2014 IEEE 8th Sensor Array and Multichannel Signal Processing Workshop

(SAM 2014)

A Coruna, Spain
22 – 25 June 2014
Program

Tutorial 1: Tradeoffs in MIMO Radar -- S. Vorobyov (Aalto University, Finland) and M. Lops (University of Cassino, Italy) -- Room Finisterre

Free with registration

Tutorial 2: Cartography for Cognitive Networks -- G. Giannakis (University of Minnesota, USA) -- Room Finisterre

Free with registration

Student Poster Competition -- Room Finisterre

Localisation Based on Signal Structure
Elad Tzoreff (Tel Aviv University, Israel); Ben Zion Bobrovsky (Tel Aviv University, Israel); Anthony J. Weiss (Tel Aviv University, Israel)
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Continuous Sparse Recovery for Direction of Arrival Estimation with Co-prime Arrays
Zhao Tan (Washington University in St. Louis, USA); Yonina C. Eldar (Technion-Israel Institute of Technology, Israel); Arye Nehorai (Washington University in St. Louis, USA)
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Efficient Linear Precoding for Massive MIMO Systems using Truncated Polynomial Expansion
Axel Müller (Supélec & Intel, France); Abla Kammoun (Supelec, France); Emil Björnson (Linköping University, Sweden); Mérouane Debbah (Supelec, France)
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Tensor-based Power Spectra Separation and Emitter Localization for Cognitive Radio
Xiao Fu (The Chinese University of Hong Kong, Hong Kong); Nikolaos D Sidiropoulos (University of Minnesota, USA); Wing-Kin Ma (The Chinese University of Hong Kong, Hong Kong)
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Near-Field Source Localization: Sparse Recovery Techniques and Grid Matching
Keke Hu (Delft University of Technology, P.R. China); Sundeep Prabhakar Chepuri (Delft University of Technology, The Netherlands); Geert Leus (Delft University of Technology, The Netherlands)
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State Estimation with Sampling Offsets in Wide Area Measurement Systems
Hoi-To Wai (University of California, Davis, USA); Anna Scaglione (University of California, Davis, USA)
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A Sparse Regularization Technique for Source Localization with Non-uniform Sensor Gain
Christian Weiss (Darmstadt University of Technology, Germany); Abdelhak M Zoubir (Darmstadt University of Technology, Germany)
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A Sparse Bayesian Learning Algorithm With Dictionary Parameter Estimation
Thomas L Hansen (Aalborg University, Denmark); Mihai Alin Badiu (Aalborg University, Denmark); Bernard Henri Fleury (Aalborg University, Denmark); Bhaskar Rao (University of California, San Diego, USA)
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Direction Finding and Array Calibration Based on Sparse Reconstruction in Partly Calibrated Arrays
Christian Steffens (TU Darmstadt, Germany); Marius Pesavento (Technische Universität Darmstadt, Germany); Pouyan Parvazi (TU Darmstadt, Germany)
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Joint Beamforming and Transmit Design for the Non-Regenerative MIMO Broadcast Relay Channel

Jens Steinwandt (Ilmenau University of Technology, Germany); Sergiy A. Vorobyov (Aalto University & University of Alberta on leave, Finland); Martin Haardt (Ilmenau University of Technology, Germany)

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Application of Krylov based methods in Calibration for Radio Astronomy

Ahmad Mouri Sardarabadi (Delft University of Technology, The Netherlands); Alle-Jan van der Veen (TUDelft, The Netherlands)

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A Coruña Tour -- Departure from Hotel Finisterre (SAM venue)

Free with registration

The tour will depart from Hotel Finisterre (venue of SAM 2014) and will arrive at the welcome reception site (Aquarium Finisterrae)

Welcome Reception -- Aquarium Finisterrae

Free with registration

Opening Ceremony -- Room Victoria

Plenary 1: Modeling the Aggregator Problem: the Economic Dispatch and Dynamic Scheduling of Flexible Electrical Loads -- Anna Scaglione (University of California Davis, USA) -- Room Victoria

The increasing need for fast-ramping generation capacity and costly reserves to balance the grid under high penetration levels of intermittent resources, have sparked great interest in designing new paradigms that allow electricity demand to respond to economic signals. It is expected that the grid will soon incorporate an access layer to manage the access to power by a set of flexible appliances. Aggregators are the entities that will interact with the wholesale market and manage large populations of flexible demand. The objective is for the Aggregators to utilize an interface that is safe for the grid and economically desirable for the consumers. In this talk we will highlight the design opportunities and challenges in dealing with the modeling problem behind the Aggregator design. Electrical Vehicles will be our case study to illustrate advances in the ex-ante modeling and the on-line scheduling of flexible loads.

P1A: Direction-of-arrival Estimation

Direction of Arrival Estimation of Harmonic Signal Using Single Moving Sensor

Yusuke Hioka (University of Auckland, New Zealand); Masako Kishida (University of Canterbury, New Zealand)

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Optimal Virtual Array Length Under Position Imperfections

Anders Mannesson (Lund University, Sweden); Bo Bernhardsson (Lund University, Sweden); Muhammad Atif Yaqoob (Lund University, Sweden); Fredrik Tufvesson (Lund University, Sweden)

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Decentralized Direction Finding Using Lanczos Method

Wassim Suleiman (TU Darmstadt & LOEWE Schwerpunkt Cocoon, Germany); Pouyan Parvazi (TU Darmstadt, Germany); Marius Pesavento (Technische Universität Darmstadt, Germany); Abdelhak M Zoubir (Darmstadt University of Technology, Germany)

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On MSE Performance of Time-Reversal MUSIC

Domenico Ciouonzo (Second University of Naples, Italy); Gianmarco Romano (Second University of Naples, Italy); Raffaele Solimene (Second University of Naples, Italy)
Analytical ESPRIT-Based Performance Study: What Can We Gain From Non-Circular Sources?
Jens Steinwandt (Ilmenau University of Technology, Germany); Florian Roemer (Ilmenau University of Technology, Germany); Martin Haardt (Ilmenau University of Technology, Germany)
pp. 17-20

Direction Finding and Array Calibration Based on Sparse Reconstruction in Partly Calibrated Arrays
Christian Steffens (TU Darmstadt, Germany); Marius Pesavento (Technische Universität Darmstadt, Germany); Pouyan Parvazi (TU Darmstadt, Germany)
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P1B: Localization in Wireless Sensor Networks

A Moving Horizon Convex Relaxation for Mobile Sensor Network Localization
Andrea Simonetto (Delft University of Technology, The Netherlands); Geert Leus (Delft University of Technology, The Netherlands)
pp. 25-28

Network Design Via Modular Set Function Optimization in Localization Problems
Iman Shames (The University of Melbourne, Australia); Tyler Summers (ETH Zurich, Switzerland)
pp. 29-32

Cooperative Simultaneous Localization and Synchronization: Toward a Low-Cost Hardware Implementation
Bernhard Etzlinger (Johannes Kepler University Linz, Austria); Florian Meyer (Vienna University of Technology, Austria); Henk Wymeersch (Chalmers University of Technology, Sweden); Franz Hlawatsch (Vienna University of Technology, Austria); Gerhard Mueller (Johannes Kepler University Linz, Austria); Andreas Springer (Johannes Kepler University Linz, Austria)
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A Weighted KNN Epipolar Geometry-Based Approach for Vision-Based Indoor Localization Using Smartphone Cameras
Hamed Sadeghi (University of Toronto, Canada); Shahrokh Valaeei (University of Toronto, Canada); Shahram Shirani (McMaster University, Canada)
pp. 37-40

Preprocessing Algorithm for Source Localisation in a Multipath Environment
Athanassios Manikas (Imperial College London, United Kingdom); Evangelos Venieris (Imperial College London, United Kingdom)
pp. 41-44

Improving the Projection Method for TOA Source Localization in the Presence of Sensor Position Errors
Jinzhou Li (University of Missouri, USA); Dominic K. C. Ho (University of Missouri, USA); Fucheng Guo (National University of Defense Technology, P.R. China); Wen-Li Jiang (National University of Defense Technology, P.R. China)
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P1C: Estimation in Cyber-Physical Energy Systems

State Estimation with Sampling Offsets in Wide Area Measurement Systems
Hoi-To Wai (University of California, Davis, USA); Anna Scaglione (University of California, Davis, USA)
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Delay Constrained Linear Transmission of Random State Measurements
Onur Tan (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC) - Polytechnic University of Catalonia, Spain); Deniz Gündüz (Imperial College London, United Kingdom); Jesús Gómez-Vilardebo (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain)
pp. 53-56
Power System Event Classification via Dimensionality Reduction of Synchrophasor Data
Yang Chen (Texas A&M University, USA); Le Xie (Texas A&M University, USA); P. R. Kumar (Texas A&M University, USA)
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Max-Flow Min-Cut for Power System Security Index Computation
Oliver Kosut (Arizona State University, USA)
pp. 61-64

Energy Grid State Estimation under Random and Structured Bad Data
Ali Tajer (Rensselaer Polytechnic Institute, USA)
pp. 65-68

P1D: Blind Source Separation and Channel Identification

Robust Interchannel Phase Difference Modeling with Wrapped Regression Splines
Johannes Traa (UIUC, USA); Paris Smaragdis (University of Illinois at Urbana-Champaign, USA)
pp. 69-72

The Correlation Preserving Transform Resolves Phase Ambiguity in Complex Decorrelating Transforms
Clive Cheong Took (University of Surrey, United Kingdom); Scott Douglas (Southern Methodist University & LGT Corporation, USA); Danilo Mandic (Imperial College, London, United Kingdom)
pp. 73-76

Estimation of Inter-Channel Phase Differences using Non-Negative Matrix Factorization
Hendrik Kayser (University of Oldenburg, Germany); Joern Anemueller (University of Oldenburg, Germany); Kamil Adiloglu (HörTech gGmbH, Germany)
pp. 77-80

Nonnegative Compression for Semi-Nonnegative Independent Component Analysis
Lu Wang (Université de Rennes 1 & Laboratoire Traitement du Signal et de l’Image, France); Amar Kachenoura (University of Rennes1-LTSI & Inserm - UMR 1099, France); Laurent Albera (Université de Rennes1 & Inserm, France); Hua Zhong Shu (Southeast University, P.R. China); Lotfi Senahdji (Université de Rennes 1 & Inserm, France); Ahmad Karfoul (Al-Baath University, Syria)
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Lunch Time -- Room Novo

Keynote 1: Signals, data, and information: The research of Prof. Kailath -- Anibal R Figueiras-Vidal (Universidad Carlos III de Madrid, Spain) -- Room Victoria

Plenary 2: Displacement Structure of Matrices: An Introduction -- Thomas Kailath (Stanford University, USA) -- Room Victoria

P2A: Information-Based Signal Processing

Sparse-signal processing on information-based range grid
Edwin de Jong (University of Groningen, The Netherlands); Radmila Pribic (Thales Nederland Delft, The Netherlands)
pp. 85-88

Angular Information Resolution Limit of Sensor Arrays
Yongqiang Cheng (National University of Defense Technology, P.R. China); Xuezhi Wang (University of Melbourne, Australia); Bill Moran (University of Melbourne, Australia)
pp. 89-92
A Sparse Regularization Technique for Source Localization with Non-uniform Sensor Gain
Christian Weiss (Darmstadt University of Technology, Germany); Abdelhak M Zoubir (Darmstadt University of Technology, Germany)
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Cooperative Compressive Power Spectrum Estimation
Dyonisius Dony Ariananda (Delft University of Technology, The Netherlands); Daniel Romero (University of Vigo, Spain); Geert Leus (Delft University of Technology, The Netherlands)
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Nonlinear Parameter Estimation in Statistical Manifolds
Xuezhi Wang (University of Melbourne, Australia); Yongqiang Cheng (National University of Defense Technology, P.R. China); Bill Moran (University of Melbourne, Australia)
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P2B: Antenna Array Processing for GNSS Applications

Space-Time Adaptive Principle Component Analysis for Time-Delay Estimation
Felix Trötschel (German Aerospace Center (DLR), Germany); Felix Antreich (German Aerospace Center (DLR), Germany); Josef A. Nossek (TU Munich, Germany)
pp. 105-108

GNSS Structural Interference Mitigation Technique Using Antenna Array Processing
Saeed Daneshmand (University of Calgary, Canada); Ali Jafarnia-Jahromi (University of Calgary, Canada); Ali Broumandan (University of Calgary, Canada); Gerard Lachapelle (University of Calgary, Canada)
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Accuracy of an OTA System Emulating a Realistic 3D Environment for GNSS and Multi-Satellite Receiver Testing
Christopher Schirmer (Ilmenau University of Technology, Germany); Wim A. Th. Kotterman (Technische Universität Ilmenau, Germany); Gregor Siegert (Fraunhofer IIS, Germany); Alexander Rügamer (Fraunhofer IIS, Germany); Giovanni Del Galdo (Fraunhofer Institute for Integrated Circuits IIS, Germany); Albert Heuberger (Fraunhofer IIS, Germany); Markus Landmann (Fraunhofer Institute for Integrated Circuits IIS, Germany)
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Interference and multipath sequential tests for signal integrity in multi-antenna GNSS receivers
Daniel Egea (Universitat Autònoma de Barcelona, Spain); José A. López-Salcedo (Universitat Autònoma de Barcelona, Spain); Gonzalo Seco-Granados (Universitat Autònoma de Barcelona, Spain)
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Interference Mitigation in GNSS Receivers by Array Signal Processing: A Software Radio Approach
Javier Arribas (Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Spain); Pau Closas (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Carles Fernández-Prades (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain)
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P2C: Detection and Estimation

Regularized robust estimation of mean and covariance matrix under heavy tails and outliers
Ying Sun (HKUST, Hong Kong); Prabhu Babu (HKUST, Hong Kong); Daniel P Palomar (Hong Kong University of Science and Technology, Hong Kong)
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A Real Time Tracker of Complex Circularity
Sithan Kanna (Imperial College London, United Kingdom); Scott Douglas (Southern Methodist University & LGT Corporation, USA); Danilo Mandic (Imperial College, London, United Kingdom)
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Distributed Detection of Correlated Random Processes under Energy and Bandwidth Constraints
Juan A. Maya (University of Buenos Aires, Argentina); Leonardo Rey Vega (University of Buenos Aires, Facultad de Ingeniería & CONICET, Argentina); Cecilia G. Galarza (University of Buenos Aires, Argentina); Andrés Altieri (University of Buenos Aires, Argentina)
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Gaussian Processes Regressors for Complex Proper Signals in Digital Communications
Rafael Boloix-Tortosa (Universidad de Sevilla, Spain); F. Javier Payan-Somet (Departamento de Teoría de la Señal y Comunicaciones. Universidad de Sevilla, Spain); Juan José Murillo-Fuentes (Universidad de Sevilla, Spain)
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A search-and-revisit procedure for early target detection with agile-beam radars
Emanuele Grossi (University of Cassino and Southern Lazio & Consorzio Nazionale Inter-universitario per le Telecomunicazioni (CNIT), Italy); Marco Lops (University of Cassino & CNIT - Consorzio Universitario Nazionale per le Telecomunicazioni, Italy); Luca Venturino (Università degli Studi di Cassino e del Lazio Meridionale & Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Italy)
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Scalar Estimation From Unreliable Binary Observations
Ryan M Corey (University of Illinois at Urbana-Champaign, USA); Andrew C. Singer (University of Illinois at Urbana Champaign, USA)
pp. 145-148

Energy Detection for Decision Fusion in Wireless Sensor Networks over Ricean-Mixture Fading
Pierluigi Salvo Rossi (Second University of Naples, Italy); Domenico Ciuonzo (Second University of Naples, Italy); Torbjorn Ekman (Norwegian University of Science and Technology, Norway); Kimmo Kansanen (Norwegian University of Science and Technology, Norway)
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Application of Krylov based methods in Calibration for Radio Astronomy
Ahmad Mouri Sardarabadi (Delft University of Technology, The Netherlands); Alle-Jan van der Veen (TUDelft, The Netherlands)
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Experimental Assessment of Eigenvalue-based Detection for Cognitive Radio
João Paulo Miranda (CPqD, Brazil); Boris Galkin (Trinity College, Ireland); Giuseppe Abreu (Jacobs University Bremen, Germany); Luiz DaSilva (Trinity College, Ireland)
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P2D: Multi-user communication

Robust Beamforming For Two-User MISO Broadcasting Channel with Delayed CSIT
Yi Luo (University of Edinburgh, United Kingdom); Huiqin Du (Jinan University, P.R. China); Tharmalingam Ratnarajah (The University of Edinburgh, United Kingdom)
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Power Minimization in the Multiple Stream MIMO Broadcast Channel with Imperfect CSI
José P González-Coma (University of A Coruña, Spain); Michael Joham (Technische Universität München, Germany); Paula M. Castro (University of A Coruña, Spain); Luis Castedo (University of A Coruña, Spain)
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Joint Beamforming and Transmit Design for the Non-Regenerative MIMO Broadcast Relay Channel
Jens Steinwandt (Ilmenau University of Technology, Germany); Sergiy A. Vorobyov (Aalto University & University of Alberta on leave, Finland); Martin Haardt (Ilmenau University of Technology, Germany)
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Analog Joint Source-Channel Coding for MIMO Multiple Access Channels
Óscar Fresno (University of A Coruña, Spain); José P González-Coma (University of A Coruña, Spain); Luis Castedo (University of A Coruña, Spain); Javier García-Frias (University of Delaware, USA)
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SINR Optimization in Wideband Full-Duplex MIMO Relays under Limited Dynamic Range
Emilio Antonio-Rodríguez (Aalto University, Finland); Roberto López-Valcarce (Universidad de Vigo, Spain); Taneli Riihonen (Aalto University School of Electrical Engineering, Finland); Stefan Werner (Aalto University, Finland); Risto Wichman (Aalto University School of Electrical Engineering, Finland)
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P3A: Applications of Array Processing

FPGA-based Real-Time Acoustic Camera using PDM MEMS Microphones with a Custom Demodulation Filter
Héctor Sánchez-Hevia (University of Alcalá, Spain); Roberto Gil-Pita (University of Alcalá, Spain); Manuel Rosa (University of Alcalá, Spain)
pp. 181-184

Ultrasonic Array Imaging for Immersion Non-Destructive Testing
Nasim Moallemi (University of Ontario Institute of Technology, Canada); Shahram Shahbazi Panahi (University of Ontario Institute of Technology, Canada)
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Localization and Array Shape Estimation Using Software Defined Radio Array Test Bed
Athanassios Manikas (Imperial College London, United Kingdom); Akinbiyi Akindoyin (Imperial College London, United Kingdom); Marc Willerton (Imperial College London, United Kingdom)
pp. 189-192

Accumulated Rainfall Estimation Using Maximum Attenuation of Microwave Radio Signal
Jonatan Ostrometzky (Tel Aviv University, Israel); Hagit Messer (Tel Aviv University, Israel)
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Localization Based on Signal Structure
Elad Tzoreff (Tel Aviv University, Israel); Ben Zion Bobrovsky (Tel Aviv University, Israel); Anthony J. Weiss (Tel Aviv University, Israel)
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P3B: Data-Driven Distributed Estimation and Tracking

Real-time Kernel-based Multiple Target Tracking for Robotic Beating Heart Surgery
Gerhard Kurz (Karlsruhe Institute of Technology (KIT), Germany); Marcus Baum (University of Connecticut, USA); Uwe D Hanebeck (Intelligent Sensor-Actuator Systems Laboratory & Karlsruhe Institute of Technology (KIT), Germany)
pp. 201-204

Joint Sensors-Sources Association and Tracking
Guohua Ren (University of Texas at Arlington, USA); Ioannis Schizas (University of Texas at Arlington, USA); Vasileios Maroulas (University of Tennessee at Knoxville, USA)
pp. 205-208

MMOSPA-based Direction-of-Arrival Estimation for Planar Antenna Arrays
Marcus Baum (University of Connecticut, USA); Peter Willett (University of Connecticut, USA); Uwe D Hanebeck (Intelligent Sensor-Actuator Systems Laboratory & Karlsruhe Institute of Technology (KIT), Germany)
pp. 209-212

Scalar-gain Distributed Estimators for Hermitian Systems
Usman Khan (Tufts University, USA)
pp. 213-216
**Distributed Ensemble Kalman Filtering**
Arslan Shahid (McGill University, Canada); Deniz Üstebay (McGill University, Canada); Mark Coates (McGill University, Canada)
pp. 217-220

**Tracking Simplified Shapes Using a Stochastic Boundary**
Antonio Zea (Karlsruhe Institute of Technology, Germany); Florian Faion (Karlsruhe Institute of Technology (KIT) & Institute for Anthropomatics, Germany); Marcus Baum (University of Connecticut, USA); Uwe D Hanebeck (Intelligent Sensor-Actuator Systems Laboratory & Karlsruhe Institute of Technology (KIT), Germany)
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**P3C: Sensor Networks**

**Cooperative mesh networks with EGC detectors**
Petar M. Djurić (Stony Brook University, USA); Ángel Bravo-Santos (Universidad Carlos III de Madrid, Spain)
pp. 225-228

**Envelope Only TDOA Estimation for Sensor Network Self Calibration**
Dan Ohev Zion (Tel Aviv University, Israel); Hagit Messer (Tel-Aviv University, Israel)
pp. 229-232

**Strategies for principal component analysis in wireless sensor networks**
Nisrine Ghadban (Université de Technologie de Troyes, France); Paul Honeine (Université de Technologie de Troyes, France); Clovis Francis (Lebanese university, Lebanon); Farah Mourad-Chehade (Université de Technologie de Troyes, France); Joumana Farah (Holy-Spirit University of Kaslik, Lebanon)
pp. 233-236

**Ridge regression and Kalman filtering for target tracking in wireless sensor networks**
Sandy Mahfouz (Université de Technologie de Troyes, France); Farah Mourad-Chehade (Université de Technologie de Troyes, France); Paul Honeine (Université de Technologie de Troyes, France); Joumana Farah (Holy-Spirit University of Kaslik, Lebanon); Hichem Snoussi (University of Technology of Troyes, France)
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**On the uniform asymptotic convergence of a distributed particle filter**
Joaquin Míguez (Universidad Carlos III de Madrid, Spain)
pp. 241-244

**Detection in Analog Sensor Networks with a Large Scale Antenna Fusion Center**
Feng Jiang (University of California, Irvine, USA); Jie Chen (University of California, Irvine, USA); Lee Swindlehurst (University of California at Irvine, USA)
pp. 245-248

**P3D: Wireless Communications**

**Single-carrier time-interleaved space-time code for frequency-selective fading channels**
Benjamin Ng (Macao Polytechnic Institute, Macao); Chan-Tong Lam (Macao Polytechnic Institute, Macao)
pp. 249-252

**Bandwidth Expansion Analog Joint Source-Channel Coding with Channel Inversion and Multiple Receive Antennas**
Eduardo Hodgson (Federal University of Technology - Paraná (UTFPR), Brazil); Glauber Brante (Federal University of Technology - Paraná (UTFPR), Brazil); Richard Demo Souza (Federal University of Technology - Paraná (UTFPR), Brazil); Javier Garcia-Frias (University of Delaware, USA)
pp. 253-256
Achieving Positive Rate With Undetectable Communication Over MIMO Rayleigh Channels
Seonwoo Lee (Georgia Institute of Technology, USA); Robert John Baxley (Georgia Tech Research Institute, USA); Joseph McMahon (US-DoD, USA); Scott R. Frazier (US, USA)
pp. 257-260

Enhancing Physical Layer Security in Untrusted Relay Networks With Artificial Noise: A Symbol Error Rate Based Approach
Ying Liu (Technische Universität Darmstadt, Germany); Liang Li (Technische Universität Darmstadt, Germany); Marius Pesavento (Technische Universität Darmstadt, Germany)
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Massive MIMO meets Decision Fusion: Decode-and-Fuse vs. Decode-then-Fuse
Domenico Ciuonzo (Second University of Naples, Italy); Pierluigi Salvo Rossi (Second University of Naples, Italy); Subhrakanti Dey (Uppsala University, Sweden)
pp. 265-268

Antenna competition to boost Active Interference Cancellation in cognitive MIMO-OFDM
Jorge F. Schmidt (University of Vigo, Spain); Roberto López-Valcarce (Universidad de Vigo, Spain)
pp. 269-272

Plenary 3: Label-Free Estimation and Tracking -- Peter Willett (University of Connecticut, USA) -- Room Victoria

Multi-object estimation poses three questions: How many objects are in the scene? Where are there objects? And: Which object is which? Let's ignore - at least for now - the first, which is admittedly very important but here is not germane.

To estimate the location of (say) two objects from prior information and measurements is, for those of you who like to think in these terms, an optimization. The familiar metric is mean square error, and to minimize it answers both the second and third questions. But suppose that we are interested only in the second question. We can recognize this a relaxation of a constraint in our optimization; can the best metric improve?

In this talk it is shown that it can, and the result is (unfortunately) called MMOSPA. We find a rich area of label-free estimation, both static and dynamic. Versions of the trackers are shown to beat coalescence problems for closely spaced targets. And for those of you who like labels, it is shown that labeling can be re-inserted to the estimates, but in a way that is perhaps more honest than for labeled ones, as a posterior label probability.

P4A: Massive MIMO

Efficient Linear Precoding for Massive MIMO Systems using Truncated Polynomial Expansion
Axel Müller (Supélec & Intel, France); Abla Kammoun (Supelec, France); Emil Björnson (Linköping University, Sweden); Mériouane Debbah (Supelec, France)
pp. 273-276

Subspace Precoding with Limited Feedback for the Massive MIMO Interference Channel
Samer Bazzi (DoCoMo Communications Laboratories Europe GmbH & Technical University of Munich, Germany); Guido K E Dietl (University of Applied Sciences Landshut & DOCOMO Euro-Labs, Germany); Wolfgang Utschick (Technische Universität München, Germany)
pp. 277-280

Antenna Array Configurations for Massive MIMO Outdoor Base Stations
Xavier Artiga (Centre tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Julien Perruisseau-Carrier (Ecole Polytechnique Fédérale de Lausanne & EPFL, Switzerland); Ana Pérez-Neira (Centre Tecnologic de Telecomunicacions de Catalunya Castelldefels, Spain)
pp. 281-284

DCT and VQ based Limited Feedback in Spatially-Correlated Massive MIMO Systems
Pan Cao (Dresden University of Technology, Germany); Eduard Jorswieck (TU Dresden, Germany)
pp. 285-288

Massive MIMO for Interference Management in Heterogeneous Networks
Johannes Dommel (Fraunhofer Heinrich Hertz Institute, Germany)
pp. 289-292
On the Amount of Training in Coordinated Massive MIMO Systems
David Neumann (Technische Universität München, Germany); Andreas Gründinger (Technische Universität München, Germany); Michael Joham (Technische Universität München, Germany); Wolfgang Utschick (Technische Universität München, Germany)
pp. 293-296

P4B: Space-time Adaptive Processing

Wideband Waveform Design for Clutter Suppression
Marie Ström (Chalmers University of Technology, Sweden); Ashkan Panahi (Chalmers University of Technology, Sweden); Mats Viberg (Chalmers University of Technology, Sweden); Kent Falk (Saab Electronic Defence Systems, Sweden)
pp. 297-300

CFAR property and robustness of the Low Rank Adaptive Normalized Matched Filters detectors in low rank Compound Gaussian context
Arnaud Breloy (SATIE - ENS Cachan & SONDRA - Supelec, France); Guillaume Ginolhac (Université de Savoie & LISTIC, France); Frederic Pascal (Supélec, France); Philippe Forster (GEA, Université Paris X, France)
pp. 301-304

A Three-Dimensional Displaced Phase Center Antenna Condition for Clutter Cancellation
Svante Björklund (FOI, Swedish Defence Research Agency, Sweden); Mats Pettersson (Blekinge Institute of Technology, Sweden)
pp. 305-308

P4C: Experimental Evaluation in Wireless Communications

Conditional variance LMMSE estimator for a GARCH process clutter model
Juan Pascual (Universidad Nacional de La Plata, Argentina); Nicolas von Ellenrieder (National University of La Plata, Argentina); Carlos H Muravchik (Universidad Nacional de La Plata, Argentina)
pp. 309-312

Mismatch Loss Constrained Instrumental Variable Filtering for GSM Passive Bistatic Radar
Florian Bahlke (Technische Universität Darmstadt, Germany); Reda Zemmari (Fraunhofer FKIE, Germany); Ulrich R.O. Nickel (Fraunhofer FKIE, Germany); Marius Pesavento (Technische Universität Darmstadt, Germany)
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Correlated UE Impairments in ZF MU-MIMO Transmissions
Martin Klaus Müller (Vienna University of Technology, Austria); Michael Meidlinger (Vienna University of Technology, Austria); Markus Rupp (Vienna University of Technology, Austria)
pp. 317-320

Experimental Testbed for 5G Cognitive Radio Access in 4G LTE Cellular Systems
Martin Danneberg (Technische Universität Dresden, Germany); Rohit Datta (TU Dresden, Germany); Andreas Festag (TU Dresden, Germany); Gerhard Fettweis (Technische Universität Dresden, Germany)
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Experimental Analysis of Network-Aided Interference-Aware Receiver for LTE MU-MIMO
Florian Kaltenberger (Eurecom, France); Sebastian Wagner (Eurecom, France)
pp. 325-328

Measurement-Based Characterization of Residual Self-Interference on a Full-Duplex MIMO Testbed
Konstantinos Alexandris (Technical University of Crete, Greece); Alexios Balatsoukas-Stimming (EPFL, Switzerland); Andreas Burg (EPFL, Switzerland)
pp. 329-332

How to Implement Doubly-Stochastic Matrices for Consensus-Based Distributed Algorithms
Sergio Valcarcel Macua (Universidad Politecnica de Madrid (UPM), Spain); Carlos Moreno Leon (Universidad Politecnica de Madrid (UPM), Spain); Jhoan Samuel Romero (Universidad Politecnica
de Madrid (UPM), Colombia; Silvana Silva Pereira (Universitat Politècnica de Catalunya - Barcelona Tech, Spain); Javier Zazo (Universidad Politécnica de Madrid, Spain); Alba Pagès-Zamora (Technical University of Catalonia & UPC, Spain); Roberto López-Valcarce (Universidad de Vigo, Spain); Santiago Zazo (Universidad Politecnica Madrid, Spain)

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Energy Profiling of FPGA-based PHY-layer Building Blocks Encountered in Modern Wireless Communication Systems
Nikolaos Bartzoudis (CTTC, Spain); Oriol Font-Bach (Centre Tecnològic de Telecomunicacions de Catalunya, Spain); Miquel Payaró (CTTC, Spain); Antonio Pascual-Iserte (Universitat Politècnica de Catalunya, Spain); Javier Rubio (Universitat Politècnica de Catalunya, Spain); Juan José García Fernández (Universidad Carlos III de Madrid, Spain); Ana García Armada (Universidad Carlos III de Madrid, Spain)

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Experimental Validation of ICI-Aware OFDM Receivers under Time-Varying Conditions
José Rodríguez-Piñeiro (University of A Coruña, Spain); Pedro Suárez-Casal (University of A Coruña, Spain); José A. García-Naya (University of A Coruña, Spain); Luis Castedo (University of A Coruña, Spain); Cesar Rodríguez (Universidad Politécnica de Madrid, Spain); José I. Alonso (Universidad Politécnica de Madrid, Spain)

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Quantization-based Complexity Reduction for Range-dependent Modified Gilbert Model
Veronika Shivaldova (Vienna University of Technology, Austria); Christoph F Mecklenbräuker (Vienna University of Technology, Austria)

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Experimental Evaluation of a Cooperative Kernel-Based Approach for Robust Spectrum Sensing
Julio Manco-Vásquez (University of Cantabria, Spain); Steven Van Vaerenbergh (University of Cantabria, Spain); Javier Vía (University of Cantabria, Spain); Ignacio Santamaría (University of Cantabria, Spain)

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Measuring the Impact of Outdated Channel State Information in Interference Alignment Techniques
Gerald Artner (Vienna University of Technology, Austria); Martin Mayer (Vienna University of Technology, Austria); Maxime Guillaud (Vienna University of Technology, Austria); Markus Rupp (Vienna University of Technology, Austria)

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Measuring the performance of a distributed interference management scheme in a LTE-based HetNet deployment
Oriol Font-Bach (Centre Tecnològic de Telecomunicacions de Catalunya, Spain); Nikolaos Bartzoudis (CTTC, Spain); Miquel Payaró (CTTC, Spain); Antonio Pascual-Iserte (Universitat Politècnica de Catalunya, Spain)

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Measurement and Modelling of Interference Alignment Impairments
Martin Mayer (Vienna University of Technology, Austria); Maxime Guillaud (Vienna University of Technology, Austria); Gerald Artner (Vienna University of Technology, Austria); Markus Rupp (Vienna University of Technology, Austria)

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Lunch Time -- Room Novo

Keynote 2: Opportunities for International Research Support through the US Office of Naval Research-Global (ONRG) -- Leonard Ferrari (ONRG) -- Room Victoria

Plenary 4: Towards 5G -- Angel Lozano (Universitat Pompeu Fabra, Spain) -- Room Victoria

With the 4th generation of wireless systems still being rolled out, challenges keep mounting: traffic demand doubles yearly and user needs and expectations keep growing at a very fast pace. Against this backdrop, the debate is open as to what shall come next in the evolution of wireless systems—what is loosely referred to as the 5th generation—and this debate stage can be a very fertile time for ideas to take root. This talk intends to contribute to the ongoing discussion, not from the perspective of a manufacturer, operator, or user, but from the perspective of a researcher. With that goal in mind, the presentation is organized around five reflections touching on aspects that relate to 5G but that also have broader conceptual implications in research.

Santiago de Compostela Tour -- Departure from Hotel Finisterre (SAM venue)

Free with registration

The Santiago de Compostela Tour will depart from the conference venue (Hotel Finisterre) and will arrive at the venue of the Gala Dinner (Pazo de Vilaboa).

Gala Dinner -- Pazo de Vilaboa

Free with registration

The Santiago de Compostela tour will finish in the venue of the Gala Dinner. There will be also buses from the conference venue (Hotel Finisterre) to the venue of the Gala Dinner.

Plenary 5: Distributed Optimization over Network -- Wotao Yin (University of California Los Angeles, USA) -- Room Victoria

There has been considerable recent interest in solving optimization problems with data stored over a network. For these problems we need techniques that process data locally yet converge rapidly to an (approximate) solution across the entire network. This talk reviews primarily first-order algorithms for large-scale optimization of the distributed or decentralized types. We emphasize on recognizing separable structures in a large set of signal processing and statistical learning problems and demonstrate that, through skillful uses of gradient, proximal, duality, and splitting techniques, massively parallel algorithms can be developed. Numerical results are presented to demonstrate the scalability of the parallel codes on typical unix clusters and Amazon EC2.

P5A: Sparsity in Array Processing: Methods and Performance

Performance Analysis for Sparse Based Biased Estimator: Application to Line Spectra Analysis
Stephanie Bernhardt (Universite Paris Sud - L2S, France); Rémy Boyer (CNRS, Université Paris-Sud (UPS), Supelec, France); Bo Zhang (UPS-L2S, France); Sylvie Marcos (Laboratoire des Signaux et Systems, Supélec, CNRS UMR, France); Pascal Larzabal (ENS-Cachan, PARIS, France)
pp. 365-368

Near-Field Source Localization: Sparse Recovery Techniques and Grid Matching
Keke Hu (Delft University of Technology, P.R. China); Sundeep Prabhakar Chepuri (Delft University of Technology, The Netherlands); Geert Leus (Delft University of Technology, The Netherlands)
pp. 369-372
**DOA Estimation in Partially Correlated Noise Using Low-Rank/Sparse Matrix Decomposition**
Mohammadreza Malek-Mohammadi (Sharif University of Technology, Iran); Magnus Jansson (KTH Royal Institute of Technology, Sweden); Arash Owrang (KTH Royal Institute of Technology, Sweden); Ali Koochakzadeh (Sharif University of Technology, Iran); Massoud Babaie-Zadeh (Sharif University of Technology, Iran)
pp. 373-376

**Directions of Arrival Estimation by Learning Sparse Dictionaries for Sparse Spatial Spectra**
Cheng-Yu Hung (University of Minnesota, USA); Jimeng Zheng (University of Minnesota, USA); Mostafa Kaveh (University of Minnesota, USA)
pp. 377-380

**Basis Pursuit over Continuum Applied to Range-Doppler Estimation Problem**
Ashkan Panahi (Chalmers University of Technology, Sweden); Marie Ström (Chalmers University of Technology, Sweden); Mats Viberg (Chalmers University of Technology, Sweden)
pp. 381-384

**A Sparse Bayesian Learning Algorithm With Dictionary Parameter Estimation**
Thomas L Hansen (Aalborg University, Denmark); Mihai Alin Badiu (Aalborg University, Denmark); Bernard Henri Fleury (Aalborg University, Denmark); Bhaskar Rao (University of California, San Diego, USA)
pp. 385-388

**Distributed image reconstruction for very large arrays in radio astronomy**
André Ferrari (Université de Nice Sophia-Antipolis, France); David Mary (Université de Nice Sophia-Antipolis, France); Rémi Flamary (Université de Nice Sophia-Antipolis & Laboratoire Lagrange, UMR CNRS, France); Cédric Richard (Université de Nice Sophia-Antipolis, France)
pp. 389-392

**Continuous Sparse Recovery for Direction of Arrival Estimation with Co-prime Arrays**
Zhao Tan (Washington University in St. Louis, USA); Yonina C. Eldar (Technion-Israel Institute of Technology, Israel); Arye Nehorai (Washington University in St. Louis, USA)
pp. 393-396

**P5B: Compressed Sensing and Sparsity-Based Signal Processing**

**Sampling Size in Monte Carlo Bayesian Compressive Sensing**
Ioannis Kyriakides (University of Nicosia, Cyprus); Radmila Pribic (Thales Nederland Delft, The Netherlands)
pp. 397-400

**Signature-Assisted Rendezvous in OFDM-Based Cognitive Networks Using sub-Nyquist Samples**
Seyed Alireza Razavi (Tampere University of Technology, Finland); Mikko Valkama (Tampere University of Technology, Finland); Danijela Cabric (University of California Los Angeles, USA)
pp. 401-404

**An Improved RIP-Based Performance Guarantee for Sparse Signal Reconstruction via Subspace Pursuit**
Ling-Hua Chang (National Chiao Tung University, Taiwan); Jwo-Yuh Wu (National Chiao Tung University, Taiwan)
pp. 405-408

**Sparse Delay-Doppler Image Reconstruction under Off-Grid Problem**
Oguzhan Teke (Bilkent University, Turkey); Ali C Gurbuz (TOBB University of Economics and Technology, Turkey); Orhan Arikan (Bilkent University, Turkey)
pp. 409-412

**Direction of Arrival Estimation of Wideband Signals using sub-Nyquist Samples**
Amal Chaturvedi (University of Cincinnati, USA); Howard Fan (University of Cincinnati, USA)
pp. 413-416
Truncated Nuclear Norm Minimization for Tensor Completion
Long-ting Huang (City University of Hong Kong, Hong Kong); Hing Cheung So (City University of Hong Kong, Hong Kong); Yuan Chen (City University of Hong Kong, Hong Kong); Wen-Qin Wang (University of Electronic Science and Technology of China, P.R. China)
pp. 417-420

Tensor-based Power Spectra Separation and Emitter Localization for Cognitive Radio
Xiao Fu (The Chinese University of Hong Kong, Hong Kong); Nikolaos D Sidiropoulos (University of Minnesota, USA); Wing-Kin Ma (The Chinese University of Hong Kong, Hong Kong)
pp. 421-424

Deterministic Blind Identification in Antenna Array Processing
Souleymen Sahnoun (GIPSA-Lab & CNRS UMR5216, France); Pierre Comon (CNRS UMR5216, France)
pp. 425-428

Direction of Arrival Estimation Using Nested Vector-Sensor Arrays Via Tensor Modeling
Keyong Han (Washington University in St. Louis, USA); Arye Nehorai (Washington University in St. Louis, USA)
pp. 429-432

Imputation of Streaming Low-Rank Tensor Data
Morteza Mardani (University of Minnesota, USA); Gonzalo Mateos (University of Minnesota, USA); Georgios B. Giannakis (University of Minnesota, USA)
pp. 433-436

Fast multilinear Singular Value Decomposition for higher-order Hankel tensors
Maxime Boizard (LSS, Supelec, France); Rémy Boyer (CNRS, Université Paris-Sud (UPS), Supelec, France); Favier Gérard (Université de Nice Sophia-Antipolis, France); Pascal Larzabal (ENS-Cachan, PARIS, France)
pp. 437-440

Multidimensional ESPRIT: A Coupled Canonical Polyadic Decomposition Approach
Mikael Sorensen (Leuven, Belgium); Lieven De Lathauwer (K.U.Leuven, Belgium)
pp. 441-444

Tensor-Based Approach to Channel Estimation in Amplify-and-Forward MIMO Relaying Systems
Ítalo V Cavalcante (Federal University of Ceará, Brazil); André Almeida (Federal University of Ceará & Wireless Telecom Research Group - GTEL, Brazil); Martin Haardt (Ilmenau University of Technology, Germany)
pp. 445-448

CP decomposition of semi-nonnegative semi-symmetric tensors based on QR matrix factorization
Lu Wang (Université de Rennes 1 & Laboratoire Traitement du Signal et de l’Image, France); Laurent Albera (Université de Rennes1 & Inserm, France); Amar Kachenoura (University of Rennes1-LTSI & Inserm - UMR 1099, France); Hua Zhong Shu (Southeast University, P.R. China); Lotfi Senahdji (Université de Rennes 1 & Inserm, France)
pp. 449-452

Symmetric Tensor Decomposition of Narrowband Single Channel Signals
Samaneh Kouchaki (University of Surrey, United Kingdom); Saeid Sanei (University of Surrey, United Kingdom)
pp. 453-456
Lunch Time -- Room Novo

Plenary 6: Array Processing Underground -- James H. McClellan (Georgia Tech, USA) -- Room Victoria

This talk will describe aspects of sensor array processing that have been successful in areas such as geophysics and ground penetrating radar. Some examples are land mine detection, sonic well-logging and micro-seismic monitoring. These applications employ wideband sensors and benefit from array processing when a complete frequency-wavenumber domain analysis of the space-time wavefield is performed. Furthermore, new systems increasingly use three-axis sensors where vector signals are processed to extract parameters such as polarization. On the signal processing side, theoretical advances have kept pace with the ever-expanding data sets produced by new sensors. In particular, new sparsity-aware methods provide powerful algorithms for locating isolated targets as well as extracting other attributes such as orientation.

P6A: Dealing with Non-Standard Conditions in Array Processing and Spectral Analysis

Naive, Robust or Fully-Adaptive: An Estimation Problem for CES Distributions
Maria S. Greco (University of Pisa, Italy); Stefano Fortunati (University of Pisa, Italy); Fulvio Gini (University of Pisa, Italy)
pp. 457-460

CRLB under K-distributed observation with parameterized mean
Mohammed Nabil El Korso (Paris 10 University & LEME-EA 4416, France); Alexandre Renaux (Universite Paris 11, France); Philippe Forster (GEA, Université Paris X, France)
pp. 461-464

New Insights into Second and Fourth-Order Direction Finding for NonCircular Sources
Anne Ferréol (Thales Communications, France); Pascal Chevalier (Thales Communication, France)
pp. 465-468

Asymptotic analysis of Beamspace-MUSIC in the context of large arrays
Pascal Vallet (Institut Polytechnique de Bordeaux & IMS, France); Xavier Mestre (CTTC, Spain); Philippe Loubaton (Université de Marne La Vallée, France); Romain Couillet (Supélec, France)
pp. 469-472

Robust parametric detection in non homogeneous clutter
Boukaba Toufik (Ecole Nationale Polytechnique Algeria, Algeria); Abdelhak M Zoubir (Darmstadt University of Technology, Germany); Berkani Daoud (Ecole Nationale Polytechnique Algeria, Algeria)
pp. 473-476

Performance Analysis of Time frequency Subspace based Direction Finding algorithms in presence of perturbed array manifold
Adel Belouchrani (Ecole Nationale Polytechnique, Algiers, Algeria); Mohamed Khodja (Ecole Nationale Polytechnique, Algeria)
pp. 477-480

P6B: Compressive Sensing for Urban Radar

CS Based Specular Multipath Exploitation in TWRI under Wall Position Uncertainties
Michael Leisgnering (Technische Universität Darmstadt, Germany); Fauzia Ahmad (Villanova University, USA); Moeness G. Amin (Villanova University, USA); Abdelhak M Zoubir (Darmstadt University of Technology, Germany)
pp. 481-484

Compressive Noise Radar for Urban Sensing
Mahesh C Shastry (3M & Penn State University, USA); Ram M Narayanan (The Pennsylvania State University, USA); Muralidhar Rangaswamy (AFRL, USA)
pp. 485-488
Multi-Stage Compressed Sensing and Wall Clutter Mitigation for Through-the-Wall Radar Image Formation
Fok Hing Chi Tivive (University of Wollongong, Australia); Abdesselam Bouzerdoum (University of Wollongong, Australia); Van Ha Tang (University of Wollongong & School of Electrical, Computer and Telecommunications Engineering, Australia)
pp. 489-492

Time Domain CS Kernel Design for Mitigation of Wall Reflections in Urban Radar
Yujie Gu (University of Oklahoma, USA); Nathan A Goodman (University of Oklahoma, USA)
pp. 493-496

RIP Analysis of the Measurement Matrix for Compressive Sensing-Based MIMO Radars
Bo Li (Rutgers, The State University of New Jersey, USA); Athina Petropulu (Rutgers, The State University of New Jersey, USA)
pp. 497-500

P6C: MIMO Radar

Statistical Angular Resolution Limit for Array Radar with Ultrawideband Stochastic Signals
Xiaoli Zhou (National University of Defense Technology, P.R. China); Hong-Qiang Wang (National University of Defense Technology, P.R. China); Yongqiang Cheng (National University of Defense Technology, P.R. China); Yu-Liang Qin (National University of Defense Technology, P.R. China); Hao-wen Chen (National University of Defense Technology, P.R. China); Bin Sun (National University of Defense Technology, P.R. China)
pp. 501-504

Robust DOA Estimation in MIMO Radar with Transmitting Uncertainties
Vyacheslav Kashin (Nizhny Novgorod State Technical University, Russia); Evgeny Mavrychev (Nizhny Novgorod State Technical University, Russia)
pp. 505-508

Target Localization Sensitivity Using MIMO Radar in the Presence of Antenna Position Uncertainties
Bin Sun (National University of Defense Technology, P.R. China); Xufeng Zhang (School of Electronic Science and Engineering NUDT, P.R. China); Dongping Liao (National University of Defense Technology, P.R. China); Xiang Li (National University of Defense Technology, P.R. China)
pp. 509-512

Sparse MIMO Architectures For Through-The-Wall Imaging
Li Li (Duke University, USA); Petros T Boufounos (Mitsubishi Electric Research Laboratories & Rice University, USA); Dehong Liu (Mitsubishi Electric Research Laboratories, USA); Hassan Mansour (Mitsubishi Electric Research Laboratories, USA); Zafer Sahinoglu (Mitsubishi Electric Research Laboratories, USA)
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P6D: Co-Prime Sampling and Arrays

Soft-Thresholding for Spectrum Sensing with Coprime Samplers
Piya Pal (University of Maryland, College Park, USA); P. p. Vaidyanathan (Cal Tech., USA)
pp. 517-520

Distributed Source Processing with Linear Nested Arrays
Keyong Han (Washington University in St. Louis, USA); Arye Nehorai (Washington University in St. Louis, USA)
pp. 521-524

Exploiting Array Motion for Augmentation of Co-prime Arrays
Juan Ramirez, Jr. (Duke University, USA); Jonathan Odom (Duke University, USA); Jeffrey Krolik (Duke University, USA)
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Generalized coprime array configurations
Si Qin (Villanova University, USA); Yimin D. Zhang (Villanova University, USA); Moeness G. Amin (Villanova University, USA)
pp. 529-532

Coprime Conditions for Fourier Sampling for Sparse Recovery
Hema Achanta (University of Iowa, USA); Sampurna Biswas (University of Iowa, USA); Soura Dasgupta (The University of Iowa, USA); Mathews Jacob (University of Iowa, USA); Bhanumati Dasgupta (University of Iowa, USA); Raghuraman Mudumbai (University of Iowa, USA)
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