Mimo Radar Matlab Code

An introduction to technical details related to the PhysicalLayer of the LTE standard with MATLAB ® The LTE (Long Term Evolution) and LTE-Advanced are among thelatest mobile communications standards, designed to realize thedream of a truly global, fast, all-IP-based, secure broadbandmobile access technology. This book examines the Physical Layer (PHY) of the LTE standardsby incorporating three conceptual elements: an overview of thetheory behind key enabling technologies; a concise discussionregarding standard specifications; and the MATLAB ® algorithmsneeded to simulate the standard. The use of MATLAB ® , a widely used technical computinglanguage, is one of the distinguishing features of this book.Through a series of MATLAB ® programs, the author explores eachof the enabling technologies, pedagogically synthesizes an LTE PHYsystem model, and evaluates system performance at each stage.Following this step-by-step process, readers will achieve deeperunderstanding of LTE concepts and specifications throughsimulations. Key Features: • Accessible, intuitive, and progressive; one of the fewbooks to focus primarily on the modeling, simulation, andimplementation of the LTE PHY standard • Includes case studies and testbenches in MATLAB ® ,which build knowledge gradually and incrementally until afunctional specification for the LTE PHY is attained • Accompanying Web site includes all MATLAB ® programs,together with PowerPoint slides and other illustrative examples Dr Houman Zarrinkoub has served as a development manager andnow as a senior product manager with MathWorks, based inMassachusetts, USA. Within his 12 years at MathWorks, he has beenresponsible for multiple signal processing and communicationssoftware tools. Prior to MathWorks, he was a research scientist inthe Wireless Group at Nortel Networks, where he contributed tomultiple standardization projects for 3G mobile technologies. Hehas been awarded multiple patents on topics related to computersimulations. He holds a BSc degree in Electrical Engineering fromMcGill University and MSc and PhD degrees in Telecommunicationsfrom the Institut Nationale de la Recherche Scientifique, inCanada. ahref="http://www.wiley.com/go/zarrinkoub"www.wiley.com/go/zarrinkoub/a

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.

This comprehensive resource provides readers with the tools necessary to perform analysis of various waveforms for use in radar systems. It provides information about how to produce synthetic aperture (SAR) images by giving a tomographic formulation and implementation for SAR imaging. Tracking filter fundamentals, and each parameter associated with the filter and how each affects tracking performance are also presented. Various radar cross section measurement techniques are covered, along with waveform selection analysis through the study of the ambiguity function for each particular waveform from simple linear frequency modulation (LFM) waveforms to more complicated coded waveforms. The text includes the Python tool suite, which allows the reader to analyze and predict radar performance for various scenarios and applications. Also provided are MATLAB ® scripts corresponding to the Python tools. The software includes a user-friendly graphical user interface (GUI) that provides visualizations of the concepts being covered. Users have full access to both the Python and MATLAB source code to modify for their application. With examples using the tool suite are given at the end of each chapter, this text gives readers a clear understanding of how important target scattering is in areas of target detection, target tracking, pulse integration, and target discrimination.

MIMO-OFDM is a key technology for next-generation cellular communications (3GPP-LTE, Mobile WiMAX, IMT-Advanced) as well as wireless LAN (IEEE 802.11a, IEEE 802.11n), wireless PAN (MB-OFDM), and broadcasting (DAB, DVB, DMB). In MIMO-OFDM Wireless Communications with MATLAB ® , the authors provide a comprehensive introduction to the theory and practice of wireless channel modeling, OFDM, and MIMO, using MATLAB ® programs to simulate the various techniques on MIMO-OFDM systems. One of the only books in the area dedicated to explaining simulation aspects Covers implementation to help cement the key concepts Uses materials that have been classroom-tested in numerous universities Provides the analytic solutions and practical examples with downloadable MATLAB ® codes Simulation examples based on actual industry and research projects Presentation slides with key equations and figures for instructor use MIMO-OFDM Wireless Communications with MATLAB ® is a key text for graduate students in wireless communications. Professionals and technicians in wireless communication fields, graduate students in signal processing, as well as senior undergraduates majoring in wireless communications will find this book a practical introduction to the MIMO-OFDM techniques. Instructor materials and MATLAB ® code examples available for download at www.wiley.com/go/chomimo

From Fundamentals to Advanced Techniques

MIMO Radar Waveform Design for Spectrum Sharing with Cellular Systems

Massive MIMO Networks

Radar Techniques Using Array Antennas

Waveform Design for Active Sensing Systems

Fundamentals of Radar Signal Processing

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

Analyzes and discusses the operating principle, signal processing method, and experimental results of this advanced radar technology This book systematically discusses the operating principle, signal processing method, target measurement technology, and experimental results of a new kind of radar called synthetic impulse and aperture radar (SIAR). The purpose is to help readers acquire an insight into the concept and principle of the SIAR, to know its operation mode, signal processing method, the difference between the traditional radar and itself, the designing ideals, and the developing method. It includes 10 chapters. Chapter 1 gives an introduction to the basic principle of SIAR and its characteristic of four antis. Chapter 2 introduces the operating principles and system constitution of SIAR. Chapter 3 presents the main waveforms and the corresponding signal processing methods. Chapter 4 is about the long-time integration technique. Chapter 5 shows the high-accuracy measurement and tracking of 4D parameters of target in SIAR. The range-angle coupling and decoupling are introduced in Chapter 6, where a criteria for transmit frequency optimization of array elements is studied to overcome the coupling among range, azimuth and elevation. In Chapter 7, detection and tracking of targets in strong interference background is investigated. Chapter 8 analyzes quantitatively the influence of array error on the tracking accuracy of SIAR. Expansion of impulse and aperture synthesis to HF band and microwave band are introduced respectively in Chapter 9 and Chapter 10. The operating principle of the novel bi-static surface wave radar system, as well as the experimental system and the experimental results are included in Chapter 9. Written by a highly experienced author with extensive knowledge of SIAR (Chen), the book can be used as a reference for engineering technical personnel and scientific research personnel working in the research of SIAR, MIMO radar, digital radar or other new type of radar. It can also be a reference for teachers and students in universities who engage in related professional work. Details the operating principle, signal processing method, target measurement technology, and experimental results of synthetic impulse and aperture radar (SIAR) Expands the technique of impulse and aperture synthesisfrom the VHF band to the HF band and the microwave band Written by a leading author with many years' research and practical experience in sparse array SIAR, a typical MIMO radar Engineers, researchers and postgraduates working in radar engineering will find this an invaluable resource.

This book presents a comprehensive coverage of the five fundamental yet intertwined pillars paving the road towards the future of connected autonomous electric vehicles and smart cities. The connectivity pillar covers all the latest advancements and various technologies on vehicle-to-everything (V2X) communications/networking and vehicular cloud computing, with special emphasis on their role towards vehicle autonomy and smart cities applications. On the other hand, the autonomy track focuses on the different efforts to improve vehicle spatiotemporal perception of its surroundings using multiple sensors and different perception technologies. Since most of CAVs are expected to run on electric power, studies on their electrification technologies, satisfaction of their charging demands, interactions with the grid, and the reliance of these components on their connectivity and autonomy, is the third pillar that this book covers. On the smart services side, the book highlights the game-changing roles CAV will play in future mobility services and intelligent transportation systems. The book also details the ground-breaking directions exploiting CAVs in broad spectrum of smart cities applications. Example of such revolutionary applications are autonomous mobility on-demand services with integration to public transit, smart homes, and buildings. The fifth and final pillar involves the illustration of security mechanisms, innovative business models, market opportunities, and societal/economic impacts resulting from the soon-to-be-deployed CAVs. This book contains an archival collection of top quality, cutting-edge and multidisciplinary research on connected autonomous electric vehicles and smart cities. The book is an authoritative reference for smart city decision makers, automotive manufacturers, utility operators, smart-mobility service providers, telecom operators, communications engineers, power engineers, vehicle charging providers, university professors, researchers, and students who would like to learn more about the advances in CAEVs connectivity, autonomy, electrification, security, and integration into smart cities and intelligent transportation systems.

This comprehensive resource provides theoretical formulation for detecting and geolocating non-cooperative emitters. Implementation of geolocation algorithms are discussed, as well as performance prediction of a hypothetical passive location system for systems analysis or vulnerability calculation. Comparison of novel direction finding and geolocation algorithms to classical forms are also included. Rooted in statistical signal processing and array processing theory, this book also provides an overview of the application of novel detection and estimation algorithms to real world problems in EW. The book is divided into three parts: detection, angle of arrival estimation, and geolocation. Each section begins with an introductory chapter covering the relevant signal processing theory (either detection or estimation), then provides a series of chapters covering specific methods to achieve the desired end-product. MATLAB® code is provided to assist readers with relevant probability and statistics, RF propagation, atmospheric absorption, and noise, giving readers an understanding of the implementation of the algorithms in the book, as well as developing new approaches to solving problems. Packed with problem sets and examples, this book strikes a balance between introductory texts and reference manuals, making it useful for novice as well as advanced practitioners.

Wireless Communication Signals

Micro-Doppler Characteristics of Radar Targets

MATLAB Simulations for Radar Systems Design

MIMO Radar: Theory and Application

Smart Antennas for Wireless Communications

Inverse Synthetic Aperture Radar Imaging With MATLAB Algorithms

This book presents a mathematical treatment of the radio resource allocation of modern cellular communications systems in contested environments. It focuses on fulfilling the quality of service requirements of the living applications on the user devices, which leverage the cellular system, and with attention to elevating the users' quality of experience. The authors also address the congestion of the spectrum by allowing sharing with the band incumbents while providing with a quality-of-service-minded resource allocation in the network. The content is of particular interest to telecommunications scheduler experts in industry, communications applications academia, and graduate students whose paramount research deals with resource allocation and quality of service.

This series will appeal to radar practitioners within military or government. The first volume was written as a textbook for courses in radar systems and technology and the second volume is aimed at practicing radar engineers and graduate level students. The third volume is designed to serve as a self-contained reference for those aiming to become experts in an advanced technology or application area. POMR: Radar Applications Volume 3 includes concise descriptions of the purposes, principal issues and radar methods found in a wide variety of current radar types. POMR: Advanced Techniques Volume 2 is a professional reference for practicing engineers that provides a stepping stone to advanced practice. POMR: Basic Principles Volume 1 focuses on 4 keys areas; basic concepts, radar signal phenomenology, major subsystems of modern radars and signal and data processing basics.

Smart antennas boost the power of a wireless network, saving energy and money and greatly increasing the range of wireless broadband. Smart Antennas is a rigorous textbook on smart antenna design and deployment.

This book provides an overview of radar waveform synthesis obtained as the result of computational optimization processes and covers the most challenging application fields. The book balances a practical point of view with a rigorous mathematical approach corroborated with a wealth of numerical study cases and some real experiments. Additionally, the book has a cross-disciplinary approach because it exploits cross-fertilization with the recent research and discoveries in optimization theory. The material of the book is organized into ten chapters, each one completed with a comprehensive list of references.

From Mathematical Modeling to Simulation and Prototyping

Frequenzkamm-basiertes breitbandiges MIMO-OFDM-Radar

Software-Defined Radio for Engineers

Sparse Representations for Radar with MATLAB Examples

Proceedings of ICCDN 2018

Detecting and Classifying Low Probability of Intercept Radar

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

The book covers recent trends in the field of devices, wireless communication and networking. It presents the outcomes of the International Conference in Communication, Devices and Networking (ICCDN 2018), which was organized by the Department of Electronics and Communication Engineering, Sikkim Manipal Institute of Technology, Sikkim, India on 2 – 3 June, 2018. Gathering cutting-edge research papers prepared by researchers, engineers and industry professionals, it will help young and experienced scientists and developers alike to explore new perspectives, and offer them inspirations on addressing real-world problems in the field of electronics, communication, devices and networking.

Build your knowledge of SAR/ISAR imaging with this comprehensive and insightful resource The newly revised Second Edition of Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms covers in greater detail the fundamental and advanced topics necessary for a complete understanding of inverse synthetic aperture radar (ISAR) imaging and its concepts. Distinguished author and academician, Caner Özdemir, describes the practical aspects of ISAR imaging and presents illustrative examples of the radar signal processing algorithms used for ISAR imaging. The topics in each chapter are supplemented with MATLAB codes to assist readers in better understanding each of the principles discussed within the book. This new edition incudes discussions of the most up-to-date topics to arise in the field of ISAR imaging and ISAR hardware design. The book provides a comprehensive analysis of advanced techniques like Fourier-based radar imaging algorithms, and motion compensation techniques along with radar fundamentals for readers new to the subject. The author covers a wide variety of topics, including: Radar fundamentals, including concepts like radar cross section, maximum detectable range, frequency modulated continuous wave, and doppler frequency and pulsed radar The theoretical and practical aspects of signal processing algorithms used in ISAR imaging The numeric implementation of all necessary algorithms in MATLAB ISAR hardware, emerging topics on SAR/ISAR focusing algorithms such as bistatic ISAR imaging, polarimetric ISAR imaging, and near-field ISAR imaging, Applications of SAR/ISAR imaging techniques to other radar imaging problems such as thru-the-wall radar imaging and ground-penetrating radar imaging Perfect for graduate students in the fields of electrical and electronics engineering, electromagnetism, imaging radar, and physics, Inverse Synthetic Aperture Radar Imaging With MATLAB Algorithms also belongs on the bookshelves of practicing researchers in the related areas looking for a useful resource to assist them in their day-to-day professional work.

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

Radar Waveform Design based on Optimization Theory

In Honor of John Benedetto ' s 80th Birthday

Excursions in Harmonic Analysis, Volume 6

Array and Statistical Signal Processing

Cellular Communications Systems in Congested Environments

Code Generation for Embedded Convex Optimization

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

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

JOINT COMMUNICATIONS AND SENSING Authoritative resource systematically introducing JCAS technologies and providing valuable information and knowledge to researchers and engineers Based on over six years of dedicated research on joint communications and sensing (JCAS) by the authors, their collaborators, and students, Joint Communications and Sensing is the first book to comprehensively cover the subject of JCAS, which is expected to deliver huge cost and energy savings, and therefore has become a hallmark of future 6G and next generation radar technologies. The book has three parts. Part I presents the basic JCAS concepts and applications and the basic signal processing algorithms to support JCAS. Part II covers communications-centric JCAS designs that describe how sensing can be integrated into communications networks such as 5G and 6G. Part III presents ways to integrate communications in various radar sensing technologies and platforms. Specific sample topics covered in Joint Communications and Sensing include: Three categories of JCAS systems, potential sensing applications of JCAS, signal processing fundamentals, and channel models for communications and radar Frameworks for perceptive mobile networks (PMNs), system modifications to enable PMN sensing, and PMN system issues Orthogonal time-frequency space waveform-based JCAS for IoT, including signal models, echo pre-processing, and target parameter estimation Joint Communications and Sensing provides valuable information and knowledge to researchers and engineers in the communications and radar sensing communities and industries, enabling them to upskill and prepare for JCAS technology research and development. The text is of particular interest to engineers in the wireless communications industry who are pursuing new capabilities in 6G.

This book dives into radio resource allocation optimizations, a research area for wireless communications, in a pragmatic way and not only includes wireless channel conditions but also incorporates the channel in a simple and practical fashion via well-understood equations. Most importantly, the book presents a practical perspective by modeling channel conditions using terrain-aware propagation which narrows the gap between purely theoretical work and that of industry methods. The provided propagation modeling reflects industry grade scenarios for radio environment map and hence makes the channel based resource allocation presented in the book a field-grade view. Also, the book provides large scale simulations that account for realistic locations with terrain conditions that can produce realistic scenarios applicable in the field. Most portions of the book are accompanied with MATLAB code and occasionally MATLAB/Python/C code. The book is intended for graduate students, academics, researchers of resource allocation in mathematics, computer science, and electrical engineering departments as well as working professionals/engineers in wireless industry.

Based on the popular Artech House classic, Digital Communication Systems Engineering with Software-Defined Radio, this book provides a practical approach to quickly learning the software-defined radio (SDR) concepts needed for work in the field. This up-to-date volume guides readers on how to quickly prototype wireless designs using SDR for real-world testing and experimentation. This book explores advanced wireless communication techniques such as OFDM, LTE, WLA, and hardware targeting. Readers will gain an understanding of the core concepts behind wireless hardware, such as the radio frequency front-end, analog-to-digital and digital-to-analog converters, as well as various processing technologies. Moreover, this volume includes chapters on timing estimation, matched filtering, frame synchronization message decoding, and source coding. The orthogonal frequency division multiplexing is explained and details about HDL code generation and deployment are provided. The book concludes with coverage of the WLAN toolbox with OFDM beacon reception and the LTE toolbox with downlink reception. Multiple case studies are provided throughout the book. Both MATLAB and Simulink source code are included to assist readers with their projects in the field.

Emitter Detection and Geolocation for Electronic Warfare

MIMO-OFDM Wireless Communications with MATLAB

A Laboratory-based Approach

Radar Networks

Connected and Autonomous Vehicles in Smart Cities

Practical Channel-Aware Resource Allocation

WIRELESS COMMUNICATION SIGNALS A practical guide to wireless communication systems and concepts Wireless technologies and services have evolved significantly over the last couple of decades, and Wireless Communication Signals offers an important guide to the most recent advances in wireless communication systems and concepts grounded in a practical and laboratory perspective. Written by a noted expert on the topic, the book provides the information needed to model, simulate, test, and analyze wireless system and wireless circuits using modern instrumentation and computer aided design software. Designed as a practical resource, the book provides a clear understanding of the basic theory, software simulation, hardware test, and modeling, system component testing, software and hardware interactions and co-simulations. This important book: Provides organic and harmonized coverage of wireless communication systems Covers a range of systems from radio hardware to digital baseband signal processing Presents information on testing and measurement of wireless communication systems and subsystems Includes MATLAB file codes Written for professionals in the communications industry, technical managers, and researchers in both academia and industry. Wireless Communication Signals introduces wireless communication systems and concepts from both a practical and laboratory perspective.

This revised and expanded second edition brings you to the cutting edge with new chapters on LPI radar design, including over-the-horizon radar, random noise radar, and netted LPI radar. You also discover critical LPI detection techniques, parameter extraction signal processing techniques, and anti-radiation missile design strategies to counter LPI radar.

John J. Benedetto has had a profound influence not only on the direction of harmonic analysis and its applications, but also on the entire community of people involved in the field. The chapters in this volume – compiled on the occasion of his 80th birthday – are written by leading researchers in the field and pay tribute to John's many significant and lasting achievements. Covering a wide range of topics in harmonic analysis and related areas, these chapters are organized into four main parts: harmonic analysis, wavelets and frames, sampling and signal processing, and compressed sensing and optimization. An introductory chapter also provides a brief overview of John's life and mathematical career. This volume will be an excellent reference for graduate students, researchers, and professionals in pure and applied mathematics, engineering, and physics.

Micro-Doppler Characteristics of Radar Targets is a monograph on radar target's micro-Doppler effect theory and micro-Doppler feature extraction techniques. The micro-Doppler effect is presented from two aspects, including micro-Doppler effect analysis and micro-Doppler feature extraction, with micro-Doppler effects induced by different micro-motional targets in different radar systems analyzed and several methods of micro-Doppler feature extraction and three-dimensional micro-motion feature reconstruction presented. The main contents of this book include micro-Doppler effect in narrowband radar, micro-Doppler effect in wideband radar, micro-Doppler effect in bistatic radar, micro-Doppler feature analysis and extraction, and three-dimensional micro-motion feature reconstruction, etc. This book can be used as a reference for scientific and technical personnel engaged in radar signal processing and automatic target recognition, etc. It is especially suitable for beginners who are interested in research on micro-Doppler effect in radar. Presents new views on micro-Doppler effects, analyzing and discussing micro-Doppler effect in wideband radar rather than focusing on narrowband Provides several new methods for micro-Doppler feature extraction which are very helpful and practical for readers Includes practical cases that align with main MATLAB codes in each chapter, with detailed program annotations

W-Band FMCW MIMO radar demonstrator system for 3D imaging.

Spectral, Energy, and Hardware Efficiency

MIMO OFDM Radar-Communication System with Mutual Interference Cancellation

Joint Communications and Sensing

Simplified Robust Adaptive Detection and Beamforming for Wireless Communications

Understanding LTE with MATLAB

Developed from the author's graduate-level courses, the first edition of this book filled the need for a comprehensive, self-contained, and hands-on treatment of radar systems analysis and design. It quickly became a bestseller and was widely adopted by many professors. The second edition built on this successful format by rearranging and updating

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 req

This book constitutes the refereed proceedings of the First International Conference on Future Internet Technologies and Trends, ICFITT 2017, held in Surat, India, August 31 – September 2, 2017. The 28 full papers were selected from 66 submissions and present next generation requirements for extremely high speed data communications, IoT, security, broadband technology, cognitive radio, vehicular technology, gigabit wireless networks, data management and big data

One of the most dangerous situations when flying a helicopter is landing over dry sand or powder snow. The rotors swirl particles creating a dense cloud. With optical methods navigating through this cloud is impossible but for millimetre waves it becomes almost transparent. As a consequence millimetre waves are an outstanding choice for the development of imaging systems that can be used as a landing aid. The aim of this work is the 3D imaging of static scenes with a large field of view, good resolution and high dynamics. In this thesis a demonstrator system is presented, which is based on the MIMO principle and works with FMCW radar modules in the millimetre wavelength range. The set-up of the demonstrator system is explained and the hardware components are described. An algorithm for image reconstruction is presented as well as a calibration routine. An optimized antenne aperture is determined that enables unambiguous imaging of the half-space in front of the aperture with good resolution and low side lobes. Various measurements illustrate three-dimensional imaging capabilities and show long-range operation. In addition, the data acquisition rate is determined.

Future Internet Technologies and Trends

A Computational Approach

Advances in Communication, Devices and Networking

Radar Signal Analysis and Processing Using MATLAB

Introduction to Radar Using Python and MATLAB

Resource Allocation and End-to-End Quality of Service Solutions with MATLAB

This book discusses spectrum sharing between cellular systems and radars. The book addresses a novel way to design radar waveforms that can enable spectrum sharing between radars and communication systems, without causing interference to communication systems, and at the same time achieving radar objectives of target detection, estimation, and tracking. The book includes a MATLAB-based approach, which provides reader with a way to learn, experiment, compare, and build on top of existing algorithms.

Wirth (senior consultant, Research Establishment for Applied Science, Germany) introduces the techniques, procedures, and concepts related to modern radar using active array antennas. Chapters cover signal representation and mathematical tools, statistical signal theory, array antennas, beamforming, sampling and digitization of signals, pulse compression with polyphase codes, detection of targets by a pulse series, sequential detection, adaptive beamforming for jammer suppression, monopulse direction estimation, superresolution in angle, space-time adaptive processing, synthetic aperture radar with active phased arrays, inverse synthetic aperture radar, experimental phased array systems, the floodlight radar concept, and system and parameter considerations. Annotation copyrighted by Book News, Inc., Portland, OR

Convex optimization is widely used, in many fields, but is nearly always constrained to problems solved in a few minutes or seconds, and even then, nearly always with a human in the loop. The advent of parser-solvers has made convex optimization simpler and more accessible, and greatly increased the number of people using convex optimization. Most current applications, however, are for the design of systems or analysis of data. It is possible to use convex optimization for real-time or embedded applications, where the optimization solver is a part of a larger system. Here, the optimization algorithm must find solutions much faster than a generic solver, and often has a hard, real-time deadline. Use in embedded applications additionally means that the solver cannot fail, and must be robust even in the presence of relatively poor quality data. For ease of embedding, the solver should be simple, and have minimal dependencies on external libraries. Convex optimization has been successfully applied in such settings in the past. However, they have usually necessitated a custom, hand-written solver. This requires signficant time and expertise, and has been a major factor preventing the adoption of convex optimization in embedded applications. This work describes the implementation and use of a prototype code generator for convex optimization, CVXGEN, that creates high-speed solvers automatically. Using the principles of disciplined convex programming, CVXGEN allows the user to describe an optimization problem in a convenient, high-level language, then receive code for compilation into an extremely fast, robust, embeddable solver.

In den vergangenen Jahren hat OFDM im Radarbereich immer mehr an Bedeutung gewonnen. Ein Nachteil ist jedoch die Notwendigkeit hoher Abtastraten, weshalb das Frequency-Comb-OFDM-Radar-Verfahren genau an diesem Punkt ansetzt. Mit dessen Hilfe kann die Signalbandbreite vergrößert werden, ohne gleichzeitig die Abtastraten erhöhen zu müssen. Hierdurch kann trotz eines Verzichts auf schnelle Wandler eine hohe Entfernungsauflösung erreicht werden. - In recent years, OFDM has become more and more important for radar applications. A disadvantage, however, is the need for high sampling rates, which is exactly the starting point of the frequency comb OFDM radar scheme. With its help, the bandwidth in the radar channel can be enhanced without increasing the sampling rates at the same time. In this way, a high range resolution can be achieved without using fast converters with high sampling rates.

A Novel Multi-Frequency MIMO Radar

Academic Press Library in Signal Processing

A MATLAB Based Approach

Radar Systems Analysis and Design Using MATLAB

Synthetic Impulse and Aperture Radar (SIAR)

Principles of Modern Radar

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

Massive MIMO Networks is the first book on the subject to cover the spatial channel correlation and consider rigorous signal processing design essential for the complete understanding by the students, practicing engineers and researchers working on modern day communication systems.

Ideal for researchers and practitioners looking to develop and use computational algorithms for waveform design in diverse active sensing applications.

Offering radar-related software for the analysis and design of radar waveform and signal processing, Radar Signal Analysis and Processing Using MATLAB® provides a comprehensive source of theoretical and practical information on radar signals, signal analysis, and radar signal processing with companion MATLAB® code. After an overview of radar systems operation and design, the book reviews elements of signal theory relevant to radar detection and radar signal processing, along with random variables and processes. The author then presents the unique characteristic of the matched filter and develops a general formula for the output of the matched filter that is valid for any waveform. He analyzes several analog waveforms, including the linear frequency modulation pulse and stepped frequency waveforms, as well as unmodulated pulse-train, binary, polyphase, and frequency codes. The book explores radar target detection and pulse integration, emphasizing the constant false alarm rate. It also covers the stretch processor, the moving target indicator, radar Doppler processing, beamforming, and adaptive array processing. Using configurable MATLAB code, this book demonstrates how to apply signal processing to radar applications. It includes many examples and problems to illustrate the practical application of the theory.

With MATLAB

First International Conference, ICFITT 2017, Surat, India, August 31 - September 2, 2017, Proceedings

Spectrum Sharing Between Radars and Communication Systems

Multi-pitch Estimation

MIMO Radar Signal Processing

With MATLAB and Python Code

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 it's 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 implantation 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.

This book presents spectrum sharing efforts between cellular systems and radars. The book addresses coexistence algorithms for radar and communication systems. Topics include radar and cellular system models; spectrum sharing with small radar systems; spectrum sharing with large radar systems; radar spectrum sharing with coordinated multipoint systems (CoMP); and spectrum sharing with overlapped MIMO radars. The primary audience is the radar and wireless communication community, specifically people in industry, academia, and research whose focus is on spectrum sharing. The topics are of interest for both communication and signal processing technical groups. In addition, students can use MATLAB code to enhance their learning experience.

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.