
Narrowband Direction Of Arrival Estimation For An

Direction of Arrival Estimation and Tracking of Narrowband and Wideband Signals

Radar Array Processing

Cyclostationarity Based DOA Estimation and Tracking

Principles and Applications of RELAX: A Robust and Universal Estimator

Smart Antennas

Machine Learning Applications in Electromagnetics and Antenna Array Processing

Classical and Modern Direction-of-Arrival Estimation

Narrowband Direction of Arrival Estimation for Antenna Arrays

Wireless Communication and Sensor Network

Fundamentals of Narrowband Array Signal Processing

Smart Antennas

Presidential Elections and Independence Referendums in the Baltic States, the Soviet

Union and Successor States

Microphone Array Signal Processing

2020 14th European Conference on Antennas and Propagation (EuCAP)

Business Intelligence

The Computational Brain, 25th Anniversary Edition

Fundamentals of Adaptive Signal Processing

IoT as a Service

Direction of Arrival Estimation Technique for Narrow-band Signals Based on Spatial Discrete Fourier Transform

Wideband Direction of Arrival Estimation Techniques for a Class of Arbitrary Array Geometries

Direction-of-arrival Estimation of Wideband Sources Using Sensor Arrays

A Comparison of Wideband Subspace Methods for Direction-of-arrival Estimation

Practical ESM Analysis

Localization Algorithms and Strategies for Wireless Sensor Networks: Monitoring and Surveillance Techniques for Target Tracking

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Complex-valued Neural Networks

Robust Adaptive Beamforming

Sensor Array Signal Processing

Handbook of Smart Antennas for RFID Systems

Direction of Arrival Estimation and Localization of Multi-Speech Sources

Direction of Arrival Estimation and Beamforming for Narrowband and Wideband Signals

Direction of Arrival Estimation by Maximum Likelihood Method for Narrowband and Wideband Signals

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Wireless Sensor Networks

Antenna Arrays and Beam-formation

Intelligent Data analysis and its Applications, Volume I

Direction of Arrival Estimation Using Wideband Spectral Subspace Projection

Wireless and Satellite Systems

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*Direction of Arrival Estimation and
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Direction-of-Arrival (DOA) estimation and

tracking with antenna arrays is a central topic of signal processing for decades due to its application to many walks of life. By collecting and processing target-originated signals on a passive receiving antenna array, multiple targets in the field will be detected and estimated in terms of their directions with respect to the receiving antenna array. If the

targets are moving, their directions will be estimated and tracked as the targets move across the observation field. This dissertation addresses issues of interference and noise suppressing, wideband sources, multipath environment and computational complexity in DOA estimation and tracking. Several algorithms for DOA estimation or DOA tracking are developed. All of the algorithms are signal selective, that is, only the directions of the Signals Of Interest (SOI) will be detected or tracked. First, two signal selective DOA estimation algorithms (Improved Cyclic MUSIC, Improved Conjugate Cyclic MUSIC) are developed for narrowband signals. Then, based on these methods, two new algorithms (Averaged Cyclic MUSIC,

Extended Wideband Cyclic MUSIC) which are able to deal with wideband cyclostationary signals are proposed. Then, to deal with the multipath problem, a method applying Spatial Smoothing (SS) technique to the Averaged Cyclic MUSIC algorithm is proposed. But SS results in a smaller effective array aperture, thus DOAs of fewer sources could be detected and the angle resolution is reduced. Therefore, an instantaneous DOA estimation method is proposed to simultaneously solve the wideband and multipath problems without using SS. After the directions for all the paths from multipath propagation are being detected, it is useful to assign the detected paths to their corresponding sources. Therefore, a path-source

association algorithm for this purpose is developed. Finally the tracking problem is addressed. A new signal selective DOA tracking algorithm is presented for moving sources emitting narrowband or wideband cyclostationary signals. Computer simulations for all the algorithms are carried out to illustrate the effectiveness of these algorithms. *Radar Array Processing* CRC Press

Sensor arrays are used in many applications where their ability to localize signal sources is essential. For many applications, it is necessary to estimate the direction-of-arrival (DOA) of target sources. Although there are many DOA estimation methods available, most of them are valid only for narrowband signals where time delay can be approximated as a phase shift. This

thesis focuses on DOA estimation algorithms for wideband sources. Specifically, this thesis proposes the pruned fast beamformer which can reduce the number of computations of Delay-and-Sum (DS) beamforming by using a multi-resolution structure. For high resolution methods, signal subspace methods are required. Most of the subspace techniques for wideband signals decompose the received wideband signals into several bands of narrowband signals through bandpass filtering. Then, there are two different ways of processing decomposed signals. The incoherent methods process each band independently by a given narrowband method and average the results. The coherent methods attempt to modulate the signals in each band so

that they can be combined coherently. In this thesis, a new DOA estimator, which is called TOPS, is developed to avoid disadvantages of both the incoherent and the coherent methods. The new method which can be categorized as a non-coherent method is tested and compared with other methods. It exhibits many desirable features for a number of applications where the sources are wideband such as acoustic direction finding.

Cyclostationarity Based DOA Estimation and Tracking Springer

Academic Press Library in Signal Processing, Volume 7: Array, Radar and Communications Engineering is aimed at university researchers, post graduate students and R&D engineers in the industry, providing a tutorial-based,

comprehensive review of key topics and technologies of research in Array and Radar Processing, Communications Engineering and Machine Learning. Users will find the book to be an invaluable starting point to their research and initiatives. With this reference, readers will quickly grasp an unfamiliar area of research, understand the underlying principles of a topic, learn how a topic relates to other areas, and learn of research issues yet to be resolved. Presents a quick tutorial of reviews of important and emerging topics of research Explores core principles, technologies, algorithms and applications Edited and contributed by international leading figures in the field Includes comprehensive references to journal articles and other literature upon

which to build further, more detailed knowledge

Principles and Applications of RELAX: A Robust and Universal Estimator Springer Nature

Narrowband Direction of Arrival Estimation for Antenna Arrays Springer Nature

Smart Antennas John Wiley & Sons
Sensors arrays are used in diverse applications across a broad range of disciplines. Regardless of the application, however, the tools of sensor array signal processing remain the same. Furthermore, whether your interest is in acoustic, seismic, mechanical, or electromagnetic wavefields, they all have a common mathematical framework. Mastering this *Machine Learning Applications in*

Electromagnetics and Antenna Array Processing Artech House

This practical resource provides an overview of machine learning (ML) approaches as applied to electromagnetics and antenna array processing. Detailed coverage of the main trends in ML, including uniform and random array processing (beamforming and detection of angle of arrival), antenna optimization, wave propagation, remote sensing, radar, and other aspects of electromagnetic design are explored. An introduction to machine learning principles and the most common machine learning architectures and algorithms used today in electromagnetics and other applications is presented, including basic neural networks, gaussian processes, support

vector machines, kernel methods, deep learning, convolutional neural networks, and generative adversarial networks. Applications in electromagnetics and antenna array processing that are solved using machine learning are discussed, including antennas, remote sensing, and target classification.

Classical and Modern Direction-of-Arrival Estimation World Scientific

This work deals with the further development of a method for Direction of Arrival (DOA) estimation based on the Discrete Fourier Transform (DFT) of the sensor array output. In the existing DFT-based algorithm, relatively high SNR is considered, and it is assumed that a large number of sensors are available. In this study an overview of some of the most commonly used DOA estimation

techniques will be presented. Then the performance of the DFT method will be analyzed and compared with the performance of existing techniques. Two main objectives will be studied, firstly the reduction of the number of sensors and secondly the performance of the DFT based technique in the presence of noise. Experimental simulations will be presented to illustrate that in absence of noise, the proposed method is very fast and using just one snapshot is sufficient to accurately estimate DOAs. Also, in presence of noise, the method is still relatively fast and using a small number of snapshots, it can accurately estimate DOAs. The above mentioned properties are the result of taking an average of the peaks of the DFTs, $X_n(k)$, obtained from a sequence of N_s snapshots. With

N_s sufficiently large, the average over N_s snapshots approaches expected value. Also, the conditions that should be satisfied to avoid overlapping of main-lobes, and thus losing the DOA of some signals, in the DFT spectrum are examined. This study further analyzes the performance of the proposed method as well as two other commonly used algorithms, MUSIC and conventional beamformer. An extensive simulation was conducted and different features of the spatial DFT technique, such as accuracy, resolution, sensitivity to noise, effect of multiple snapshots and the number of sensors were evaluated and compared with those of existing techniques. The simulations indicate that in most aspects the proposed spatial DFT algorithm outperforms the other

techniques.

Narrowband Direction of Arrival Estimation for Antenna Arrays Morgan Kaufmann

This volume constitutes the first of three parts of the refereed proceedings of the First International Conference on Computer Science and Information Technology, CCSIT 2010, held in Bangalore, India, in January 2011. The 59 revised full papers presented in this volume were carefully reviewed and selected. The papers are organized in topical sections on distributed and parallel systems and algorithms; DSP, image processing, pattern recognition, and multimedia; software engineering; database and data Mining; as well as soft computing, such as AI, neural networks, fuzzy systems, etc.

Wireless Communication and Sensor Network Springer Science & Business Media

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.

Fundamentals of Narrowband Array Signal Processing

BoD - Books on Demand

Spatial processing and smart antenna beam formation are considered as completely essential approaches to be employed for forthcoming progress in the standards and implementation of the wireless communication systems. The book aims, besides introducing up-to-date contributions that are not readily available in the related literature, to present and demonstrate the recent research ideas in the field of antenna array design and beam-forming algorithms in a synthetic, coherent, and unified manner for the interested researchers. The presented topics range from relatively straightforward mathematical analysis and derivations to

simulation and empirical results. The book is designed to serve as an informative reference for the researcher involved in the analysis of the spatial signal processing techniques for smart antenna systems. The book will help the readers, in particular wireless communication researchers, to have wider futuristic and innovative visions for the advances in the field.

Smart Antennas CRC Press

Radar Array Processing presents modern techniques and methods for processing radar signals received by an array of antenna elements. With the recent rapid growth of the technology of hardware for digital signal processing, it is now possible to apply this to radar signals and thus to enlist the full power of sophisticated computational

algorithms. Topics covered in detail here include: super-resolution methods of array signal processing as applied to radar, adaptive beam forming for radar, and radar imaging. This book will be of interest to researchers and students in the radar community and also in related fields such as sonar, seismology, acoustics and radio astronomy.

Presidential Elections and Independence Referendums in the Baltic States, the Soviet Union and Successor States

Artech House

The use of smart antennas to increase mobile communications channels has reignited research and development in the field. Practicing engineers are eager to discover more about this subject, and need a comprehensive book that can provide a learning platform and prevent

the loss of time spent on searches through journal literature. *Smart Antennas* examines nearly all aspects of array signal processing and presents them in a logical manner. It delivers a detailed treatment of antenna array processing schemes, adaptive algorithms to adjust weighting, direction of arrival (DOA) estimation methods, diversity-combining methods that combat fading and reduce errors. The book introduces the various processor structures suitable for the narrowband field, examining the behavior of both element space and beamspace processors. It then explores adaptive processing, focusing on the simple matrix inversion algorithm, constrained least mean squares (LMS), the neural network approach, and more. The text

also describes smart antennas that are suitable for broadband signals, and presents analyses and techniques suitable for correlated fields in narrowband and broadband signals. This volume supplements its content with extensive references, enabling you to further investigate smart antenna array schemes and application.

Microphone Array Signal Processing

Academic Press

Smart Antennas—State of the Art brings together the broad expertise of 41 European experts in smart antennas. They provide a comprehensive review and an extensive analysis of the recent progress and new results generated during the last years in almost all fields of smart antennas and MIMO (multiple-input multiple-output) transmission. The

following represents a summarized table of content. Receiver: space-time processing, antenna combining, reduced rank processing, robust beamforming, subspace methods, synchronization, equalization, multiuser detection, iterative methods Channel: propagation, measurements and sounding, modelling, channel estimation, direction-of-arrival estimation, subscriber location estimation Transmitter: space-time block coding, channel side information, unified design of linear transceivers, ill-conditioned channels, MIMO-MAC strategies Network Theory: channel capacity, network capacity, multihop networks Technology: antenna design, transceivers, demonstrators and testbeds, future air interfaces Applications and Systems: 3G system

and link level aspects, MIMO HSDPA, MIMO-WLAN/UMTS implementation issues This book serves as a reference for scientists and engineers who need to be aware of the leading edge research in multiple-antenna communications, an essential technology for emerging broadband wireless systems.

2020 14th European Conference on Antennas and Propagation (EuCAP)

Springer

Wireless localization techniques are an area that has attracted interest from both industry and academia, with self-localization capability providing a highly desirable characteristic of wireless sensor networks. Localization Algorithms and Strategies for Wireless Sensor Networks encompasses the significant and fast growing area of wireless

localization techniques. This book provides comprehensive and up-to-date coverage of topics and fundamental theories underpinning measurement techniques and localization algorithms. A useful compilation for academicians, researchers, and practitioners, this Premier Reference Source contains relevant references and the latest studies emerging out of the wireless sensor network field.

Business Intelligence Springer

The latest research and developments in robust adaptive beamforming Recent work has made great strides toward devising robust adaptive beamformers that vastly improve signal strength against background noise and directional interference. This dynamic technology has diverse applications, including radar,

sonar, acoustics, astronomy, seismology, communications, and medical imaging. There are also exciting emerging applications such as smart antennas for wireless communications, handheld ultrasound imaging systems, and directional hearing aids. Robust Adaptive Beamforming compiles the theories and work of leading researchers investigating various approaches in one comprehensive volume. Unlike previous efforts, these pioneering studies are based on theories that use an uncertainty set of the array steering vector. The researchers define their theories, explain their methodologies, and present their conclusions. Methods presented include: * Coupling the standard Capon beamformers with a spherical or ellipsoidal uncertainty set of

the array steering vector * Diagonal loading for finite sample size beamforming * Mean-squared error beamforming for signal estimation * Constant modulus beamforming * Robust wideband beamforming using a steered adaptive beamformer to adapt the weight vector within a generalized sidelobe cancellation formulation Robust Adaptive Beamforming provides a truly up-to-date resource and reference for engineers, researchers, and graduate students in this promising, rapidly expanding field.

The Computational Brain, 25th Anniversary Edition Springer

In recent years, complex-valued neural networks have widened the scope of application in optoelectronics, imaging, remote sensing, quantum neural devices

and systems, spatiotemporal analysis of physiological neural systems, and artificial neural information processing. In this first-ever book on complex-valued neural networks, the most active scientists at the forefront of the field describe theories and applications from various points of view to provide academic and industrial researchers with a comprehensive understanding of the fundamentals, features and prospects of the powerful complex-valued networks. Fundamentals of Adaptive Signal Processing MIT Press

Array signal processing is an actively developing research area connected to the progress in optimization theory, and remains the key technological development that attracts prevalent attention in signal processing. This

chapter provides an overview of the fundamental concepts and essential terminologies employed in narrowband array signal processing. We first develop a general signal model for narrowband adaptive arrays and discuss the beamforming operation. We next introduce the basic performance parameters of adaptive arrays and the second order statistics of the array data. We then formulate various optimal weigh vector solution criteria. Finally, we discuss various types of adaptive filtering algorithms. Besides, this chapter emphasizes the theory of narrowband array signal processing employed in narrowband beamforming and direction-of-arrival (DOA) estimation algorithms. IoT as a Service Springer

The multiple signal demixing and

parameter estimation problems that result from the impacts of background noise and interference are issues that are frequently encountered in the fields of radar, sonar, communications, and navigation. Research in the signal processing and control fields has always focused on improving the estimation performance of parameter estimation methods at low SNR and maintaining the robustness of estimations in the presence of model errors. This book presents a universal and robust relaxation estimation method (RELAX), and introduces its basic principles and applications in the fields of classical line spectrum estimation, time of delay estimation, DOA estimation, and radar target imaging. This information is explained comprehensively and in great

detail, and uses metaphors pertaining to romantic relationships to visualize the basic problems of parameter estimation, the basic principles of the five types of classical parameter estimation methods, and the relationships between these principles. The book serves as a reference for scientists and technologists in the fields of signal processing and control, while also providing relevant information for graduate students in the related fields.

**Direction of Arrival Estimation
Technique for Narrow-band Signals
Based on Spatial Discrete Fourier
Transform** Hindawi Publishing
Corporation

An anniversary edition of the classic work that influenced a generation of neuroscientists and cognitive

neuroscientists. Before *The Computational Brain* was published in 1992, conceptual frameworks for brain function were based on the behavior of single neurons, applied globally. In *The Computational Brain*, Patricia Churchland and Terrence Sejnowski developed a different conceptual framework, based on large populations of neurons. They did this by showing that patterns of activities among the units in trained artificial neural network models had properties that resembled those recorded from populations of neurons recorded one at a time. It is one of the first books to bring together computational concepts and behavioral data within a neurobiological framework. Aimed at a broad audience of neuroscientists, computer scientists,

cognitive scientists, and philosophers, *The Computational Brain* is written for both expert and novice. This anniversary edition offers a new preface by the authors that puts the book in the context of current research. This approach influenced a generation of researchers. Even today, when neuroscientists can routinely record from hundreds of neurons using optics rather than electricity, and the 2013 White House BRAIN initiative heralded a new era in innovative neurotechnologies, the main message of *The Computational Brain* is still relevant.

Wideband Direction of Arrival Estimation Techniques for a Class of Arbitrary Array Geometries Springer

This proceedings volume collects the most up-to-date, comprehensive and

state-of-the-art knowledge on wireless communication, sensor network, network technologies, services and application. Written by world renowned researchers, each chapter is original in content, featuring high-impact presentations and late-breaking contributions. Researchers and practitioners will find this edition a useful resource material and an

inspirational read. Contents:Wireless CommunicationsNetwork TechnologiesServices and Application Readership: Researchers, academics, professionals and graduate students in neural networks/networking, electrical & electronic engineering, and condensed matter physics.

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