# PROCEEDINGS OF SPIE

# **Automatic Target Recognition XXIII**

Firooz A. Sadjadi Abhijit Mahalanobis Editors

29–30 April 2013 Baltimore, Maryland, United States

Sponsored and Published by SPIE

Volume 8744

Proceedings of SPIE 0277-786X, V. 8744

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

Automatic Target Recognition XXIII, edited by Firooz A. Sadjadi, Abhijit Mahalanobis, Proc. of SPIE Vol. 8744, 87441C  $\cdot$  © 2013 SPIE  $\cdot$  CCC code: 0277-786X/13/\$18  $\cdot$  doi: 10.1117/12.2033658

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 Automatic Target Recognition XXIII, edited by Firooz A. Sadjadi, Abhijit Mahalanobis, Proceedings of SPIE Vol. 8744 (SPIE, Bellingham, WA, 2013) Article CID Number.

ISSN: 0277-786X ISBN: 9780819495358

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 © 2013, 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/13/\$18.00.

Printed in the United States of America.

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



**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	NEW METHODOLOGIES I
8744 01	Generalized linear correlation filters [8744-1]  A. Rodriguez, Air Force Research Lab. (United States); B. V. K. Vijaya Kumar, Carnegie Mellon Univ. (United States)
8744 02	An ATR architecture for algorithm development and testing [8744-2] G. M. Breivik, K. H. Løkken, A. Brattli, H. C. Palm, T. Haavardsholm, Norwegian Defence Research Establishment (Norway)
8744 03	Implementation of a cascaded HOG-based pedestrian detector [8744-3] C. Reale, Univ. of Maryland, College Park (United States) and U.S. Army Research Lab. (United States); P. Gurram, S. Hu, A. Chan, U.S. Army Research Lab. (United States)
8744 04	No-reference image quality measurement for low-resolution images [8744-4] J. Sanderson, Wright State Univ. (United States); Y. Liang, Central State Univ. (United States)
8744 05	Unsupervised pedestrian detection using support vector data description [8744-5] P. Gurram, S. Hu, C. Reale, A. Chan, U.S. Army Research Lab. (United States)
SESSION 2	IMAGE AND SIGNAL PROCESSING FOR TARGET TRACKING APPLICATIONS I
<b>SESSION 2</b> 8744 06	IMAGE AND SIGNAL PROCESSING FOR TARGET TRACKING APPLICATIONS I  Improved real-time photogrammetric stitching [8744-7]  J. de Villiers, Council for Scientific and Industrial Research (South Africa) and Univ. of Cape Town (South Africa); J. Cronje, Council for Scientific and Industrial Research (South Africa)
	Improved real-time photogrammetric stitching [8744-7]  J. de Villiers, Council for Scientific and Industrial Research (South Africa) and Univ. of Cape
8744 06	Improved real-time photogrammetric stitching [8744-7] J. de Villiers, Council for Scientific and Industrial Research (South Africa) and Univ. of Cape Town (South Africa); J. Cronje, Council for Scientific and Industrial Research (South Africa)  Multi-camera rigid body pose estimation using higher-order dynamic models [8744-8] A. E. Forsman, D. A. Schug, Naval Air Warfare Ctr. Aircraft Div. (United States); A. J. Haug,
8744 06 8744 07	Improved real-time photogrammetric stitching [8744-7] J. de Villiers, Council for Scientific and Industrial Research (South Africa) and Univ. of Cape Town (South Africa); J. Cronje, Council for Scientific and Industrial Research (South Africa)  Multi-camera rigid body pose estimation using higher-order dynamic models [8744-8] A. E. Forsman, D. A. Schug, Naval Air Warfare Ctr. Aircraft Div. (United States); A. J. Haug, The Johns Hopkins Univ. Applied Physics Lab. (United States)  Score-based gating control method in the presence of stop-move maneuvering motorboat's wake [8744-9]

# 8744 0B Position-independent ATR using hierarchical hidden Markov model as the identification algorithm (Invited Paper) [8744-12]

A. Sokolnikov, Visual Solutions and Applications (United States)

#### SESSION 4 IR-BASED ATR I

# Noise cancellation in IR video based on empirical mode decomposition [8744-13] J. Piñeiro-Ave, M. Blanco-Velasco, F. Cruz-Roldán, Univ. de Alcalá (Spain); A. Artés-Rodríguez, Univ. Carlos III (Spain)

### 8744 0D Robust coastal region detection method using image segmentation and sensor LOS information for infrared search and track [8744-14]

S. Kim, Yeungnam Univ. (Korea, Republic of); S.-G. Sun, Agency for Defense Development (Korea, Republic of); S. Kwon, Daegu Gyeongbuk Institute of Science and Technology (Korea, Republic of); K.-T. Kim, Pohang Univ. of Science and Technology (Korea, Republic of)

#### 8744 0E Person detection in LWIR imagery using image retrieval [8744-15]

T. Müller, D. Manger, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

8744 0F Hot spot detection and classification in LWIR videos for person recognition [8744-16] M. Teutsch, T. Müller, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

#### SESSION 5 IR BASED ATR II

### 8744 01 **Boosting target tracking using particle filter with flow control** [8744-19] N. Moshtagh, M. W. Chan, Lockheed Martin Space Systems Co. (United States)

# Dynamic Data Driven Applications Systems (DDDAS) modeling for automatic target recognition [8744-20]

E. Blasch, G. Seetharaman, Air Force Research Lab. (United States); F. Darema, Air Force Office of Scientific Research (United States)

#### SESSION 6 NEW METHODOLOGIES II

#### 8744 OL Pre- and post-processing correlation filter data [8744-22]

A. Rodriguez, Air Force Research Lab. (United States); B. V. K. Vijaya Kumar, Carnegie Mellon Univ. (United States)

#### 8744 0M Target manifold formation using a quadratic SDF [8744-23]

C. F. Hester, K. K. D. Risko, U.S. Army Research, Development and Engineering Command (United States)

#### 8744 0N Dealing with circular correlation effects [8744-24]

A. Rodriguez, Air Force Research Lab. (United States); B. V. K. Vijaya Kumar, Carnegie Mellon Univ. (United States)

8744 00	Multi-kernel aggregation of local and global features in long-wave infrared for detection of SWAT teams in challenging environments [8744-25]  A. S. Arya, D. T. Anderson, C. L. Bethel, D. Carruth, Mississippi State Univ. (United States)
8744 OP	From shape to threat: exploiting the convergence between visual and conceptual organization for weapon identification and threat assessment (Invited Paper) [8744-26] A. N. Arslan, C. F. Hempelmann, C. Di Ferrante, S. Attardo, N. M. Sirakov, Texas A&M Univ. (United States)
SESSION 7	NEW METHODOLOGIES III
8744 OR	Chipping and segmentation of target of interest from low-resolution electro-optical data [8744-28] S. Fernandes, Y. Liang, Central State Univ. (United States)
8744 OS	Robust static and moving object detection via multi-scale attentional mechanisms [8744-29] A. Honda, Y. Chen, D. Khosla, HRL Labs., LLC (United States)
8744 OT	<b>AKITA: Application Knowledge Interface to Algorithms</b> [8744-30] P. Barros, A. Mathis, K. Newman, S. Wilder, Lockheed Martin Corp. (United States)
8744 OU	Automatic laser beam alignment using blob detection for an environment monitoring spectroscopy [8744-31]  J. Khidir, Univ. of Arkansas at Little Rock (United States) and Salahaddin Univ. (Iraq); Y. Chen, G. Anderson, Univ. of Arkansas at Little Rock (United States)
8744 0V	Target localization and function estimation in sparse sensor networks (Invited Paper) [8744-32] N. A. Schmid, West Virginia Univ. (United States)
8744 0W	A method for constructing orthonormal basis functions with good time-frequency localization [8744-41]  I. Gertner, The City Univ. of New York (United States)
SESSION 8	ACTIVE SENSORS, RADAR/LASER/SONAR PROCESSING
8744 OX	SAR imaging in the presence of spectrum notches via fast missing data IAA (Invited Paper) [8744-33] W. Rowe, Univ. of Florida (United States); J. Karlsson, KTH Royal Institute of Technology (Sweden); L. Xu, Univ. of Florida (United States) and Integrated Adaptive Applications, Inc. (United States); GO. Glentis, Univ. of Peloponnese (Greece); J. Li, Univ. of Florida (United States) and Integrated Adaptive Applications, Inc. (United States)
8744 OY	Fast computer-free holographic adaptive optics [8744-34] G. P. Andersen, F. Ghebremichael, R. Gaddipati, P. Gaddipati, P. Gelsinger-Austin, K. MacDonald, Hua, Inc. (United States)

### 8744 0Z Performance metric development for a group state estimator in airborne UHF GMTI applications [8744-35]

R. A. Elwell, U.S. Army Communications-Electronics Research Development and Engineering Command (United States)

# 8744 10 A simulation study of target detection using hyperspectral data analysis [8744-36] E. Sharifahmadian, Y. Choi, S. Latifi, Univ. of Nevada, Las Vegas (United States)

### Sonar signal feature extraction for target recognition in range-dependent environments [8744-37]

V. T. Gomatam, P. Loughlin, Univ. of Pittsburgh (United States)

#### 8744 13 Propagation in channels [8744-40]

J. S. Ben-Benjamin, L. Cohen, The City Univ. of New York (United States)

Author Index

#### **Conference Committee**

Symposium Chair

Kenneth R. Israel, Major General (USAF Retired) (United States)

Symposium Cochair

**David A. Whelan**, Boeing Defense, Space, and Security (United States)

Conference Chairs

**Firooz A. Sadjadi**, Lockheed Martin Advanced Technology Laboratories (United States)

**Abhijit Mahalanobis**, Lockheed Martin Missiles and Fire Control (United States)

#### Conference Program Committee

**Mohammad S. Alam**, University of South Alabama (United States) **Farid Amoozeaar**, Jet Propulsion Laboratory (United States)

Mahmood R. Azimi-Sadjadi, Colorado State University (United States)

David Casasent, Carnegie Mellon University (United States)

**Leon Cohen**, The City University of New York (United States)

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

Guillermo C. Gaunaurd, Consultant (United States)

**Izidor Gertner**, The City University of New York (United States)

Patti S. Gillespie, U.S. Army Research Laboratory (United States)

Riad I. Hammoud, BAE Systems (United States)

Bahram Javidi, University of Connecticut (United States)

Ismail I. Jouny, Lafayette College (United States)

Behzad Kamgar-Parsi, U.S. Naval Research Laboratory (United States)

**Timothy J. Klausutis**, Air Force Research Laboratory (United States)

Wolfgang Kober, Data Fusion Corporation (United States)

Agron D. Lanterman, Georgia Institute of Technology (United States)

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

**Robert R. Muise**, Lockheed Martin Missiles and Fire Control (United States)

Nasser M. Nasrabadi, U.S. Army Research Laboratory (United States)

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

Joseph A. O'Sullivan, Washington University in St. Louis (United States)

Mubarak Ali Shah, University of Central Florida (United States)

**Andre U. Sokolnikov**, Visual Solutions and Applications (United States)

# **Bradley C. Wallet**, Automated Decisions LLC (United States) **Edmund Zelnio**, Air Force Research Laboratory (United States)

#### Session Chairs

- New Methodologies I
   Alan J. Van Nevel, Naval Air Warfare Center Aircraft Division (United States)
- 2 Image and Signal Processing for Target Tracking Applications I Andre U. Sokolnikov, Visual Solutions and Applications (United States)
- 3 Image and Signal Processing for Target Tracking Applications II Andre U. Sokolnikov, Visual Solutions and Applications (United States)
- 4 IR-Based ATR I Riad I. Hammoud, BAE Systems (United States)
- 5 IR Based ATR II Riad I. Hammoud, BAE Systems (United States)
- 6 New Methodologies II

  Andres F. Rodriguez, Air Force Research Laboratory (United States)
- 7 New Methodologies III Izidor Gertner, The City University of New York (United States)
- 8 Active Sensors, Radar/Laser/Sonar Processing **Leon Cohen**, The City University of New York (United States)