

PROCEEDINGS OF SPIE

Algorithms for Synthetic Aperture Radar Imagery XVIII

**Edmund G. Zelnio
Frederick D. Garber**
Editors

**27–28 April 2011
Orlando, Florida, United States**

Sponsored and Published by
SPIE

Volume 8051

Proceedings of SPIE, 0277-786X, v. 8051

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Algorithms for Synthetic Aperture Radar Imagery XVIII*, edited by Edmund G. Zelnio, Frederick D. Garber, Proceedings of SPIE Vol. 8051 (SPIE, Bellingham, WA, 2011) Article CID Number.

ISSN 0277-786X
ISBN 9780819486257

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Copyright © 2011, Society of Photo-Optical Instrumentation Engineers

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/11/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE 
Digital Library

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

vii *Conference Committee*

SESSION 1 **ADVANCED SAR IMAGING I**

- 8051 02 **Fast synthetic aperture radar imaging with a streamlined 2D fractional Fourier transform** [8051-01]
M. Pepin, M. M. Hayat, The Univ. of New Mexico (United States)
- 8051 03 **A comparison of SAR imaging algorithms for high-squint angle trajectories** [8051-02]
M. S. Horvath, B. D. Rigling, Wright State Univ. (United States)
- 8051 04 **Extensions to polar formatting with spatially variant post-filtering** [8051-03]
W. L. Garber, R. W. Hawley, Matrix Research Inc. (United States)
- 8051 05 **A butterfly algorithm for synthetic aperture radar** [8051-04]
L. Demanet, Massachusetts Institute of Technology (United States); M. Ferrara, Matrix Research Inc. (United States); N. Maxwell, The Univ. of Houston (United States); J. Poulson, L. Ying, The Univ. of Texas at Austin (United States)
- 8051 06 **A study of multi-static ultrasonic tomography using propagation and back-propagation method** [8051-05]
C. Dong, Shanghai Univ. of Finance and Economics (China); Y. Jin, Univ. of Maryland Eastern Shore (United States); M. Ferrara, K. Priddy, Air Force Research Lab. (United States)
- 8051 07 **Aperture weighting technique for video synthetic aperture radar** [8051-06]
R. W. Hawley, W. L. Garber, Matrix Research Inc. (United States)
- 8051 09 **Filtered back projection inversion of turntable ISAR data** [8051-08]
J. X. Lopez, Z. Qiao, The Univ. of Texas-Pan American (United States)
- 8051 0A **An algorithm for wide aperture 3D SAR imaging with measured data** [8051-09]
F. Lee-Elkin, L. Potter, The Ohio State Univ. (United States)
- 8051 0C **Computationally efficient FBP-type direct segmentation of synthetic aperture radar images** [8051-10]
H. C. Yanik, Z. Li, B. Yazıcı, Rensselaer Polytechnic Institute (United States)

SESSION 2 **ADVANCED SAR IMAGING II**

- 8051 0D **Performance analysis of sparse 3D SAR imaging** [8051-12]
C. D. Austin, J. N. Ash, R. L. Moses, The Ohio State Univ. (United States)
- 8051 0E **Toeplitz embedding for fast iterative regularized imaging** [8051-13]
R. Ahmad, C. D. Austin, L. C. Potter, The Ohio State Univ. (United States)

- 8051 OF **Doppler synthetic aperture radar imaging** [8051-14]
L. Wang, Nanjing Univ. of Aeronautics and Astronautics (China); B. Yazıcı, Rensselaer Polytechnic Institute (United States)
- 8051 OH **Observations of clutter suppression in bistatic VHF/UHF-band synthetic-aperture radar** [8051-16]
L. M. H. Ulander, FOI (Sweden); R. Baqué, H. Cantalloube, P. Dreuillet, ONERA (France); B. Flood, P.-O. Fröling, A. Gustavsson, T. Jonsson, B. Larsson, D. Murdin, R. Ragnarsson, FOI (Sweden); O. Ruault du Plessis, ONERA (France); G. Stenström, FOI (Sweden)
- 8051 OI **Spatially variant interference suppression method based on superresolution algorithm for synthetic aperture radar** [8051-17]
K. Suwa, T. Wakayama, Mitsubishi Electric Corp. (Japan)
- 8051 OJ **Nonparametric missing sample spectral analysis and its applications to interrupted SAR** [8051-18]
D. Vu, L. Xu, J. Li, Univ. of Florida (United States)
- 8051 OK **CBP-based multichannel autofocus for near-field SAR imaging** [8051-19]
H. J. Cho, D. C. Munson, Jr., Univ. of Michigan, Ann Arbor (United States)
- 8051 OL **Windowing functions for focused range-Doppler imaging** [8051-20]
P. R. Williams, Raytheon Co. (United States)
- 8051 OO **InSAR processing using a GPGPU** [8051-40]
A. Rogan, R. Carande, Neva Ridge Technologies, Inc. (United States)

SESSION 3 ADVANCE MOTION PROCESSING

- 8051 OP **Along-track interferometry for simultaneous SAR and GMTI: application to Gotcha challenge data** [8051-23]
R. W. Deming, Solid State Scientific Corp. (United States)
- 8051 OQ **Ground moving target indication via multi-channel airborne SAR** [8051-24]
D. Vu, B. Guo, L. Xu, J. Li, Univ. of Florida (United States)
- 8051 OR **Persistent SAR change detection with posterior models** [8051-25]
G. E. Newstadt, Univ. of Michigan, Ann Arbor (United States); E. G. Zelnio, Air Force Research Lab. (United States); A. O. Hero III, Univ. of Michigan, Ann Arbor (United States)
- 8051 OS **Analysis of SAR moving grid processing for focusing and detection of ground moving targets** [8051-26]
D. E. Hack, Air Force Institute of Technology (United States) and Dynetics, Inc. (United States); M. A. Saville, Air Force Institute of Technology (United States)
- 8051 OT **Waveform-diverse moving-target spotlight SAR** [8051-27]
M. Cheney, Rensselaer Polytechnic Institute (United States); B. Borden, Naval Postgraduate School (United States)

- 8051 0U **Passive imaging of moving targets using distributed apertures in multiple-scattering environments** [8051-28]
L. Wang, Nanjing Univ. of Aeronautics and Astronautics (China); B. Yazıcı, Rensselaer Polytechnic Institute (United States)
- 8051 0V **The physics of vibrating scatterers in SAR imagery** [8051-29]
D. B. André, D. Blacknell, DSTL (United Kingdom); D. G. Muff, M. R. Nottingham, JARIC (United Kingdom)

SESSION 4 AUTOMATIC TARGET DETECTION/PROCESSING/RECOGNITION

- 8051 0W **Low complexity efficient raw SAR data compression** [8051-30]
S. Rane, P. Boufounos, A. Vetro, Mitsubishi Electric Research Labs. (United States); Y. Okada, Mitsubishi Electric Corp. (Japan)
- 8051 0X **Feature phenomenology and feature extraction of civilian vehicles from SAR images** [8051-31]
C. Paulson, D. Wu, Univ. of Florida (United States)
- 8051 0Y **Comparison of the HRRP phase gradient statistics between a ship and sea surface using alpha-stable distribution** [8051-32]
D. Jiang, X. Xu, BeiHang Univ. (China); L. Jie, J. Lei, National Key Lab. for Aerospace System Simulation (China)
- 8051 0Z **Prediction of coherent change detection performance in SAR** [8051-33]
A. J. Bennett, D. Blacknell, K. Martin, D. B. André, DSTL (United Kingdom)
- 8051 10 **Predicting the effectiveness of SAR imagery for target detection** [8051-34]
D. Gutches, Charles River Analytics (United States); J. M. Irvine, M. Young, Draper Lab. (United States); M. S. Snorrason, Charles River Analytics (United States)
- 8051 11 **Derived operating conditions for classifier performance understanding** [8051-35]
J. P. Blackburn, T. D. Ross, A. R. Nolan, J. C. Mossing, J. U. Sherwood, D. J. Pikas, E. G. Zelnio, Air Force Research Lab. (United States)
- 8051 12 **Joint sparse representation based automatic target recognition in SAR images** [8051-36]
H. Zhang, Northwestern Polytechnical Univ. (China) and Univ. of Illinois at Urbana-Champaign (United States); N. M. Nasrabadi, U.S. Army Research Lab. (United States); T. S. Huang, Univ. of Illinois at Urbana-Champaign (United States); Y. Zhang, Northwestern Polytechnical Univ. (China)
- 8051 13 **Target classification in synthetic aperture radar using map-seeking circuit technology** [8051-37]
C. K. Peterson, P. Murphy, P. Rodriguez, Johns Hopkins Univ. (United States)
- 8051 14 **Radar target classification using morphological image processing** [8051-38]
J. A. Jackson, P. Brady, Air Force Institute of Technology (United States)
- 8051 15 **Automatic target recognition from highly incomplete SAR data** [8051-39]
C. Du, G. Rilling, M. Davies, B. Mulgrew, The Univ. of Edinburgh (United Kingdom)

Author Index

Conference Committee

Symposium Chair

William Jeffrey, HRL Laboratories, LLC (United States)

Symposium Cochair

Kevin P. Meiners, Office of the Secretary of Defense (United States)

Conference Chairs

Edmund G. Zelnio, Air Force Research Laboratory (United States)

Frederick D. Garber, Wright State University (United States)

Program Committee

David Blacknell, Defence Science and Technology Laboratory (United Kingdom)

Mujdat Cetin, Sabanci University (Turkey)

Gil J. Etfinger, BAE Systems Advanced Information Technologies (United States)

Charles V. Jakowatz, Jr., Sandia National Laboratories (United States)

Eric R. Keydel, SAIC (United States)

Jian Li, University of Florida (United States)

Michael Minardi, Air Force Research Laboratory (United States)

Randolph L. Moses, The Ohio State University (United States)

Les Novak, Scientific Systems Company, Inc. (United States)

Lee Potter, The Ohio State University (United States)

Brian D. Rigling, Wright State University (United States)

Timothy D. Ross, Air Force Research Laboratory (United States)

Michael A. Saville, Air Force Institute of Technology (United States)

Gerard W. Titi, BAE Systems Advanced Information Technologies (United States)

Session Chairs

- 1 Advanced SAR Imaging I
Charles V. Jakowatz, Jr., Sandia National Laboratories (United States)
- 2 Advanced SAR Imaging II
Lee Potter, The Ohio State University (United States)
- 3 Advance Motion Processing
Michael A. Saville, Air Force Institute of Technology (United States)

- 4 Automatic Target Detection/Processing/Recognition
David Blacknell, Defence Science and Technology Laboratory (United Kingdom)