

PROCEEDINGS OF SPIE

***Algorithms and Technologies  
for Multispectral, Hyperspectral,  
and Ultraspectral Imagery XVI***

**Sylvia S. Shen  
Paul E. Lewis**  
*Editors*

**5–8 April 2010  
Orlando, Florida, United States**

*Sponsored and Published by*  
SPIE

**Volume 7695**

Proceedings of SPIE, 0277-786X, v. 7695

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 and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XVI*, edited by Sylvia S. Shen, Paul E. Lewis, Proceedings of SPIE Vol. 7695 (SPIE, Bellingham, WA, 2010) Article CID Number.

ISSN 0277-786X  
ISBN 9780819481597

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 © 2010, 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/10/\$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

xiii *Conference Committee*

---

## DETECTION AND IDENTIFICATION I

---

- 7695 02 **Continuum fusion: a new methodology for creating hyperspectral detection algorithms** [7695-01]  
A. Schaum, U.S. Naval Research Lab. (United States)
- 7695 03 **Sparse subspace target detection for hyperspectral imagery** [7695-02]  
Y. Chen, The Johns Hopkins Univ. (United States); N. M. Nasrabadi, U.S. Army Research Lab. (United States); T. D. Tran, The Johns Hopkins Univ. (United States)
- 7695 04 **Urchin: an RX-derivative accounting for anisotropies in whitened clutter** [7695-03]  
B. J. Daniel, A. P. Schaum, U.S. Naval Research Lab. (United States)
- 7695 05 **Segmentation adaptive RX: an algorithm for spectral anomaly detection in a variety of measured-radiance conditions** [7695-04]  
A. V. Kanaev, Global Defense Technology & Systems Inc. (United States); J. Murray-Krezan, U.S. Naval Research Lab. (United States)
- 7695 06 **Hyperspectral outlier detector based on conditional distributions** [7695-05]  
E. Lo, Susquehanna Univ. (United States)
- 7695 07 **Improved outlier identification in hyperspectral imaging via nonlinear dimensionality reduction** [7695-06]  
C. C. Olson, J. M. Nichols, J. V. Michalowicz, F. Bucholtz, U.S. Naval Research Lab. (United States)

---

## SPECTRAL IMAGING SYSTEMS

---

- 7695 08 **An overview of the Landsat Data Continuity Mission (Invited Paper)** [7695-07]  
J. R. Irons, NASA Goddard Space Flight Ctr. (United States); J. L. Dwyer, USGS Earth Resources Observation & Science Ctr. (United States)
- 7695 09 **Compact infrared hyperspectral imaging polarimeter** [7695-08]  
J. Craven, M. W. Kudenov, M. G. Stapelbroek, E. L. Dereniak, College of Optical Sciences, The Univ. of Arizona (United States)
- 7695 0A **An airborne real-time hyperspectral target detection system** [7695-09]  
T. Skauli, T. V. Haavardsholm, I. Kåsen, G. Arisholm, A. Kavara, T. O. Opsahl, A. Skaugen, Norwegian Defence Research Establishment (Norway)

- 7695 0B **Hyperspectral sensor for analysis of gases in the atmosphere (HYGAS)** [7695-10]  
R. Harig, Sigma ElectroOptics GmbH (Germany); A. Keens, Bruker Optics GmbH (Germany);  
P. Rusch, J. Gerhard, Sigma ElectroOptics GmbH (Germany); S. Sabbah, Hamburg Univ. of  
Technology (Germany)

---

#### SPECTRAL DATA ANALYSIS METHODOLOGIES I

---

- 7695 0C **A scalable approach to modeling nonlinear structure in hyperspectral imagery and other high-dimensional data using manifold coordinate representations** [7695-11]  
C. M. Bachmann, T. L. Ainsworth, R. A. Fusina, U.S. Naval Research Lab. (United States)
- 7695 0D **A high-speed implementation of manifold coordinate representations of hyperspectral imagery: a GPU-based approach to rapid nonlinear modeling** [7695-12]  
T. R. Topping, J. French, M. F. Hancock, Jr., Celestech, Inc. (United States)
- 7695 0E **Using k-MST, k-EC, and k-VC neighbor graphs construction methods with spatial coherent distance for manifold learning in hyperspectral image processing** [7695-13]  
N. Rey-Villamizar, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez (United States)
- 7695 0F **Illumination-invariant recognition of 3D hyperspectral textures using spectral/spatial Gabor filters** [7695-14]  
T. C. Bau, G. Healey, Univ. of California, Irvine (United States)

---

#### SPECTRAL METHODOLOGIES AND APPLICATIONS

---

- 7695 0G **Accelerating a hyperspectral inversion model for submerged marine ecosystems using high-performance computing on graphical processor units** [7695-16]  
J. A. Goodman, Univ. de Puerto Rico Mayagüez (United States); D. Kaeli, D. Schaa,  
A. Yilmazer, Northeastern Univ. (United States)
- 7695 0H **Estimating canopy coverage via VNIR/SWIR hyperspectral detection methods** [7695-17]  
M. Z. Salvador, Logos Technologies, Inc. (United States); W. L. Nelson, National  
Geospatial-Intelligence Agency (United States); D. L. Rall, EOIR Technologies, Inc. (United  
States)
- 7695 0I **Hyperspectral object tracking using small sample size** [7695-18]  
D. Rosario, U.S. Army Research Lab. (United States); H. Kling, U.S. Army Night Vision &  
Electronic Sensors Directorate (United States)
- 7695 0J **Denoising of hyperspectral images by best multilinear rank approximation of a tensor**  
[7695-19]  
M. Marin-McGee, M. Velez-Reyes, Univ. de Puerto Rico Mayagüez (United States)

---

#### SPECTRAL DATA COLLECTION EXPERIMENTS

---

- 7695 0K **Spectral imagery collection experiment** [7695-20]  
J. M. Romano, U.S. Army Armament Research, Development and Engineering Ctr. (United  
States); D. Rosario, U.S. Army Research Lab. (United States); V. Farley, Telops Inc. (Canada);  
B. Sohr, Invoke, LLC (United States)

- 7695 0M **A new hyperspectral dataset and some challenges** [7695-22]  
N. Wadströmer, J. Ahlberg, T. Svensson, Swedish Defence Research Agency (Sweden)

---

#### MODELING AND SIMULATION

---

- 7695 0N **Sub-pixel radiometry: a three-part study in generating synthetic imagery that incorporates sub-pixel variation** [7695-23]  
S. E. Paul, A. A. Goodenough, S. D. Brown, C. Salvaggio, Rochester Institute of Technology (United States)
- 7695 0O **Full spectrum cloudy scene simulation** [7695-24]  
S. C. Richtsmeier, A. Singer-Berk, R. L. Sundberg, Spectral Sciences, Inc. (United States)
- 7695 0P **Characterization of material reflectance variation through measurement and simulation** [7695-25]  
J. Kerekes, C. Hart, M. Gartley, B. Bartlett, Rochester Institute of Technology (United States);  
C. E. Nance, Raytheon Intelligence and Information Systems (United States)

---

#### INTRODUCTION TO CZMIL: A MULTISENSOR AIRBORNE MAPPING SYSTEM: JOINT SESSION WITH CONFERENCE 7684

---

- 7695 0Q **Requirements for the Coastal Zone Mapping and Imaging Lidar (CZMIL) (Invited Paper)** [7695-26]  
J. M. Wozencraft, U.S. Army Corps of Engineers, Joint Airborne Lidar Bathymetric Technical Ctr. of Expertise (United States)
- 7695 0R **Overview of the Coastal Zone Mapping and Imaging Lidar (CZMIL): a new multisensor airborne mapping system for the U.S. Army Corps of Engineers** [7695-27]  
G. Tuell, Optech International, Inc. (United States); K. Barbor, The Univ. of Southern Mississippi (United States); J. Wozencraft, U.S. Army Corps of Engineers, Joint Airborne Lidar Bathymetric Technical Ctr. of Expertise (United States)
- 7695 0S **Prelude to CZMIL: seafloor imaging and classification results achieved with CHARTS and the rapid environmental assessment (REA) processor** [7695-28]  
J. Aitken, V. Ramnath, V. Feygels, A. Mathur, M. Kim, J. Y. Park, G. Tuell, Optech International, Inc. (United States)
- 7695 0T **A proposed field validation campaign for CZMIL** [7695-29]  
A. G. Cottin, M. O. Gonsalves, S. A. Epps, K. Barbor, K. Martin, P. Heidingsfelder, The Univ. of Southern Mississippi (United States); J. Aitken, M. Kim, Optech International, Inc. (United States)

---

#### CZMIL HARDWARE: JOINT SESSION WITH CONFERENCE 7684

---

- 7695 0U **Conceptual design of the CZMIL data acquisition system (DAS): integrating a new bathymetric lidar with a commercial spectrometer and metric camera for coastal mapping applications** [7695-30]  
E. Fuchs, G. Tuell, Optech International, Inc. (United States)

- 7695 0V **Development of a novel laser system for the CZMIL lidar** [7695-31]  
J. W. Pierce, JP Innovations, LLC (United States); E. Fuchs, Optech International, Inc. (United States); S. Nelson, Nelson Optical Engineering (United States); V. Feygels, G. Tuell, Optech International, Inc. (United States)
- 7695 0W **Utilizing circular scanning in the CZMIL system** [7695-32]  
E. Fuchs, A. Mathur, Optech International, Inc. (United States)
- 7695 0X **Selection of COTS passive imagers for CZMIL** [7695-33]  
J. Aitken, J. Y. Park, A. Mathur, M. Kim, G. Tuell, Optech International, Inc. (United States)
- 7695 0Y **Proposed lidar receiver architecture for the CZMIL system** [7695-34]  
A. Payment, V. Feygels, E. Fuchs, Optech International, Inc. (United States)
- 7695 0Z **Predicted lidar ranging accuracy for CZMIL** [7695-35]  
A. Mathur, V. Ramnath, V. Feygels, E. Fuchs, J. Y. Park, G. H. Tuell, Optech International, Inc. (United States)

---

**CZMIL ALGORITHMS AND SOFTWARE: JOINT SESSION WITH CONFERENCE 7684**

- 7695 10 **Conceptual design of the CZMIL data processing system (DPS): algorithms and software for fusing lidar, hyperspectral data, and digital images** [7695-36]  
J. Y. Park, G. Tuell, Optech International, Inc. (United States)
- 7695 11 **Predicted bathymetric lidar performance of Coastal Zone Mapping and Imaging Lidar (CZMIL)** [7695-37]  
V. Ramnath, V. Feygels, Optech International, Inc. (United States); Y. Kopilevich, Saint-Petersburg State Univ. of Information Technologies, Mechanics and Optics (Russian Federation); J. Y. Park, G. Tuell, Optech International, Inc. (United States)
- 7695 12 **The CZMIL manual editor (CME): a new tool for analyzing bathymetric lidar waveforms and editing point clouds** [7695-38]  
G. Q. Morris, Ctr. for Higher Learning, The Univ. of Southern Mississippi (United States); J. Depner, Naval Oceanographic Office (United States); R. Hilderbrand, Ctr. for Higher Learning, The Univ. of Southern Mississippi (United States); V. Ramnath, Optech International, Inc. (United States)
- 7695 13 **A constrained optimization technique for estimating environmental parameters from CZMIL hyperspectral and lidar data** [7695-39]  
M. Kim, J. Y. Park, G. Tuell, Optech International, Inc. (United States)
- 7695 14 **Development of a suspended particulate matter (SPM) algorithm for the Coastal Zone Mapping and Imaging Lidar (CZMIL)** [7695-40]  
S. Epps, S. Lohrenz, The Univ. of Southern Mississippi (United States); G. Tuell, Optech International, Inc. (United States); K. Barbor, The Univ. of Southern Mississippi (United States)
- 7695 15 **Active-passive data fusion algorithms for seafloor imaging and classification from CZMIL data** [7695-41]  
J. Y. Park, V. Ramnath, V. Feygels, M. Kim, A. Mathur, J. Aitken, G. Tuell, Optech International, Inc. (United States)

---

## SPECTRAL DATA ANALYSIS METHODOLOGIES II

---

- 7695 16 **Instrument calibration and lineshape modeling for ultraspectral imagery measurements of industrial smokestack emissions** [7695-42]  
K. C. Gross, Air Force Institute of Technology (United States); P. Tremblay, Telops, Inc. (United States); K. C. Bradley, Air Force Institute of Technology (United States); M. Chamberland, V. Farley, Telops, Inc. (Canada); G. P. Perram, Air Force Institute of Technology (United States)
- 7695 17 **Advanced atmospheric modeling with perturbation for VNIR/SWIR hyperspectral data analysis** [7695-43]  
P. Fuehrer, G. Healey, D. Slater, B. Rauch, HyperTech Systems (United States); A. Ratkowski, Air Force Research Lab. (United States)
- 7695 18 **Vision inspired spatial engine (VISE): automated object registration for multisource fusion** [7695-44]  
D. Lewis, D. Edwards, J. Hufnagel, M. Kim, National Geospatial-Intelligence Agency (United States)
- 7695 19 **Quantitative image restoration** [7695-45]  
I. Gladkova, M. Grossberg, F. Shahriar, The City College of New York, NOAA/CREST (United States)
- 7695 1A **Dimensionality reduction, classification, and spectral mixture analysis using nonnegative underapproximation** [7695-46]  
N. Gillis, Univ. Catholique de Louvain (Belgium); R. J. Plemmons, Wake Forest Univ. (United States)
- 7695 1B **Parameters selection of morphological scale-space decomposition for hyperspectral images using tensor modeling** [7695-47]  
S. Velasco-Forero, J. Angulo, MINES ParisTech (France)

---

## CLUSTERING AND CLASSIFICATION

---

- 7695 1C **Improved feature extraction from high-resolution remotely sensed imagery using object geometry** [7695-48]  
H. G. Momm, B. Gunter, G. Easson, Univ. of Mississippi (United States)
- 7695 1D **Study on the use of complexity measures for estimation of correct classification percentage in hyperspectral imagery** [7695-49]  
S. Hunt, O. Martinez, Univ. de Puerto Rico Mayagüez (United States)
- 7695 1E **Spherical harmonics as a shape descriptor for hyperspectral image classification** [7695-50]  
F. Nina Paravecino, V. Manian, Univ. de Puerto Rico Mayagüez (United States)
- 7695 1F **Semi-supervised hyperspectral image segmentation using regionalized stochastic watershed** [7695-51]  
J. Angulo, S. Velasco-Forero, MINES ParisTech (France)

---

## CHANGE DETECTION

---

- 7695 1G **A model-based approach to hyperspectral change detection** [7695-52]  
J. Meola, M. T. Eismann, Air Force Research Lab. (United States); R. L. Moses, J. N. Ash, The Ohio State Univ. (United States)
- 7695 1H **Total least squares for anomalous change detection** [7695-53]  
J. Theiler, A. M. Matsekh, Los Alamos National Lab. (United States)
- 7695 1I **Iterative convex hull volume estimation in hyperspectral imagery for change detection** [7695-54]  
A. K. Ziemann, D. W. Messinger, W. F. Basener, Rochester Institute of Technology (United States)
- 7695 1J **A novel method for change detection in spectral imagery** [7695-55]  
A. Schlamm, D. Messinger, W. Basener, Rochester Institute of Technology (United States)
- 7695 1K **Variability analysis and change characterization of HSI data for urban mapping** [7695-56]  
F. A. Kruse, R. C. Olsen, Naval Postgraduate School (United States)

---

## ENDMEMBER EXTRACTION AND SPECTRAL UNMIXING

---

- 7695 1L **L1-endmembers: a robust endmember detection and spectral unmixing algorithm** [7695-57]  
A. Zare, P. Gader, Univ. of Florida (United States)
- 7695 1M **Endmember extraction in hyperspectral images using l-1 minimization and linear complementary programming** [7695-58]  
D. Nguyen, T. Tran, The Johns Hopkins Univ. (United States); C. Kwan, B. Ayhan, Signal Processing, Inc. (United States)
- 7695 1N **Endmember finding and spectral unmixing using least-angle regression** [7695-59]  
A. R. Boisvert, P. V. Villeneuve, A. D. Stocker, Space Computer Corp. (United States)
- 7695 1O **Sparse demixing** [7695-60]  
J. B. Greer, National Geospatial-Intelligence Agency (United States)
- 7695 1P **Fast algorithm for searching endmember set per pixel** [7695-61]  
N. Raksuntorn, Q. Du, Mississippi State Univ. (United States)
- 7695 1Q **Fast algorithms to implement N-FINDR for hyperspectral endmember extraction** [7695-62]  
W. Xiong, C.-I. Chang, K. Kalpakis, Univ. of Maryland, Baltimore County (United States)
- 7695 1R **Understanding the impact of spatial resolution in unmixing of hyperspectral images** [7695-63]  
A. Santos-García, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez (United States)

---

## DETECTION AND IDENTIFICATION II

---

- 7695 1S **Detection and characterization of chemical vapor fugitive emissions from hyperspectral infrared imagery by nonlinear optimal estimation** [7695-64]  
C. M. Gittins, Physical Sciences Inc. (United States)
- 7695 1T **Use of ensemble learning technique for detection/identification of chemical plumes** [7695-65]  
P. Rauss, H. Kwon, U.S. Army Research Lab. (United States)
- 7695 1U **Ensemble learning based on multiple kernel learning for hyperspectral chemical plume detection** [7695-66]  
P. Gurram, H. Kwon, U.S. Army Research Lab. (United States)
- 7695 1V **Hyperspectral sub-pixel target identification using least-angle regression** [7695-67]  
P. V. Villeneuve, A. R. Boisvert, A. D. Stocker, Space Computer Corp. (United States)
- 7695 1W **Performance evaluation of hyperspectral detection algorithms for subpixel objects** [7695-68]  
R. S. DiPietro, Northeastern Univ. (United States); D. Manolakis, R. Lockwood, MIT Lincoln Lab. (United States); T. Cooley, Air Force Research Lab. (United States); J. Jacobson, National Air and Space Intelligence Ctr. (United States)

---

## SENSOR PERFORMANCE ANALYSIS

---

- 7695 1X **A generalized performance model for spatial interferometric hyperspectral imagers** [7695-69]  
P. G. Lucey, Univ. of Hawai'i (United States); E. Tsiang, Spectrum Photonics, Inc. (United States)
- 7695 1Y **Simulating systematic scene-change artifacts in Fourier-transform spectroscopy** [7695-70]  
K. C. Gross, A. M. Young, Air Force Institute of Technology (United States); C. Borel, Riverside Research Institute (United States); B. J. Steward, National Air and Space Intelligence Ctr. (United States); G. P. Perram, Air Force Institute of Technology (United States)
- 7695 1Z **Liquid-crystal-based hyperspectral image projector** [7695-71]  
A. Linnenberger, H. Masterson, Boulder Nonlinear Systems, Inc. (United States); J. P. Rice, National Institute of Standards and Technology (United States); J. Stockley, Boulder Nonlinear Systems, Inc. (United States)
- 7695 20 **An information measure of sensor performance and its relation to the ROC curve** [7695-72]  
J. Ahlberg, I. G. Renhorn, N. Wadströmer, Swedish Defence Research Agency (Sweden)

---

## TARGET DETECTION BLIND TEST PROJECT

---

- 7695 21 **Unresolved target detection blind test project overview** [7695-73]  
J. P. Kerekes, D. K. Snyder, Rochester Institute of Technology (United States)
- 7695 22 **Hybrid algorithm for hyperspectral target detection** [7695-74]  
V. Roy, Defence Research and Development Canada (Canada)

- 7695 23 **Results of GLMM-based target detection on the RIT data set** [7695-75]  
D. Gillis, U.S. Naval Research Lab. (United States); E. Ientilucci, Rochester Institute of Technology (United States); J. Bowles, U.S. Naval Research Lab. (United States)
- 7695 24 **Hyperspectral target detection assessment using an online evaluation system** [7695-76]  
W. Zhu, Q. Du, Mississippi State Univ. (United States)
- 7695 25 **Clutter and anomaly removal for enhanced target detection** [7695-77]  
W. F. Basener, Rochester Institute of Technology (United States)
- 7695 26 **Characterization of physics-based radiative transfer modeling parameters for a blind test airborne hyperspectral data set** [7695-78]  
S. Matteoli, Univ. of Pisa (Italy); E. J. Ientilucci, J. P. Kerekes, Rochester Institute of Technology (United States)
- 7695 27 **Global, local, and stochastic background modeling for target detection in mixed pixels** [7695-79]  
M. S. Halper, MITRE Corp. (United States)

---

#### SPECTROSCOPIC CHARACTERIZATION OF THE ATMOSPHERE

---

- 7695 2A **Estimating atmosphere parameters in hyperspectral data** [7695-82]  
J. Ahlberg, Swedish Defence Research Agency (Sweden)
- 7695 2B **Atmospheric compensation of thermal infrared hyperspectral imagery with the emissive empirical line method and the in-scene atmospheric compensation algorithms: a comparison** [7695-83]  
R. J. DiStasio, Jr., R. G. Resmini, MITRE Corp. (United States)

---

#### POSTER SESSION

---

- 7695 2D **A comparison study of dimension estimation algorithms** [7695-85]  
A. Schlamm, Rochester Institute of Technology (United States); R. G. Resmini, George Mason Univ. (United States); D. Messinger, W. Basener, Rochester Institute of Technology (United States)
- 7695 2E **Spectral face recognition using orthogonal subspace bases** [7695-87]  
A. Wimberly, Oberlin College (United States); S. A. Robila, Montclair State Univ. (United States); T. Peplau, St. Lawrence Univ. (United States)
- 7695 2F **Image sharpening toolkit (ISTK)** [7695-88]  
D. Pulido, Science Applications International Corp. (United States)
- 7695 2G **Unmixing and anomaly detection in hyperspectral data due to cluster variation and local information** [7695-89]  
J. M. Maerker, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation (Germany); J. Huber, Univ. of Basel (Switzerland); W. Middelmann, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation (Germany)

- 7695 2H **Evaluation of different structural models for target detection in hyperspectral imagery**  
[7695-90]  
C. Peña-Ortega, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez (United States)
- 7695 2J **Accuracy assessment of land cover dynamic in hill land on integration of DEM data and TM image** [7695-92]  
Y. Li, X. Wang, Nanjing Normal Univ. (China); Q. Wang, C. Wu, Satellite Environment Application Ctr. (China); J. Huang, Nanjing Normal Univ. (China)
- 7695 2L **Orthogonal subspace projection approach to finding signal sources in hyperspectral imagery** [7695-94]  
X. Jiao, C.-I. Chang, Univ. of Maryland, Baltimore County (United States); Y. Du, Indiana Univ.-Purdue Univ. Indianapolis (United States)

*Author Index*



# Conference Committee

## *Symposium Chair*

**Michael T. Eismann**, Air Force Research Laboratory (United States)

## *Symposium Cochair*

**William Jeffrey**, HRL Laboratories, LLC (United States)

## *Conference Chairs*

**Sylvia S. Shen**, The Aerospace Corporation (United States)

**Paul E. Lewis**, National Geospatial-Intelligence Agency (United States)

## *Program Committee*

**Gail P. Anderson**, Air Force Research Laboratory (United States)

**Hsiao-hua K. Burke**, MIT Lincoln Laboratory (United States)

**Chein-I Chang**, University of Maryland, Baltimore County (United States)

**Eustace L. Dereniak**, College of Optical Sciences, The University of Arizona (United States)

**Michael T. Eismann**, Air Force Research Laboratory (United States)

**Glenn E. Healey**, University of California, Irvine (United States)

**James R. Irons**, NASA Goddard Space Flight Center (United States)

**Fred A. Kruse**, Naval Postgraduate School (United States)

**David W. Messinger**, Rochester Institute of Technology (United States)

**Alan P. Schaum**, Naval Research Laboratory (United States)

**Joel Susskind**, NASA Goddard Space Flight Center (United States)

**Grady H. Tuell**, Optech International, Inc. (United States)

**Miguel Vélez-Reyes**, Universidad de Puerto Rico Mayagüez (United States)

## *Session Chairs*

1 Detection and Identification I  
**Sylvia S. Shen**, The Aerospace Corporation (United States)

2 Spectral Imaging Systems  
**Eustace L. Dereniak**, College of Optical Sciences, The University of Arizona (United States)

- 3 Spectral Data Analysis Methodologies I  
**Glenn E. Healey**, University of California, Irvine (United States)
- 4 Spectral Methodologies and Applications  
**Michael T. Eismann**, Air Force Research Laboratory (United States)
- 5 Spectral Data Collection Experiments  
**Miguel Vélez-Reyes**, Universidad de Puerto Rico Mayagüez (United States)
- 6 Modeling and Simulation  
**David W. Messinger**, Rochester Institute of Technology (United States)
- 7 Introduction to CZMIL: A Multisensor Airborne Mapping System: Joint Session with Conference 7684  
**Paul E. Lewis**, National Geospatial-Intelligence Agency (United States)  
**Monte D. Turner**, Defense Advanced Research Projects Agency (United States)
- 8 CZMIL Hardware: Joint Session with Conference 7684  
**Grady H. Tuell**, Optech International, Inc. (United States)
- 9 CZMIL Algorithms and Software: Joint Session with Conference 7684  
**Grady H. Tuell**, Optech International, Inc. (United States)
- 10 Spectral Data Analysis Methodologies II  
**Fred A. Kruse**, Naval Postgraduate School (United States)
- 11 Clustering and Classification  
**Gail P. Anderson**, Air Force Research Laboratory (United States)
- 12 Change Detection  
**Fred A. Kruse**, Naval Postgraduate School (United States)
- 13 Endmember Extraction and Spectral Unmixing  
**Miguel Vélez-Reyes**, Universidad de Puerto Rico Mayagüez (United States)
- 14 Detection and Identification II  
**Sylvia S. Shen**, The Aerospace Corporation (United States)
- 15 Sensor Performance Analysis  
**Paul E. Lewis**, National Geospatial-Intelligence Agency (United States)
- 16 Target Detection Blind Test Project  
**David W. Messinger**, Rochester Institute of Technology (United States)  
**John P. Kerekes**, Rochester Institute of Technology (United States)

- 17 Target Detection Blind Test Project Discussion  
**John P. Kerekes**, Rochester Institute of Technology (United States)
- 18 Spectroscopic Characterization of the Atmosphere  
**Paul E. Lewis**, National Geospatial-Intelligence Agency (United States)

