenomena. Representative examples of topics covered include: chaos gates, social networks, communication, sensors, lasers, molecular motors, biomedical anomalies, stochastic resonance, nano-oscillators for generating microwave signals and related complex systems. A common theme among these and many other related lectures is to model, study, understand, and exploit the rich behavior exhibited by nonlinear systems to design and fabricate novel technologies with superior characteristics. Consider, for instance, the fact that a shark's sensitivity to electric fields is 400 times more powerful than the most sophisticated electric-field sensor. In spite of significant advances in material properties, in many cases it remains a daunting task to duplicate the superior signal processing capabilities of most animals. Since nonlinear systems tend to be highly sensitive to perturbations when they occur near the onset of a bifurcation, there are also lectures on the general topic of bifurcation theory and on how to exploit such bifurcations for signal enhancements purposes. This manuscript will appeal to researchers interested in both theory and implementations of nonlinear systems.

Based on the author's own research, this book rigorously and systematically develops the theory of Gaussian white noise measures on Hilbert spaces to provide a comprehensive account of nonlinear filtering theory. Covers Markov processes, cylinder and quasi-cylinder probabilities and conditional expectation as well as predictio0n and smoothing and the varied processes used in filtering. Especially useful for electronic engineers and mathematical statisticians for explaining the systematic use of finely additive white noise theory leading to a more simplified and direct presentation. Applications of phase-locked loops play an increasingly important role in modern electronic systems, and the last 25 years have seen new developments in the underlying theories as well. Phase-Locked Loops presents the latest information on the basic theory and applications of PLLs. Organized in a logical format, it first introduces the subject in a qualitative manner and discusses key applications. Next, it develops basic models for components of a PLL, and these are used to develop a basic PLL model. The text then discusses both linear and nonlinear methods that are used to analyze the basic PLL model. This book includes extensive coverage of the nonlinear behavior of phase-locked loops, an important area of this field and one where exciting new research is being performed. No other book available covers this critical area in such careful detail. Improvements brought about by the advent of the personal computer, especially in the use of numerical results, are integrated into the text. This book also focuses on PLL component technologies used in system implementation.

This study uses a linear analysis to predict the S/N of a backward-wave oscillator, considered as a local oscillator. Local oscillator RF power is calculated using an approximate expression for efficiency. Noise power is found by calculating skirt gain and noise figure for each side band. The analysis assumes that skirt gain can be calculated from linear theory for the start-oscillation condition. Losses are neglected. Where necessary, equations developed by other authors for small values of the impedance parameter, C, are modified to allow large-C calculations. All the basic equations and their modifications are reviewed in the appendices. This study shows that linear theory predicts that the impedance parameter may be adjusted to achieve an optimum S/N. The value of C obtained is in the neighborhood of 0.003 and is lower than the value of C usually found in commercial backward-wave oscillators. The results indicate that an order of magnitude improvement in R may be expected. (Author).

This second edition of Mathematical Methods in the Robust Control of Linear Stochastic Systems includes a large number of recent results in the control of linear stochastic systems. More specifically, the new results presented are: - A unified and abstract framework for Riccati type equations arising in the stochastic control - Stability and control problems for systems perturbed by homogeneous Markov processes with infinite number of states - Mixed H2 / H? control problem and numerical procedures - Linear differential equations with positive evolution on ordered Banach spaces with applications for stochastic systems including both multiplicative white noise and Markovian jumps represented by a Markov chain with countable infinite set of states - Kalman filtering for stochastic systems subject both to state dependent noise and Markovian jumps - H? reduced order filters for stochastic systems The book will appeal to graduate students, researchers in advanced control engineering, finance, mathematical systems theory, applied probability and stochastic processes, and numerical analysis. From Reviews of the First Edition: This book is concerned with robust control of stochastic systems. One of the main features is its coverage of jump Markovian systems. ... Overall, this book presents results taking into consideration both white noise and Markov chain perturbations. It is clearly written and should be useful for people working in applied mathematics and in control and systems theory. The references cited provide further reading sources. (George Yin, Mathematical Reviews, Issue 2007 m) This book considers linear time varying stochastic systems, subjected to white noise disturbances and system parameter Markovian jumping, in the context of optimal control ... robust stabilization, and disturbance attenuation. ... The material presented in the book is organized in seven chapters. ... The book is very well written and organized. ... is a valuable reference for all researchers and graduate students in applied mathematics and control engineering interested in linear stochastic time varying control systems with Markovian parameter jumping and white noise disturbances. (Zoran Gajic, SIAM Review, Vol. 49 (3), 2007)

A random field is a mathematical model of evolutional fluctuatingcomplex systems parametrized by a multi-dimensional manifold like acurve or a surface. As the parameter varies, the random field carriesmuch information and hence it has complex stochastic structure.The authors of this book use an approach that is characteristic: namely, they first construct innovation, which is the most elementalstochastic process with a basic and simple way of dependence, and thenexpress the given field as a function of the innovation. Theytherefore establish an infinite-dimensional stochastic calculus, inparticular a stochastic variational calculus. The analysis offunctions of the innovation is essentially infinite-dimensional. Theauthors use not only the theory of functional analysis, but also theirnew tools for the study

In two main sections, this volume covers peaks of random functions and the effects of noise on relays and nonlinear self-excited oscillations in the presence of noise. Includes bibliographic references and index.

The field of Stochastic Partial Differential Equations (SPDEs) is one of the most dynamically developing areas of mathematics. It lies at the cross section of probability, partial differential equations, population biology, and mathematical physics. The field is especially attractive because of its interdisciplinary nature and the enormous richness of current and potential future applications. This volume is a collection of six important topics in SPDEs presented from the viewpoint of distinguished scientists working in the field and related areas. Emphasized are the genesis and applications of

SPDEs as well as mathematical theory and numerical methods.

Overcome the effects of noise to push the level of circuit performance with this practical reference. Thoroughly explaining the theory of noise in high-frequency circuits, the book focuses on the real-world problems noise creates. It provides you with a full understanding of methods for analyzing and minimizing noise in linear and nonlinear circuits. The book pays special attention to phase noise in oscillators, offering you a comprehensive and accessible treatment of this critical topic. Additionally, this authoritative volume examines noise in low-noise amplifiers, mixers, and frequency multipliers.

Noise theory is continuing to gain momentum as a leading topic.Developments in the field are proving increasingly important to theelectronics engineer or researcher specialising in communicationsand microwave engineering. This text provides a comprehensiveoverview of noise theory in linear and nonlinear circuits andserves as a practical guide for engineers designing circuits wherenoise is a significant factor. Features include: * A practical approach to the design of noise circuits * Graphical representations of noise quantities * Definition of all noise quantities for both active and passivecircuits * Formulae for the conversion of different sets of noiseparameters * Equations derived for the overall noise parameters of embeddednoisy networks * Determination of Volterra transfer functions of nonlinearmulti-port networks containing multi-dimensionalnonlinearities * Analysis of noise theory in nonlinear networks based on themulti-port Volterra-series approach Presenting material currently only available in the primaryliterature, this book serves as an invaluable reference source foradvanced students, academics and researchers in the fields

ofelectronics and microwave engineering. The comprehensive coveragewill also appeal to communications and microwave engineers inindustry.
As their name implies, VLSI systems involve the integration of various component systems. While all of these components systems are rooted in semiconductor manufacturing, they involve a broad range of technologies. This volume of the Principles and Applications of Engineering series examines the technologies associated with VLSI systems, including
The theory of linear discrete time filtering started with a paper by Kol mogorov in 1941. He addressed the problem for stationary random se quences and introduced the idea of the innovations process, which is a useful tool for the more general problems considered here. The reader may object and note that Gauss discovered least squares much earlier; however, I want to distinguish between the problem of parameter estimation, the Gauss problem, and that of Kolmogorov estimation of a process. This sep aration is of more than academic interest as the least squares problem leads to the normal equations, which are numerically ill conditioned, while the process estimation problem in the linear case with appropriate assumptions leads to uniformly asymptotically stable equations for the estimator and the gain. The conditions relate to controlability and observability and will be detailed in this volume. In the present volume, we present a series of lectures on linear and nonlinear sequential filtering theory. The theory is due to Kalman for the linear colored observation noise problem; in the case of white observation noise it is the analog of the continuous-time Kalman-Bucy theory. The discrete time filtering theory requires only modest mathematical tools in counterpoint to the continuous time theory and is aimed at a senior-level undergraduate course. The present book, organized by lectures, is actually based on a course that meets once a

week for three hours, with each meeting constituting a lecture.

Linear and Non-Linear System Theory focuses on the basics of linear and non-linear systems, optimal control and optimal estimation with an objective to understand the basics of state space approach linear and non-linear systems and its analysis thereof. Divided into eight chapters, materials cover an introduction to the advanced topics in the field of linear and non-linear systems, optimal control and estimation supported by mathematical tools, detailed case studies and numerical and exercise problems. This book is aimed at senior undergraduate and graduate students in electrical, instrumentation, electronics, chemical, control engineering and other allied branches of engineering. Features Covers both linear and non-linear system theory Explores state feedback control and state estimator concepts Discusses non-linear systems and phase plane analysis Includes non-linear system stability and bifurcation behaviour Elaborates optimal control and estimation

Provides state-of-the-art algorithms for sound capture, processing and enhancement Sound Capture and Processing: Practical Approaches covers the digital signal processing algorithms and devices for capturing sounds, mostly human speech. It explores the devices and technologies used to capture, enhance and process sound for the needs of communication and speech recognition in modern computers and communication devices. This book gives a comprehensive introduction to basic acoustics and microphones, with coverage of algorithms for noise reduction, acoustic echo cancellation, dereverberation and microphone arrays; charting the progress of such technologies from their evolution to present day standard. Sound Capture and Processing: Practical Approaches Brings together the state-of-the-art algorithms for sound capture, processing and enhancement in one easily accessible volume Provides invaluable implementation techniques required to process algorithms for real life applications and devices Covers a number of advanced sound processing techniques, such as multichannel acoustic echo cancellation, dereverberation and source separation Generously illustrated with figures and charts to demonstrate how sound capture and audio processing systems work An accompanying website containing Matlab code to illustrate the algorithms This invaluable guide will provide audio, R&D and software engineers in the industry of building systems or computer peripherals for speech enhancement with a comprehensive overview of the technologies, devices and algorithms required for modern computers and communication devices. Graduate students studying electrical engineering and computer science, and researchers in multimedia, cell-phones, interactive systems and acousticians will also benefit from this book.

The ultimate handbook on microwave circuit design with CAD. Full of tips and insights from seasoned industry veterans, Microwave Circuit Design offers practical, proven advice on improving the design quality of microwave passive and active circuits-while cutting costs and time. Covering all levels of microwave circuit design from the elementary to the very advanced, the book systematically presents computer-aided methods for linear and nonlinear designs used in the design and manufacture of microwave amplifiers, oscillators, and mixers. Using the newest CAD tools, the book shows how to design transistor and diode circuits, and also details CAD's usefulness in microwave integrated circuit (MIC) and monolithic microwave integrated circuit (MMIC) technology. Applications of nonlinear SPICE programs, now available for microwave CAD, are described. State-of-the-art coverage includes microwave transistors (HEMTs, MODFETs, MESFETs, HBTs, and more), high-power amplifier design, oscillator design including feedback topologies, phase noise and examples, and more. The techniques presented are illustrated with several MMIC designs, including a wideband amplifier, a low-noise amplifier, and an MMIC mixer. This unique, one-stop handbook also features a major case study of an actual anticollision radar transceiver, which is compared in detail against CAD predictions; examples of actual circuit designs with photographs of completed circuits; and tables of design formulae.

Covers encoding and binary digits, entropy, language and meaning, efficient encoding and the noisy channel, and explores ways in which information theory relates to physics, cybernetics, psychology, and art. 1980 edition.