

Radar Systems Analysis And Design Using Matlab

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Aircraft Surveillance Systems CRC Press

This book presents the theory, analysis, and design of ultra-wideband (UWB) radar and sensor systems (in short, UWB systems) and their components. UWB systems find numerous applications in the military, security, civilian, commercial and medicine fields. This book addresses five main topics of UWB systems: System Analysis, Transmitter Design, Receiver Design, Antenna Design and System Integration and Test. The developments of a practical UWB system and its components using microwave integrated circuits, as well as various measurements, are included in detail to demonstrate the theory, analysis and design technique. Essentially, this book will enable the reader to design their own UWB systems and components. In the System Analysis chapter, the UWB principle of operation as well as the power budget analysis and range resolution analysis are presented. In the UWB Transmitter Design chapter, the design, fabrication and measurement of impulse and monocycle pulse generators are covered. The UWB Receiver Design chapter addresses the design and measurement of the strobe pulse generator, sampling mixer, low-noise amplifier and synchronous sampling receiver. Next, the UWB Antenna Design chapter details the design and measurement of two UWB antennas: the microstrip quasi-horn antenna and the UWB uniplanar antenna. The System Integration and Test chapter covers the transmission-reception test, signal processing, system integration, and evaluation of the UWB sensor. The final chapter provides a summary and conclusion of the work. Multistatic Radars and Multistatic Radar Systems Radar Systems Analysis and Design Using MATLAB

Covering the fundamentals of detection and estimation theory, this systematic guide describes statistical tools that can be used to analyze, design, implement and optimize real-world systems. Detailed derivations of the various statistical methods are provided, ensuring a deeper understanding of the basics. Packed with practical insights, it uses extensive examples from communication, telecommunication and radar engineering to illustrate how theoretical results are derived and applied in practice. A unique blend of theory and applications and over 80 analytical and computational end-of-chapter problems make this an ideal resource for both graduate students and professional engineers.

Radar System Analysis and Modeling CRC Press

The national interest in large radio and radar telescope systems spans the entire engineering and scientific community, and there is every indication that the country will embark upon the construction of still more of these systems in the near future. Radio and radar astronomers now require very large mechanical devices. The system specifications lead to structural criteria which are unique and outside the immediate interest and/or capability of most of the structures community. Radio and radar telescopes and the radomes that may protect them are often enormous structures. Their design presents extremely complicated technological problems. These instruments must operate with precision in varied environments and environmental conditions. Radomes must protect radio and radar antennas without seriously interfering with the incoming information. The Office of Naval Research and MIT cosponsored an international conference in 1967 on the structural problems associated with large radio and radar telescope systems, the proceedings of which are collected here. The papers in this book deal with the problems outlined above from several points of view. The contents of the papers can be grouped roughly as follows: 1. Requirements and standards for supporting structures, tracking equipment, antennas, and radomes. 2. Design and performance of existing systems. 3. Theoretical analysis of the structures of supporting structures, antennas, and radomes. In some cases the analysis is made for a structure under stress. Computer techniques are described for several problems. 4. Methods for evaluating actual or predicted performance of various structures. Here again computer techniques are employed.

Radar System Analysis, Design, and Simulation CRC Press

This book presents the theory, analysis and design of microwave stepped-frequency radar sensors. Stepped-frequency radar sensors are attractive for various sensing applications that require fine resolution. The book consists of five chapters. The first chapter describes the fundamentals of radar sensors including applications followed by a review of ultra-wideband pulsed, frequency-modulated continuous-wave (FMCW), and stepped-frequency radar sensors. The second chapter discusses a general analysis of radar sensors including wave propagation in media and scattering on targets, as well as the radar equation. The third chapter addresses the analysis of stepped-frequency radar sensors including their principles and design parameters. Chapter 4 presents the development of two stepped-frequency radar sensors at microwave and millimeter-wave frequencies based on microwave integrated circuits (MICs), microwave monolithic integrated circuits (MMICs) and printed-circuit antennas, and discusses their signal processing. Chapter 5 provides the electrical characterization and test results of the developed microwave and millimeter-wave stepped-frequency radar sensors. Finally, a summary and conclusion is provided.

Signal Processing in Radar Systems John Wiley & Sons
In recent years, various algorithms for radar signal design, that

rely heavily upon complicated processing and/or antenna architectures, have been suggested. These techniques owe their genesis to several factors, including revolutionary technological advances (new flexible waveform generators, high speed signal processing hardware, digital array radar technology, etc.) and the stressing performance requirements, often imposed by defence applications in areas such as airborne early warning and homeland security. Increasingly complex operating scenarios calls for sophisticated algorithms with the ability to adapt and diversify dynamically the waveform to the operating environment in order to achieve a performance gain over classic radar waveforms. Thus, for example, a modern multifunction phased array radar can adapt the waveform, dwell time and update interval according to the nature of the particular target, e.g. the likely type of target, the clutter environment, the signal-to-noise ratio, the threat that it may represent and the degree to which it is manoeuvring. This is essentially the subject of waveform diversity. This new flexibility demands new ways of characterising waveform properties and optimising waveform design. This ability is very critical in increasing our objective performance as the ability will match the transmission waveform to the transmission environment and the sensing objective. This is the first book, in which several quintessential concepts inherent to the application of waveform design and diversity for advanced radar detection, tracking, and classification are brought together.

Signal Processing for Multistatic Radar Systems Mit Press

An authoritative work on Synthetic Aperture Radar system engineering, with key focus on high resolution imaging, moving target indication, and system engineering technology Synthetic Aperture Radar (SAR) is a powerful microwave remote sensing technique that is used to create high resolution two or three-dimensional representations of objects, such as landscapes, independent of weather conditions and sunlight illumination. SAR technology is a multidisciplinary field that involves microwave technology, antenna technology, signal processing, and image information processing. The use of SAR technology continues to grow at a rapid pace in a variety of applications such as high-resolution wide-swath observation, multi-azimuth information acquisition, high-temporal information acquisition, 3-D terrain mapping, and image quality improvement. Design Technology of Synthetic Aperture Radar provides detailed coverage of the fundamental concepts, theories, technology, and design of SAR systems and sub-systems. Supported by the author's over two decades of research and practice experience in the field, this in-depth volume systematically describes SAR design and presents the latest research developments. Providing examination of all topics relevant to SAR—from radar and antenna system design to receiver technology and signal and image information processing—this comprehensive resource: Provides wide-ranging, up-to-date examination of all major topics related to SAR science, systems, and software Includes guidelines to conduct grounding system designs and analysis Offers coverage of all SAR algorithm classes and detailed SAR algorithms suitable for enabling software implementations Surveys SAR and computed imaging literature of the last sixty years Emphasizes high resolution imaging, moving target indication, and system engineering Design Technology of Synthetic Aperture Radar is indispensable for graduate students majoring in SAR system design, microwave antenna, signal and information processing as well as engineers and technicians involved in SAR system techniques.

Artech House Radar Library (Ha

Introduction to Radar Analysis, Second Edition is a major revision of the popular textbook. It is written within the context of communication theory as well as the theory of signals and noise. By emphasizing principles and fundamentals, the textbook serves as a vital source for students and engineers. Part I bridges the gap between communication, signal analysis, and radar. Topics include modulation techniques and associated Continuous Wave (CW) and pulsed radar systems. Part II is devoted to radar signal processing and pulse compression techniques. Part III presents special topics in radar systems including radar detection, radar clutter, target tracking, phased arrays, and Synthetic Aperture Radar (SAR). Many new exercises are included and the author provides comprehensive easy-to-follow mathematical derivations of all key equations and formulas. The author has worked extensively for the U.S. Army, the U.S. Space and Missile Command, and other military agencies. This is not just a textbook for senior level and graduates students, but a valuable tool for practicing radar engineers. Features Authored by a leading industry radar professional. Comprehensive up-to-date coverage of radar systems analysis issues. Easy to follow mathematical derivations of all equations and formulas Numerous graphical plots and table format outputs. One part of the book is dedicated to radar waveforms and radar signal processing.

Concepts, Principles, and Practices CRC Press

Providing a practical review of the latest technology in the field,

Ultrawideband Radar Applications and Design presents cutting-edge advances in theory, design, and practical applications of ultrawideband (UWB) radar. This book features contributions from an international team of experts to help readers learn about a wide range of UWB topics, including: History of the technology American and European governmental regulations and key definitions Nonsinusoidal wave propagation theory Random signal radar Object detection by ground permittivity measurements Large-target backscattering effects Medical applications Large current radiator antenna design Materials-penetrating theory Radar signal processing Weak-signal detection methods Holographic and real time radar imaging This book's contributors use practical information to illustrate the latest theoretical developments and demonstrate UWB radar principles through case studies. Radar system engineers will find ideas for precision electronic sensing systems for use in medical, security, industrial, construction, and geophysical applications, as well as those used in archeological, forensic and transportation operations.

Handbook of Radar Signal Analysis CRC Press

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 Radar Signal Processing Chapman & Hall

This introductory reference covers the technology and concepts of ultra-wideband (UWB) radar systems. It provides up-to-date information for those who design, evaluate, analyze, or use UWB technology for any application. Since UWB technology is a developing field, the authors have stressed theory and hardware and have presented basic principles and concepts to help guide the design of UWB systems. Introduction to Ultra-Wideband Radar Systems is a comprehensive guide to the general features of UWB technology as well as a source for more detailed information.

Introduction to Radar Analysis Artech House Publishers

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.

Waveform Design and Diversity for Advanced Radar Systems Academic Press

Radar Systems Analysis and Design Using MATLAB CRC Press

Introduction to Radar Systems IET

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

Introduction to Radar Using Python and MATLAB John Wiley & Sons

A thorough update to the Artech House classic *Modern Radar Systems Analysis*, this reference is a comprehensive and cohesive introduction to radar systems design and performance estimation. It offers you the knowledge you need to specify, evaluate, or apply radar technology in civilian or military systems. The book presents accurate detection range equations that let you realistically estimate radar performance in a variety of practical situations. With its clear, easy-to-understand language, you quickly learn the tradeoffs between

choice of wavelength and radar performance and see the inherent advantages and limitations associated with each radar band. You find modeling procedures to help you analyze enemy systems or evaluate radar integrated into new weapon systems. The book covers ECM and ECCM for both surveillance and tracking to help you estimate the effects of active and passive ECM, select hardware/software for reconnaissance or jamming, and plan the operation of EW systems. As radar systems evolve, this book provides the equations needed to calculate and evaluate the performance of the latest advances in radar technology.

Applications and Design John Wiley & Sons

This book presents the basic principles, analyses, design formulas, and characteristics of various fin-line configurations. You'll find summaries of hundreds of rigorous formulas as well as approximate closed-form expressions, which can be readily programmed to generate design data for any structure. Discover millimeter-wave integrated circuits and components realized using the various fin-line techniques presented in the text, including directional couplers, power dividers, attenuators, detectors, modulators, and oscillators. An Artech House bestseller!

Radar Limitations and the Advent of the Automatic Dependent

Surveillance Broadcast Springer Science & Business Media

Bogen beskæftiger sig specielt med de grundlæggende teorier inden for søge- og følgeradar.

Basic Radar Analysis, Second Edition Cambridge University Press

In planning a radar system, having the proper mathematical modeling of propagation effects, clutter, and target statistics is essential. Radar Systems Principles provides a strong theoretical basis for the myriad of formulas and rules of thumb required for analysis, conceptual design, and performance evaluation of radar systems. Mathematical derivations of formulas commonly used by radar engineers are presented, with detailed discussions of the assumptions behind these expressions and their ranges of validity. These principles are used in a wide range of radar applications. Radar Systems Principles makes it easy to understand the steps in calculating various formulas and when and how these formulas are used. A set of problems is provided for each chapter, enabling you to check your progress in applying the principles discussed in each section of the text. There are more than 170 figures illustrating key concepts. Numerous references to well-known books on radar for coverage of practical design issues and other specialized topics are given. Radar Systems Principles is an ideal textbook for advanced undergraduates and first-year graduate students and also makes an excellent vehicle for self-study by engineers wishing to enhance their understanding of radar principles and their implication in actual systems.

Ultrawideband Radar CRC Press

The Communication, Navigation and Surveillance (CNS) systems provide air traffic controllers with the information necessary to ensure the specified separation between aircraft and efficient management of airspace, as well as assistance to flight crew for safe navigation. However, the radar systems that support air traffic management (ATM), and in particular air traffic control (ATC), are at their operational limit. This is particularly acute in the provision of the ATC services in low altitude, remote and oceanic areas. Limitations in the current surveillance systems include unavailability of services in oceanic and remote areas, limited services during extreme weather conditions, and outdated equipment with limited availability of spare parts to support system operation. These limitations have resulted in fatal accidents. This book addresses the limitations of radar to support ATC in various operational environments, identified and verified by analysing five years of safety data from Avinor, the Air Navigation Service Provider (ANSP) in Norway. It derives a set of taxonomy and from this develops a causal model for incident/accident due to limitations in the surveillance system. The taxonomy provides a new method for ANSPs to categorize incidents while the causal model is useful for incident/accident investigations. The book also provides theoretical justifications for the use of Automatic Dependent Surveillance Broadcast (ADS-B) to overcome the limitations of radar systems and identify areas of improvements to enable seamless ATC services. Written in a style that makes it accessible to non-specialists, Aircraft Surveillance Systems will be of interest to many in the field of aviation, particularly ATM, safety and accident/incident investigation. It will also offer a useful reference on this vital topic for air traffic management courses.

Fundamentals of Multisite Radar Systems Artech House on Demand

This new handbook on radar signal analysis adopts a deliberate and systematic approach. It uses a clear and consistent level of delivery while maintaining strong and easy-to-follow mathematical details. The emphasis of this book is on radar signal types and their relevant signal processing and not on radar systems hardware or components. This handbook serves as a valuable reference to a wide range of audience. More specifically, college-level students, practicing radar engineers, as well as casual readers of the subject are the intended target audience of the first few chapters of this book. As the book chapters progress, these grow in complexity and specificity. Accordingly, later chapters are intended for practicing engineers, graduate college students, and advanced readers. Finally, the last few chapters contain several special topics on radar systems that are both educational and scientifically entertaining to all readers. The presentation of topics in this handbook takes the reader on a scientific journey whose major landmarks comprise the different radar subsystems and components. In this context, the chapters follow the radar signal along this journey from its birth to the end of its life. Along the way, the different relevant radar subsystems are analyzed and discussed in great detail. The chapter contributors of this new handbook comprise experienced academia

members and practicing radar engineers. Their combined years of academic and real-world experiences are in excess of 175.

Together, they bring a unique, easy-to-follow mix of mathematical and practical presentations of the topics discussed in this book. See the "Chapter Contributors" section to learn more about these individuals.

Fundamental Principles of Radar Artech House on Demand

An introduction to radar systems should ideally be self-contained and hands-on, a combination lacking in most radar texts. The first edition of Radar Systems Analysis and Design Using MATLAB® provided such an approach, and the second edition continues in the same vein. This edition has been updated, expanded, and reorganized to include advances in the field and to be more logical in sequence. Ideal for anyone encountering the topic for the first time or for professionals in need of on-the-job reference, this book features an abundance of MATLAB programs and code. Radar Systems Analysis and Design Using MATLAB®, Second Edition presents the fundamentals and principles of radar along with enough rigorous mathematical derivations to ensure that you gain a deep understanding. The author has extensively revised chapters on radar cross-section and polarization, matched filter and radar ambiguity function, and radar wave propagation. He also added information on topics such as PRN codes, multipath and refraction, clutter and MTI processing, and high range resolution. With all MATLAB functions updated to reflect version 7.0 and an expanded set of self-test problems, you will find this up-to-date text to be the most complete treatment of radar available, providing the hands-on tools that will enrich your learning.