Digital Spectral Analysis With Applications Prentice Hall Series In Signal Processing

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Spectral Methods Digital Spectral AnalysisSecond Edition Bernard Helffer's graduate-level introduction to the basic tools in spectral analysis is illustrated by numerous examples from the Schrödinger operator theory and various branches of physics: statistical mechanics, superconductivity, fluid mechanics and kinetic theory. The later chapters also introduce non self-adjoint operator theory with an emphasis on the role of the pseudospectra. The author's focus on applications, along with exercises and examples, enables readers to connect theory with practice so that they develop a good understanding of how the abstract spectral theory can be applied. The final chapter provides various problems that have been the subject of active research in recent years and will challenge the reader's understanding of the material covered.

Advanced Digital Signal Processing and Noise Reduction Elsevier Introduction and background; Probability functions and amplitude measures; Correlation and spectral density functions; Single input/single output relationships; System identification and response; Propagation path identification; Single input/multiple output problems; Multiple input/output relationships; Energy source identification; Procedures for solving multiple input/output problems; Statistical errors in measurements.

Concepts and Applications Holden Day The Spectral Analysis of Time Series describes the techniques and theory of the frequency domain analysis of time series. The book discusses the physical processes and the basic features of models of time series. The central feature of all models is the existence of a spectrum by which the time series is decomposed into a linear combination of sines and cosines. The investigator can used Fourier decompositions or other kinds of spectrals in time series analysis. The text explains the Wiener theory of spectral analysis, the spectral representation for weakly stationary stochastic processes, and the real spectral representation. The book also discusses sampling, aliasing,

discrete-time models, linear filters that have general properties with applications to continuous-time processes, and the applications of multivariate spectral models. The text describes finite parameter models, the distribution theory of spectral estimates with applications to statistical inference, as well as sampling properties of spectral estimates, experimental design, and spectral computations. The book is intended either as a textbook or for individual reading for one-semester or two-quarter course for students of time series analysis users. It is also suitable for mathematicians or professors of calculus, statistics, and advanced mathematics.

Orthogonal Polynomials in the Spectral Analysis of Markov Processes SIAM

Outlines the basic principles, advanced instrumentation, applications and future potential of a range of spectral techniques in food analysis. The book introduces new applications of GC-MS, LC-MS, MALDI TOF-MS, GC-FTIR, SFC-FTIR, ATR, and Raman spectroscopy. The book covers the identification and quantitation of food constituents, additives and contaminants.

Analog and Digital Signal Analysis John Wiley & Sons

This book covers the basics of processing and spectral analysis of monovariate discrete-time signals. The approach is practical, the aim being to acquaint the reader with the indications for and drawbacks of the various methods and to highlight possible misuses. The book is rich in original ideas, visualized in new and illuminating ways, and is structured so that parts can be skipped without loss of continuity. Many examples are included, based on synthetic data and real measurements from the fields of physics, biology, medicine, macroeconomics etc., and a complete set of MATLAB exercises requiring no previous experience of programming is provided. Prior advanced mathematical skills are not needed in order to understand the contents: a good command of basic mathematical analysis is sufficient. Where more advanced mathematical tools are necessary, they are included in an Appendix and presented in an easy-to-follow way. With this book, digital signal processing leaves the domain of engineering to address the needs of scientists and scholars in traditionally less quantitative disciplines, now facing increasing amounts of data.

Handbook of Digital Signal Processing Prentice Hall

Describes the leading techniques for analyzing noise. Discusses methods that are applicable to periodic signals,aperiodic signals, or random processes over finite or infiniteintervals. Provides readers with a useful reference when designing ormodeling communications systems.

Applications of Digital Spectral Analysis and Monte Carlo Simulations to the Measurement of Signal Characteristics Butterworth-Heinemann

Combining clear explanations of elementary principles, advanced topics and applications with step-by-step mathematical derivations, this textbook provides a comprehensive yet accessible introduction to digital signal processing. All the key topics are covered, including discrete-time Fourier transform, z-transform, discrete Fourier transform and FFT, A/D conversion, and FIR and IIR filtering algorithms, as well as more advanced topics such as multirate systems, the discrete cosine transform and spectral signal processing. Over 600 full-color illustrations, 200 fully worked examples, hundreds of end-of-chapter homework problems and detailed computational examples of DSP algorithms implemented in MATLAB® and C aid understanding, and help put knowledge into practice. A wealth of supplementary material accompanies the book online, including interactive programs for instructors, a full set of solutions and MATLAB® laboratory exercises, making this the ideal text for senior undergraduate and graduate courses on digital signal processing.

Spectral Theory and Special Tensors Springer Science & Business Media

Window functions—otherwise known as weighting functions, tapering functions, or apodization functions—are mathematical functions that are zero-valued outside the chosen interval. They are well established as a vital part of digital signal processing. Window Functions and their Applications in Signal Processing presents an exhaustive and detailed account of window functions and their applications in signal processing, focusing on the areas of digital spectral analysis, design of FIR filters, pulse compression radar, and speech signal processing. Comprehensively reviewing previous research and recent developments, this book: Provides suggestions on how to choose a window function for particular applications Discusses Fourier analysis techniques and pitfalls in the computation of the DFT Introduces window functions in the continuous-time and discrete-time domains Considers two implementation strategies of window functions in the time- and frequency domain Explores well-known applications of window functions in the fields of radar, sonar, biomedical signal analysis, audio processing, and synthetic aperture radar

Principles of Random Signal Analysis and Low Noise Design Steve F. Russell

User guide to Digital spectral analysis.--

An Introduction to the Analysis of Physiological Signals Cambridge University Press

Signal Processing for Neuroscientists introduces analysis techniques primarily aimed at neuroscientists and biomedical engineering students with a reasonable but modest background in mathematics, physics, and computer programming. The focus of this text is on what can be considered the ‘golden trio’ in the signal processing field: averaging, Fourier analysis, and filtering. Techniques such as convolution, correlation, coherence, and wavelet analysis are considered in the context of time and frequency domain analysis. The whole spectrum of signal analysis is covered, ranging from data acquisition to data processing; and from the mathematical background of the analysis to the practical application of processing algorithms. Overall, the approach to the mathematics is informal with a focus on basic understanding of the methods and their interrelationships rather than detailed proofs or derivations. One of the principle goals is to provide the reader with the background required to understand the principles of commercially available analyses software, and to allow him/her to construct his/her own analysis tools in an environment such as MATLAB®. Multiple color illustrations are integrated in the text Includes an introduction to biomedical signals, noise characteristics, and recording techniques Basics and background for more advanced topics can be found in extensive notes and appendices A Companion Website hosts the MATLAB scripts and several data files: http://www.elsevierdirect.com/companion.jsp?ISBN=9780123708670

The Spectral Analysis of Time Series CRC Press

Quantum-Mechanical Signal Processing and Spectral Analysis describes the novel application of quantum mechanical methods to signal processing across a range of interdisciplinary research fields. Conventionally, signal processing is viewed as an engineering discipline with its own specific scope, methods, concerns and priorities, not usually encompassing quantum mechanics. However, the dynamics of systems that generate time signals can be successfully described by the general principles and methods of quantum physics, especially within the Schroedinger framework. Most time signals that are measured experimentally are mathematically equivalent to quantum-mechanical auto-correlation functions built from the evolution

operator and wavefunctions. This fact allows us to apply the rich conceptual strategies and mathematical apparatus of quantum mechanics to signal processing. Among the leading quantum-mechanical signal processing methods, this book emphasizes the role of Pade approximant and the Lanczos algorithm, highlighting the major benefits of their combination. These two methods are carefully incorporated within a unified framework of scattering and spectroscopy, developing an algorithmic power that can be exported to other disciplines. The novelty of the author's approach to key signal processing problems, the harmonic inversion and the moment problem, is in establishing the Pade approximant and Lanczos algorithm as entirely algerbraic spectral estimators. This is of paramount theoretical and practical importance, as now spectral analysis can be carried out from closed analytical expressions. This overrides the notorious mathematical ill-conditioning problems with round-off errors that plague inverse reconstructions in those fields that rely upon signal processing. Quantum-Mechanical Signal Processing and Spectral Analysis will be an invaluable resource for researchers involved in signal processing across a wide range of disciplines.

Modern Spectral Estimation John Wiley & Sons

This work is essentially an extensive revision of my Ph.D. dissertation, [1J. It 1S primarily a research document on the application of probability theory to the parameter estimation problem. The people who will be interested in this material are physicists, economists, and engineers who have to deal with data on a daily basis; consequently, we have included a great deal of introductory and tutorial material. Any person with the equivalent of the mathematics background required for the graduate level study of physics should be able to follow the material contained in this book, though not without elfort. From the time the dissertation was written until now (approximately one year) our understanding of the parameter estimation problem has changed extensively. We have tried to incorporate what we have learned into this book. I am indebted to a number of people who have aided me in preparing this docu ment: Dr. C. Ray Smith, Steve Finney, Juana Sunchez, Matthew Self, and Dr. Pat Gibbons who acted as readers and editors. In addition, I must extend my deepest thanks to Dr. Joseph Ackerman for his support during the time this manuscript was being prepared.

Principles and Applications Prentice-Hall PTR

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.

Spectral Theory and its Applications Cambridge University Press

This dissertation covers both the theory and practice of estimating the spectrum of signals in noise using digital data. The theory of describing some of the signal processing concepts for digital data are given and various spectral estimation methods are given. The theory of MEM is described in detail using approaches from estimation theory, communication theory, and statistics. The work was intended to give researchers the theory and practice of practical means of spectral estimation using communications or scientific data. The Maximum Entropy Method by John Parker Burg is explained from what was known in 1974-75. KEY WORDS: Calculus-of-Variations, Data Systems, Noise , Spectrum Analysis, Time Series Analysis, Autocorrelation, Computer Programs, Data Windowing, Ergodic Process, Maximum Entropy Method (MEM, Fourier Transformation, Optimum Order of Estimation, Sampling, Spectral Resolution, Statistical Significance Test, Systems Analysis, Wiener-Khinchine Theorem. From The Smithsonian/NASA Astrophysics Data System -- The practical aspects of spectral analysis are contrasted with the mathematical theory. Treatment is limited to ergodic processes and emphasizes data window and noise effects. The Discrete Fourier Transform (DFT) and Maximum Entropy Method (MEM) are covered extensively both in theory and application with FORTRAN programs and many examples being provided. Several of the chapters are tutorial and discuss the important topics of sampling theory and system analysis. Topics on MEM include a complete calculus-of-variations solution, relationship between MEM and the Wiener-Khinchine relations, spectral resolution, and choosing the optimum order of the estimation. DFT leakage effects are modeled. A statistical significance test was developed to determine the realness of a spectral component. Keywords: Data Systems, Noise (Sound), Spectrum Analysis, Time Series Analysis, Autocorrelation, Computer Programs, Ergodic Process, Fourier Transformation, Sampling, Systems Analysis [less]

2 CRC Press

Digital Spectral Analysis provides a single source thatoffers complete coverage of the spectral analysis domain. Thisself-contained work includes details on advanced topics that areusually presented in scattered sources throughout theliterature. The theoretical principles necessary for the understanding ofspectral analysis are discussed in the first four chapters:fundamentals, digital signal processing, estimation in spectralanalysis, and time-series models. An entire chapter is devoted to the non-parametric methods mostwidely used in industry. High resolution methods are detailed in a further four chapters:spectral analysis by stationary time series modeling, minimumvariance, and subspace-based estimators. Finally, advanced concepts are the core of the last four chapters:spectral analysis of non-stationary random signals, space timeadaptive processing: irregularly sampled data processing, particlefiltering and tracking of varying sinusoids. Suitable for students, engineers working in industry, and academicsat any level, this book provides a rare complete overview of thespectral analysis

domain.
Algorithms, Analysis and Applications Elsevier
I became interested in Random Vibration during the preparation of my PhD dissertation, which was concerned with the seismic response of nuclear reactor cores. I was initiated into this field through the cla.ssical books by Y.K.Lin, S.H.Crandall and a few others. After the completion of my PhD, in 1981, my supervisor M.Gera.din encouraged me to prepare a course in Random Vibration for fourth and fifth year students in Aeronautics, at the University of Liege. There was at the time very little material available in French on that subject. A first draft was produced during 1983 and 1984 and revised in 1986. These notes were published by the Presses Poly techniques et Universitaires Romandes (Lausanne, Suisse) in 1990. When Kluwer decided to publish an English translation ofthe book in 1992, I had to choose between letting Kluwer translate the French text in-extenso or doing it myself, which would allow me to carry out a sustantial revision of the book. I took the second option and decided to rewrite or delete some of the original text and include new material, based on my personal experience, or reflecting recent technical advances. Chapter 6, devoted to the response of multi degree offreedom structures, has been completely rewritten, and Chapter 11 on random fatigue is entirely new. The computer programs which have been developed in parallel with these chapters have been incorporated in the general purpose finite element software SAMCEF, developed at the University of Liege.
The Intuitive Guide to Fourier Analysis & Spectral Estimation with MATLAB CRC Press
FROM THE PREFACE: Many new useful ideas are presented in this handbook, including new finite impulse response (FIR) filter design techniques, half-band and multiplierless FIR filters, interpolated FIR (IFIR) structures, and error spectrum shaping.
Theory and Applications Springer Science & Business Media
In the framework of Digital Signal Processing, the Parametric Modeling of Signals offers as a natural byproduct a class of Spectral tools, namely the so-called Rational Spectra. This class of Spectra (and their associated Estimators) applies to the case of Stationary as well as Non-Stationary Signals and Random Processes. This important text brings together the significant advances that have been achieved over the last ten years from the confrontation of the theory and its variety of applications.
A Nonprobabilistic Theory Springer
This text provides a thorough explanation of the underlying principles of spectral analysis and the full range of estimation techniques used in engineering. The applications of these techniques are demonstrated in numerous case studies, illustrating the approach required and the compromises to be made when solving real engineering problems. The principles outlined in these case studies are applicable over the full range of engineering disciplines and all the reader requires is an understanding of elementary calculus and basic statistics. The realistic approach and comprehensive nature of this text will provide undergraduate engineers and physicists of all disciplines with an invaluable introduction to the subject and the detailed case studies will interest the experienced professional. No more than a knowledge of elementary calculus, and basic statistics and probability is needed Accessible to undergraduates at any stage of their courses Easy and clear to follow
Digital Signal Processing Springer Science & Business Media
Spectral analysis requires subjective decisions which influence the final estimate and mean that different analysts can obtain different results from the same stationary stochastic observations. Statistical signal processing can overcome this difficulty, producing a unique solution for any set of observations but that is only acceptable if it is close to the best attainable accuracy for most types of stationary data. This book describes a method which fulfils the above near-optimal-solution criterion, taking advantage of greater computing power and robust algorithms to produce enough candidate models to be sure of providing a suitable candidate for given data.