

# Stepped Frequency Radar Sensors Theory Analysis And Design Springerbriefs In Electrical And Computer Engineering

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*Bearing Capacity of Roads, Railways and Airfields* - Andreas Loizos  
2017-07-20

*Bearing Capacity of Roads, Railways and Airfields* includes the contributions to the 10th International Conference on the Bearing Capacity of Roads, Railways and Airfields (BCRRA 2017, 28-30 June 2017, Athens, Greece). The papers cover aspects related to materials, laboratory testing, design, construction, maintenance and management systems of transport infrastructure, and focus on roads, railways and airfields. Additional aspects that concern new materials and characterization, alternative rehabilitation techniques, technological advances as well as pavement and railway track substructure sustainability are included. The contributions discuss new concepts and innovative solutions, and are concentrated but not limited on the following topics: · Unbound aggregate materials and soil properties · Bound materials characteristics, mechanical properties and testing · Effect of traffic loading · In-situ measurements techniques and monitoring · Structural evaluation · Pavement serviceability condition · Rehabilitation and maintenance issues · Geophysical assessment · Stabilization and reinforcement · Performance modeling · Environmental challenges · Life cycle assessment and sustainability *Bearing Capacity of Roads, Railways and Airfields* is essential reading for academics and professionals involved or interested in transport infrastructure systems, in particular roads, railways and airfields.

**Compressive Sensing for Urban Radar** - Moeness Amin 2017-12-19

With the emergence of compressive sensing and sparse signal reconstruction, approaches to urban radar have shifted toward relaxed constraints on signal sampling schemes in time and space, and to effectively address logistic difficulties in data acquisition. Traditionally, these challenges have hindered high resolution imaging by restricting both bandwidth and aperture, and by imposing uniformity and bounds on sampling rates. *Compressive Sensing for Urban Radar* is the first book to focus on a hybrid of two key areas: compressive sensing and urban sensing. It explains how reliable imaging, tracking, and localization of indoor targets can be achieved using compressed observations that amount to a tiny percentage of the entire data volume. Capturing the latest and most important advances in the field, this state-of-the-art text: Covers both ground-based and airborne synthetic aperture radar (SAR) and uses different signal waveforms Demonstrates successful applications of compressive sensing for target detection and revealing building interiors Describes problems facing urban radar and highlights sparse reconstruction techniques applicable to urban environments Deals with both stationary and moving indoor targets in the presence of wall clutter and multipath exploitation Provides numerous supporting examples using real data and computational electromagnetic modeling Featuring 13 chapters written by leading researchers and experts, *Compressive Sensing for Urban Radar* is a useful and authoritative reference for radar engineers and defense contractors, as well as a seminal work for graduate students and academia.

**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

**Compressive Sensing of Earth Observations** - C.H. Chen 2017-05-25  
Future remote sensing systems will make extensive use of Compressive

Sensing (CS) as it becomes more integrated into the system design with increased high resolution sensor developments and the rising earth observation data generated each year. Written by leading experts in the field *Compressive Sensing of Earth Observations* provides a comprehensive and balanced coverage of the theory and applications of CS in all aspects of earth observations. This work covers a myriad of practical aspects such as the use of CS in detection of human vital signs in a cluttered environment and the corresponding modeling of rib-cage breathing. Readers are also presented with three different applications of CS to the ISAR imaging problem, which includes image reconstruction from compressed data, resolution enhancement, and image reconstruction from incomplete data.

**Mine Action** - Multiple Authors 2017-08-30

Every day, civilians in dozens of countries around the world are injured and killed by landmines and other lethal leftovers of conflict, years after hostilities of war have ended. Once planted, a mine will never be able to tell the difference between a military and civilian footstep, and a bomblet will continue to attract children and metal dealers. In order to put an end to the suffering and casualties caused by antipersonnel mines, the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction (the Ottawa Convention or Mine Ban Treaty), was adopted in 1997. Further, in order to prevent suffering and casualties caused by cluster munitions at the time of their use, the Convention on the Use, Stockpiling, Production and Transfer of Cluster Munitions (the Oslo Convention), was adopted in 2008. In 1996, the Royal Military Academy (RMA) opted for the implementation of mine action technological projects funded by the Belgian Ministry of Defense and the Belgian State Secretariat for Development Cooperation. It further decided to set up a close collaboration with other Belgian universities, which started organizing their own research activities on mine action. Later, other funding sources were granted to RMA by the Belgian Science Policy, the European Commission, and the European Committee for Standardization. At a more politico-administrative level, RMA participates in the States Parties Meetings of the Mine Ban Treaty, and in this context, Prof. Achery created an expert group on mine action technologies with representatives of different organizations and countries, aiming at informing the States Parties of the Mine Ban Treaty about the evolution of the mine action technologies. Further, Prof. Y. Baudoin created working groups dedicated to robotics in mine action within international organization. This book reports research activities achieved by the RMA.s

**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.

**Theory, Analysis and Design of RF Interferometric Sensors** - Cam

Nguyen 2011-11-23

Theory, Analysis and Design of RF Interferometric Sensors presents the theory, analysis and design of RF interferometric sensors. RF interferometric sensors are attractive for various sensing applications that require every fine resolution and accuracy as well as fast speed. The book also presents two millimeter-wave interferometric sensors realized using RF integrated circuits. The developed millimeter-wave homodyne sensor shows sub-millimeter resolution in the order of 0.05 mm without correction for the non-linear phase response of the sensor's quadrature mixer. The designed millimeter-wave double-channel homodyne sensor provides a resolution of only 0.01 mm, or 1/840th of the operating wavelength, and can inherently suppress the non-linearity of the sensor's quadrature mixer. The experimental results of displacement and velocity measurement are presented as a way to demonstrate the sensing ability of the RF interferometry and to illustrate its many possible applications in sensing. The book is succinct, yet the material is very much self-contained, enabling readers with an undergraduate background in electrical engineering or physics with some experiences or graduate courses in RF circuits to understand easily.

**Micro-Doppler Characteristics of Radar Targets** - Qun Zhang  
2016-10-31

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

Statistical Methods for Materials Science - Jeffrey P. Simmons  
2019-02-13

Data analytics has become an integral part of materials science. This book provides the practical tools and fundamentals needed for researchers in materials science to understand how to analyze large datasets using statistical methods, especially inverse methods applied to microstructure characterization. It contains valuable guidance on essential topics such as denoising and data modeling. Additionally, the analysis and applications section addresses compressed sensing methods, stochastic models, extreme estimation, and approaches to pattern detection.

**Sensor Technologies for Civil Infrastructures** - Ming L. Wang  
2014-05-19

Sensors are used for civil infrastructure performance assessment and health monitoring, and have evolved significantly through developments in materials and methodologies. Sensor Technologies for Civil Infrastructure Volume II provides an overview of sensor data analysis and case studies in assessing and monitoring civil infrastructures. Part one focuses on sensor data interrogation and decision making, with chapters on data management technologies, data analysis, techniques for damage detection and structural damage detection. Part two is made up of case studies in assessing and monitoring specific structures such as bridges, towers, buildings, dams, tunnels, pipelines, and roads. Sensor Technologies for Civil Infrastructure provides a standard reference for structural and civil engineers, electronics engineers, and academics with an interest in the field. Provides an in-depth examination of sensor data management and analytical techniques for fault detection and localization, looking at prognosis and life-cycle assessment Includes case studies in assessing structures such as bridges, buildings, super-tall towers, dams, tunnels, wind turbines, railroad tracks, nuclear power plants, offshore structures, levees, and pipelines

**Small and Short-Range Radar Systems** - Gregory L. Charvat  
2014-04-04

Radar Expert, Esteemed Author Gregory L. Charvat on CNN and CBS Author Gregory L. Charvat appeared on CNN on March 17, 2014 to discuss whether Malaysia Airlines Flight 370 might have literally flown below the radar. He appeared again on CNN on March 20, 2014 to explain the basics of radar, and he explored the hope and limitations of the technology involved in the search for Flight 370 on CBS on March 22, 2014. Get His Book Now Coupling theory with reality, from derivation to implementation of actual radar systems, Small and Short-Range Radar Systems analyzes and then provides design procedures and working design examples of small and short-range radar systems. Discussing applications from automotive to through-wall imaging, autonomous vehicle, and beyond, the practical text supplies high-level descriptions, theoretical derivations, back-of-envelope calculations, explanations of processing algorithms, and case studies for each type of small radar system covered, including continuous wave (CW), ultrawideband (UWB) impulse, linear frequency modulation (FM), linear rail synthetic aperture radar (SAR), and phased array. This essential reference: Explains how to design your own radar devices Demonstrates how to process data from small radar sensors Provides real-world, measured radar data to test algorithms before investing development time Complete with downloadable MATLAB® scripts and actual radar measurements, Small and Short-Range Radar Systems empowers you to rapidly develop small radar technology for your application.

*Air and Spaceborne Radar Systems* - Philippe Lacomme 2001-03-27

A practical tool on radar systems that will be of major help to technicians, student engineers and engineers working in industry and in radar research and development. The many users of radar as well as systems engineers and designers will also find it highly useful. Also of interest to pilots and flight engineers and military command personnel and military contractors. "This introduction to the field of radar is intended for actual users of radar. It focuses on the history, main principles, functions, modes, properties and specific nature of modern airborne radar. The book examines radar's role within the system when carrying out is assigned missions, showing the possibilities of radar as well as its limitations. Finally, given the changing operational requirements and the potential opened up by modern technological developments, a concluding section describes how radar may evolve in the future. The authors review the current state of the main types of airborne and spaceborne radar systems, designed for specific missions as well as for the global environment of their host aircraft or satellites. They include numerous examples of the parameters of these radars. The emphasis in the book is not only on a particular radar technique, but equally on the main radar functions and missions. Even if a wide range of techniques are described in this book, the focus is on those which are connected to practical applications.

*Subsurface Sensing* - Ahmet S. Turk 2011-07-06

This book provides readers with a solid understanding of the capabilities and limitations of the techniques used for buried object detection. Presenting theory along with applications and the existing technology, it covers the most recent developments in hardware and software technologies of sensor systems with a focus on primary sensors such as Ground Penetrating Radar (GPR) and auxiliary sensors such as Nuclear Quadruple Resonance (NQR). It is essential reading for students, practitioners, specialists, and academicians involved in the design and implementation of buried object detection sensors.

*High-Frequency Integrated Circuits* - Sorin Voinigescu 2013-02-28

A transistor-level, design-intensive overview of high speed and high frequency monolithic integrated circuits for wireless and broadband systems from 2 GHz to 200 GHz, this comprehensive text covers high-speed, RF, mm-wave, and optical fibre circuits using nanoscale CMOS, SiGe BiCMOS, and III-V technologies. Step-by-step design methodologies, end-of chapter problems, and practical simulation and design projects are provided, making this an ideal resource for senior undergraduate and graduate courses in circuit design. With an emphasis on device-circuit topology interaction and optimization, it gives circuit designers and students alike an in-depth understanding of device structures and process limitations affecting circuit performance.

*Planar Microwave Sensors* - Ferran Martín 2022-09-27

Comprehensive resource detailing the latest advances in microwave and wireless sensors implemented in planar technology Planar Microwave Sensors is an authoritative resource on the subject, discussing the main relevant sensing strategies, working principles, and applications on the basis of the authors' own experience and background, while also highlighting the most relevant contributions to the topic reported by international research groups. The authors provide an overview of planar

microwave sensors grouped by chapters according to their working principle. In each chapter, the working principle is explained in detail and the specific sensor design strategies are discussed, including validation examples at both simulation and experimental level. The most suited applications in each case are also reported. The necessary theory and analysis for sensor design are further provided, with special emphasis on performance improvement (i.e., sensitivity and resolution optimization, dynamic range, etc.). Lastly, the work covers a number of applications, from material characterization to biosensing, including motion control sensors, microfluidic sensors, industrial sensors, and more. Sample topics covered in the work include: Non-resonant and resonant sensors, reflective-mode and transmission-mode sensors, single-ended and differential sensors, and contact and contactless sensors. Design guidelines for sensor performance optimization and analytical methods to retrieve the variables of interest from the measured sensor responses. Radiofrequency identification (RFID) sensor types, prospective applications, and materials/technologies towards "green sensors" implementation. Comparisons between different technologies for sensing and the advantages and limitations of microwave sensors, particularly planar sensors. Engineers and qualified professionals involved in sensor technologies, along with undergraduate and graduate students in related programs of study, can harness the valuable information inside *Planar Microwave Sensors* to gain complete foundational knowledge on the subject and stay up to date on the latest research and developments in the field.

*Indicators for the Signal Degradation and Optimization of Automotive Radar Sensors Under Adverse Weather Conditions* - Alebel Arage Hassen 2007

*Emerging Technologies in Non-Destructive Testing V* - Alkiviadis S. Paipetis 2012-01-26

Non-destructive evaluation (NDE) methods have dominated most of the fields of applied research and technology over the last twenty years. These techniques provide information on the functional efficiency of materials and structures without causing any structural impact on the structure itself. Their use enables the monitoring of the structural inte

**Recent Advancements in Radar Imaging and Sensing Technology** - Piotr Samczynski 2021-07-21

The aim of this Printed Edition of Special Issue entitled "Recent Advancements in Radar Imaging and Sensing Technology" was to gather the latest research results in the area of modern radar technology using active and/or radar imaging sensing techniques in different applications, including both military use and a broad spectrum of civilian applications. As a result, the 19 papers that have been published highlighted a variety of topics related to modern radar imaging and microwave sensing technology. The sequence of articles included in the Printed Edition of Special Issue dealt with wide aspects of different applications of radar imaging and sensing technology in the area of topics including high-resolution radar imaging, novel Synthetic Aperture Radar (SAR) and Inverse SAR (ISAR) imaging techniques, passive radar imaging technology, modern civilian applications of using radar technology for sensing, multiply-input multiply-output (MIMO) SAR imaging, tomography imaging, among others.

*Time-Domain Ultra-Wideband Radar, Sensor and Components* - Cam Nguyen 2014-04-09

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.

*Phase-coded Pulse Compression* - 2017

**Digital Signal Processing Techniques and Applications in Radar Image Processing** - Bu-Chin Wang 2008-08-29

A self-contained approach to DSP techniques and applications in radar imaging. The processing of radar images, in general, consists of three major fields: Digital Signal Processing (DSP); antenna and radar operation; and algorithms used to process the radar images. This book brings together material from these different areas to allow readers to gain a thorough understanding of how radar images are processed. The book is divided into three main parts and covers: \* DSP principles and signal characteristics in both analog and digital domains, advanced signal sampling, and interpolation techniques \* Antenna theory (Maxwell equation, radiation field from dipole, and linear phased array), radar fundamentals, radar modulation, and target-detection techniques (continuous wave, pulsed Linear Frequency Modulation, and stepped Frequency Modulation) \* Properties of radar images, algorithms used for radar image processing, simulation examples, and results of satellite image files processed by Range-Doppler and Stolt interpolation algorithms. The book fully utilizes the computing and graphical capability of MATLAB<sup>®</sup> to display the signals at various processing stages in 3D and/or cross-sectional views. Additionally, the text is complemented with flowcharts and system block diagrams to aid in readers' comprehension. *Digital Signal Processing Techniques and Applications in Radar Image Processing* serves as an ideal textbook for graduate students and practicing engineers who wish to gain firsthand experience in applying DSP principles and technologies to radar imaging.

**Medical and Biological Microwave Sensors and Systems** - Isar Mostafanezhad 2017-06-30

In this comprehensive work, experts in the field detail recent advances in medical and biological microwave sensors and systems, with chapters on topics such as implantable sensors, wearable microwave tags, and UWB technology. Each chapter explores the theory behind the technology, as well as its design and implementation. This is supported by practical examples and details of experimental results, along with discussion of system design, design trade-offs, and possible constraints and manufacturing issues. Applications described include intracranial pressure monitoring, vital signs monitoring, and non-invasive molecular and cellular investigations. Presenting new research and advances in the field, and focusing on the state of the art in medical and biological microwave sensors, this work is an invaluable resource for enthusiastic researchers and practicing engineers in the fields of electrical engineering, biomedical engineering, and medical physics.

*Masters Theses in the Pure and Applied Sciences* - Wade H. Shafer 2012-12-06

*Masters Theses in the Pure and Applied Sciences* was first conceived, published, and disseminated by the Center for Information and Numerical Data Analysis and Synthesis (CINDAS) \* at Purdue University in 1957, starting its coverage of theses with the academic year 1955. Beginning with Volume 13, the printing and dissemination phases of the activity were transferred to University Microfilms/Xerox of Ann Arbor, Michigan, with the thought that such an arrangement would be more beneficial to the academic and general scientific and technical community. After five years of this joint undertaking we had concluded that it was in the interest of all concerned if the printing and distribution of the volumes were handled by an internal and broader dissemination publishing house to assure improved service. Hence, starting with Volume 18, *Masters Theses in the Pure and Applied Sciences* has been disseminated on a worldwide basis by Plenum Publishing Corporation of New York, and in the same year the coverage was broadened to include Canadian universities. All back issues can also be ordered from Plenum. We have reported in Volume 30 (thesis year 1985) a total of 12,400 theses titles from 26 Canadian and 186 United States universities. We are sure that this broader base for these titles reported will greatly enhance the value of this important annual reference work.

*Structural Sensing, Health Monitoring, and Performance Evaluation* - D. Huston 2010-09-21

Structural health monitoring (SHM) uses one or more in situ sensing systems placed in or around a structure, providing real-time evaluation of its performance and ultimately preventing structural failure. Although most commonly used in civil engineering, such as in roads, bridges, and dams, SHM is now finding applications in other engineering

environments, such as naval and aerospace engineering. Written by a highly respected expert in the field, Structural Sensing, Health Monitoring, and Performance Evaluation provides the first comprehensive coverage of SHM. The text begins with a review of the various types of sensors currently used in SHM, including point sensors and noncontact systems. Subsequent chapters explain the processing and interpretation of data from a number of sensors working in parallel. After considering issues related to the structures themselves, the author surveys the design of a tailor-made SHM system. He also presents a collection of case studies, many of which are drawn from his own experiences. Exploring the power of sensors, this book shows how SHM technologies can be applied to a variety of structures and systems, including multistory buildings, offshore wind energy plants, and ecological systems.

**Advanced Ultrawideband Radar** - James D. Taylor 2016-12-19

This book presents the latest theory, developments, and applications related to high resolution materials-penetrating sensor systems. An international team of expert researchers explains the problems and solutions for developing new techniques and applications. Subject areas include ultrawideband (UWB) signals propagation and scattering, materials-penetrating radar techniques for small object detection and imaging, biolocation using holographic techniques, tomography, medical applications, nondestructive testing methods, electronic warfare principles, through-the-wall radar propagation effects, and target identification through measuring the target return signal spectrum changes.

**Stepped-Frequency Radar Sensors** - Cam Nguyen 2015-11-05

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 ultrawideband 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.

**Modern Sensing Technologies** - Subhas Chandra Mukhopadhyay 2018-08-24

This book provides an overview of modern sensing technologies and reflects the remarkable advances that have been made in the field of intelligent and smart sensors, environmental monitoring, health monitoring, and many other sensing and monitoring contexts in today's world. It addresses a broad range of aspects, from human health monitoring to the monitoring of environmental conditions, from wireless sensor networks and the Internet of Things to structural health monitoring. Given its breadth of scope, the book will benefit researchers, practitioners, technologists and graduate students involved in the monitoring of systems within the human body, functions and activities, healthcare technologies and services, the environment, etc.

**Radar for Indoor Monitoring** - Moeness Amin 2017-09-14

This book aims to capture recent advances and breakthroughs in in-home radar monitoring of human motions and activities. It addresses three key attributes of radar for in-door human monitoring, namely: motion classification including fall, detection of vital signs, and categorization of human gait for risk assessment and progression of physical impairments and disabilities. It explores recent developments in radar technology for human monitoring inside homes and residences. The reader will learn enhanced detection and classification techniques of radar signals associated with human micro- and macro-motions. Furthermore, the book includes examples using real data collected from healthy individuals, patients, and retirement communities based on the subject Doppler and range information, and using different single and multi-antenna radar system configurations. Results are also presented using modeled data based on biomechanics and kinematics. Indoor monitoring is further demonstrated using alternative technologies of infrared sensors and RF signals of opportunities.

*Scientific and Technical Aerospace Reports* - 1995

**Concepts for Short Range Millimeter-wave Miniaturized Radar Systems with Built-in Self-Test** - Girma, Mekdes 2019-11-21

**Waveform Diversity: Theory & Applications** - S Pillai 2011-05-22

Cutting-edge transmitter and receiver waveform design techniques Optimum design can improve signal direction, interference, and noise suppression across various disciplines that utilize waveforms, including radar, sonar, and communications. Waveform Diversity explains the role of transmitter and receiver waveform design to boost overall performance. Written by experts in the field, this monograph covers joint transmitter receiver design, optimum design methods, constant envelope transmit signals, and sparsity-based receivers. Proven methods for mitigating noise and clutter and maximizing output signal power are included in this practical guide. Waveform Diversity covers: Waveform design and matched filtering New methods for optimum transmitter and receiver design Transmitter threshold energy and energy-bandwidth tradeoff Increasing transmit power efficiency with constant envelope transmit signals Optimum waveform design to reduce noise and clutter Discrete-time waveform design Sparsity-based receiver design methods **Trends in Wireless Communication and Information Security** - Mithun Chakraborty 2021-04-22

This book presents best selected papers presented at the International Conference on Emerging Wireless Communication Technologies and Information Security (EWCIS 2020), held from 8th & 9th October 2020 at Amity University Jharkhand, Ranchi, India. The book includes papers in the research area of wireless communications and intelligent systems, signal and image processing in engineering applications, data communication and information security, IoT and cloud computing. The contribution ranges from scientists, engineers and technologists from academia as well as from industry.

**Sparsity-Based Multipath Exploitation for Through-the-Wall Radar Imaging** - Michael Leigsnering 2018-02-16

This thesis reports on sparsity-based multipath exploitation methods for through-the-wall radar imaging. Multipath creates ambiguities in the measurements provoking unwanted ghost targets in the image. This book describes sparse reconstruction methods that are not only suppressing the ghost targets, but using multipath to one's advantage. With adopting the compressive sensing principle, fewer measurements are required for image reconstruction as compared to conventional techniques. The book describes the development of a comprehensive signal model and some associated reconstruction methods that can deal with many relevant scenarios, such as clutter from building structures, secondary reflections from interior walls, as well as stationary and moving targets, in urban radar imaging. The described methods are evaluated here using simulated as well as measured data from semi-controlled laboratory experiments.

**Radar Signal Analysis and Processing Using MATLAB** - Bassem R. Mahafza 2016-04-19

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.

**Stepped-Frequency Radar Sensors** - Cam Nguyen 2016-03-29

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.

*Short-Range Micro-Motion Sensing with Radar Technology* - Changzhan Gu 2019-08

Covering radar sensor hardware, digital signal processing and machine learning, the book provides researchers and practitioners with insights into the latest advancements in the field.

**Electromagnetic Methods in Geophysics** - Fabio Giannino 2021-08-31

Discover the utility of four popular electromagnetic geophysical techniques In GeoRadar, FDEM, TDEM, and AEM Methods, accomplished researchers Fabio Giannino and Giovanni Leucci deliver an in-depth exploration of the theory and application of four different electromagnetic geophysical techniques: ground penetrating radar, the frequency domain electromagnetic method, the time domain electromagnetic method, and the airborne electromagnetic method. The authors offer a full description of each technique as they relate to the economics, planning, and logistics of deploying each of them on-site. The book also discusses the potential output of each method and how it can be combined with other sources of below- and above-ground information to create a digitized common point cloud containing a wide variety of data. Giannino and Leucci rely on 25 years of professional experience in over 40 countries around the world to provide readers with a fulsome description of the optimal use of GPR, FDEM, TDEM, and AEM, demonstrating their flexibility and applicability to a wide variety of use cases. Readers will also benefit from the inclusion of: A thorough introduction to electromagnetic theory, including the operative principles and theory of ground penetrating radar (GPR) and the frequency domain electromagnetic method (FDEM) An exploration of hardware architecture and surveying, including GPR, FDEM, time domain electromagnetic method (TDEM), and airborne electromagnetic (AEM) surveying A collection of case studies, including a multiple-geophysical archaeological GPR survey in Turkey and a UXO search in a building area in Italy using FDEM /li> Discussions of planning and mobilizing a campaign, the shipment and clearance of survey equipment, and managing the operative aspects of field activity Perfect for forensic and

archaeological geophysicists, GeoRadar, FDEM, TDEM, and AEM Methods will also earn a place in the libraries of anyone seeking a one-stop reference for the planning and deployment of GDR, FDEM, TDEM, and AEM surveying techniques.

**Sensor Technologies for Civil Infrastructures** - Jerome P. Lynch 2022-07-19

*Sensor Technologies for Civil Infrastructure, Volume 1: Sensing Hardware and Data Collection Methods for Performance Assessment*, Second Edition, provides an overview of sensor hardware and its use in data collection. The first chapters provide an introduction to sensing for structural performance assessment and health monitoring, and an overview of commonly used sensors and their data acquisition systems. Further chapters address different types of sensor including piezoelectric transducers, fiber optic sensors, acoustic emission sensors, and electromagnetic sensors, and the use of these sensors for assessing and monitoring civil infrastructures. The new edition now includes chapters on machine learning methods and reliability analysis for structural health monitoring. All chapters have been revised to include the latest advances in materials (such as piezoelectric and mechanoluminescent materials), technologies (such as LIDAR), and applications. Describes sensing hardware and data collection, covering a variety of sensors including LIDAR Examines fiber optic systems, acoustic emission, piezoelectric sensors, electromagnetic sensors, terahertz technologies, ultrasonic methods, and radar and millimeter wave technology Covers strain gauges, micro-electro-mechanical systems (MEMS), multifunctional materials and nanotechnology for sensing, and vision-based sensing and lasers Includes new chapters on machine learning methods and reliability analysis

**Dissertation Abstracts International** - 2005

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Learn about the most recent theoretical and practical advances in radar signal processing using tools and techniques from compressive sensing. Providing a broad perspective that fully demonstrates the impact of these tools, the accessible and tutorial-like chapters cover topics such as clutter rejection, CFAR detection, adaptive beamforming, random arrays for radar, space-time adaptive processing, and MIMO radar. Each chapter includes coverage of theoretical principles, a detailed review of current knowledge, and discussion of key applications, and also highlights the potential benefits of using compressed sensing algorithms. A unified notation and numerous cross-references between chapters make it easy to explore different topics side by side. Written by leading experts from both academia and industry, this is the ideal text for researchers, graduate students and industry professionals working in signal processing and radar.