

PROCEEDINGS OF SPIE

# ***Algorithms for Synthetic Aperture Radar Imagery XV***

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

**17–18 March 2008  
Orlando, Florida, USA**

*Sponsored and Published by*  
SPIE

**Volume 6970**

Proceedings of SPIE, 0277-786X, v. 6970

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 XV*, edited by Edmund G. Zelnio, Frederick D. Garber, Proceedings of SPIE Vol. 6970 (SPIE, Bellingham, WA, 2008) Article CID Number.

ISSN 0277-786X  
ISBN 9780819471611

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 © 2008, 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](http://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/08/\$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](http://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 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 INVITED SESSION: SPARSE RECOGNITION FOR IMAGING

---

- 6970 03 **Sparse reconstruction for radar (Invited Paper)** [6970-02]  
L. C. Potter, P. Schniter, J. Ziniel, The Ohio State Univ. (USA)
- 6970 04 **Mono- and multistatic polarimetric sparse aperture 3D SAR imaging** [6970-03]  
S. DeGraaf, C. Twigg, L. Phillips, Essex Corp. (USA)
- 6970 05 **Joint space aspect reconstruction of wide-angle SAR exploiting sparsity** [6970-04]  
I. Stojanovic, Boston Univ. (USA); M. Cetin, Sabanci Univ. (Turkey); W. C. Karl, Boston Univ. (USA)
- 6970 06 **Three-dimensional sparse-aperture moving-target imaging** [6970-05]  
M. Ferrara, Air Force Research Lab. (USA); J. Jackson, The Ohio State Univ. (USA); M. Stuff, Michigan Tech Research Institute (USA)
- 6970 08 **Multibaseline IFSAR for 3D target reconstruction** [6970-07]  
E. Ertin, R. L. Moses, L. C. Potter, The Ohio State Univ. (USA)
- 6970 09 **Hyper-parameter selection in non-quadratic regularization-based radar image formation** [6970-08]  
Ö. Batu, Sabanci Univ. (Turkey); M. Çetin, Sabanci Univ. (Turkey) and Massachusetts Institute of Technology (USA)

---

## SESSION 2 CIRCULAR SAR

---

- 6970 0C **Fast CSAR algorithm** [6970-11]  
J. Burki, C. F. Barnes, Georgia Institute of Technology (USA)

---

## SESSION 3 ADVANCED IMAGING I

---

- 6970 0H **An implementation of a fast backprojection image formation algorithm for spotlight-mode SAR** [6970-16]  
D. E. Wahl, D. A. Yocky, C. V. Jakowatz, Jr., Sandia National Labs. (USA)
- 6970 0I **Imaging that exploits spatial, temporal, and spectral aspects of far-field radar data** [6970-17]  
M. Cheney, Rensselaer Polytechnic Institute (USA); B. Borden, Naval Postgraduate School (USA)
- 6970 0J **Distributed aperture imaging with multiple transmitters in complex environments** [6970-18]  
T. Varslot, B. Yazici, M. Cheney, Rensselaer Polytechnic Institute (USA)

6970 OL **Subsidence measurement and DSM extraction of IFSAR data using anisotropic diffusion and wavelet denoising filters** [6970-20]  
K. Sartor, J. D. V. Allen, E. Ganthier, M. Rahmes, Harris Corp. (USA); G. B. Tenali, S. Kozaitis, Florida Institute of Technology (USA)

6970 OM **Multipath simulation and removal from SAR imagery** [6970-21]  
D. B. André, R. D. Hill, C. P. Moate, QinetiQ Ltd. (United Kingdom)

---

**SESSION 4 ADVANCED IMAGING II**

---

6970 ON **Through-the-wall polarimetric imaging** [6970-22]  
F. Ahmad, M. G. Amin, Villanova Univ. (USA)

6970 OO **Autofocus for 3D imaging** [6970-34]  
F. Lee-Elkin, SET Corp. (USA)

6970 OP **Recursive SAR imaging** [6970-23]  
R. L. Moses, J. N. Ash, The Ohio State Univ. (USA)

6970 OQ **Beamforming as a foundation for spotlight-mode SAR image formation by backprojection (Invited Paper)** [6970-24]  
C. V. Jakowatz, Jr., D. E. Wahl, D. A. Yocky, Sandia National Labs. (USA)

---

**SESSION 5 DETECTION, TRACKING, AND IDENTIFICATION TECHNIQUES I**

---

6970 OR **Analyzing the effects of square versus non-square resolutions on automatic target recognition performance** [6970-26]  
L. J. Montagnino, M. L. Cassabaum, S. D. Halversen, C. L. Hebert, C. T. Rupp, M. T. Young, Raytheon Missile Systems (USA); N. Ku, Raytheon Space and Airborne Systems (USA)

6970 OS **An ATR challenge problem using HRR data** [6970-27]  
B. Kahler, J. Querns, General Dynamics (USA); G. Arnold, Air Force Research Lab. (USA)

6970 OT **Performance model for joint tracking and ATR with HRR radar** [6970-28]  
S. Cong, L. Hong, Wright State Univ. (USA); E. Blasch, Air Force Research Lab. (USA)

6970 OU **Vehicle tracking for urban surveillance** [6970-29]  
W. Roberts, L. Watkins, D. Wu, J. Li, Univ. of Florida (USA)

---

**SESSION 6 DETECTION, TRACKING, AND IDENTIFICATION TECHNIQUES II**

---

6970 OW **A rotation-invariant transform for target detection in SAR images** [6970-31]  
W. Ye, C. Paulson, D. O. Wu, J. Li, Univ. of Florida (USA)

6970 OX **Ripplet transform for feature extraction** [6970-32]  
J. Xu, D. Wu, Univ. of Florida (USA)

6970 OY **A target detection scheme for VHF SAR ground surveillance** [6970-33]

W. Ye, C. Paulson, D. O. Wu, J. Li, Univ. of Florida (USA)

6970 OZ **Discrimination of civilian vehicles using wide-angle SAR** [6970-35]

K. E. Dungan, L. C. Potter, The Ohio State Univ. (USA); J. Blackaby, Wright State Univ. (USA);  
J. Nehrbass, Ohio Super Computer Ctr. (USA)

*Author Index*



# Conference Committee

## *Symposium Chair*

**Larry B. Stotts**, Defense Advanced Research Projects Agency (USA)

## *Symposium Cochair*

**Ray O. Johnson**, Lockheed Martin Corporation (USA)

## *Program Track Chair*

**Ivan Kadar**, Interlink Systems Sciences, Inc. (USA)

## *Conference Chairs*

**Edmund G. Zelnio**, Air Force Research Laboratory (USA)

**Frederick D. Garber**, Wright State University (USA)

## *Program Committee*

**Bir Bhanu**, University of California/Riverside (USA)

**Müjdat Çetin**, Sabancı University (Turkey)

**Dan E. Dudgeon**, BAE Systems plc (USA)

**Gil J. Etfinger**, BAE Systems Advanced Information Technologies (USA)

**Robert A. Hummel**, Booz Allen Hamilton (USA)

**Charles V. Jakowatz, Jr.**, Sandia National Laboratories (USA)

**Eric R. Keydel**, Science Applications International Corporation (USA)

**John M. Miller**, Army Research Laboratory (USA)

**Randolph L. Moses**, The Ohio State University (USA)

**Brian D. Rigling**, Wright State University (USA)

**Timothy D. Ross**, Air Force Research Laboratory (USA)

**Gerard W. Titi**, BAE Systems Advanced Information Technologies (USA)

**Stephen P. Welby**, Defense Advanced Research Projects Agency  
(USA)

**Robert L. Williams**, Air Force Research Laboratory (USA)

## *Session Chairs*

Invited Session: Sparse Recognition for Imaging

**Randolph L. Moses**, The Ohio State University (USA)

Circular SAR

**Gerard W. Titi**, BAE Systems Advanced Information Technologies (USA)

Advanced Imaging I

**Charles V. Jakowatz, Jr.**, Sandia National Laboratories (USA)

Advanced Imaging II

**Charles V. Jakowatz, Jr.**, Sandia National Laboratories (USA)

Detection, Tracking, and Identification Techniques I

**Edmund G. Zelnio**, Air Force Research Laboratory (USA)