

Spacetime Adaptive Processing For Radar

High Frequency Over-the-Horizon Radar
High-Resolution and Robust Signal Processing
Synthetic Aperture Radar Signal Processing with MATLAB Algorithms
Radar Essentials
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Space-time Adaptive Processing
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Radar, Sonar, Navigation & Avionics Series)

High Frequency Over-the-Horizon Radar

This comprehensive new resource provides in-depth and timely coverage of the underpinnings and latest advances of MIMO radar. This book provides a comprehensive introduction to MIMO radar and demonstrates its utility in real-world applications, then culminates with the latest advances in optimal and adaptive MIMO radar for enhanced detection and target ID in challenging environments. Signal processing prerequisites are explained, including radar signals, orthogonal waveforms, matched filtering, multi-channel beam forming, and Doppler processing. This book discusses MIMO radar signal model, antenna properties, system modeling and waveform alternatives. MIMO implementation challenges are covered, including computational complexity, adaptive clutter mitigation, calibration and equalization, and hardware constraints. Applications for GMTI radar, OTH radar, maritime radar, and automotive radar are explained. The book offers an introduction to optimum MIMO radar and includes details about detection, clutter, and target ID. Insight into adaptive MIMO radar and MIMO channel estimation is presented and techniques and illustrative examples are given. Readers find exclusive flight testing data from DARPA. The breadth of coverage in this all-inclusive resource makes it suitable for both practicing

engineers and advanced researchers. The book concludes with discussions on areas for future research.

High-Resolution and Robust Signal Processing

Radar Resource Management (RRM) is vital for optimizing the performance of modern phased array radars, which are the primary sensor for aircraft, ships, and land platforms. Adaptive Radar Resource Management gives an introduction to radar resource management (RRM), presenting a clear overview of different approaches and techniques, making it very suitable for radar practitioners and researchers in industry and universities. Coverage includes: RRM's role in optimizing the performance of modern phased array radars The advantages of adaptivity in implementing RRM The role that modelling and simulation plays in evaluating RRM performance Description of the simulation tool Adapt_MFR Detailed descriptions and performance results for specific adaptive RRM techniques The only book fully dedicated to adaptive RRM A comprehensive treatment of phased array radars and RRM, including task prioritization, radar scheduling, and adaptive track update rates Provides detailed knowledge of specific RRM techniques and their performance

Synthetic Aperture Radar Signal Processing with MATLAB

Algorithms

The purpose of this book is to introduce the reader to the basic theory of signal detection and estimation. It is assumed that the reader has a working knowledge of applied probability and random processes such as that taught in a typical first-semester graduate engineering course on these subjects. This material is covered, for example, in the book by Wong (1983) in this series. More advanced concepts in these areas are introduced where needed, primarily in Chapters VI and VII, where continuous-time problems are treated. This book is adapted from a one-semester, second-tier graduate course taught at the University of Illinois. However, this material can also be used for a shorter or first-tier course by restricting coverage to Chapters I through V, which for the most part can be read with a background of only the basics of applied probability, including random vectors and conditional expectations. Sufficient background for the latter option is given for example in the book by Thomas (1986), also in this series.

Radar Essentials

Discover the technology for the next generation of radar systems Here is the first book that brings together the key concepts essential for the application of Knowledge Based Systems (KBS) to radar detection, tracking, classification, and

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scheduling. The book highlights the latest advances in both KBS and radar signal and data processing, presenting a range of perspectives and innovative results that have set the stage for the next generation of adaptive radar systems. The book begins with a chapter introducing the concept of Knowledge Based (KB) radar. The remaining nine chapters focus on current developments and recent applications of KB concepts to specific radar functions. Among the key topics explored are: Fundamentals of relevant KB techniques KB solutions as they apply to the general radar problem KBS applications for the constant false-alarm rate processor KB control for space-time adaptive processing KB techniques applied to existing radar systems Integrated end-to-end radar signals Data processing with overarching KB control All chapters are self-contained, enabling readers to focus on those topics of greatest interest. Each one begins with introductory remarks, moves on to detailed discussions and analysis, and ends with a list of references. Throughout the presentation, the authors offer examples of how KBS works and how it can dramatically improve radar performance and capability. Moreover, the authors forecast the impact of KB technology on future systems, including important civilian, military, and homeland defense applications. With chapters contributed by leading international researchers and pioneers in the field, this text is recommended for both students and professionals in radar and sonar detection, tracking, and classification and radar resource management.

Detection, Estimation, and Modulation Theory, Set (Volumes:

I,II, III,IV)

This highly-anticipated second edition of an Artech House classic covers several key radar analysis areas: the radar range equation, detection theory, ambiguity functions, waveforms, antennas, active arrays, receivers and signal processors, CFAR and chaff analysis. Readers will be able to predict the detection performance of a radar system using the radar range equation, its various parameters, matched filter theory, and Swerling target models. The performance of various signal processors, single pulse, pulsed Doppler, LFM, NLFM, and BPSK, are discussed, taking into account factors including MTI processing, integration gain, weighting loss and straddling loss. The details of radar analysis are covered from a mathematical perspective, with in-depth breakdowns of radar performance in the presence of clutter. Readers will be able to determine the noise temperature of a multi-channel receiver as it is used in active arrays. With the addition of three new chapters on moving target detectors, inverse synthetic aperture radar (ISAR) and constant false alarm rate (CFAR) and new MATLAB codes, this expanded second edition will appeal to the novice as well as the experienced practitioner.

Space-Time Adaptive Processing for Radar, Second Edition

This text discusses various applications of space-time adaptive processing,

including applications in OTH-radar, ground target tracking, STAP in real world clutter environments, jammer cancellation, superresolution, active sonar, seismics and communications. It is divided into two parts: the first dealing with the classical adaptive suppression of airborne and spacebased radar clutter, and the second comprising of miscellaneous applications in other fields such as communications, underwater sound and seismics.

Knowledge Based Radar Detection, Tracking and Classification

This book provides an excellent reference for all professionals working in the area of array signal processing and its applications in wireless communications. Wideband beamforming has advanced with the increasing bandwidth in wireless communications and the development of ultra wideband (UWB) technology. In this book, the authors address the fundamentals and most recent developments in the field of wideband beamforming. The book provides a thorough coverage of the subject including major sub-areas such as sub-band adaptive beamforming, frequency invariant beamforming, blind wideband beamforming, beamforming without temporal processing, and beamforming for multi-path signals. Key Features: Unique book focusing on wideband beamforming Discusses a hot topic coinciding with the increasing bandwidth in wireless communications and the development of UWB technology Addresses the general concept of beamforming including fixed beamformers and adaptive beamformers Covers advanced topics

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including sub-band adaptive beamforming, frequency invariant beamforming, blind wideband beamforming, beamforming without temporal processing, and beamforming for multi-path signals Includes various design examples and corresponding complexity analyses This book provides a reference for engineers and researchers in wireless communications and signal processing fields. Postgraduate students studying signal processing will also find this book of interest.

Space-time Adaptive Processing

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

Adaptive Radar Resource Management

Space-time adaptive processing (STAP) is an exciting technology for advanced radar systems that allows for significant performance enhancements over conventional approaches. Based on a time-tested course taught in industry, government and academia, this second edition reviews basic STAP concepts and methods, placing emphasis on implementation in real-world systems. It addresses the needs of radar engineers who are seeking to apply effective STAP techniques to their systems, and serves as an excellent reference for non-radar specialists with an interest in the signal processing applications of STAP. Engineers find the analysis tools they need to assess the impact of STAP on a variety of important radar applications. A toolkit of STAP algorithms and implementation techniques allows practitioners the flexibility of adapting the best methods to their application. In addition, this second edition adds brand new coverage on “STAP on Transmit” and “Knowledge-Aided STAP (KA-STAP).

Basic Radar Analysis, Second Edition

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This authoritative, leading-edge resource gives you a comprehensive overview of sample rate conversion (SRC) and its applications in software configurable radios. The book helps you understand the limits of feasible systems for sample rate conversion, as well as the limits of interpolation. You get sound advice on selecting the appropriate types of SRC for specific applications, and assistance in handling the trade-off between hardware complexity and the clock rate of a system. From an introduction to software radio and a refresher on the fundamentals of sampling and sample rate conversion, to discussions on block signal processing and well-known and novel structures for sample rate conversion, the book offers you practical guidance that enables you to quickly find solutions for your challenging projects in the field. This first-of-its-kind reference concludes with a list of questions that - when answered - helps to design a system for sample rate conversion. Over 890 equations and 90 illustrations support key topics throughout the book.

Design of Multi-Frequency CW Radars

Chronicling the new field of cognitive radar (CR), this cutting-edge resource provides an accessible introduction to the theory and applications of CR, and presents a comprehensive overview of the latest developments in this emerging area. The first book on the subject, Cognitive Radar covers important breakthroughs in advanced radar systems, and offers new and powerful methods

for combating difficult clutter environments. You find details on specific algorithmic and real-time high-performance embedded computing (HPEC) architectures. This practical book is supported with numerous examples that clarify key topics, and includes more than 370 equations.

MIMO Radar: Theory and Application

Although the field of sparse representations is relatively new, research activities in academic and industrial research labs are already producing encouraging results. The sparse signal or parameter model motivated several researchers and practitioners to explore high complexity/wide bandwidth applications such as Digital TV, MRI processing, and certain defense applications. The potential signal processing advancements in this area may influence radar technologies. This book presents the basic mathematical concepts along with a number of useful MATLAB(r) examples to emphasize the practical implementations both inside and outside the radar field.

Space Based Radar

Signal processing plays an important role in many diverse application areas, including radar, sonar, communications, seismology, radio astronomy,

tomography, and communications. Now, by popular demand, acclaimed author Harry Van Trees' four-part encyclopedic treatment of signal processing is now collected into a set offering 25 years of information in a single source.

An Introduction to Signal Detection and Estimation

Sensors arrays are used in diverse applications across a broad range of disciplines. Regardless of the application, however, the tools of sensor array signal processing remain the same. Furthermore, whether your interest is in acoustic, seismic, mechanical, or electromagnetic wavefields, they all have a common mathematical framework. Mastering this framework and those tools lays a strong foundation for more specialized study and research. Sensor Array Signal Processing helps build that foundation. It unravels the underlying principles of the subject without reference to any particular application. Instead, the author focuses on the common threads that exist in wavefield analysis. After introducing the basic equations governing different wavefields, the treatment includes topics from simple beamformation, spatial filtering, and high resolution DOA estimation to imaging and reflector mapping. It studies different types of sensor configurations, but focuses on the uniform linear and circular arrays-the most useful configurations for understanding array systems in practice. Unique in its approach, depth, and quantitative focus, Sensor Array Signal Processing offers the ideal starting point and an outstanding reference for those working or interested in medical imaging,

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astronomy, radar, communications, sonar, seismology-any field that studies propagating wavefields. Its clear exposition, numerical examples, exercises, and wide applicability impart a broad picture of array signal processing unmatched by any other text on the market.

Colloquium on Random Signal Analysis, 1 April 1977

Annotation This is a systematic introduction to MTI (moving target indication) system design for use in the fields of earth observation, surveillance and reconnaissance, with particular regard to the suppression of clutter returns. Coverage includes signal processing, clutter models, array processing theory, adapted linear arrays, non-linear antenna configurations, circular arrays, space-frequency techniques, and clutter suppression jamming conditions. This book is a follow up to the author's successful first book on STAP.

MTI and Pulsed Doppler Radar

When you need vital data fast, turn to Radar Essentials. This compact yet comprehensive reference has compiled the most used principles, data, tables, and equations that are used by radar and aerospace system designers on a daily basis. Experts and non-experts alike will find this to be their go-to source for recalling and

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understanding the fundamentals and employing them in design and performance analysis. Key features: Discussion of principles, design, and operation including radar functions, types, frequencies, configurations and nomenclature. Characteristics and capabilities of key subsystems including antennas, transmitters, receivers, T/R modules, and signal and data processing. Radar performance evaluation techniques and data including radar cross section, signal-to-noise ratio, target detection, search, radar measurements, and tracking. Discussion and data on the radar environment including atmospheric refraction and losses, rain attenuation, terrain, sea and rain clutter, terrain masking and multipath, ionospheric effects on radar performance, and electronic countermeasures. Radar techniques including waveform design, moving-target indication (MTI), displaced phase-center arrays (DPCA), pulse Doppler operation, space-time adaptive processing (STAP), and target classification, discrimination and identification.

Topics in Radar Signal Processing

This book deals with the basic theory for design and analysis of Low Probability of Intercept (LPI) radar systems. The design of one such multi-frequency high resolution LPI radar, PANDORA, is covered. This work represents the first time that the topic of multi-frequency radars is discussed in such detail and it is based on research conducted by the author in The Netherlands. The book provides the

design tools needed for development, design, and analysis of high resolution radar systems for commercial as well as military applications. Software written in MATLAB and C++ is provided to guide the reader in calculating radar parameters and in ambiguity function analysis. Some radar simulation software is also included.

2018 48th European Microwave Conference

Beamforming: Sensor Signal Processing for Defence Applications presents a range of important research contributions concerned with sensor array signal processing and, in particular, with the superresolution beamformers fundamental to many civilian and defence applications. Both space and space-time (STAP) beamforming algorithms and their application to radar systems are considered with emphasis given to "look-down" airborne radars, synthetic aperture radar (SAR), arrayed MIMO radar and a number of common wake-wave detection algorithms for two-dimensional SAR imagery. Furthermore, ocean towed arrays, which find applications in a variety of areas such as defence, oil and gas exploration, and geological and marine life studies, are also considered paying particular attention to receiver positional uncertainties resulting from the array's flexible structure. Array geometrical and electrical uncertainties, design of auto-calibration algorithms, beamforming "pointing" error uncertainties and robustification issues are also presented. This book is self-contained and unified in its presentation, and

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comprehensively covers some of the classic and fundamental models of beamforming for sensor signal processing. It is suitable as an advanced textbook for graduate students and researchers in the area of signal processing, as well as a reference book for engineers in the defence industry. Contents: Space-Time Adaptive Beamforming Algorithms for Airborne Radar Systems (Rodrigo de Lamare) Transmit Beamforming for Forward-Looking Space-Time Radars (Mathini Sellathurai and David Wilcox) Digital Beamforming for Synthetic Aperture Radar (Karen Mak and Athanassios Manikas) Arrayed MIMO Radar: Multi-target Parameter Estimation for Beamforming (Harry Commin, Kai Luo and Athanassios Manikas) Beamforming for Wake Wave Detection and Estimation — An Overview (Karen Mak and Athanassios Manikas) Towed Arrays: Channel Estimation, Tracking and Beamforming (Vidhya Sridhar, Marc Willerton and Athanassios Manikas) Array Uncertainties and Auto-calibration (Marc Willerton, Evangelos Venieris and Athanassios Manikas) Robust Beamforming to Pointing Errors (Jie Zhuang and Athanassios Manikas) Readership: Postgraduate students and researchers working in the area of signal processing as well as researchers working in the defence industry. The UDRC runs a series of short courses in signal processing for PhD students and industrial researchers and this book is recommended reading. Key Features: Unique treatment of beamforming Unique modelling techniques using array processing of modern radar systems such as MIMO, SAR, etc. New material related to the research carried out at UDRC. This book is considered as one of the academic outcomes of the UDRC in Signal Processing

Keywords: Space-Time

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Algorithms;Adaptive Beamforming;Transmit Beamforming;Robust Beamforming;Digital Beamforming;Spatiotemporal Beamforming;Forward-Looking STAP Radar;Airborne Radar;Synthetic Aperture Radar;MIMO Radar;Array Calibration;Array Uncertainties

Principles of Space-time Adaptive Processing

13th Conference will include sessions on all aspects of theory, design and applications of signal processing Prospective authors are invited to propose papers in any of the following areas, but not limited to A Digital Signal Processing (DSP) B Spectrum Estimation and Modeling C TF Spectrum Analysis and Wavelet D Higher Order Spectral Analysis E Adaptive Filtering and SP F Array Signal Processing G Hardware Implementation for Signal Processing H Speech and Audio Coding I Speech Synthesis and Recognition J Image Processing and Understanding K PDE for Image Processing L Video compression and Streaming M Computer Vision and VR N Multimedia and Human computer Interaction O Statistic Learning and Pattern Recognition P AI and Neural Networks Q Communication Signal processing R SP for Internet and Wireless Communications S Biometrics and Authentication T SP for Bio medical and Cognitive Science U SP for

Cognitive Radar

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This is a systematic introduction to airborne MTI radar design in use in the fields of earth observation, surveillance and reconnaissance, with particular regard to the suppression of clutter returns. It explores signal processing techniques, jamming and system applications, including sonar.

Compressed Sensing in Radar Signal Processing

Radar Array Processing presents modern techniques and methods for processing radar signals received by an array of antenna elements. With the recent rapid growth of the technology of hardware for digital signal processing, it is now possible to apply this to radar signals and thus to enlist the full power of sophisticated computational algorithms. Topics covered in detail here include: super-resolution methods of array signal processing as applied to radar, adaptive beam forming for radar, and radar imaging. This book will be of interest to researchers and students in the radar community and also in related fields such as sonar, seismology, acoustics and radio astronomy.

Academic Press Library in Signal Processing

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

Radar Array Processing

Advances in Bistatic Radar updates and extends bistatic and multistatic radar developments since the publication of Willis' Bistatic Radar in 1991. New and recently declassified military applications are documented, civil applications are detailed including commercial and scientific systems and leading radar engineers provide expertise to each of these applications. Advances in Bistatic Radar consists of two major sections: Bistatic/Multistatic Radar Systems and Bistatic Clutter and Signal Processing. Starting with a history update, the first section documents the early and now declassified military AN/FPS-23 Fluttar DEW-Line Gap-filler, and high

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frequency (HF) bistatic radars developed for missile attack warning. It then documents the recently developed passive bistatic and multistatic radars exploiting commercial broadcast transmitters for military and civilian air surveillance. Next, the section documents scientific bistatic radar systems for planetary exploration, which have exploited data link transmitters over the last forty years; ionospheric measurements, again exploiting commercial broadcast transmitters; and 3-D wind field measurements using a bistatic receiver hitchhiking off doppler weather radars. This last application has been commercialized. The second section starts by documenting the full, unclassified bistatic clutter scattering coefficient data base, along with the theory and analysis supporting its development. The section then details two major clutter-related developments, spotlight bistatic synthetic aperture radar (SAR), which can now generate high resolution images using bistatic autofocus and related techniques; and adaptive moving target indication (MTI), which allows cancellation of nonstationary clutter generated by moving (i.e. airborne) platforms through the use of bistatic space-time adaptive processing (STAP).

Fundamentals of Radar Signal Processing

Learn about the latest theoretical and practical advances in radar signal processing using tools from compressive sensing.

Radar Networks

This thoroughly updated second edition of an Artech House bestseller brings together a team of leading experts who provide you with a current and comprehensive treatment of the Global Positioning System (GPS). The book covers all the latest advances in technology, applications, and systems. The second edition includes new chapters that explore the integration of GPS with vehicles and cellular telephones, new classes of satellite broadcast signals, the emerging GALILEO system, and new developments in the GPS marketplace. This single-source reference provides both a quick overview of GPS essentials and an in-depth treatment of advanced topics. The book guides you in developing new applications and shows you how to evaluate their performance. It explains all the differential GPS services available to let you decide which is best for particular applications. You learn how to build GPS receivers and integrate them into navigational and communications equipment. Moreover, this unique volume helps you determine how technology is affecting the marketplace and where best to invest your company's resources.

Understanding GPS

The book focuses on the history, main principles, functions, modes, properties and

specific nature of modern airborne radar. It provides a practical tool that will be of major help to engineers and technicians working in industry and in radar research and development.

Advances in Bistatic Radar

Advances in DSP (digital signal processing) have radically altered the design and usage of radar systems -- making it essential for both working engineers as well as students to master DSP techniques. This text, which evolved from the author's own teaching, offers a rigorous, in-depth introduction to today's complex radar DSP technologies. Contents: Introduction to Radar Systems * Signal Models * Sampling and Quantization of Pulsed Radar Signals * Radar Waveforms * Pulse Compression Waveforms * Doppler Processing * Detection Fundamentals * Constant False Alarm Rate (CFAR) Detection * Introduction to Synthetic Aperture Imaging

2016 IEEE 13th International Conference on Signal Processing (ICSP)

Discover the Applicability, Benefits, and Potential of New Technologies As advances in algorithms and computer technology have bolstered the digital signal processing capabilities of real-time sonar, radar, and non-invasive medical diagnostics

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systems, cutting-edge military and defense research has established conceptual similarities in these areas. Now civilian enterprises can use government innovations to facilitate optimal functionality of complex real-time systems. Advanced Signal Processing details a cost-efficient generic processing structure that exploits these commonalities to benefit commercial applications. Learn from a Renowned Defense Scientist, Researcher, and Innovator The author preserves the mathematical focus and key information from the first edition that provided invaluable coverage of topics including adaptive systems, advanced beamformers, and volume visualization methods in medicine. Integrating the best features of non-linear and conventional algorithms and explaining their application in PC-based architectures, this text contains new data on: Advances in biometrics, image segmentation, registration, and fusion techniques for 3D/4D ultrasound, CT, and MRI Fully digital 3D/ (4D: 3D+time) ultrasound system technology, computing architecture requirements, and relevant implementation issues State-of-the-art non-invasive medical procedures, non-destructive 3D tomography imaging and biometrics, and monitoring of vital signs Cardiac motion correction in multi-slice X-ray CT imaging Space-time adaptive processing and detection of targets interference-intense backgrounds comprised of clutter and jamming With its detailed explanation of adaptive, synthetic-aperture, and fusion-processing schemes with near-instantaneous convergence in 2-D and 3-D sensors (including planar, circular, cylindrical, and spherical arrays), the quality and illustration of this text's concepts and techniques will make it a favored reference.

Space-time Adaptive Processing for Radar

The first book to present a systematic and coherent picture of MIMO radars Due to its potential to improve target detection and discrimination capability, Multiple-Input and Multiple-Output (MIMO) radar has generated significant attention and widespread interest in academia, industry, government labs, and funding agencies. This important new work fills the need for a comprehensive treatment of this emerging field. Edited and authored by leading researchers in the field of MIMO radar research, this book introduces recent developments in the area of MIMO radar to stimulate new concepts, theories, and applications of the topic, and to foster further cross-fertilization of ideas with MIMO communications. Topical coverage includes: Adaptive MIMO radar Beampattern analysis and optimization for MIMO radar MIMO radar for target detection, parameter estimation, tracking, association, and recognition MIMO radar prototypes and measurements Space-time codes for MIMO radar Statistical MIMO radar Waveform design for MIMO radar Written in an easy-to-follow tutorial style, MIMO Radar Signal Processing serves as an excellent course book for graduate students and a valuable reference for researchers in academia and industry.

Beamforming

High-Resolution and Robust Signal Processing describes key methodological and theoretical advances achieved in this domain over the last twenty years, placing emphasis on modern developments and recent research pursuits. Applications-grounded, this sophisticated resource links theoretical background with high-resolution methods used in wireless communications, brain signal analysis, and space-time radar signal processing. Chapter extras include theorem proofs, derivations, and computational shortcuts, as well as open problems, numerical measurement, and performance examples, and simulation results Sixteen illustrious field leaders invest High-Resolution and Robust Signal Processing with: in-depth reviews of parametric high-resolution estimation and detection techniques; robust array processing solutions for adaptive beam forming and high-resolution direction finding; Parafac techniques for high-resolution array processing and specific areas of application; high-resolution nonparametric methods and implementation tactics for spectral analysis; multidimensional high-resolution data models and discussion of R-D unitary ESPRIT with colored noise; multidimensional high-resolution parameter estimation techniques applicable to channel sounding; estimation procedures for high-resolution space-time radar signal processing using 2-D or 1-D/1-D models; and models and methods for EEG/MEG space-time dipole source estimation and sensory array design.

MIMO Radar Signal Processing

Advanced Signal Processing

Discusses theory and design of pulsed Doppler radar and MTI with details on clutter, clutter modelling and theory of optimum processing. The book also covers special topics related to the use of the Doppler effect in radar systems which involve the application of special Doppler signal processing techniques that provide unique, otherwise unachievable features within the radar system.

Applications of Space-Time Adaptive Processing

Digital Signal Processing 101: Everything You Need to Know to Get Started provides a basic tutorial on digital signal processing (DSP). Beginning with discussions of numerical representation and complex numbers and exponentials, it goes on to explain difficult concepts such as sampling, aliasing, imaginary numbers, and frequency response. It does so using easy-to-understand examples with minimum mathematics. In addition, there is an overview of the DSP functions and implementation used in several DSP-intensive fields or applications, from error correction to CDMA mobile communication to airborne radar systems. This book has been updated to include the latest developments in Digital Signal Processing, and has eight new chapters on: Automotive Radar Signal Processing Space-Time Adaptive Processing Radar Field Orientated Motor Control Matrix Inversion

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algorithms GPUs for computing Machine Learning Entropy and Predictive Coding Video compression Features eight new chapters on Automotive Radar Signal Processing, Space-Time Adaptive Processing Radar, Field Orientated Motor Control, Matrix Inversion algorithms, GPUs for computing, Machine Learning, Entropy and Predictive Coding, and Video compression Provides clear examples and a non-mathematical approach to get you up to speed quickly Includes an overview of the DSP functions and implementation used in typical DSP-intensive applications, including error correction, CDMA mobile communication, and radar systems

Sensor Array Signal Processing

The First Comprehensive Guide to the Principles, Design Methods, and Applications of Space Based Radar Turn to Space Based Radar for authoritative information on the latest developments in Space Based Radar (SBR), covering fundamental principles, cutting-edge design methods, and several new applications. This SBR guide focuses on clutter and target data generation from an SBR platform, and on Space Time Adaptive Processing (STAP) to enhance the target detection and the clutter cancellation capabilities of the radar system. Designed to save you hours of research time and effort, this one-stop resource explores the full range of SBR topics, including SBR footprint and range foldover phenomenon Doppler shift that accounts for Earth's rotation terrain modeling STAP algorithms for enhanced target detection and much more. Packed with over 250 full-color illustrations, Space Based

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Radar features: Complete coverage of the technical issues associated with SBR and their impact on system performance A CD containing all of the book's illustrations, equations, and samples; plus more than 250 PowerPoint slides for self-study or lectures Inside This Pioneering SBR Sourcebook • Introducing Space Based Radar • The Conics • Two Body Orbital Motion and Kepler's Laws • SBR Kinematics • Space Time Adaptive Processing for Space Based Radar • Performance Analysis Using Cramer-Rao Bounds • Waveform Diversity

Sparse Representations for Radar with MATLAB Examples

Wideband Beamforming

This book gives an introduction to the possibilities of radar technology based on active array antennas, giving examples of modern practical systems, many of which were developed in Europe. In addition to coverage of antennas, array signal processing, adaptive digital beamforming, adaptive monopulse, superresolution, and sequential detection, several modern systems are described including space-time adaptive processing (STAP), moving target detection using synthetic aperture radar (SAR), and several other experimental phased array radar systems. There are many valuable lessons presented for designers of future high standard

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multifunction radar systems for military and civil applications. The book will appeal to graduate level engineers, researchers, and managers in the field of radar, aviation and space technology.

Adaptive Signal Processing for Radar

Walks the reader through adaptive approaches to radar signal processing by detailing the basic concepts of various techniques and then developing equations to analyze their performance. Finally, it presents curves that illustrate the attained performance.

Digital Signal Processing 101

An up-to-date analysis of the SAR wavefront reconstruction signal theory and its digital implementation With the advent of fast computing and digital information processing techniques, synthetic aperture radar (SAR) technology has become both more powerful and more accurate. Synthetic Aperture Radar Signal Processing with MATLAB Algorithms addresses these recent developments, providing a complete, up-to-date analysis of SAR and its associated digital signal processing algorithms. This book introduces the wavefront reconstruction signal theory that underlies the best SAR imaging methods and provides clear guidelines

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to system design, implementation, and applications in diverse areas-from airborne reconnaissance to topographic imaging of ocean floors to surveillance and air traffic control to medical imaging techniques, and numerous others. Enabling professionals in radar signal and image processing to use synthetic aperture technology to its fullest potential, this work:

- * Includes M-files to supplement this book that can be retrieved from The MathWorks anonymous FTP server at <ftp://ftp.mathworks.com/pub/books/soumekh>
- * Provides practical examples and results from real SAR, ISAR, and CSAR databases
- * Outlines unique properties of the SAR signal that cannot be found in other information processing systems
- * Examines spotlight SAR, stripmap SAR, circular SAR, and monopulse SAR modalities
- * Discusses classical SAR processing issues such as motion compensation and radar calibration

Air and Spaceborne Radar Systems

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