PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 11019

, "Front Matter: Volume 11019," Proc. SPIE 11019, Situation Awareness in Degraded Environments 2019, 1101901 (10 July 2019); doi: 10.1117/12.2536303

Event: SPIE Defense + Commercial Sensing, 2019, Baltimore, MD, United States

PROCEEDINGS OF SPIE

Situation Awareness in Degraded Environments 2019

John (Jack) N. Sanders-Reed
Jarvis (Trey) J. Arthur III
Editors

16–17 April 2019
Baltimore, Maryland, United States

Sponsored and Published by
SPIE

Volume 11019

Proceedings of SPIE 0277-786X, V. 11019

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

Situation Awareness in Degraded Environments 2019, edited by John N. Sanders-Reed, Jarvis J. Arthur III,
Proc. of SPIE Vol. 11019, 1101901 · © 2019 SPIE · CCC code: 0277-786X/19/\$18 · doi: 10.1117/12.2536303

Proc. of SPIE Vol. 11019 1101901-1

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIDigitalLibrary.org.

The papers 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 these proceedings:

Author(s), "Title of Paper," in *Situation Awareness in Degraded Environments 2019*, edited by John N. Sanders-Reed, Jarvis J. Arthur III, Proceedings of SPIE Vol. 11019 (SPIE, Bellingham, WA, 2019)
Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510627031
ISBN: 9781510627048 (electronic)

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 © 2019, 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/19/\$18.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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. A unique citation identifier (CID) number is assigned to each article at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five 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.

Contents

v	<i>Authors</i>
vii	<i>Conference Committee</i>

SESSION 1 DVE SYSTEMS AND ANALYSIS I

11019 02	Degraded visual environment paradigm shift from mission deterrent to combat enabler [11019-1]
11019 04	Development of an army aviator composite risk assessment model [11019-3]

SESSION 2 DVE SYSTEMS AND ANALYSIS II

11019 05	Integration and use of an AR display in a maritime helicopter simulator [11019-5]
11019 06	Integration and flight testing of a DVE system on the H145 [11019-6]

SESSION 3 SENSING AND PHENOMENOLOGY I

11019 08	Performance enhancement of point-to-point diffuse links at 265 nm under fog conditions [11019-8]
----------	--

SESSION 4 SENSING AND PHENOMENOLOGY II

11019 0B	Novel low-cost camera-based continuous wave laser detection [11019-12]
11019 0C	Disparate sensor real-time scene fusion for tactical environments [11019-13]

SESSION 5 HUMAN PERFORMANCE I

11019 0E	Evaluation of a head-worn display with ambient vision cues for unusual attitude recovery [11019-15]
11019 0F	Changes in physiological parameters induced by optical misalignment in night vision binocular devices [11019-16]

- 11019 OG **Modeling the effect of macular pigment enhancement on mesopic vision in degraded visual environments (DVE) in artificial light** [11019-17]
- 11019 OH **Binocular rivalry in monocular augmented reality devices: a review** [11019-18]

SESSION 6 HUMAN PERFORMANCE II

- 11019 OJ **Virtual reality headsets as external vision displays for helicopter operations: the potential of an exocentric viewpoint** [11019-20]
- 11019 OL **Emissive microdisplays for helmet mounted display applications** [11019-22]

SESSION 7 GPS-DENIED

- 11019 OM **High-integrity navigation for sensor-based 3D world modeling** [11019-23]
- 11019 ON **UAV navigation in GPS-denied environment using particle filtered RVL** [11019-24]

POSTER SESSION

- 11019 OP **Two unique W-band radar clutter signatures** [11019-11]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Abel, Larry, 0F	St. Onge, Paul M., 0G
Akhloufi, Moulay A., 0N	Syvridis, Dimitris, 08
Arthur, Jarvis (Trey), 0E	Taylor, Max, 0M
Ballard, Kathryn, 0E	Temme, Leonard A., 0G
Bayle, Elodie, 0H	Tipper, Sean, 0B
Boggs, Chris, 0M	Waanders, T., 06
Bratt, Richard M., 02	Walker, Allen D., 02
Burgess, Christopher, 0B	Walko, Christian, 05
Burke, David, 0C	Westgate, Christopher, 0B
Couturier, Andy, 0N	
Douglass, Amanda, 0F	
Ebrecht, Lars, 0J	
Ellis, Kyle E., 0E	
Ernst, Johannes M., 0J	
Footo, Bobby, 0L	
Fragkos, Markos-Alexandros, 08	
Gavrilescu, Maria, 0F	
Gavrilets, Vladislav, 0M	
Gibbs, Peter, 0F	
Goosey, Raquel, 04	
Guilbaud, Esetelle, 0H	
Harding, Thomas H., 04	
Hashroni, O., 06	
Hourlier, Sylvain, 0H	
Ibrahim, Ariel, 0P	
Johnston, Chase, 0C	
Karas, Renee, 0F	
Lake, Renee C., 0E	
Lelandais, Sylvie, 0H	
Leroy, Laure, 0H	
Moyer, Lee, 0P	
Muensterer, T., 06	
Neveu, Pascaline, 0H	
Nicholas, Stephanie N., 0E	
Nikas, Thomas, 08	
O'Brien, Kevin J., 0G	
Peinecke, Niklas, 05	
Pikasis, Evangelos, 08	
Plantier, Justin, 0H	
Plorin, J., 06	
Prinzel, Lawrence J., III, 0E	
Raptis, Nikos, 08	
Roditi, Eugenia, 08	
Ropers, Michael, 0L	
Roth, F., 06	
Schmerwitz, Sven, 0J	
Selleck, Matthew B., 0C	
Shpak, M., 06	
Singer, B., 06	

Conference Committee

Symposium Chairs

Jay Kumler, JENOPTIK Optical Systems, LLC (United States)
Ruth L. Moser, Air Force Research Laboratory (United States)

Symposium Co-chair

John Pellegrino, Electro-Optical Systems Laboratory, Georgia Institute of Technology (United States)

Conference Chairs

John (Jack) N. Sanders-Reed, The Boeing Company (United States)
Jarvis (Trey) J. Arthur III, NASA Langley Research Center (United States)

Conference Program Committee

Brendan W. Blanton, The Boeing Company (United States)
Michael P. Browne, SA Photonics (United States)
Daniel D. Desjardins, Air Force Research Laboratory (United States)
Gary W. Jones, NanoQuantum Sciences, Inc. (United States)
Shanalyn A. Kemme, Sandia National Labs. (United States)
Jim E. Melzer, Thales Visionix, Inc. (United States)
Thomas R. Muensterer, HENSOLDT Sensors GmbH (Germany)
Niklas Peinecke, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)
Kalluri R. Sarma, Honeywell Technology (United States)
Carlo L. Tiana, Rockwell Collins, Inc. (United States)

Session Chairs

- 1 DVE Systems and Analysis I
Niklas Peinecke, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)
- 2 DVE Systems and Analysis II
Brendan W. Blanton, The Boeing Company (United States)
- 3 Sensing and Phenomenology I
Shanalyn A. Kemme, Sandia National Labs. (United States)

- 4 Sensing and Phenomenology II
Daniel D. Desjardins, Air Force Research Laboratory (United States)
- 5 Human Performance I
Michael P. Browne, SA Photonics, Inc. (United States)
- 6 Human Performance II
John (Jack) N. Sanders-Reed, The Boeing Company (United States)
- 7 GPS-denied
Gary W. Jones, NanoQuantum Sciences, Inc. (United States)