Basic Radar Analysis Artech House Radar

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Principles of Radar and Sonar Signal Processing Chevalier François Le 2002

Basic Radar Analysis Mervin C. Budge (Jr.) 2015 2.2.1.5 The Target and Radar Cross Section; 2.2.1.6 Antenna Again; 2.2.1.7 Antenna Directivity Again; 2.2.1.8 Losses; 2.2.2 Derivation of EN; 2.3 A Power Approach to SNR; 2.4 Example 1; 2.5 Detection Range; 2.6 Search Radar Range Equation; 2.7 Example 2; 2.8 Radar Range Equation Summary; 2.9 Exercises; References; Appendix 2A: Derivation of Search.

Multifunction Array Radar Sergio Sabatini 1994 This book details the advantages of MFAR main parameter design and guides you through parameter and performance evaluation procedures. It presents practical design information on combinations of various radar functions, clutter conditions, multipath, and transmitted waveform design when Doppler filters adapted for clutter cancellation.

Signal Processing for Passive Bistatic Radar Mateusz Malanowski 2019-08-31 This cutting-edge resource introduces the basic concepts of passive bistatic radar, such as bistatic geometry, bistatic radar equation and analysis of different illuminating signals. These techniques, although known for almost a century, have not been developed intensively for decades, mainly due to technical limitations, but today, the passive radar concept can be realized in practice, and is of great interest for military and civilian users. This book provides insight into understanding the potential and limitations of passive radar systems, as well as the differences between signal processing in active and passive radar. Each of the signal processing stages typically applied in passive radar is described, including digital beamforming, clutter removal, target detection, localization and tracking. These concepts are illustrated with both simulated and measured data along with examples of passive radar systems. Correlation processing, which is crucial for passive radar operation, is presented, as well as practical approaches for calculating the cross-ambiguity function. The problems of range and velocity-cell migration are also introduced. The book analyzes and compares different antenna array geometries to show readers the appropriate solution for a particular scenario of passive radar. Cartesian tracking is also presented, based on the extended Kalman filter. Parallel and sequential updating approaches are introduced and compared. These concepts are illustrated with both simulated and measured data along with examples of passive radar systems, making this book useful for both novice and advanced practitioners.

Basic Radar Tracking Mervin C. Budge 2018-10-31 Detailed closed-loop bandwidth and transient response approach is a subject rarely found in current literature. This innovative resource offers practical explanations of closed-loop radar tracking techniques in range, Doppler and angle tracking. To address analog closed loop trackers, a review of basic control theory and modeling is included. In addition, control

theory, radar receivers, signal processors, and circuitry and algorithms necessary to form the signals needed in a tracker are presented. Digital trackers and multiple target tracking are also covered, focusing on g-h and g-h-k filters. Readers learn techniques for modeling digital, closed-loop trackers. The radar circuitry/block diagrams necessary for range, Doppler and angle tracking are presented and described, with examples and simulations included. Factors such as noise and Swerling type fluctuations are taken into account. In addition to numerous worked examples, this approachable reference includes MATLAB® code associated with analysis, simulations and figures. The book contains solutions to practical problems, making it useful for both novice and advanced radar practitioners. Software will be available for download on this page.

Radar Cross Section Analysis and Control Asoke K. Bhattacharyya 1991 This reference describes techniques for controlling the RCS of targets, provides analytical methods for estimating RCS, develops models for the design of low RCS targets and antennas, and discusses several RCS enhancement techniques.

Time-frequency Transforms for Radar Imaging and Signal Analysis Victor C. Chen 2002 This resource introduces a new image formation algorithm based on time-frequency-transforms, showing its advantage over the more conventional Fourier-based image formation. Referenced with over 170 equations and 80 illustrations, the book presents new algorithms that help improve the result of radar imaging and signal processing.

Adaptive Signal Processing for Radar Ramon Nitzberg 1992 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.

Phased Array Antenna Handbook, Third Edition Robert J. Mailloux 2017-11-30 This completely revised third edition of an Artech House classic, Phased Array Antenna Handbook, Second Edition, offers an up-to-date and comprehensive treatment of array antennas and systems. This edition provides a wealth of new material, including expanded coverage of phased array and multiple beam antennas. New modern machine learning techniques used for analysis are included. Additional material on wideband antennas and wideband coverage in array antennas are incorporated in this book, including new methods, devices, and technologies that have developed since the second edition. A detailed treatment of antenna system noise, sections on antenna pattern synthesis, developments in subarray technology, and in-depth coverage of array architecture and components are additional new features of this book. The book explores design elements that demonstrate how to size an array system with speed and confidence. Moreover, this resource provides expanded coverage of systems aspects of arrays for radar and communications. Supported with numerous equations and illustrations, this practical book helps evaluate basic antenna parameters such as gain, sidelobe levels, and noise. Readers learn how to compute antenna system noise, design subarray geometries for given bandwidth, scan and sidelobe constraints, and choose array illumination tapers for given sidelobe levels.

Introduction to LabVIEW FPGA for RF, Radar, and Electronic Warfare Applications Terry Stratoudakis 2021-01-31 Real-time testing and simulation of open- and closed-loop radio frequency (RF) systems for signal generation, signal analysis and digital signal processing require deterministic, low-latency, high-throughput capabilities afforded by user reconfigurable field programmable gate arrays (FPGAs). This comprehensive book introduces LabVIEW FPGA, provides best practices for multi-FPGA solutions, and guidance for developing high-throughput, low-latency FPGA based RF systems. Written by

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a recognized expert with a wealth of real-world experience in the field, this is the first book written on the subject of FPGAs for radar and other RF applications.

Detecting and Classifying Low Probability of Intercept Radar Phillip E. Pace 2009 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.

Fourier Transforms in Radar and Signal Processing, Second Edition David Brandwood 2012 Fourier transforms are used widely, and are of particular value in the analysis of single functions and combinations of functions found in radar and signal processing. Still, many problems that could have been tackled by using Fourier transforms may have gone unsolved because they require integration that is difficult and tedious. This newly revised and expanded edition of a classic Artech House book provides you with an up-to-date, coordinated system for performing Fourier transforms on a wide variety of functions. Along numerous updates throughout the book, the Second Edition includes a critical new chapter on periodic waveforms a topic not covered in any other book and detailed coverage of asymmetric triangular pulse. By building upon Woodward's well known "Rules and Pairs" method and related concepts and procedures, this book establishes a unified system that makes implicit the integration required for performing Fourier transforms on a wide variety of functions. It details how complex functions can be broken down to their constituent parts for analysis. You can now concentrate on functional relationships instead of getting bogged down in the details of integration. This approach to implementing Fourier transforms is illustrated with many specific examples from digital signal processing as well as radar and antenna operation. DVD-ROM Included! Contains MATLAB programs that implement many of the results presented in the book.

Basic Radar Analysis Mervin C. Budge 2015-09-01

Practical ESM Analysis Sue Robertson 2019-03-31 Written by a prominent expert in the field, this authoritative resource considers radar parameters and how they affect ESM systems. It describes the ESM environment, including types of radar, pulse density, the latest radar developments and how they will be seen by ESM systems. Different types of ESM systems are described, with methods of calculation of Direction of Arrival (DOA) of pulses. Conventional wisdom about RF scan strategies for narrow-band receivers will be challenged and new methods (proven to be effective in trials) will be proposed. The book describes ESM Antenna separation, which plays a significant part in the generation of DOA errors, with examples of the effects for different situations. The book will explain the common phenomena seen in ESM systems with many examples of how to recognize issues in the ESM data and solutions for their mitigation. Techniques for visualizing ESM data and how to set up ESM trials will be given, including the simulation of the electromagnetic environment. The book also presents detailed calculations for generating emitter beam-shapes for use in simulations of pulse trains and the calculation of detection range will be useful for data analysts, trials engineers and system assessors, which are not published elsewhere. The identification of radars by ESM systems is considered in detail with ideas presented on how to generate an effective radar library.

Multiple-target Tracking with Radar Applications Samuel S. Blackman 1986

Monopulse Principles and Techniques Samuel M. Sherman 2011 Monopulse is a type of radar that sends additional information in the signal in order to avoid problems caused by rapid changes in signal

strength. Monopulse is resistant to jamming which is one of the main reasons it is used in most radar systems today. This updated and expanded edition of an Artech House classic offers you a current and comprehensive treatment of monopulse radar principles, techniques, and applications. The Second Edition features two brand new chapters, covering monopulse countermeasures and counter-countermeasures and monopulse for airborne radar and homing seekers.This essential volume categorizes and describes the various forms of monopulse radar, and analyzes their capabilities and limitations. The book also devotes considerable space to monopulse circuits and hardware components, explaining their functions and performance. This practical resource features numerous photographs and illustrations drawn from actual radar systems and components. This book serves as a valuable reference for both experienced radar engineers and those new to the field.

Radar Equations for Modern Radar David Knox Barton 2013 Based on the classic Radar Range-Performance Analysis from 1980, this practical volume extends that work to ensure applicability of radar equations to the design and analysis of modern radars. This unique book helps you identify what information on the radar and its environment is needed to predict detection range. Moreover, it provides equations and data to improve the accuracy of range calculations. You find detailed information on propagation effects, methods of range calculation in environments that include clutter, jamming and thermal noise, as well as loss factors that reduce radar performance. This invaluable book is supported with nearly 200 illustrations and over 430 equations.

Introduction to Radar Using Python and MATLAB Lee Andrew (Andy) Harrison 2019-10-31 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.

Electronic Intelligence Richard G. Wiley 1993 This expertly-written reference provides a wealth of information on electronic intelligence (ELINT) analysis techniques with coverage of their applications, strengths, and limitations.

Electronic Warfare in the Information Age D. Curtis Schleher 1999-01-01 Here's an advanced practitioner's guide to the latest concepts and threats associated with modern electronic warfare (EW). This new book identifies and explains the newest radar and communications threats, and provides EW and radar engineers, managers, and technical professionals with practical, "how-to" information on designing and implementing ECM and ECCM systems.

MATLAB Simulations for Radar Systems Design Bassem R. Mahafza 2003-12-17 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

The Micro-Doppler Effect in Radar Victor Chen 2011 This highly practical resource provides you with thorough working knowledge of the micro-Doppler effect in radar, including its principles, applications and implementation with MATLAB codes. The book presents code for simulating radar backscattering from targets with various motions, generating micro-Doppler signatures, and analyzing the characteristics of targets. You find detailed descriptions of the physics and mathematics of the Doppler and micro-Doppler effect. Moreover, you learn how to derive rigid and non-rigid body motion induced micro-Doppler effect in radar scattering. The book provides a wide range of clear examples, including an oscillating pendulum, a spinning and precession heavy top, rotating rotor blades of a helicopter, rotating wind-turbine blades, a person walking with swinging arms and legs, a flying bird, and movements of quadruped animals.

Basic Radar Analysis, Second Edition Mervin C. Budge 2020-04-30 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 nose 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.

MIMO Radar: Theory and Application Jamie Bergin 2018-03-31 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.

Airborne Pulsed Doppler Radar Guy V. Morris 1996-01-01 Offering updated information on radar technologies since 1987, this work also provides an insight into specific issues unique to airborne systems. It contains treatment of the medium PRF waveform for more accurate performance analysis.

The book provides the background necessary to: plan and predict the outcome of test programs; evaluate proposals for new radar systems or upgrades; analyze the performance of airborne radars in various scenarios; and understand the capabilities and limitations of airborne systems.

Radar Range-performance Analysis Lamont V. Blake 1986-01-01

ELINT Richard G. Wiley 2006 Annotation In these times, correctly and quickly identifying a stray electronic blip on a radar screen can have incalculable consequences. Now more than ever, radar electronic intelligence (ELINT) can be the first line of defense for the battlefield or the homeland. Offering new insight into radar signal analysis, this book ensures more reliable and timely gathering of electronic intelligence. Combining and updating the author's two previous definitive books on ELINT, this volume is the indispensable reference for every ELINT professional.

Radar Resolution and Complex-image Analysis August W. Rihaczek 1996 Target identification and other modern-day radar problems can't be solved by conventional radar technology -- but they can be solved with the ground-breaking signal processing and analysis methods presented in this unique, expertly authored book.

The Micro-Doppler Effect in Radar, Second Edition Victor C. Chen 2019-02-28 Written by a prominent expert in the field, this updated and expanded second edition of an Artech House classic includes the most recent breakthroughs in vital sign and gender recognition via micro-radar, as well as covering basic principles of Doppler effect and micro-Doppler effect and describing basic applications of micro-Doppler signatures in radar. The book presents detailed procedures about how to generate and analyze micro-Doppler signatures from radar signals. Readers will learn how to model and animate an object (such as human, spinning top, rotating rotor blades) with movement, simulation of radar returns from the object, and generating micro-Doppler signature. The book includes coverage of the Google project "Soli", which demonstrated the use of radar micro-Doppler effect to sense and recognize micro motions of human hand gesture for controlling devices. It also discusses noncontact detection of human vital sign (micro motions of breathing and heart beating) using radar, another important application of radar micro-Doppler sensors. Detailed MATLAB source codes for simulation of radar backscattering from targets with various motions are provided, along with source codes for generating micro-Doppler signatures and analyzing characteristics of targets.

Radar System Analysis and Modeling David K. Barton 2004-10-01 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.

Radar System Design and Analysis Shahen A. Hovanessian 1984 En lærebog i radarteknik. Beskriver systematisk alle væsentlige sider af radarteknikken.

Space-Time Adaptive Processing for Radar, Second Edition J.R. Guerci 2014-11-01 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).

Radar Systems Analysis and Design Using MATLAB Bassem R. Mahafza 2016-04-19 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

An Introduction to Passive Radar Hugh D. Griffiths 2017-02-28 Developed by recognized experts in the field, this first-of-its-kind resource introduces the basic principles of passive radar technology and provides an overview of recent developments in this field and existing real passive radar systems. This book explains how passive radar works, how it differs from the active type, and demonstrates the benefits and drawbacks of this novel technology. Properties of illuminators, including ambiguity functions, digital vs. analog, digitally-coded waveforms, vertical-plane coverage, and satellite-borne and radar illuminators are explored. Readers find practical guidance on direct signal suppression, passive radar performance prediction, and detection and tracking. This book provides concrete examples of systems and results, including analog TV, FM radio, cell phone base stations, DVB–T and DAB, HF skywave transmissions, indoor WiFi, satellite-borne illuminators, and low-cost scientific remote sensing. Future developments and applications of passive radar are also presented.

Radar Vulnerability to Jamming Robert N. Lothes 1990 A short course on noise jamming, range, angle and velocity deception and on-off keying. Demonstrated are analyses of radar and ECM interaction problems. In the toughest cases, when jamming is difficult to analyze, the reader will see how computer simulation can be used to investigate radar ECM interactions.

Design and Analysis of Modern Tracking Systems Samuel S. Blackman 1999 Here's a thorough overview of the state-of-the-art in design and implementation of advanced tracking for single and multiple sensor systems. This practical resource provides modern system designers and analysts with in-depth evaluations of sensor management, kinematic and attribute data processing, data association, situation assessment, and modern tracking and data fusion methods as applied in both military and non-military arenas.

Handbook of Radar Measurement David Knox Barton 1984-01-01

Handbook of Radar Scattering Statistics for Terrain Fawwaz Ulaby 2019-06-30 The classic reference for radar and remote sensing engineers, Handbook of Radar for Scattering Statistics for Terrain, has been reissued with updated, practical software for modern data analysis applications. First published in 1989, this update features a new preface, along with three new appendices that explain how

to use the new software and graphical user interface. Python- and MATLAB-based software has been utilized so remote sensing and radar engineers can utilize the wealth of statistical data that came with the original book and software. This update combines the book and software, previously sold separately, into a single new product. The text first presents detailed examinations of the statistical behavior of speckle when superimposed on nonuniform terrain. The Handbook of Radar Scattering Statistics for Terrain then supports system design and signal processing applications with a complete database of calibrated backscattering coefficients. Compiled over 30 years, the statistical summaries of radar backscatter from terrain offers you over 400,000 data points compiled in tabular format. With this text, you'll own the most comprehensive database of radar terrain scattering statistics ever compiled. Derived from measurements made by both airborne and ground-based scatterometer systems, the database includes information from 114 references. The text provides over 60 tables of backscatter data for 9 different surface categories, all derived under strict quality criteria. Rigorous standards for calibration accuracy, measurement precision, and category identification make the database the most reliable source for scattering statistics ever available.

Modern Radar System Analysis David Knox Barton 1988 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!

Coherent Radar Performance Estimation James A. Scheer 1993-01-01 With its detailed treatment of theory, applications and measurements of coherent radar error effects, this book sets out to provide a complete understanding of error effects in coherent radar systems.