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Fundamentals of Statistical Signal Processing, Volume III Fundamentals of Statistical Signal Processing: Detection theory *Fault Detection, Supervision and Safety of Technical Processes 2006 Target Acquisition in Communication Electronic Warfare Systems* MMSE-Based Algorithm for Joint Signal Detection, Channel and Noise Variance Estimation for OFDM Systems *Grundlagen der digitalen Signalverarbeitung Advances in Adaptive Radar Detection and Range Estimation* Applications in Time-Frequency Signal Processing *Fault Detection Applied Underwater Acoustics Model-Based Signal Processing* Advanced Radar Detection Schemes Under Mismatched Signal Models *Crime Prevention Technologies and Applications for Advancing Criminal Investigation* Fundamentals in Information Theory and Coding Principles of Signal Detection and Parameter Estimation *Bayesian Signal Processing Handbook of Position Location Underwater Acoustic Signal Processing* *Statistische Physik und Theorie der Wärme Elementare Wahrscheinlichkeitstheorie und stochastische Prozesse* *Digital Signal Processing Fundamentals* Speech Processing *Digital Sonar Design in Underwater Acoustics Identification of Physical Systems Radar Networks Optimal Combining and Detection Probability, Random Variables, and Random Processes* *Classical, Semi-classical and Quantum Noise* Physical Layer Security Issues in Massive MIMO and GNSS *Cooperative and Graph Signal Processing* Correlative Learning *Academic Press Library in Signal Processing Signal and Image Processing in Navigational Systems Resonance Precision Cosmology Multi-pitch Estimation Handbook of Signal Processing in Acoustics Detection Theory Multirate Statistical Signal Processing* *MATLAB Simulations for Radar Systems Design*

Fundamentals of Statistical Signal Processing: Detection theory Oct 05 2022 V.2 Detection theory -- V.1 Estimation theory. Precision Cosmology Dec 03 2019

Applied Underwater Acoustics Jan 28 2022 Applied Underwater Acoustics meets the needs of scientists and engineers working in underwater acoustics and graduate students solving problems in, and preparing theses on, topics in underwater acoustics. The book is structured to provide the basis for rapidly assimilating the essential underwater acoustic knowledge base for practical application to daily research and analysis. Each chapter of the book is self-supporting and focuses on a single topic and its relation to underwater acoustics. The chapters start with a brief description of the topic's physical background, necessary definitions, and a short description of the applications, along with a roadmap to the chapter. The subtopics covered within individual subchapters include most frequently used equations that describe the topic. Equations are not derived, rather, assumptions behind equations and limitations on the applications of each equation are emphasized. Figures, tables, and illustrations related to the sub-topic are presented in an easy-to-use manner, and examples on the use of the equations, including appropriate figures and tables are also included. Provides a complete and up-to-date treatment of all major subjects of underwater acoustics Presents chapters written by recognized experts in their individual field Covers the fundamental knowledge scientists and engineers need to solve problems in underwater acoustics Illuminates, in shorter sub-chapters, the modern applications of underwater acoustics that are described in worked examples Demands no prior knowledge of underwater acoustics, and the physical principles and mathematics are designed to be readily understood by scientists, engineers, and graduate students of underwater acoustics Includes a comprehensive list of literature references for each chapter

Resonance Jan 04 2020 Resonance is a common phenomenon, which is observed both in nature and in numerous devices and structures. It occurs in literally all types of vibrations. To mention just a few examples, acoustic, mechanical, or electromagnetic resonance can be distinguished. In the present book, 12 chapters dealing with different aspects of resonance phenomena have been presented.

Advances in Adaptive Radar Detection and Range Estimation Apr 30 2022 This book provides a comprehensive and systematic framework for the design of adaptive architectures, which take advantage of the available a priori information to enhance the detection performance. Moreover, this framework also provides guidelines to develop decision schemes capable of estimating the target position within the range bin. To this end, the readers are driven step-by-step towards those aspects that have to be accounted for at the design stage, starting from the exploitation of system and/or environment information up to the use of target energy leakage (energy spillover), which allows inferring on the target position within the range cell under test. In addition to design issues, this book presents an extensive number of illustrative examples based upon both simulated and real-recorded data. Moreover, the performance analysis is enriched by considerations about the trade-off between performances and computational requirements. Finally, this book could be a valuable resource for PhD students, researchers, professors, and, more generally, engineers working on statistical signal processing and its applications to radar systems.

Handbook of Position Location Jun 20 2021 Radio systems capable of localization have emerging applications in homeland security, law enforcement, emergency response, defense command and control, multi-robot coordination and vehicle-to-vehicle and vehicle-to-pedestrian collision avoidance. In fact, high resolution localization is vital for many applications, including: traffic alert, emergency services, e.g., indoor localization for firefighters, and battlefield command and control. These systems promise to dramatically reduce society's vulnerabilities to catastrophic events and improve its quality of life. While work this important area is progressing, limited resources are available to support graduate students and researchers in this important area. Specifically, a limited number of books has been published in this area covering selected subjects. This comprehensive handbook offers gaps of available localization books presenting in-depth coverage from fundamentals of coordinates to advanced application examples.

Bayesian Signal Processing Jul 22 2021 Presents the Bayesian approach to statistical signal processing for a variety of useful model sets This book aims to give readers a unified Bayesian treatment starting from the basics (Baye's rule) to the more advanced (Monte Carlo sampling), evolving to the next-generation model-based techniques (sequential Monte Carlo sampling). This next edition incorporates a new chapter on "Sequential Bayesian Detection," a new section on "Ensemble Kalman Filters" as well as an expansion of Case Studies that detail Bayesian solutions for a variety of applications. These studies illustrate Bayesian approaches to real-world problems incorporating detailed particle filter designs, adaptive particle filters and sequential Bayesian detectors. In addition to these major developments a variety of sections are expanded to "fill-in-the gaps" of the first edition. Here metrics for particle filter (PF) designs with emphasis on classical "sanity testing" lead to ensemble techniques as a basic requirement for performance analysis. The expansion of information theory metrics and their application to PF designs is fully developed and applied. These expansions of the book have been updated to provide a more cohesive discussion of Bayesian processing with examples and applications enabling the comprehension of alternative approaches to solving estimation/detection problems. The second edition of Bayesian Signal Processing features: "Classical" Kalman filtering for linear, linearized, and nonlinear systems; "modern" unscented and ensemble Kalman filters; and the "next-generation" Bayesian particle filters Sequential Bayesian detection techniques incorporating model-based schemes for a variety of real-world problems Practical Bayesian processor designs including comprehensive methods of performance analysis ranging from simple sanity testing and ensemble techniques to sophisticated information metrics New case studies on adaptive particle filtering and sequential Bayesian detection are covered detailing more Bayesian approaches to applied problem solving MATLAB® notes at the end of each chapter help readers solve complex problems using readily available software commands and point out other software packages available Problem sets included to test readers' knowledge and help them put their new skills into practice Bayesian Signal Processing, Second Edition is written for all students, scientists, and engineers who investigate and apply signal processing to their everyday problems.

Radar Networks Oct 13 2020 Radar networks are increasingly regarded as an efficient approach to enhancing radar capabilities in the face of popular anti-radar techniques and hostile operating environments. Reader-friendly and self-contained, this book provides a comprehensive overview of the latest radar networking technologies. The text addresses basic, relevant aspects of radar signal processing and statistical theories, including both civilian and military radar applications. It also discusses emerging topics that directly relate to networks, such as multiple-input-multiple-output (MIMO) radars, waveform design, and diversity via multiple transmitters. Other topics covered include target recognition and imaging using radar networks. Features Gives a comprehensive view of the latest radar network technologies Covers both civilian and military applications of radar Provides basic statistics and signal processing necessary for understanding radar networks Includes up-to-date information on MIMO radars Presents waveform design and diversity for radar networks with multiple transmitters

Academic Press Library in Signal Processing Mar 06 2020 This third volume, edited and authored by world leading experts, gives a review of the principles, methods and techniques of important and emerging research topics and technologies in array and statistical signal processing. With this reference source you will: Quickly grasp a new area of research Understand the underlying principles of a topic and its application Ascertain how a topic relates to other areas and learn of the research issues yet to be resolved Quick tutorial reviews of important and emerging topics of research in array and statistical signal processing Presents core principles and shows their application Reference content on core principles, technologies, algorithms and applications Comprehensive references to journal articles and other literature on which to build further, more specific and detailed knowledge Edited by leading people in the field who, through their reputation, have been able to commission experts to write on a particular topic

Detection Theory Aug 30 2019 Using simplified notation and a practical approach, *Detection Theory: Applications and Digital Signal Processing* introduces the principles of detection theory, the necessary mathematics, and basic signal processing methods along with some recently developed statistical techniques. Throughout the book, the author keeps the needs of practicing engineers firmly in mind. His presentation and choice of topics allows students to quickly become familiar with the detection and signal processing fields and move on to more advanced study and practice. The

author also presents many applications and wide-ranging examples that demonstrate how to apply the concepts to real-world problems.

Multi-pitch Estimation Nov 01 2019 Periodic signals can be decomposed into sets of sinusoids having frequencies that are integer multiples of a fundamental frequency. The problem of finding such fundamental frequencies from noisy observations is important in many speech and audio applications, where it is commonly referred to as pitch estimation. These applications include analysis, compression, separation, enhancement, automatic transcription and many more. In this book, an introduction to pitch estimation is given and a number of statistical methods for pitch estimation are presented. The basic signal models and associated estimation theoretical bounds are introduced, and the properties of speech and audio signals are discussed and illustrated. The presented methods include both single- and multi-pitch estimators based on statistical approaches, like maximum likelihood and maximum a posteriori methods, filtering methods based on both static and optimal adaptive designs, and subspace methods based on the principles of subspace orthogonality and shift-invariance. The application of these methods to analysis of speech and audio signals is demonstrated using both real and synthetic signals, and their performance is assessed under various conditions and their properties discussed. Finally, the estimators are compared in terms of computational and statistical efficiency, generalizability and robustness. Table of Contents: Fundamentals / Statistical Methods / Filtering Methods / Subspace Methods / Amplitude Estimation

MATLAB Simulations for Radar Systems Design Jun 28 2019 Simulation is integral to the successful design of modern radar systems, and there is arguably no better software for this purpose than MATLAB. But software and the ability to use it does not guarantee success. One must also: Understand radar operations and design philosophy Know how to select the radar parameters to meet the design requirements Be able to perform detailed trade-off analysis in the context of radar sizing, modes of operation, frequency selection, waveforms, and signal processing Develop loss and error budgets associated with the design MATLAB Simulations for Radar Systems Design teaches all of this and provides the M-files and hands-on simulation experience needed to design and analyze radar systems. Part I forms a comprehensive description of radar systems, their analysis, and the design process. The authors' unique approach involves a design case study introduced in Chapter 1 and followed throughout the text. As the treatment progresses, the complexity increases and the case study requirements are adjusted accordingly. Part II presents a series of chapters-some authored by other experts in the field-on specialized radar topics important to a full understanding of radar systems design and analysis. A comprehensive set of MATLAB programs and functions support both parts of the book and are available for download from the CRC Press Web site.

Identification of Physical Systems Nov 13 2020 Identification of a physical system deals with the problem of identifying its mathematical model using the measured input and output data. As the physical system is generally complex, nonlinear, and its input-output data is corrupted noise, there are fundamental theoretical and practical issues that need to be considered. Identification of Physical Systems addresses this need, presenting a systematic, unified approach to the problem of physical system identification and its practical applications. Starting with a least-squares method, the authors develop various schemes to address the issues of accuracy, variation in the operating regimes, closed loop, and interconnected subsystems. Also presented is a non-parametric signal or data-based scheme to identify a means to provide a quick macroscopic picture of the system to complement the precise microscopic picture given by the parametric model-based scheme. Finally, a sequential integration of totally different schemes, such as non-parametric, Kalman filter, and parametric model, is developed to meet the speed and accuracy requirement of mission-critical systems. Key features: Provides a clear understanding of theoretical and practical issues in identification and its applications, enabling the reader to grasp a clear understanding of the theory and apply it to practical problems Offers a self-contained guide by including the background necessary to understand this interdisciplinary subject Includes case studies for the application of identification on physical laboratory scale systems, as well as number of illustrative examples throughout the book Identification of Physical Systems is a comprehensive reference for researchers and practitioners working in this field and is also a useful source of information for graduate students in electrical, computer, biomedical, chemical, and mechanical engineering.

Fundamentals in Information Theory and Coding Sep 23 2021 The work introduces the fundamentals concerning the measure of discrete information, the modeling of discrete sources without and with a memory, as well as of channels and coding. The understanding of the theoretical matter is supported by many examples. One particular emphasis is put on the explanation of Genomic Coding. Many examples throughout the book are chosen from this particular area and several parts of the book are devoted to this exciting implication of coding.

Classical, Semi-classical and Quantum Noise Jul 10 2020 David Middleton was a towering figure of 20th Century engineering and science and one of the founders of statistical communication theory. During the second World War, the young David Middleton, working with Van Fleck, devised the notion of the matched filter, which is the most basic method used for detecting signals in noise. Over the intervening six decades, the contributions of Middleton have become classics. This collection of essays by leading scientists, engineers and colleagues of David are in his honor and reflect the wide influence that he has had on many fields. Also included is the introduction by Middleton to his forthcoming book, which gives a wonderful view of the field of communication, its history and his own views on the field that he developed over the past 60 years. Focusing on classical noise modeling and applications, Classical, Semi-Classical and Quantum Noise includes coverage of statistical communication theory, non-stationary noise, molecular footprints, noise suppression, Quantum error correction, and other related topics.

Applications in Time-Frequency Signal Processing Mar 30 2022 Because most real-world signals, including speech, sonar, communication, and biological signals, are non-stationary, traditional signal analysis tools such as Fourier transforms are of limited use because they do not provide easily accessible information about the localization of a given frequency component. A more suitable approach for those studying non-stationary signals is the use of time frequency representations that are functions of both time and frequency. Applications in Time-Frequency Signal Processing investigates the use of various time-frequency representations, such as the Wigner distribution and the spectrogram, in diverse application areas. Other books tend to focus on theoretical development. This book differs by highlighting particular applications of time-frequency representations and demonstrating how to use them. It also provides pseudo-code of the computational algorithms for these representations so that you can apply them to your own specific problems. Written by leaders in the field, this book offers the opportunity to learn from experts. Time-Frequency Representation (TFR) algorithms are simplified, enabling you to understand the complex theories behind TFRs and easily implement them. The numerous examples and figures, review of concepts, and extensive references allow for easy learning and application of the various time-frequency representations.

Elementare Wahrscheinlichkeitstheorie und stochastische Prozesse Mar 18 2021 Aus den Besprechungen: "Unter den zahlreichen Einführungen in die Wahrscheinlichkeitsrechnung bildet dieses Buch eine erfreuliche Ausnahme. Der Stil einer lebendigen Vorlesung ist über Niederschrift und Übersetzung hinweg erhalten geblieben. In jedes Kapitel wird sehr anschaulich eingeführt. Sinn und Nützlichkeit der mathematischen Formulierungen werden den Lesern nahegebracht. Die wichtigsten Zusammenhänge sind als mathematische Sätze klar formuliert." #FREQUENZ#1

Digital Signal Processing Fundamentals Feb 14 2021 Now available in a three-volume set, this updated and expanded edition of the bestselling *The Digital Signal Processing Handbook* continues to provide the engineering community with authoritative coverage of the fundamental and specialized aspects of information-bearing signals in digital form. Encompassing essential background material, technical details, standards, and software, the second edition reflects cutting-edge information on signal processing algorithms and protocols related to speech, audio, multimedia, and video processing technology associated with standards ranging from WiMax to MP3 audio, low-power/high-performance DSPs, color image processing, and chips on video. Drawing on the experience of leading engineers, researchers, and scholars, the three-volume set contains 29 new chapters that address multimedia and Internet technologies, tomography, radar systems, architecture, standards, and future applications in speech, acoustics, video, radar, and telecommunications. Emphasizing theoretical concepts, *Digital Signal Processing Fundamentals* provides comprehensive coverage of the basic foundations of DSP and includes the following parts: Signals and Systems; Signal Representation and Quantization; Fourier Transforms; Digital Filtering; Statistical Signal Processing; Adaptive Filtering; Inverse Problems and Signal Reconstruction; and Time-Frequency and Multirate Signal Processing.

Signal and Image Processing in Navigational Systems Feb 03 2020 Classical and modern theories have given us a degree of noise immunity by defining the sufficient statistic of the mean of the likelihood function. The generalized theory moves beyond these limitations to determine the jointly sufficient statistics of the mean and variance of the likelihood function. *Signal and Image Processing in Navigational Systems* introduces us to the generalized approach, and then delves rigorously into the theory and practical applications of this approach. This volume represents the most in-depth discussion of the generalized approach to date, providing many examples and computer models to demonstrate how this approach raises the upper limits of noise immunity for navigation systems, leading to better detection performances. This book is vital for signal and image processing experts, radar, communications, acoustics, and navigational systems designers, as well as professionals in the fields of statistical pattern recognition, biomedicine, astronomy, and robotics who wish to extend the boundaries of noise immunity and improve qualitative performance of their systems.

Underwater Acoustic Signal Processing May 20 2021 This book provides comprehensive coverage of the detection and processing of signals in underwater acoustics. Background material on active and passive sonar systems, underwater acoustics, and statistical signal processing makes the book a self-contained and valuable resource for graduate students, researchers, and active practitioners alike. Signal detection topics span a range of common signal types including signals of known form such as active sonar or communications signals; signals of unknown form, including passive sonar and narrowband signals; and transient signals such as marine mammal vocalizations. This text, along with its companion volume on beamforming, provides a thorough treatment of underwater acoustic signal processing that speaks to its author's broad experience in the field.

Fundamentals of Statistical Signal Processing, Volume III Nov 06 2022 *The Complete, Modern Guide to Developing Well-Performing Signal Processing Algorithms* In *Fundamentals of Statistical Signal Processing, Volume III: Practical Algorithm Development*, author Steven M. Kay shows

how to convert theories of statistical signal processing estimation and detection into software algorithms that can be implemented on digital computers. This final volume of Kay's three-volume guide builds on the comprehensive theoretical coverage in the first two volumes. Here, Kay helps readers develop strong intuition and expertise in designing well-performing algorithms that solve real-world problems. Kay begins by reviewing methodologies for developing signal processing algorithms, including mathematical modeling, computer simulation, and performance evaluation. He links concepts to practice by presenting useful analytical results and implementations for design, evaluation, and testing. Next, he highlights specific algorithms that have "stood the test of time," offers realistic examples from several key application areas, and introduces useful extensions. Finally, he guides readers through translating mathematical algorithms into MATLAB® code and verifying solutions. Topics covered include Step by step approach to the design of algorithms Comparing and choosing signal and noise models Performance evaluation, metrics, tradeoffs, testing, and documentation Optimal approaches using the "big theorems" Algorithms for estimation, detection, and spectral estimation Complete case studies: Radar Doppler center frequency estimation, magnetic signal detection, and heart rate monitoring Exercises are presented throughout, with full solutions. This new volume is invaluable to engineers, scientists, and advanced students in every discipline that relies on signal processing; researchers will especially appreciate its timely overview of the state of the practical art. Volume III complements Dr. Kay's Fundamentals of Statistical Signal Processing, Volume I: Estimation Theory (Prentice Hall, 1993; ISBN-13: 978-0-13-345711-7), and Volume II: Detection Theory (Prentice Hall, 1998; ISBN-13: 978-0-13-504135-2).

Digital Sonar Design in Underwater Acoustics Dec 15 2020 "Digital Sonar Design in Underwater Acoustics Principles and Applications" provides comprehensive and up-to-date coverage of research on sonar design, including the basic theory and techniques of digital signal processing, basic concept of information theory, ocean acoustics, underwater acoustic signal propagation theory, and underwater signal processing theory. This book discusses the general design procedure and approaches to implementation, the design method, system simulation theory and techniques, sonar tests in the laboratory, lake and sea, and practical validation criteria and methods for digital sonar design. It is intended for researchers in the fields of underwater signal processing and sonar design, and also for navy officers and ocean explorers. Qihu Li is a professor at the Institute of Acoustics, Chinese Academy of Sciences, and an academician of the Chinese Academy of Sciences.

MMSE-Based Algorithm for Joint Signal Detection, Channel and Noise Variance Estimation for OFDM Systems Jul 02 2022 This book presents an algorithm for the detection of an orthogonal frequency division multiplexing (OFDM) signal in a cognitive radio context by means of a joint and iterative channel and noise estimation technique. Based on the minimum mean square criterion, it performs an accurate detection of a user in a frequency band, by achieving a quasi-optimal channel and noise variance estimation if the signal is present, and by estimating the noise level in the band if the signal is absent. Organized into three chapters, the first chapter provides the background against which the system model is presented, as well as some basics concerning the channel statistics and the transmission of an OFDM signal over a multipath channel. In Chapter 2, the proposed iterative algorithm for the noise variance and the channel estimation is detailed, and in Chapter 3, an application of the algorithm for the free-band detection is proposed. In both Chapters 2 and 3, the principle of the algorithm is presented in a simple way, and more elaborate developments are also provided. The different assumptions and assertions in the developments and the performance of the proposed method are validated through simulations, and compared to methods of the scientific literature.

Probability, Random Variables, and Random Processes Aug 11 2020 Probability, Random Variables, and Random Processes is a comprehensive textbook on probability theory for engineers that provides a more rigorous mathematical framework than is usually encountered in undergraduate courses. It is intended for first-year graduate students who have some familiarity with probability and random variables, though not necessarily of random processes and systems that operate on random signals. It is also appropriate for advanced undergraduate students who have a strong mathematical background. The book has the following features: Several appendices include related material on integration, important inequalities and identities, frequency-domain transforms, and linear algebra. These topics have been included so that the book is relatively self-contained. One appendix contains an extensive summary of 33 random variables and their properties such as moments, characteristic functions, and entropy. Unlike most books on probability, numerous figures have been included to clarify and expand upon important points. Over 600 illustrations and MATLAB plots have been designed to reinforce the material and illustrate the various characterizations and properties of random quantities. Sufficient statistics are covered in detail, as is their connection to parameter estimation techniques. These include classical Bayesian estimation and several optimality criteria: mean-square error, mean-absolute error, maximum likelihood, method of moments, and least squares. The last four chapters provide an introduction to several topics usually studied in subsequent engineering courses: communication systems and information theory; optimal filtering (Wiener and Kalman); adaptive filtering (FIR and IIR); and antenna beamforming, channel equalization, and direction finding. This material is available electronically at the companion website. Probability, Random Variables, and Random Processes is the only textbook on probability for engineers that includes relevant background material, provides extensive summaries of key results, and extends various statistical techniques to a range of applications in signal processing.

Target Acquisition in Communication Electronic Warfare Systems Aug 03 2022 Radio communications plays an increasingly critical and growing role in today's electronic battlefield. Because more and more radio signals are deployed in electronic warfare (EW) situations, determining which ones are friendly and which are enemy has become more difficult and crucial. This book arms defense systems designers and operators with the full array of traditional search mechanisms and advanced high-resolution techniques for targeting radio signals deployed in electronic warfare. An invaluable technical reference, the book helps professionals fully understand the tradeoffs involved in designing EW target acquisition systems with less time and effort. Moreover, practitioners learn how to establish optimum methods for acquiring communication targets for exploitation or countermeasures. The book also serves as an excellent text for graduate courses in electronic warfare.

Multirate Statistical Signal Processing Jul 30 2019 Multirate Statistical Signal Processing introduces a statistical theory for extracting information from related signals with different sampling rates. This new theory generalizes the conventional deterministic theory of multirate systems beyond many of its constraints. Further, it allows for the formulation and solution of new problems: spectrum estimation, time-delay estimation and sensor fusion in the realm of multirate signal processing. This self-contained book presents background material, potential applications and leading-edge research.

Correlative Learning Apr 06 2020 Correlative Learning: A Basis for Brain and Adaptive Systems provides a bridge between three disciplines: computational neuroscience, neural networks, and signal processing. First, the authors lay down the preliminary neuroscience background for engineers. The book also presents an overview of the role of correlation in the human brain as well as in the adaptive signal processing world; unifies many well-established synaptic adaptations (learning) rules within the correlation-based learning framework, focusing on a particular correlative learning paradigm, ALOPEX; and presents case studies that illustrate how to use different computational tools and ALOPEX to help readers understand certain brain functions or fit specific engineering applications.

Principles of Signal Detection and Parameter Estimation Aug 23 2021 This textbook provides a comprehensive and current understanding of signal detection and estimation, including problems and solutions for each chapter. Signal detection plays an important role in fields such as radar, sonar, digital communications, image processing, and failure detection. The book explores both Gaussian detection and detection of Markov chains, presenting a unified treatment of coding and modulation topics. Addresses asymptotic of tests with the theory of large deviations, and robust detection. This text is appropriate for students of Electrical Engineering in graduate courses in Signal Detection and Estimation.

Model-Based Signal Processing Dec 27 2021 A unique treatment of signal processing using a model-based perspective Signal processing is primarily aimed at extracting useful information, while rejecting the extraneous from noisy data. If signal levels are high, then basic techniques can be applied. However, low signal levels require using the underlying physics to correct the problem causing these low levels and extracting the desired information. Model-based signal processing incorporates the physical phenomena, measurements, and noise in the form of mathematical models to solve this problem. Not only does the approach enable signal processors to work directly in terms of the problem's physics, instrumentation, and uncertainties, but it provides far superior performance over the standard techniques. Model-based signal processing is both a modeler's as well as a signal processor's tool. Model-Based Signal Processing develops the model-based approach in a unified manner and follows it through the text in the algorithms, examples, applications, and case studies. The approach, coupled with the hierarchy of physics-based models that the author develops, including linear as well as nonlinear representations, makes it a unique contribution to the field of signal processing. The text includes parametric (e.g., autoregressive or all-pole), sinusoidal, wave-based, and state-space models as some of the model sets with its focus on how they may be used to solve signal processing problems. Special features are provided that assist readers in understanding the material and learning how to apply their new knowledge to solving real-life problems. * Unified treatment of well-known signal processing models including physics-based model sets * Simple applications demonstrate how the model-based approach works, while detailed case studies demonstrate problem solutions in their entirety from concept to model development, through simulation, application to real data, and detailed performance analysis * Summaries provided with each chapter ensure that readers understand the key points needed to move forward in the text as well as MATLAB(r) Notes that describe the key commands and toolboxes readily available to perform the algorithms discussed * References lead to more in-depth coverage of specialized topics * Problem sets test readers' knowledge and help them put their new skills into practice The author demonstrates how the basic idea of model-based signal processing is a highly effective and natural way to solve both basic as well as complex processing problems. Designed as a graduate-level text, this book is also essential reading for practicing signal-processing professionals and scientists, who will find the variety of case studies to be invaluable. An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department

Handbook of Signal Processing in Acoustics Oct 01 2019

Speech Processing Jan 16 2021 Based on years of instruction and field expertise, this volume offers the necessary tools to understand all scientific,

computational, and technological aspects of speech processing. The book emphasizes mathematical abstraction, the dynamics of the speech process, and the engineering optimization practices that promote effective problem solving in this area of research and covers many years of the authors' personal research on speech processing. Speech Processing helps build valuable analytical skills to help meet future challenges in scientific and technological advances in the field and considers the complex transition from human speech processing to computer speech processing.

Fault Detection Feb 26 2022 In this book, a number of innovative fault diagnosis algorithms in recently years are introduced. These methods can detect failures of various types of system effectively, and with a relatively high significance.

Physical Layer Security Issues in Massive MIMO and GNSS Jun 08 2020 Wireless communication technology has evolved rapidly during the last 20 years. Nowadays, there are huge networks providing communication infrastructures to not only people but also to machines, such as unmanned air and ground vehicles, cars, household appliances and so on. There is no doubt that new wireless communication technologies must be developed, that support the data traffic in these emerging, large networks. While developing these technologies, it is also important to investigate the vulnerability of these technologies to different malicious attacks. In particular, spoofing and jamming attacks should be investigated and new countermeasure techniques should be developed. In this context, spoofing refers to the situation in which a receiver identifies falsified signals, that are transmitted by the spoofers, as legitimate or trustable signals. Jamming, on the other hand, refers to the transmission of radio signals that disrupt communications by decreasing the signal-to-interference-and-noise ratio (SINR) on the receiver side. In this thesis, we analyze the effects of spoofing and jamming both on global navigation satellite system (GNSS) and on massive multiple-input multiple-output (MIMO) communications. GNSS is everywhere and used to provide location information. Massive MIMO is one of the cornerstone technologies in 5G. We also propose countermeasure techniques to the studied spoofing and jamming attacks. More specifically, in paper A we analyze the effects of distributed jammers on massive MIMO and answer the following questions: Is massive MIMO more robust to distributed jammers compared with previous generation's cellular networks? Which jamming attack strategies are the best from the jammer's perspective, and can the jamming power be spread over space to achieve more harmful attacks? In paper B, we propose a detector for GNSS receivers that is able to detect multiple spoofers without having any prior information about the attack strategy or the number of spoofers in the environment.

Advanced Radar Detection Schemes Under Mismatched Signal Models Nov 25 2021 Adaptive detection of signals embedded in correlated Gaussian noise has been an active field of research in the last decades. This topic is important in many areas of signal processing such as, just to give some examples, radar, sonar, communications, and hyperspectral imaging. Most of the existing adaptive algorithms have been designed following the lead of the derivation of Kelly's detector which assumes perfect knowledge of the target steering vector. However, in realistic scenarios, mismatches are likely to occur due to both environmental and instrumental factors. When a mismatched signal is present in the data under test, conventional algorithms may suffer severe performance degradation. The presence of strong interferers in the cell under test makes the detection task even more challenging. An effective way to cope with this scenario relies on the use of "tunable" detectors, i.e., detectors capable of changing their directivity through the tuning of proper parameters. The aim of this book is to present some recent advances in the design of tunable detectors and the focus is on the so-called two-stage detectors, i.e., adaptive algorithms obtained cascading two detectors with opposite behaviors. We derive exact closed-form expressions for the resulting probability of false alarm and the probability of detection for both matched and mismatched signals embedded in homogeneous Gaussian noise. It turns out that such solutions guarantee a wide operational range in terms of tunability while retaining, at the same time, an overall performance in presence of matched signals commensurate with Kelly's detector. Table of Contents: Introduction / Adaptive Radar Detection of Targets / Adaptive Detection Schemes for Mismatched Signals / Enhanced Adaptive Sidelobe Blanking Algorithms / Conclusions

Optimal Combining and Detection Sep 11 2020 With signal combining and detection methods now representing a key application of signal processing in communication systems, this book provides a range of key techniques for receiver design when multiple received signals are available. Various optimal and suboptimal signal combining and detection techniques are explained in the context of multiple-input multiple-output (MIMO) systems, including successive interference cancellation (SIC) based detection and lattice reduction (LR) aided detection. The techniques are then analyzed using performance analysis tools. The fundamentals of statistical signal processing are also covered, with two chapters dedicated to important background material. With a carefully balanced blend of theoretical elements and applications, this book is ideal for both graduate students and practising engineers in wireless communications.

Statistische Physik und Theorie der Wärme Apr 18 2021

Fault Detection, Supervision and Safety of Technical Processes 2006 Sep 04 2022 The safe and reliable operation of technical systems is of great significance for the protection of human life and health, the environment, and of the vested economic value. The correct functioning of those systems has a profound impact also on production cost and product quality. The early detection of faults is critical in avoiding performance degradation and damage to the machinery or human life. Accurate diagnosis then helps to make the right decisions on emergency actions and repairs. Fault detection and diagnosis (FDD) has developed into a major area of research, at the intersection of systems and control engineering, artificial intelligence, applied mathematics and statistics, and such application fields as chemical, electrical, mechanical and aerospace engineering. IFAC has recognized the significance of FDD by launching a triennial symposium series dedicated to the subject. The SAFEPROCESS Symposium is organized every three years since the first symposium held in Baden-Baden in 1991. SAFEPROCESS 2006, the 6th IFAC Symposium on Fault Detection, Supervision and Safety of Technical Processes was held in Beijing, PR China. The program included three plenary papers, two semi-plenary papers, two industrial talks by internationally recognized experts and 258 regular papers, which have been selected out of a total of 387 regular and invited papers submitted. * Discusses the developments and future challenges in all aspects of fault diagnosis and fault tolerant control

* 8 invited and 36 contributed sessions included with a special session on the demonstration of process monitoring and diagnostic software tools

Cooperative and Graph Signal Processing May 08 2020 Cooperative and Graph Signal Processing: Principles and Applications presents the fundamentals of signal processing over networks and the latest advances in graph signal processing. A range of key concepts are clearly explained, including learning, adaptation, optimization, control, inference and machine learning. Building on the principles of these areas, the book then shows how they are relevant to understanding distributed communication, networking and sensing and social networks. Finally, the book shows how the principles are applied to a range of applications, such as Big data, Media and video, Smart grids, Internet of Things, Wireless health and Neuroscience. With this book readers will learn the basics of adaptation and learning in networks, the essentials of detection, estimation and filtering, Bayesian inference in networks, optimization and control, machine learning, signal processing on graphs, signal processing for distributed communication, social networks from the perspective of flow of information, and how to apply signal processing methods in distributed settings. Presents the first book on cooperative signal processing and graph signal processing Provides a range of applications and application areas that are thoroughly covered Includes an editor in chief and associate editor from the IEEE Transactions on Signal Processing and Information Processing over Networks who have recruited top contributors for the book

Grundlagen der digitalen Signalverarbeitung Jun 01 2022 Der Autor geht ausführlich auf zeitdiskrete, lineare, zeitinvariante Systeme sowie die Verarbeitung zeitdiskreter Signale ein und vermittelt verständlich die dazu notwendigen mathematischen Verfahren. Es folgen die Stochastische Signalverarbeitung, Schätzungen der Autokorrelationsfunktion und die immer stärker benutzten Modellsysteme. Literaturangaben schließen das Buch ab.

Crime Prevention Technologies and Applications for Advancing Criminal Investigation Oct 25 2021 The tools of crime constantly evolve, and law enforcement and forensic investigators must understand advanced forensic techniques to ensure that the most complete evidence is brought to trial. Paramount also the need for investigators to ensure that evidence adheres to the boundaries of the legal system, a place where policy often lags behind new innovations. Crime Prevention Technologies and Applications for Advancing Criminal Investigation addresses the use of electronic devices and software for crime prevention, investigation, and the application of a broad spectrum of sciences to answer questions of interest to the legal system. This book fosters a forum for advancing research and development of the theory and practice of digital crime prevention and forensics.