
Pisa, Italy
17-19 June 2015
Sparse sensing in synthetic aperture imaging systems

An Augmented Lagrangian Method for Autofocused Compressed SAR Imaging
Alper Gungor (Middle East Technical University & Aselsan, Turkey), Müjdat Çetin (Sabancı University, Turkey), H. Emre Güven (ASELSAN Inc., Turkey) .......................... 1

Gradient Algorithm Based ISAR Image Reconstruction From the Incomplete Dataset
Miloš Daković (University of Montenegro, Montenegro), Ljubisa Stankovic (University of Montenegro, Montenegro), Srdjan Stanković (Faculty of Electrical Engineering, University of Montenegro, Montenegro) .......................................................... 6

Multi Scatterer Detection within Tomographic SAR using a Compressive Sensing Approach
Matthias Weiß (Fraunhofer FHR, Germany), Gianfranco Fornaro (CNR-IREA, Italy), Diego Reale (CNR-IREA, Italy) ........................................................................ 11

Exploiting Group Sparsity in SAR Tomography
Xiao Xiang Zhu (German Aerospace Center (DLR), Germany), Nan Ge (German Aerospace Center (DLR), Germany), Muhammad Shahzad (Technische Universität München (TUM), Germany) ................................................................. 16

Signal recovery and detection I

Fiber Sensing Using Wavelength-Swept Lasers: A Compressed Sampling Approach
Christian Weiss (Darmstadt University of Technology, Germany), Abdelhak M Zoubir (Darmstadt University of Technology, Germany) ........................................... 21

Multichannel sparse recovery of complex-valued signals using Huber’s criterion
Esa Ollila (Aalto University, Finland) ........................................................................... 26

Extensions of sub-Nyquist Radar: Reduced Time-on-Target and Cognitive Radar
Deborah Cohen (Technion - Israel Institute of Technology, Israel), Alex Dikopoltsev (Technion - Israel Institute of Technology, Israel), Yonina C. Eldar (Technion-Israel Institute of Technology, Israel) ......................................................... 31

A Sub-Nyquist Radar System Based on Optimized Sensing Matrices Derived via Sparse Rulers
Hannes Stahl (Airbus Defence & Space, Germany), Jan Mietzner (Airbus Defence & Space, Germany), Robert F.H. Fischer (Ulm University, Germany) ................. 36

Wall Clutter Mitigation and Target Detection Using Discrete Prolate Spheroidal Sequences
Zhihui Zhu (Colorado School of Mines, USA), Michael Wakin (Colorado School of Mines, USA) .............................................................................................................. 41
Sparse sensing application in radar I

Morphological Component Analysis in SAR Images to Improve the Generalization of ATR Systems
Simon Wagner (Fraunhofer FHR & University of Siegen, Germany) ........................................ 46

Bayesian sparse estimation of a radar scene with weak and strong targets
Marie Lasserre (University of Toulouse / ISAE, France), Stéphanie Bidon (ISAE, France), Olivier Besson (ISAE, France), François Le Chevalier (Thales Air Systems & TU Delft, France) ........................................................................................................... 51

Sparse Recovery in MIMO Radar -- Dependence on the Support Structure
Dominik Dorsch (RWTH Aachen, Germany), Holger Rauhut (RWTH Aachen, Germany) ............................................................................................................................................................................................. 56

CFAR Analysis of the Multicoset-Thresholding Detector: Application to the Low Complexity Sub-Nyquist Radar Electronic Surveillance
Mehrdad Yaghoobi (University of Edinburgh, United Kingdom), Bernard Mulgrew (Institute for Digital Communications, The University of Edinburgh, United Kingdom), Andy Stove (Stove Specialties & University of Birmingham, United Kingdom), Mike Davies (University of Edinburgh, United Kingdom) .......................... 61

GMTI on short sequences of pulses with compressed sensing
Ludger Prünte (Fraunhofer-Institut für Hochfrequenzphysik und Radartechnik FHR, Germany) ............................................................................................................................................. 66

Compressive sensing for in depth focusing in 3D Automotive Imaging Radar
Gianfranco Matuozzo (Università degli Studi di Napoli Parthenope, Italy), Fabio Baselice (Università degli Studi di Napoli Parthenope, Italy), Giampaolo Ferraioli (Università di Napoli Parthenope, Italy), Gilda Schirinzi (Università di Napoli Parthenope, Italy), Vito Pascazio (Università di Napoli Parthenope, Italy) ................................................................. 71

Compressive acquisition techniques

Randomized Approximations of Operators and their Spectral Decomposition for Diffusion Based Embeddings of Heterogeneous Data
Wojciech Czaja (University of Maryland, USA), Ariel Hafftka (University of Maryland, College Park, USA), Benjamin Manning (University of Maryland, USA), Daniel Weinberg (University of Maryland, College Park, USA) ............................................................... 75

Ambiguity Function Surface When Using Prior Information in Compressive Sensing and Processing
Ioannis Kyriakides (University of Nicosia, Cyprus) .......................................................................... 80

Ultrawideband RF Compressed Sensing Using Spectrally-Encoded Ultrafast Laser Pulses
Bryan Bosworth (Johns Hopkins University, USA), Jasper Stroud (Johns Hopkins University, USA), Dung Tran (Johns Hopkins University, USA), Trac D. Tran (Johns Hopkins University, USA), Sang (Peter) Chin (Johns Hopkins University, USA), Mark Foster (Johns Hopkins University, USA) ........................................................................................................ 85

High-dynamic range compressive spectral imaging by adaptive filtering
Nelson Diaz (Universidad Industrial de Santander, Colombia), Hoover Rueda (University of Delaware, USA), Henry Arguello Fuentes (Universidad Industrial de Santander, Colombia) ........................................................................................................... 89
Signal recovery and detection II

Analysis of Sparsity Based Joint SAR Image Reconstruction and Autofocus Techniques
Sedat Camlica (Aselsan, Turkey), Ali Cafer Gurbuz (TOBB University of Economics and Technology, Turkey), Orhan Arikan (Bilkent University, Turkey), H. Emre Güven (ASELSAN Inc., Turkey) 99

Sparse DOA estimation with polynomial rooting
Angeliki Xenaki (Technical University of Denmark (DTU) & Scripps Institution of Oceanography, University of California San Diego, Denmark), Peter Gerstoft (University of California, San Diego, USA), Efren Fernandez-Grande (Technical University of Denmark (DTU), Denmark) 104

Photonic Compressive Sensing of GHz-band RF Signals
George Sefler (The Aerospace Corporation, USA), George Valley (The Aerospace Corporation, USA), Thomas Shaw (The Aerospace Corporation, USA) 109

Antenna-array Design in Compressive-sensing Radar Systems
Radmila Pribic (Thales Nederland BV Delft, The Netherlands), Lorenzo Cifola (Thales Nederland, The Netherlands) 114

Compressed Sensing based Jammer Detection Algorithm for Wide-band Cognitive Radio Networks
Muhammad Ozair Mughal (University of Genoa, Italy), Kresimir Dabcevic (University of Genoa, Italy), Lucio Marconcino (Università degli Studi di Genoa, Italy), Carlo S Regazzoni (University of Genoa, Italy) 119

Signal recovery and detection III

Density Evolution of Sparse Source Signals
Erich Zöchmann (Vienna University of Technology, Austria), Peter Gerstoft (University of California, San Diego, USA), Christoph F Mecklenbräuker (Vienna University of Technology, Austria) 124

Sparsity-Based Motion Detection Inside Enclosed Structures
Fauzia Ahmad (Villanova University, USA), Moeness G. Amin (Villanova University, USA), Giovanni Alli (IDS Ingegneria Dei Sistemi S.p.A., Italy), Gaetano Mollo (IDS Ingegneria Dei Sistemi S.p.A., Italy) 129

Improving Linear Inverse Scattering in Aspect-Limited Configurations: the Intra-Wall Imaging Case
Michele Ambrosanio (Università di Napoli Parthenope, Italy), Vito Pascazio (Università di Napoli Parthenope, Italy) 134

A Sparse Reduced-Rank Regression Approach for Hyperspectral Image Unmixing
Paris Giampouras (National Observatory of Athens, Greece), Athanasios A. Rontogiannis (National Observatory of Athens, Greece), Konstantinos Koutroumbas (National Observatory of Athens, Greece), Konstantinos E. Themelis (National Observatory of Athens, Greece) 139
Sparse sensing applications in radar II

**Structure and Rank Awareness for Error and Data Flow Reduction in Phase-Shift-Based ToF Imaging Systems Using Compressive Sensing**
Miguel Heredia Conde (Center for Sensorsystems (ZESS), University of Siegen, Germany), Klaus Hartmann (University of Siegen, Germany), Otmar Loffeld (Center for Sensorsystems (ZESS), University of Siegen, Germany) 144

**From weighted Least Squares Estimation to sparse CS Reconstruction**
Otmart Loffeld (Center for Sensorsystems (ZESS), University of Siegen, Germany), Thomas Espeter (University of Siegen, Germany), Miguel Heredia Conde (Center for Sensorsystems (ZESS), University of Siegen, Germany) 149

**Sparsifying Time-Frequency Distributions for Gravitational Wave Data Analysis**
Paolo Addesso (University of Salerno, Italy), Maurizio Longo (University of Salerno, Italy), Stefano Marano (University of Salerno, Italy), Vincenzo Matta (University of Salerno, Italy), Innocenzo Pinto (University of Sannio, Italy), Maria Principe (University of Sannio, Italy) 154

**Compressive Sensing for Background Subtraction Based on Error Correction Coding**
Narendra N (Tata Consultancy Services, India), Girish Chandra (Tata Consultancy Services, India), B. S. Adiga (Tata Consultancy Services, India) 159

**Blind calibration for radio interferometry using convex optimization**
Sanaz Kazemi (IBM Netherlands, The Netherlands), Paul Hurley (IBM Zurich Research Laboratory, Switzerland), Orhan Öcal (University of California, Berkeley, USA), Giovanni Cherubini (IBM Zurich Research Laboratory, Switzerland) 164

**Dynamic Underwater Sensor Network for Sparse Field Estimation**
Raffaele Grasso (CMRE, Italy), Paolo Braca (CMRE, Italy), Stefano Fortunati (University of Pisa, Italy), Fulvio Gini (University of Pisa, Italy), Maria S. Greco (University of Pisa, Italy) 169

---

**Sparse sensing applications in radar II**

**Extract before Detect, Coherent Extraction based on Gridless Compressed Sensing**
Guy Desodt (Thales Air Systems & Thales group, France), Claude Adnet (Thales Air Systems, France), Aurélie Martin (Thales Air Systems, France), Richard Castaing (Thales Air Systems, France) 174

**Velocity False Target Identification in Random Pulse Initial Phase Radar Based on Compressed Sensing**
Jinping Sui (National University of Defense Technology, P.R. China), Zhen Liu (National University of Defense Technology, P.R. China), Xizhang Wei (ISchool of Electronic Science and Engineering NUDT, P.R. China), Xiang Li (National University of Defense Technology, P.R. China), Peng Bo (National University of Defense Technology, P.R. China), Dongping Liao (National University of Defense Technology, P.R. China) 179

**Sinusoidal Frequency Modulation Sparse Recovery for Radar micro-Doppler Analysis**
Peng Bo (National University of Defense Technology, P.R. China), Zhen Liu (National University of Defense Technology, P.R. China), Xizhang Wei (ISchool of Electronic Science and Engineering NUDT, P.R. China), Xiang Li (National University of Defense Technology, P.R. China), Dongping Liao (National University of Defense Technology, P.R. China) 184
Compressive sensing in SAR, ISAR and Tomography

Testing Polarimetric SAR Tomography by Continuous Wave Radar and Compressed Sensing For Under soil Hidden Coherent Targets
Filippo Biondi (University of L’Aquila & Italian Ministry of Defence, Italy), Antonio Sarri (IDS - Ingegneria Dei Sistemi S.p.A, Italy), Luca Fiori (IDS Ingegneria dei Sistemi SpA, Italy), Kevin Dell’Omodarme (IDS, Italy) ........................................... 214

WASAR Imaging based on message passing with structured sparse constraint: approach and experiment
Chenglong Jiang (Institute of Electronics, Chinese Academy of Sciences, P.R. China), Yun Lin (Institute of Electronics, Chinese Academy of Sciences, P.R. China), Zhe Zhang (Institute of Electronics, Chinese Academy of Sciences, P.R. China), Bingchen Zhang (Institute of Electronics, Chinese Academy of Science, P.R. China), Wen Hong (National Key Laboratory of Microwave imaging Technology & Institute of Electronics, Chinese Academy of Sciences, P.R. China) ......................................................... 219

Compressive Support Detection in SAR Tomography
Alessandra Budillon (University of Naples Parthenope, Italy), Gilda Schirinzi (Università di Napoli Parthenope, Italy) ........................................................................ 224

Time-Slotted FMCW MIMO ISAR with Compressive Sensing Image Reconstruction
Alessio Bacci (CNIT & University of Pisa, Italy), Elisa Giusti (University of Pisa, Italy), Sonia Tomei (University of Pisa, Italy), Marco Martorella (University of Pisa, Italy), Fabrizio Berizzi (University of Pisa, Italy) ......................................................... 229
Compressive Sensing for RADARSAT-2 Tomography
David Kirkland (Defence Research and Development Canada, Canada) ......................................... 234

Low-rank Sparse Matrix Decomposition for Sparsity-driven SAR Image Reconstruction
Abdurrahim Soğanlı (Sabancı University, Turkey), Müjdat Çetin (Sabancı University, Turkey) ................................................................. 239

DoA estimation and array processing

Accurate Source Number Detection for Low-Cost Nested Array
Koichi Ichige (Yokohama National University, Japan), Yu Iwabuchi (Yokohama National University, Japan) .................................................................................. 244

Nested Array With Time-Delayers for Target Range and Angle Estimation
Wen-Qin Wang (University of Electronic Science and Technology of China, P.R. China), Cong Ling (Imperial College London, United Kingdom) ........................................ 249

Sparse Reconstruction Based Frequency Diverse Array Transmit Beampattern Synthesis
Hui Chen (University of Electronic Science and Technology of China, P.R. China), Huai-zong Shao (University of Electronic Science and Technology of China, P.R. China), Wen-Qin Wang (University of Electronic Science and Technology of China, P.R. China) .................................................................................................................. 253

Sparsity Based Space-Time Adaptive Processing Using Message Passing
Zeqiang Ma (Tsinghua University, Beijing, P.R. China), Yimin Liu (Tsinghua University, P.R. China), Xi Qin Wang (Tsinghua University, P.R. China) ........................................... 258

Compressed Time Difference of Arrival Based Emitter Localization
Johannes Schmitz (RWTH Aachen University, Germany), Dominik Dorsch (RWTH Aachen, Germany), Rudolf Mathar (RWTH Aachen University, Germany) .................................................. 263

DoA Estimation with Reflectarray According to Single Pixel Camera Principle
Sergii Skoblikov (TU Ilmenau, Germany), Mohamed Ibrahim (Technische Universität Ilmenau, Germany), Florian Roemer (Ilmenau University of Technology, Germany), Reiner S. Thomä (Ilmenau University of Technology, Germany), Giovanni Del Galdo (Fraunhofer Institute for Integrated Circuits IIS & Technische Universität Ilmenau, Germany) ........................................ 268

Direct Estimation of Time Difference of Arrival from Compressive Sensing Measurements
Y. t. Chan (Royal Military College of Canada, Canada), Francois Chan (Royal Military College, Canada), Sreraman Rajan (Defence Research and Development Canada-Ottawa, Canada), Bernard Haynes Lee (Royal Military College of Canada, Canada) .................................................................................................................. 273