Synthetic Aperture Radar Signal Processing With

Synthetic Aperture RadarSynthetic Aperture RadarSynthetic Aperture Radar Signal Processing with MATLAB AlgorithmsIntroduction to Synthetic Aperture Radar Using Python and MATLAB®Inverse Synthetic Aperture Radar ImagingMulti-Antenna Synthetic Aperture RadarSpotlight-Mode Synthetic Aperture Radar: A Signal Processing ApproachSynthetic Aperture RadarRadar Signal Processing and Its ApplicationsSynthetic Aperture Radar ProcessingTopics in Radar Signal ProcessingSpotlight Synthetic Aperture RadarMoon-Based Synthetic Aperture RadarSynthetic Aperture Radar SystemsTime-frequency Analysis of Synthetic Aperture Radar SignalsInverse Synthetic Aperture Radar Imaging With MATLAB AlgorithmsTime-frequency Transforms for Radar Imaging and Signal AnalysisSynthetic Aperture Radar Signal and Image Processing for Moving Target Indication and Side Lobe SuppressionAdvances in Multidimensional Synthetic Aperture Radar Signal ProcessingPrinciples of Synthetic Aperture Radar Imaging John C. Curlander J. Patrick Fitch Mehrdad Soumekh Lee Andrew (Andy) Harrison Victor C. Chen Wen-Qin Wang Charles V. J. Jakowatz J. Patrick Fitch Jian Li Giorgio Franceschetti Graham Weinberg Walter G. Carrara Zhen Xu Robert O. Harger Brooks Johnston Caner Ozdemir Victor C. Chen Carlos López Martínez Kun-Shan Chen

the use of synthetic aperture radar sar represents a new era in remote sensing technology a complete handbook for anyone who must design an sar system capable of reliably producing high quality image data products free from image artifacts and calibrated in terms of the target backscatter coefficient combines fundamentals underlying the sar imaging process and the practical system engineering required to produce quality images from a real sar system beginning with a broad overview of sar technology it goes on to examine sar system capabilities and components and detail the techniques required for design and development of the sar ground data system with emphasis on the correlation processing intended for sar system engineers and researchers it is generously illustrated for maximum clarity

radar like most well developed areas has its own vocabulary words like doppler frequency pulse compression mismatched filter carrier frequency in phase and quadrature have specific meaning to the radar engineer in fact the word radar is actually an acronym for radio detection and rang ing even though these words are well defined they can act as road blocks which keep people without a radar background from utilizing the large amount of data literature and expertise within the radar community this is unfortunate because the use of digital radar processing techniques has made possible the analysis of radar signals on many general purpose digi tal computers of special interest are the surface mapping radars such as the seasat and the shuttle imaging radars which utilize a technique known as synthetic aperture radar sar to create high resolution images pic tures this data appeals to cartographers agronomists oceanographers and others who want to perform image enhancement parameter estima tion pattern recognition and other information extraction techniques on the radar imagery the first chapter presents the basics of radar processing techniques for calculating range distance by measuring round trip propagation times for radar pulses this is the same technique that sightseers use when calculat ing the width of a canyon by timing the round trip delay using echoes in fact the corresponding approach in radar is usually called the pulse echo technique

an up to date analysis of the sar wavefront reconstruction signal theory and its digital implementation with the advent of fast computing and digital information processing techniques synthetic aperture radar sar technology has become both more powerful and more accurate synthetic aperture radar signal processing with matlab algorithms addresses these recent developments providing a complete up to date analysis of sar and its associated digital signal processing algorithms this book introduces the wavefront reconstruction signal theory that underlies the best sar imaging methods and provides clear guidelines to system design implementation and applications in diverse areas from airborne reconnaissance to topographic imaging of ocean floors to surveillance and air traffic control to medical imaging techniques and numerous others enabling professionals in radar signal and image processing to use synthetic aperture technology to its fullest potential this work includes m files to supplement this book that

can be retrieved from the mathworks anonymous ftp server at ftp ftp mathworks com pub books soumekh provides practical examples and results from real sar isar and csar databases outlines unique properties of the sar signal that cannot be found in other information processing systems examines spotlight sar stripmap sar circular sar and monopulse sar modalities discusses classical sar processing issues such as motion compensation and radar calibration

this comprehensive introduction to synthetic aperture radar sar is a practical guide to the analysis simulation and design of sar systems the video ebook uses constructive examples and real world collected datasets to demonstrate image registration and autofocus methods both two and three dimensional image formation algorithms are presented hardware software and environmental parameters are used to estimate performance limits for sar operation and utilization a set of python and matlab software tools is included and provides you with an effective mechanism to analyze and predict sar performance for various imaging scenarios and applications examples which use the software tools are provided at the end of each chapter to reinforce critical sar imaging topics such as clutter to noise ratio mapping rate spatial resolution doppler bandwidth pulse repetition frequency and coherency this is an excellent resource for engineering professionals working in areas of radar signal processing and imaging as well as students interested in studying sar

this book is based on the latest research on isar imaging of moving targets and non cooperative target recognition nctr with a focus on the advances and applications it provides readers with a working knowledge of various algorithms of isar imaging of targets and implementation with matlab

synthetic aperture radar sar is a well known remote sensing technique but conventional single antenna sar is inherently limited by the minimum antenna area constraint although there are still technical issues to overcome multi antenna sar offers many benefits from improved system gain to increased degrees of freedom and system flexibility multi antenna synthetic aperture radar explores the potential and challenges of using multi antenna sar in microwave remote sensing applications these applications include high resolution imaging wide swath remote sensing ground moving target indication and 3 d imaging the book pays particular attention to the signal processing aspects of various multi antenna sar from a top level system perspective explore recent extensions of synthetic aperture radar systems the backbone of the book is a series of innovative microwave remote sensing approaches developed by the author centered around multi antenna sar imaging these approaches address specific challenges and potential problems in future microwave remote sensing chapters examine single input multiple output simo multi antenna sar including azimuth and elevation multi antenna sar and multiple input multiple output mimo sar the book details the corresponding system

scheme signal models time phase spatial synchronization methods and high precision imaging algorithms it also investigates their potential applications introductory tutorials and novel approaches in multi antenna sar imaging rigorous and self contained this is a unique reference for researchers and industry professionals working with microwave remote sensing sar imaging and radar signal processing in addition to novel approaches the book also presents tutorials that serve as an introduction to multi antenna sar imaging for those who are new to the field

modern airborne and spaceborne imaging radars known as synthetic aperture radars sars are capable of producing high quality pictures of the earth s surface while avoiding some of the shortcomings of certain other forms of remote imaging systems primarily radar overcomes the nighttime limitations of optical cameras and the cloud cover limitations of both optical and infrared imagers in addition because imaging radars use a form of coherent illumination they can be used in certain special modes such as interferometry to produce some unique derivative image products that incoherent systems cannot one such product is a highly accurate digital terrain elevation map dtem the most recent ca 1980 version of imaging radar known as spotlight mode sar can produce imagery with spatial resolution that begins to approach that of remote optical imagers for all of these reasons synthetic aperture radar imaging is rapidly becoming a key technology in the world of modern remote sensing much of the basic workings of synthetic aperture radars is rooted in the concepts of signal processing starting with that premise this book explores in depth the fundamental principles upon which the spotlight mode of sar imaging is constructed using almost exclusively the language concepts and major building blocks of signal processing spotlight mode synthetic aperture radar a signal processing approach is intended for a variety of audiences engineers and scientists working in the field of remote sensing but who do not have experience with sar imaging will find an easy entrance into what can seem at times a very complicated subject experienced radar engineers will find that the book describes several modern areas of sar processing that they might not have explored previously e g interferometric sar for change detection and terrain elevation mapping or modern non parametric approaches to sar autofocus senior undergraduates primarily in electrical engineering who have had courses in digital signal and image processing but who have had no exposure to sar could find the book useful in a one semester course as a reference

radar signal processing and its applications brings together in one place important contributions and up to date research results in this fast moving area in twelve selected chapters it describes the latest advances in architectures design methods and applications of radar signal processing the contributors to this work were selected from the leading researchers and practitioners in the field this work originally published as volume 14 numbers 1 3 of the journal multidimensional systems and signal processing will be valuable to anyone working or researching in the field of radar signal processing it serves as an excellent reference providing insight into

some of the most challenging issues being examined today

synthetic aperture radar processing simply and methodically presents principles and techniques of synthetic aperture radar sar image generation by analyzing its system transfer function the text considers the full array of operation modes from strip to scan emphasizes processing techniques enabling the design of operational sar codes a simple example then follows this book will be invaluable to all sar scientists and engineers working in the field it may be used as the basis for a course on sar image generation or as a reference book on remote sensing it contains a wide spectrum of information presented with clarity and rigor

radar has been an important topic since its introduction in a military context during world war ii due to advances in technology it has been necessary to refine the algorithms employed within the signal processing architecture hence this book provides a series of chapters examining some topics in modern radar signal processing these include synthetic aperture radar multiple input multiple output radar as well as a series of chapters examining other key issues relevant to the central theme of the book

the book gives an excellent theoretical and practical background of sar in general and specifically of spotlight sar the rich experience of the authors in spotlight sar processing is reflected by a very detailed summary of the associated theory as well as a lot of sar image examples these images illustrate the techniques described in the book and provide a valuable connection to practice this book can be highly recommended to all scientists and engineers involved in sar system design and sar data evaluation international journal of electronics and communications

lunar explorations have received increasing attention in recent years with tremendous application values including using the moon as a remote sensing platform for earth observation as an active sensor the synthetic aperture radar sar can detect changes in the atmosphere terrain and ocean moon based sar complementary to the spaceborne sar systems expands our capabilities of watching and understanding the earth this book explains the moon earth observation geometry generic parameters image focusing and outlook using the moon based sar written as a sar imaging of earth on the lunar based platform it makes it an essential reference to those interested in planetary and earth sciences features uses the moon as a remote sensing platform for earth observation explains how to obtain a high spatial resolution with a short revisit time using the moon based sar covers the observation geometry range and signal models two dimensional signal spectrum and focusing algorithms for the moon based sar presents a detailed analysis of sources of phase errors in the moon based sar signal includes global case studies and introduces conceptual ideas for further research this book is intended for senior graduate students professional researchers and engineers studying and working in the

fields of lunar exploration and remote sensing applications especially when dealing with high orbit sar studies

build your knowledge of sar isar imaging with this comprehensive and insightful resource the newly revised second edition of inverse synthetic aperture radar imaging with matlab algorithms covers in greater detail the fundamental and advanced topics necessary for a complete understanding of inverse synthetic aperture radar isar imaging and its concepts distinguished author and academician caner Özdemir describes the practical aspects of isar imaging and presents illustrative examples of the radar signal processing algorithms used for isar imaging the topics in each chapter are supplemented with matlab codes to assist readers in better understanding each of the principles discussed within the book this new edition incudes discussions of the most up to date topics to arise in the field of isar imaging and isar hardware design the book provides a comprehensive analysis of advanced techniques like fourier based radar imaging algorithms and motion compensation techniques along with radar fundamentals for readers new to the subject the author covers a wide variety of topics including radar fundamentals including concepts like radar cross section maximum detectable range frequency modulated continuous wave and doppler frequency and pulsed radar the theoretical and practical aspects of signal processing algorithms used in isar imaging the numeric implementation of all necessary algorithms in matlab isar hardware emerging topics on sar isar focusing algorithms such as bistatic isar imaging polarimetric isar imaging and near field isar imaging applications of sar isar imaging techniques to other radar imaging problems such as thru the wall radar imaging and ground penetrating radar imaging perfect for graduate students in the fields of electrical and electronics engineering electromagnetism imaging radar and physics inverse synthetic aperture radar imaging with matlab algorithms also belongs on the bookshelves of practicing researchers in the related areas looking for a useful resource to assist them in their day to day professional work

this text explores more efficient ways to extract dispersive scattering features detect and extract weak signals in noise form clear radar images estimate parameters and perform motion compensation and detect and track moving targets in the synthetic aperture radar

principles of synthetic aperture radar imaging a system simulation approach demonstrates the use of image simulation for sar it covers the various applications of sar including feature extraction target classification and change detection provides a complete understanding of sar principles and illustrates the complete chain of a sar operati

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