

# SPIE Defense+Security

Conferences: 17–20 March 2008

Courses: 16–20 March 2008

Exhibition: 18–20 March 2008

Orlando World Center Marriott Resort & Convention Center  
Orlando, Florida, USA

2008  
Technical  
Program



**SPIE**

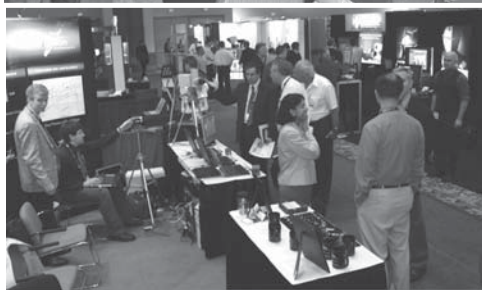
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*SPIE would like to express its deepest appreciation to the symposium chairs, conference chairs, program committees, and session chairs who have so generously given their time and advice to make this symposium possible.*

*The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members. This program is based on commitments received up to the time of publication and is subject to change without notice.*

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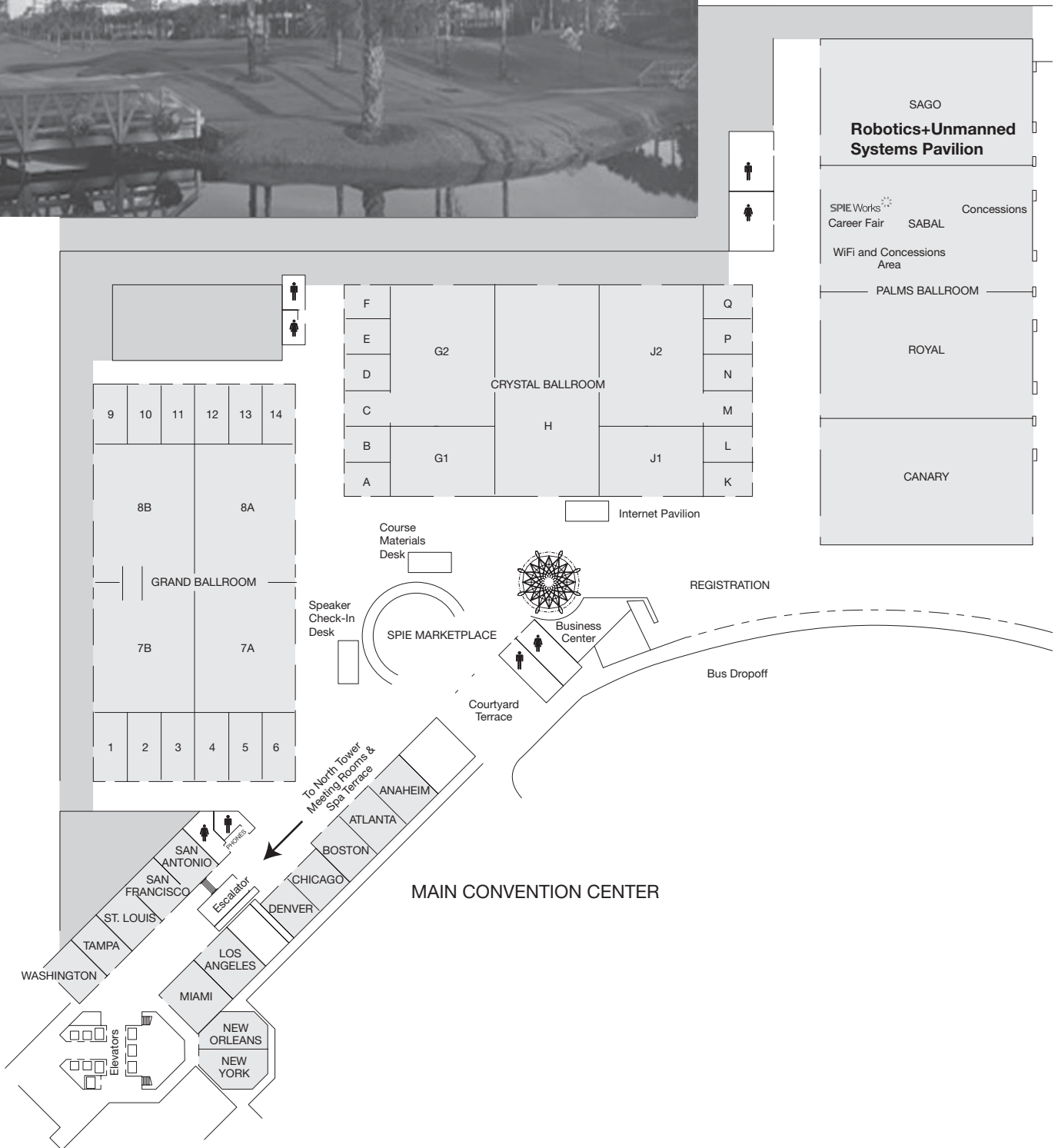
**Edmund G. Zelnio**, Air Force  
Research Lab.

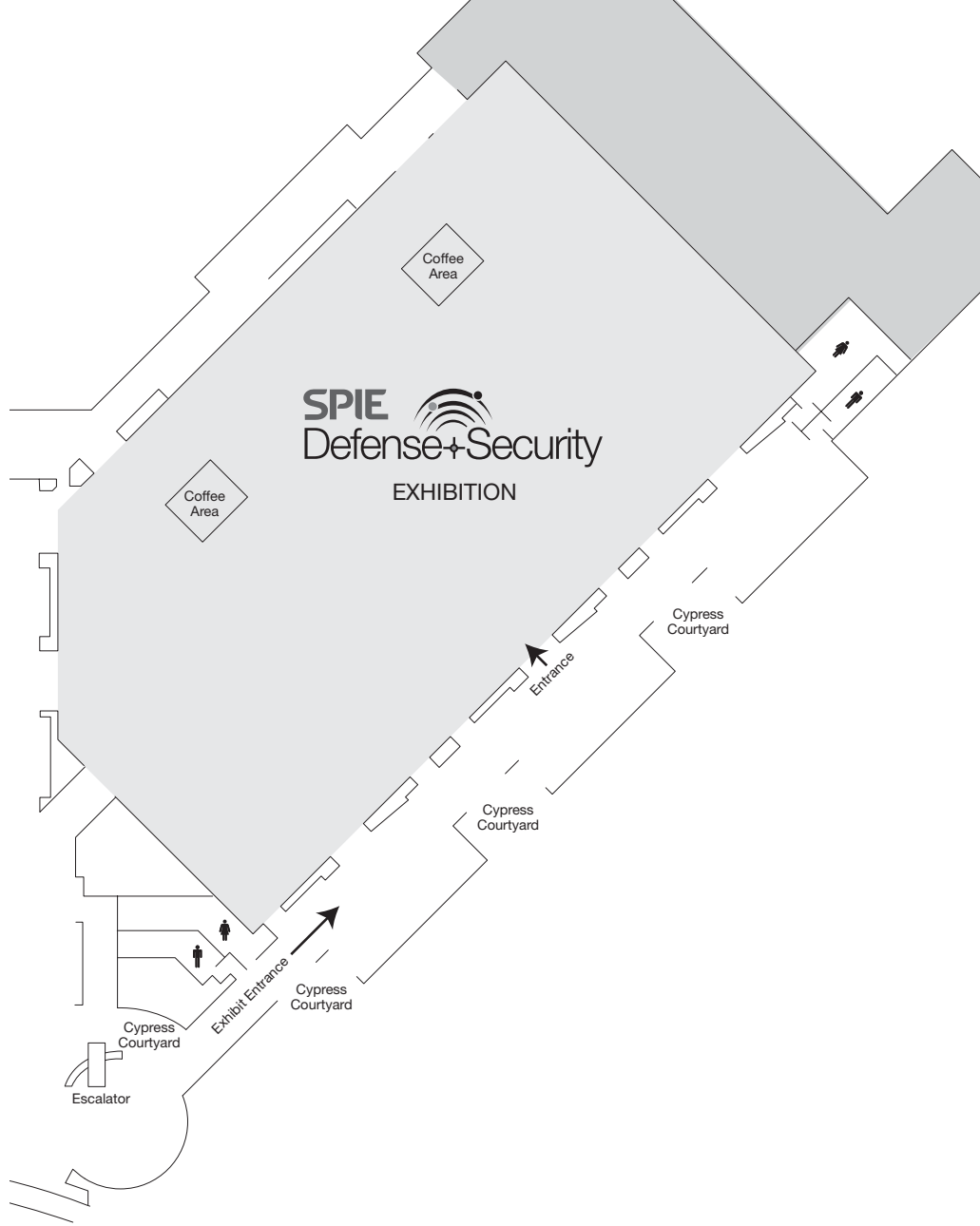
**Michael David Zoltowski**,  
Purdue Univ.

# Special Events Daily Schedule

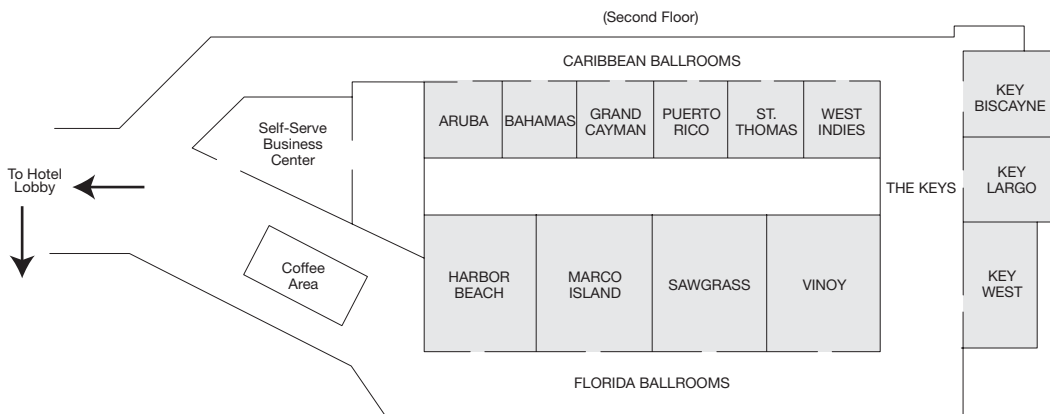
Sunday	Monday	Tuesday	Wednesday	Thursday
16 March	17 March	18 March	19 March	20 March
	<p><i>Technical Program</i> Space Technologies and Operations Track Plenary Presentation: <b>Deep Space Flight of Hayabusa Asteroid Explorer (Kuninaka/Kawaguchi)</b>, 8:00 to 9:00 am, p. 8</p> <p><i>Technical Program</i> Display Track Plenary Presentation: <b>Display Content in Advanced NVG and HMD Systems: a Pilot/Flight Surgeon's Concerns (Antonoi)</b>, 10:30 to 11:30 am, p. 8</p>			
	<p><b>Women in Optics Lunch</b>, 12:00 to 1:00 pm, p. 7</p>			
	<p><b>Student Lunch with the Experts</b>, 12:30 to 1:30 pm, p. 14</p> <p><i>HOT TOPICS:</i> <b>Food Safety (Kim, Chao)</b>, 8:00 am to 12:30 pm, p. 10 <b>Visual Analytics for Homeland Defense and Security (Tolone, Ribarsky)</b> 9:30 am to 2:20 pm, p. 10 <b>Resource Restricted Embedded and Sensor Networks (Balandin)</b> 1:30 to 5:30 pm, p. 11 <b>Forensic Science: Emerging Needs (Fitzpatrick)</b> 4:00 to 6:00 pm, p. 11</p>	<p><i>Technical Program</i> Space Technologies and Operations Track Plenary Presentation: <b>Protecting the Moon's Environment (Maclure)</b>, 8:00 to 9:00 am, p. 8</p>	<p><i>Technical Program</i> Tactical Sensors and Imagers Track Plenary Presentation: <b>Radar Horizons (Guerci)</b>, 11:00 to 11:45 am, p. 9</p>	<p><i>Industry Workshop:</i> <b>Compliance with the International Traffic in Arms Regulations (ITAR) (Palmer)</b>, 8:30 am to 12:30 pm, p. 13</p>
	<p><b>Student Chapter Meeting</b>, 3:30 to 4:30 pm, p. 14</p>	<p><b>Symposium-Wide Plenary Presentation (Cohen)</b>, 9:15 to 10:00 am, p. 6</p> <p><i>Industry Workshop:</i> <b>Intellectual Property Issues in the Defense and Security Industries (Gortych/Stanley/Kauget/Pellenberg)</b>, 8:30 am to 12:30 pm, p. 13</p>	<p><b>Banquet &amp; Award Presentation</b>, 7:00 to 9:30 pm, p. 6</p> <p><b>Innovation and the Wealth of Nations (Chisholm)</b> 5:00 to 6:00 pm, p. 7</p>	
	<p><b>Global Homeland Security Technical meeting, (Halvorson)</b> 5:15 to 6:00 pm, p. 14</p> <p><b>All Symposium Welcome Reception</b>, 6:00 to 7:00 pm, p. 7</p> <p><b>"No Ties" Student Social</b>, 7:00 to 8:30 pm, p. 12</p>	<p><b>SPIE Works  Career Fair</b>, p.14</p>		
		<p><i>HOT TOPIC:</i> <b>3D Imaging and Display (Javidi)</b> 1:00 to 4:30 pm, p. 11</p>		
		<p><i>Industry Workshop:</i> <b>Essential Skills for Engineering Project Leaders (Hinkle)</b>, 1:00 to 5:00 pm, p. 15</p>		
		<p><i>Industry Workshop:</i> <b>Playing the SBIR Game to Win (Patterson)</b>, 1:30 to 5:30 pm, p. 13</p>		
		<p><b>Future Directions for CBRNE Sensors and Systems Development (George/Gardner)</b> 5:00 to 7:00 pm, p. 7</p>		
		<p><b>Early Career Networking Social</b>, 5:00 to 6:00 pm, p. 14</p>		
		<p><b>Poster Session</b>, 6:00 to 7:30 pm, p. 7</p>		

# Orlando World Center Marriott Resort & Convention Center





**NORTH TOWER MEETING ROOMS**





## The Honorable Jay Cohen

Under Secretary for Science and Technology, U.S. Dept. of Homeland Security

## Symposium-Wide Plenary Presentation

Tuesday 18 March · 9:15 to 10:00 am · Room: Palms Ballroom, Canary  
**Free to all registered attendees**

The Honorable Jay M. Cohen is a native of New York. He was commissioned in 1968 as an ensign upon graduation from the United States Naval Academy. He holds a joint Ocean Engineering degree from Massachusetts Institute of Technology and Woods Hole Oceanographic Institution and Master of Science in Marine Engineering and Naval Architecture from MIT.

His early Navy assignments included service on conventional and nuclear submarines. From 1985 to 1988 Cohen commanded USS HYMAN G. RICKOVER (SSN 709). Following command, he served on the U.S. Atlantic Fleet as a senior member of the Nuclear Propulsion Examining Board, responsible for certifying the safe operation of nuclear powered ships and crews. From 1991 to 1993, he commanded USS L.Y. SPEAR (AS 36) including a deployment to the Persian Gulf in support of Operation DESERT STORM. After Spear, he reported to the Secretary of the Navy as Deputy Chief of Navy Legislative Affairs. During this assignment, Cohen was responsible for supervising all Navy-Congressional liaison. Cohen was promoted to the rank of Rear Admiral in October 1997 and reported to the Joint

Staff as Deputy Director for Operations responsible to the President and DoD leaders for strategic weapons release authority. In June 1999, he assumed duties as Director Navy Y2K Project Office responsible for transitioning all Navy computer systems into the new century.

In June 2000, Cohen was promoted in rank and became the 20th Chief of Naval Research. He served during the Iraq war as the Department of the Navy Chief Technology Officer (a direct report to the Secretary of the Navy, Chief of Naval Operations and Commandant of the Marine Corps). Responsible for the Navy and Marine Corps Science and Technology (S&T) Program (involving basic research to applied technology portfolios and contracting), Cohen coordinated investments with other U.S. and international S&T providers to rapidly meet war fighter combat needs. After an unprecedented five and a half year assignment as Chief of Naval Research, Rear Admiral Cohen retired on February 1, 2006.

Under Secretary Cohen was sworn in to his current position at the Department of Homeland Security on August 10, 2006.



## Dr. Dolores M. Etter

ONR Distinguished Chair in Science and Technology, Electrical Engineering Department, United States Naval Academy

## Banquet & Award Presentation

Wednesday 19 March · 7:00 to 9:30 pm

Dinner will start at 7:00 pm followed by a presentation by Dr. Dolores M. Etter. Tickets for the banquet and presentation are \$85 per person and are sold separately from conference registration. Banquet tickets must be purchased by 17 March at 1:00 pm at the SPIE Cashier.

Please join your colleagues to present the DSS Lifetime Achievement Award to the Honorable Delores Etter.

Dr. Dolores M. Etter recently rejoined the Electrical Engineering faculty at the United States Naval Academy after serving for two years as the Assistant Secretary of the Navy for Research, Development and Acquisition. Dr. Etter originally joined the faculty at the Naval Academy in 2001. She was formerly a member of the Electrical and Computer Engineering Department at the University of Colorado, Boulder (1990-98), and at the University of New Mexico (1980-89). She was also a Visiting Professor in the Information Systems Laboratory at Stanford University in 1983-84.

From June 1998 through July 2001, Dr. Etter served as the Deputy Under Secretary of Defense for Science and Technology. In that position, she was responsible for De-

fense Science and Technology strategic planning, budget allocation, and program execution and evaluation for the DoD Science and Technology Program. Dr. Etter was also the Principal U.S. representative to the NATO Research and Technology Board.

Dr. Etter is a member of the National Academy of Engineering. She is also a former member of the National Science Board and the Defense Science Board. She is a Fellow of the Institute of Electrical and Electronic Engineers (IEEE), the American Association for the Advancement of Science (AAAS), and the American Society for Engineering Education (ASEE).



## All Symposium Welcome Reception

Room: Palms Ballroom, Canary

Monday 17 March · 6:00 to 7:00 pm

All attendees are invited to the Welcome Reception. Relax, socialize, and enjoy refreshments. Please remember to wear your conference registration badges. Dress is casual.



## SPIE Women in Optics Lunch

Monday 17 March · Noon to 1:00 pm

Join us for an opportunity to network with other optics professionals, generate new contacts, and expand your resources and referrals. This SPIE hosted luncheon at Defense+Security is the perfect way to meet and develop relationships with others in your field. Register for this lunch at the SPIE Cashier onsite; location information will be provided upon sign-up.

## Poster Session

Tuesday 18 March · 6:00 to 7:30 pm

Room: Palms Ballroom, Royal

All symposium attendees are invited to attend the poster session as an opportunity to enjoy refreshments while reviewing poster papers and networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are required to wear their conference registration badges to the poster sessions.

*Don't miss these two presentations FREE to all registered attendees.*

## Future Directions for CBRNE Sensors and Systems Development

Tuesday 18 March · 5:00 to 7:00 pm · Room: Crystal H

Chairs: **Thomas George**, ViaLogy PLC;  
**Patrick J. Gardner**, Western Carolina Univ.

Events from recent years have shown us that awareness of Chemical, Biological, Radiation, Nuclear and Explosive (CBRNE) threats are no longer the exclusive domain of the military and first responder communities, but has spread to the civilian population at large. While a diverse set of sensors and instruments have been developed for the detection and characterization of these threats, government agencies are discovering that our capabilities for early detection, threat mitigation and decontamination operations are still woefully inadequate in order to effectively counter CBRNE threats. The various DoD and Homeland Security agencies have focused on a “detect-to-warn” system-integration strategy involving sensor fusion and the development network-centric systems. A key factor to be considered for future in-situ and standoff detection technologies is a rapid analysis capability with minimum false positives and negatives.

A distinguished panel of leading experts from academia, industry and the end-user will identify the future opportunities for research and new product development of CBRNE sensors intended for operation in both urban and non-urban environments. The panel will examine the various deficiencies of existing state-of-the-art technologies and unmet needs with regard to CBRNE threat sensing and mitigation. Mechanisms for rapidly and cost-effectively transitioning emerging sensing technologies from the laboratory to system-level applications will be discussed.

### PANELISTS:

**Don Buley**, Deputy Joint Program Manager Guardian

**Robert W. Dean**, President and CEO, ViaLogy PLC

**David W. Cullin**, Senior VP for Technology Transition at ICX Technologies, Inc.

**John C. Carrano**, VP for R&D at Luminex Corp.

**Augustus W. Fountain III**, Senior Research Scientist-ST, U.S. Army REDCOM/ECBC

**Greg Hebner**, Manager Lasers, Remote Sensing, Plasma Science and Complex Systems Group, Sandia National Labs.

**Paul V. Davis**, Director, Expanding Markets and Collaborative Partnerships within the Civil Security and Response Programs (CSR/P) Business Area of Raytheon's Integrated Defense Systems (IDS)

## Innovation and the Wealth of Nations

Wednesday 19 March · 5:00 to 6:00 pm · Room: Crystal H

Chair: **Roger Appleby**, QinetiQ Ltd. (United Kingdom)



**Sir John Chisholm**,  
Chairman of QinetiQ

The UK Government, along with many other governments, believes that innovation is the basis of our survival in the 21st Century. But for individuals and companies, innovation can also lead to costly mistakes. This session draws on experience across a number of industries to point the way as to how you can make money while avoiding losing it.

**Sir John Chisholm's** distinguished career bridges science, government, and industry—He is uniquely situated to discuss the role of innovation in the increasingly interconnected public-private research and development arena. Sir John is currently Chairman of QinetiQ, a firm created out of the majority privatization of the UK's Defence Evaluation and Research Agency. In 2006 the company was listed on the LSE with revenues of £1,15 bn5 and earnings of £90m. Sir John also serves as Chair of the Medical Research Council, the agency responsible for the UK's £500m biomedical research program.

Sir John is an Engineering graduate of Cambridge University. He helped to found and build CAP Group plc, a diversified computer software company, which merged with French group Sema Metra SA to become the 8000 strong Sema Group plc in 1988. Sir John served as UK Managing Director. During the nineties, Sir John was central in achieving the reorganization of the UK Defence Research Establishments into the Defence Evaluation and Research Agency.

He was Knighted by the Queen in 1999 for services to Defence Science. Sir John is a Fellow of the Royal Academy of Engineering, a Fellow of the Royal Aeronautical Society, a Fellow of the Institute of Physics, and a Fellow of the Institute of Engineering and Technology. He served as President of the Electrical Engineering Association (1989) and President of the Institution of Engineering and Technology (2005/6), as a member of the 2007 Science and Technology Policy review team, and was a founding member of the UK Government's Technology Foresight programme. Sir John is a frequent speaker on Change Management, Innovation, and Defence Science.

# Technical Program Track Plenary Presentations

Requires Conference Registration to Attend.

## Displays

Monday 17 March · 10:30 to 11:30 am · Room: Atlanta/Boston

### Display Content in Advanced NVG and HMD Systems: A Pilot/Flight Surgeon's Concerns



**Joseph (Chuck) Antonio, M.D.,**  
Naval Air Warfare Ctr.

Night vision goggles have been in use for many years and limitations in their use have been well studied through training research and flight experience. However, advances in technology have led to improvements in NVG display capabilities and in some cases helmet mounted display (HMD) technology has begun replacing NVG systems. These advances have led to an increase in the complexity of imaged scene content, thus requiring a greater level of cognitive effort for interpretation, especially when compared to the images provided by current NVG systems. In some cases the complexity of visual imagery has resulted in systems not being classified as operationally suitable. This presentation will focus on a few of the problems noted while testing some of these advanced systems.

This presentation will focus on a few of the problems noted while testing some of these advanced systems. Topics will include: added complexity of imagery in wide-field-of-view (WFOV) NVG systems, effects due to imagery created by sensors displaced from the normal eye position (increased interocular separation), effects due to imagery projected onto see-through visor designs, and effects resulting from cockpit design/geometry (e.g., location and design of large-format head-down displays, and the position of structures such as window frames). Training concerns and potential mitigation strategies for HMD design concepts will also be covered. The issues discussed are important for manufacturers to understand during the early design phase, and for testers to understand during developmental or operational testing.

**Chuck Antonio** is currently working for NAWCAD in the Human Systems Department where he is supporting several NVG and helmet mounted display (HMD) projects. He also works part time for the National Test Pilot School in Mojave, CA where he serves as an Aerospace Medicine /Night Vision Systems Pilot Instructor. Dr Antonio has written articles for various publications, authored several night vision training instructional guides, presented papers for many national and international organizations, and briefed at all programmatic levels.

## Space Technologies and Operations

### Deep Space Flight of Hayabusa Asteroid Explorer

Monday 17 March · 8:00 to 9:00 am · Room Crystal C



**Hitoshi Kuninaka, Junichiro Kawaguchi,**  
Japan Aerospace Exploration Agency

ISAS/JAXA has developed the microwave discharge ion engine myu10, which eliminates all the electrodes for plasma generation so as to realize long life and high reliability. Four myu10 propelled Hayabusa asteroid explorer, launched in 2003, and succeeded in rendezvousing with the asteroid in 2005 after a 2-year flight. Hayabusa caused serious troubles in the proximity operation and postponed the Earth return. The new software to control the attitude by means of a momentum wheel and the thrust vector control by a two-axis gimbal enabled the powered flight toward Earth again since April 2007. It will come back Earth in 2010.

**Hitoshi Kuninaka** received the B.S. degree from Department of Aeronautics, Kyoto University, in 1983, and the M.S. and Ph.D degrees from Department of Aeronautics, University of Tokyo, Japan in 1985 and 1988, respectively. He was promoted to Full Professor in ISAS/JAXA, in 2005. He holds concurrently the post of Professor in Department of Aeronautics and Astronautics, University of Tokyo. He researches the plasma interaction of satellites and develops electric propulsion. He invented the microwave discharge ion engines for the asteroid explorer HAYABUSA.

### Protecting the Moon's Environment

Tuesday 18 March · 8:00 to 9:00 am · Room: Crystal C



**Jeffrey Maclure,** International Academy of  
Astronautics and International Institute of Space  
Law

Following a summary of international treaties, agreements, and the plans of governments and private concerns who soon will voyage to the Moon, essential Earthly tenets related to the Moon are reviewed, including sovereignty, territorial appropriation, and the use of Res Communis. Future human Lunar activities-and their pros and cons for the maintenance of the Moon's environment - are speculated upon, including the Moon as a Body for international scientific and technical research; as a way-station in the exploration of Mars and the rest of the Universe; and as a New World for commercial natural resource exploitation.

**Mr. Jeffrey Maughan Maclure** is a career US Government Officer experienced in US Government international policy formulation and cooperation in satellite remote sensing programs and other S&T initiatives. He is a skilled negotiator, having represented the US in the UN Committee on the Peaceful Uses of Outer Space, a number of additional UN fora, and in other varied bilateral scientific and technical consultations. Mr. Maclure has served as a Department of State Foreign Affairs Officer since 1990 and, earlier, seven years assisting in the international management of the US Landsat and other satellite programs of the Satellite Service, NOAA. He graduated in 1983 from the Fletcher School, Tufts University, with a Master of Arts in Law and Diplomacy.

[Jeffrey Maughan Maclure, Foreign Affairs Officer, United States Department of State, Washington, D.C., 20520. The views expressed in this article are those of the author, and do not necessarily reflect those of the U.S. Department of State or the Government of the United States of America.]



## Tactical Sensors and Imagers

Wednesday 19 March · 11:00 to 11:45 am · Room: Crystal M

### Radar Horizons

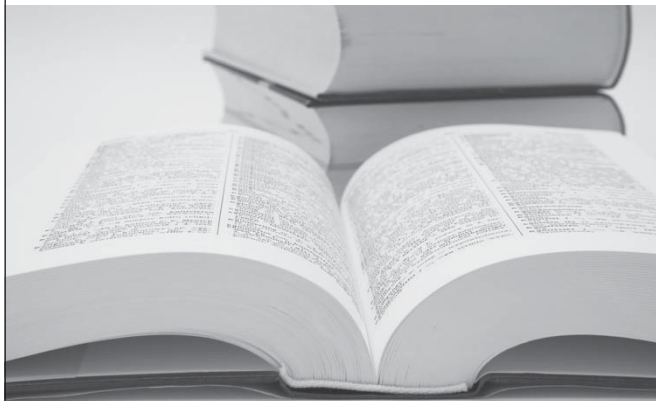


**Joseph R. Guerci**, Consultant

From sensing through walls, stratospheric airship antennas, to cognitive radars that adapt both transmit and receive functions on-the-fly in an intelligent manner, this talk surveys the latest developments in both enabling device technologies, signal processing, and entirely new applications. After covering the latest technology developments in innovative aperture technologies, low-cost ESAs, waveform diversity, knowledge-aided radar, and conformal antennas, new systems based on these technologies are discussed that can provide both unprecedented performance improvements, as well as entirely new sensing modalities.

**Dr. Guerci** has over 23 years of experience in the research and development of advanced sensor systems in industrial, academic and government settings—the latter a seven year term with the Defense Advanced Research Projects Agency (DARPA). He has over 80 peer reviewed publications, 8 US Patents, and is the author of Space-Time Adaptive Processing for Radar (Artech House, 2003). A Fellow of the IEEE, and a member of the IEEE Radar Systems Panel, he is the recipient of the 2007 IEEE Warren D. White Award for “Excellence in Radar Adaptive Processing and Waveform Diversity”.

## SPIE Marketplace



Make your visit complete

- **Books**
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- **Membership**

*Located in the Grand Atrium, see p. 4 for location.*

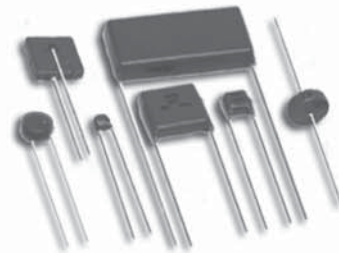
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## Booth 1433

# Hot Topics

Hear leaders in government and industry discuss recent advances, current challenges, and opportunities. Requires Conference Registration to Attend.

## Food Safety

Monday 17 March · 8:00 am to 12:30 pm · Room: Crystal N

Chairs: **Moon S. Kim**, USDA Agricultural Research Service;  
**Kaunglin Chao**, USDA Agricultural Research Service

This special food safety session will focus on optical, spectroscopic, and spectral imaging sensing techniques, and approaches for the use of biosensors, for rapid or non-destructive assessment of safety and quality for meats, fruits, and vegetables. Novel techniques, instruments for real-time measurement and processing, and industrial applications of opto-electronic sensing systems to detect diseases, defects, and fecal or bacterial contamination on meats, fruits, and vegetables will be emphasized.

### INVITED PRESENTATIONS:

8:00 am: **Optical biosensor platforms for multiplex detection of foodborne pathogens**, Arun Bhunia, Purdue Univ.

8:30 am: **Modified pressure system for imaging egg cracks**, Kurt C. Lawrence, Seung Chul Yoon, Deana R. Jones, Gerald W. Heitschmidt, Bosoon Park, USDA Agricultural Research Service

9:00 am: **Optical polarization imaging of skeletal muscle**, Xin Li, Janaka C. Ranasinghesagara, Gang Yao, Univ. of Missouri/Columbia

9:30 am: **Citrus canker detection by multispectral imaging and PCA-based image classification method**, Jianwei Qin, Thomas F. Burks, Timothy Schubert, Mark Ritenour, Univ. of Florida

10:00 to 10:30 am: **Coffee Break**

10:30 am: **Evaluation of microbial contamination on fruits using hyperspectral imaging**, Won Jun, Kangjin Lee, Manan Sharma, Moon S. Kim, USDA Agricultural Research Service

11:00 am: **Multitasking online apple inspection/sorting system**, Moon S. Kim, Kangjin Lee, Kuanglin Chao, Alan M. Lefcourt, Won Jun, USDA Agricultural Research Service

11:30 am: **Detection of Salmonella Enteritidis from egg components using different immunomagnetic beads and time-resolved fluorescence**, Shu-I Tu, Sue A. Reed, Andrew G. Gehring, Yiping He, USDA Agricultural Research Service

12:00 pm: **SERS technique for rapid species identification of Escherichia Coli, Listeria Monocytogenes, and Salmonella Typhimurium cultures**, Yongliang Liu, Kuanglin Chao, Moon S. Kim, Xiangwu Nou, USDA Agricultural Research Service

**Registration is Required.**  
See SPIE Cashier to Register.

## Visual Analytics for Homeland Defense and Security

Monday 17 March · 9:30 am to 2:20 pm · Room: Crystal J1

Chairs: **William J. Tolone**, The Univ. of North Carolina at Charlotte; **William Ribarsky**, The Univ. of North Carolina at Charlotte

Meeting the challenges of homeland defense and security requires the time-sensitive, multi-dimensional analysis of overwhelming volumes of multi-source, multimedia information including high volume imagery, sensor data, text streams, transaction streams, and geospatial data. Human judgment is essential to these analyses as insights and understandings are synthesized from information that are often dynamic, incomplete, diverse, conflicting, and even deceptive. As our ability to collect information is increasing at rates far beyond our ability to analyze, new methods are required to enable analysts to reach better insights and understandings with greater efficacy and efficiency. This conference provides both an introduction to the field of visual analytics as the science of analytical reasoning facilitated by interactive visual displays, and presentations on advances in the application of visual analytics and interactive visualizations to the challenges of information processing, exploration, and analysis, as well as human cognition and sense-making that face homeland security and defense. The intended audience includes government and industry analysts, emergency responders, and research scientists from universities, industry, government, and research institutes. This session will offer a tutorial and presentations.

### Visual Analytics and Interactive Visualizations: a Tutorial

Monday 17 March · 9:30 am to 10:30 am · Room: Crystal J1

This tutorial will provide an introduction to visual analytics as the science of analytical reasoning facilitated by interactive visual displays, will overview the national research agenda as outlined in Illuminating the Path: The Research and Development Agenda for Visual Analytics (<http://nvac.pnl.gov/agenda.stm>), and will illustrate recent advances in the field by summarizing some of the work of the National Visualization and Analytics Center and its partnering Department of Homeland Security designated Regional Visualization and Analytics Centers.

### Visual Analytics for Defense and Security Presentations

Monday 17 March · 11:00 am to 2:20 pm · Room: Crystal J1

11:00 am: **Human centric approach for geospatial data fusion in homeland defence and security application scenarios**, Eugene Levin, Michigan Technological Univ., Gennady Gienko, Univ. of the South Pacific (Fiji)

11:20 am: **Visual analysis for live LIDAR battlefield change detection**, Thomas Butkiewicz, Remco Chang, Zachary Wartell, William Ribarsky, The Univ. of North Carolina at Charlotte

11:40 am: **Using a human cognition model in the creation of collaborative knowledge visualizations**, Tera Marie Green, William Ribarsky, The Univ. of North Carolina at Charlotte

12:00 to 1:00 pm: **Lunch Break**

1:00 pm: **Computation and visualization concept for reconnaissance requirement**, Susanne Eckel Univ. Karlsruhe and Fraunhofer-Institut für Informations-und Datenverarbeitung, Juergen Geisler, Fraunhofer-Institut für Informations-und Datenverarbeitung

1:20 pm: **Visualizing uncertainty for geographical information in a global terrorism database**, Josh Jones, Winthrop Univ., Remco Chang, Thomas Butkiewicz, William Ribarsky, The Univ. of North Carolina at Charlotte

1:40 pm: **Human posture classification for intelligent visual surveillance systems**, Haroun Rababaah, Amir Shirkhodaie, Tennessee State Univ.

2:00 pm: **Visual analysis of entity relationships in global terrorism database**, Alex Godwin, Remco Chang, Robert Kosara, William Ribarsky, The Univ. of North Carolina at Charlotte

## Resource Restricted Embedded and Sensor Networks

Monday 17 March · 1:30 to 5:30 pm  
Room: Grand 9

Chair: **Sergey Balandin**, Nokia Research Ctr. (Finland)

This year's promotional session addresses most hot research questions for resource restricted embedded and sensor networks. The session consists of a number of lectures and tutorials, which give overview of the state of art and existing solutions in the field, the current vision of the applications and use scenarios and the key open issues in the area.

### PRESENTATIONS INCLUDE:

1:30 pm: **State of art and recent development of embedded networks solutions research (Tutorial)**, Michel Gillet, Sergey Balandin, Nokia Research Ctr. (Finland)

3:00 to 3:20 pm: **Coffee Break**

3:20 pm: **High-rate serial interconnections for embedded and distributed systems with power and resource constraints (Tutorial)** by Yuriy Sheynin, Elena Suvorova, Felix Shutenko, and Evgeney Yablokov, SUAI (Russia)

4:50 pm: **Building of advanced simulation tools for resource restricted networks on top of SystemC**, Michel Gillet, Sergey Balandin, Nokia Research Ctr. (Finland)

5:10 pm: **Applications of wireless sensor and control networks for industrial applications, work machines, and vehicles**, Vesa Pentikäinen, VTT Elektronikka (Finland)

## Forensic Science: Emerging Needs

Monday 17 March · 4:00 to 6:00 pm  
Room: Crystal N

Moderator: **Colleen Fitzpatrick**, Yeiser and Associates

The panel has been assembled to investigate the potential synergy between the forensics and optical communities, to bring together what is needed with what is possible. Our panelists are well known experts in the forensic sciences, drawn from both the government and the private sector. Each panelist will offer a commentary on his designated subject, after which the floor will be open to questions and discussion by the audience.

### PRESENTATIONS INCLUDE:

4:00 pm: **Present and future technologies**, Dr. Benjamin C. Garrett, Senior Scientist, FBI Forensic Science Lab Quantico, VA

4:30 pm: **Practical aspects of forensic laboratory development**, Tammy Pruett Northrup, Executive Director, Coroner Forensic Science Ctr., St. Tammany Parish, Slidell, LA

5:00 pm: **Funding sources for the forensic sciences**, Dr. Amanda Sozer, President, Sozer, Niezgoda and Associates, LLC, Alexandria, VA

5:30 pm: **Successful case study in the forensic sciences**, Dr. Michael Coble, Chief of Research, Armed Forces DNA Identification Lab., Rockville, MD

## 3D Imaging and Display

Tuesday 18 March · 1:00 to 4:30 pm  
Room: Crystal H

Chair: **Bahram Javidi**, Univ. of Connecticut

This Hot Topics Session is a forum for interchange on various algorithms, devices, systems, sensors, and architectures for novel applications in the field of 3D sensing, 3D display, and 3D visualization. Invited papers from internationally known scientists and engineers on these subjects reporting recent advances are presented.

### INVITED PRESENTATIONS:

1:00 pm: **3D imaging with aperture coding**, Saeed Bagheri, IBM Research Ctr.

1:30 pm: **3D TV and display using multi-view**, Jung Young Son, Daegu Univ. (Korea)

2:00 pm: **3D TV with integral imaging**, Fumio Okano, NHK (Japan)

2:30 pm: **3D optical microscopy using digital holography**, Adrian Stern, Ben-Gurion Univ. of the Negev (Israel)

3:00 to 3:30 pm: **Coffee Break**

3:30 pm: **3D integral imaging with optical processing**, Manuel Martinez Corral, Univ. of Valencia (Spain)

4:00 pm: **Holography of incoherently illuminated 3D scenes**, Natan T. Shaked, Joseph Rosen, Ben-Gurion Univ. of the Negev (Israel)

Papers received from these hot topic sessions will be published as part of Proceedings Volume 6983: Special Sessions on Food Safety, Visual Analytics, Resource Restricted Embedded and Sensor Networks, and 3D Imaging and Display



# Conference-Related Events

Requires Conference Registration to Attend.

## Global Homeland Security Technical Meeting

Monday 17 March · 5:00 to 6:00 pm · Room: Crystal G1

Chair: **Craig S. Halvorson**, Lawrence Livermore National Lab.

Please join us to discuss the following questions in relation to the conference on Optics and Photonics in Global Homeland Security (OPGHS):

- How should the technology needs of first responders be addressed?
- Are there ways to increase international involvement?
- Does OPGHS have the optimal balance between presentations from sponsors and presentations from researchers?
- How might corporate sponsors participate in bringing university researchers to the conference?
- Are there any particular researchers or sponsors that should be invited to present at Defense & Security 2009?
- Are there suggestions for possible symposium plenary speakers for Defense & Security 2009?

This technical meeting is held in conjunction with conference 6945. Interested attendees are welcome to attend.

## Vendor Presentations and Reception

Monday 17 March · 5:00 to 8:00 pm · Room: Crystal M

Chairs: **Andrés E. Rozlosnik**, SI Termografía Infrarroja (Argentina); **G. Raymond Peacock**, Temperatures.com, Inc.

## What's News in Hardware and Software at the 2008 DSS Exhibition?

For the fourth year, in conjunction with the Thermosense XXX conference, hardware and software vendors will give a brief presentation on what is new this year in their product lines that impact thermal imaging practices and applications. All presenting companies have a booth in the exhibition hall.

The intent of this workshop is to bring together Vendors and Early Arrival Thermosense and DSS exhibitors to highlight the newest products and services being shown at the Exhibition. In this way the busy technical conference attendees can better prioritize their activities when visiting the exhibits. It is also a relaxed opportunity for getting to know one another better and to have informal discussions on matters of mutual interest. A limited time for 10 to 15 minute vendor presentations starts the session, followed by a reception with snacks and soft drinks.

This event is organized by the Thermosense conference 6939. For presentation details see p. 36.

Invited Panel Discussion

## Issues and Challenges in Performance Assessment of Multitarget Tracking Algorithms with Applications to Real-World Problems

Monday 17 March · 7:00 to 9:45 pm · Room: Grand 4

Organizer: **Ivan Kadar**, Interlink Systems Sciences, Inc.

Moderators: **Ivan Kadar**, Interlink Systems Sciences, Inc.;

**William Dale Blair**, Georgia Tech Research Institute

Panelists: **William Dale Blair**, Georgia Tech Research Institute; **Erik Blasch**, Air Force Research Lab.;

**Chee-Yee Chong**, BAE Systems Advanced Information Technologies;

**Oliver Drummond**, Consulting Engineer; **Ivan Kadar**, Interlink Systems

Sciences, Inc.; **Thiagalingam Kirubarajan**, McMaster Univ. (Canada);

**X. Rong Li**, Univ. of New Orleans; **Ronald P. Mahler**, Lockheed Martin Tactical Systems

This panel discussion is held in conjunction with conference 6968.

Panel Discussion

## Bio-inspired Computing for Homeland Security: Issues and Answers

Tuesday 18 March · 3:30 to 4:30 pm · Room: Crystal L

Moderator: **Robert Bird**, Red Lambda, Inc.

This event is held in conjunction with conference 6964.

Demonstrations and Open Discussion

## Signal and Data Processing

Tuesday 18 March · 8:00 to 10:00 pm · Room: Grand 6

Chair: **Oliver Drummond**, Consulting Engineer

This event is held in conjunction with conference 6969.

## Polarization Technical Meeting

Wednesday 19 March · 11:40 am to 1:40 pm

Room: San Antonio

Chairs: **David B. Chenault**, Polaris Sensor Technologies, Inc.; **Dennis H. Goldstein**, Polaris Sensor Technologies, Inc.

This Technical Group is focused on research, development, engineering, and applications in fields of optics where polarization and its measurement are key issues.

**Lunch will be available for purchase.**

This meeting is held in conjunction with conference 6972.

Panel Discussion

## Performance Evaluation for Impact Assessment Systems

Wednesday 19 March · 3:30 to 5:10 pm · Room: Crystal E

Moderator: **Shanchieh Jay Yang**, Rochester Institute of Technology

Panelists: **John J. Salerno, Jr.**, Air Force Research Lab.; **James Llinas**, Univ. at Buffalo; **Robert S. Lynch, Jr.**, Naval Undersea Warfare Ctr.; **Jerome J. Braun**, MIT Lincoln Lab.; **Erik Blasch**, Air Force Research Lab.

Traditionally, fusion systems are evaluated via Monte-Carlo simulations against the ground truth. ROC charts and associated metrics are typically used to assess performance of object detection and tracking. In the case of Impact Assessment, a fusion system presumably aims at projecting future actions of the RED and BLUE teams and assessing the consequences of such actions. Because it involves "future actions" and "potential consequences," evaluating performance of an impact assessment system becomes a nontrivial problem. Techniques, metrics and data sets suitable for evaluating lower level fusion systems may no longer be applicable. This panel will identify challenges and discuss methodologies in evaluating impact assessment systems for general and specific application domains.

This panel discussion is held in conjunction with conference 6974.



Learn new technical skills and enhance your career with these workshops from SPIE.

## Intellectual Property Issues in the Defense and Security Industries

**WS639 · Course level: Introductory**  
**CEU .35 \$315 / \$365 USD**  
**Tuesday 8:30 am to 12:30 pm**

Intellectual property (IP), in the form of copyrights, trademarks, trade secrets, ideas and patents, is of great importance in the defense and security industries. Many companies and contractors are involved with developing and manufacturing specialized products or processes (read: inventions) for use by the government, often with the assistance of the government. This governmental connection creates special issues for developing, managing, protecting and leveraging IP. For many companies and government contractors, their IP is their most valuable asset, so that having a modern view of IP and the IP issues in the defense and security business is critical. The aim of this course is to provide an overview of the numerous IP issues and considerations related to doing business in the defense and security industries.

### INSTRUCTORS

**Joseph Gortych** is a registered patent attorney and is president of Opticus IP Law PLLC.

**Timothy Stanley** is Intellectual Property Counsel for Lockheed Martin Corporation.

**Harvey Kauget** is a partner at Phelps Dunbar LLP in the firm's regional commercial litigation group.

**Eric Pellenberg** is an associate at Phelps Dunbar LLP in the firm's regional commercial litigation group.

## Compliance with the International Traffic in Arms Regulations (ITAR)

**Course level: Introductory**  
**CEU .35 \$315 / \$365 USD**  
**Thursday 8:30 am to 12:30 pm**

This course provides background on the ITAR and the importance to national security of licensing defense articles. An interactive format ensures students will gain a working knowledge of the ITAR and will be able to identify potential trouble spots.

### INSTRUCTOR

**Suzanne Palmer** founded Export Compliance Solutions LLC (ECS).

## Playing the SBIR Game to Win

**WS843 · Course level: Introductory**  
**CEU .35 \$315 / \$365 USD**  
**Tuesday 1:30 to 5:30 pm**

This course provides attendees with a working knowledge of the Small Business Innovation Research (SBIR) Program and presents proven strategies to win awards. The course concentrates on those elements for Phase I that will enhance the likelihood of getting a favorable review and an Agency decision to fund your research project. Many practical and useful examples that prepare you to win more funding will be included throughout. You will learn to construct and submit winning proposals.

### INSTRUCTOR

**Fred Patterson**, is the co-founder of two of Texas' most successful SBIR companies, and a well-recognized consultant with dozens of clients nationwide.

## Product Tutorial

### Multispectral Analysis for Defense and Security using ENVI

**Wednesday 8:30 am to 5:30 pm \$300**

To Register, please visit the ITT Visual Information Systems website at <http://www.ittvis.com/training/description.asp?courseid=265>, or contact :

**Chris Fuentes**  
**Direct: 303-413-3981**  
**E-mail: cfuentes@ittviss.com**

This tutorial provides the opportunity to gain hands-on experience with multispectral image analysis using ENVI, the industry-leading remote sensing exploitation package. We'll begin with the fundamentals of using ENVI, including mastering the basic features, creating and managing image displays, and using the mouse. The tutorial continues with a review of the electromagnetic spectrum - the basis for all multispectral remote sensing - and how to obtain multispectral signatures using ENVI's z-Profile Tool. We'll also learn how to perform supervised multispectral target detection and explore RXD Anomaly Detection. This product tutorial will be hands-on, with participants learning by applying ENVI to real-world analysis scenarios.

### INTENDED AUDIENCE

This material is intended for professionals in the defense and security industries who would like to learn about applying the industry-leading spectral analysis tools in ENVI to their unique geospatial problems. A basic level of understanding of remote sensing data analysis is necessary to take advantage of what this course has to offer.

### INSTRUCTOR

**Thomas Harris** is a Consulting Engineer and Instructor in the Global Services group at ITT Visual Information Solutions, the developers of the ENVI and IDL data analysis and visualization software packages.

**Registration is Required.**  
 See SPIE Cashier to Register.

# Events for Students and Early Career Professionals

## Student Lunch with the Experts – A Networking Event

Monday, 17 March · 12:30 to 1:30 pm

Seating is Limited.  
Tickets Required.

Enjoy a casual meal with colleagues at this engaging networking opportunity. Hosted by SPIE Student Services, this event features experts willing to share their experience and wisdom on career paths in optics and photonics. Students receive one complimentary ticket with registration.

## SPIE Student Chapter

### Student Chapter Meeting

Monday, 17 March · 3:30 to 4:30 pm

By invitation Only

Meet and network with chapter leaders and members from around the world at this informal gathering. Share ideas for activities and the future direction of the chapter program.

### “No Ties” Student Social

Monday, 17 March · 7:00 to 8:30 pm · Room: Key Biscayne

Relax and hang out with new friends and peers while enjoying the casual Florida atmosphere. No ties required but please bring photo ID for bar service.



### Early Career Networking Social

Tuesday, 18 March · 5:00 to 6:00 pm · Room: Key Biscayne

Meet distinguished SPIE contributors for a casual pre-dinner cocktail. This event promises one on one networking opportunities with some of SPIE's most influential volunteers from conferences and leadership.

Attend the SPIEWorks Career Fair!



Location: Sabal Ballroom

Tuesday 18 March . . . . . 11:00 am to 3:00 pm

Wednesday 19 March . . . . . 11:00 am to 3:00 pm



Top employers are coming together to interview and hire engineers and scientists like you. The SPIEWorks Career Fair at Defense+Security is a great place to:

- Get ‘face to face’ time with employers and interview on the spot
- Learn more about the jobs available in our industry
- Network!

*NOTE: Many of the positions posted to this career event require an active security clearance or the ability to acquire one.*

**Free Admission; Registration Required.**

*Whether you are looking for a better job, re-entering the workforce or just starting your career, the SPIEWorks Career Fair is the place to start!*

In addition to the onsite recruitment activities listed above, SPIEWorks offers you online services to help you with your search for employment before, during, and after the conference. Visit [spieworks.com](http://spieworks.com) to post your resume, view jobs, or sign-up for email alerts.

**Free Services for Employers**

*Don't Miss This Recruiting Opportunity—hire top talent at Defense+Security*

- Stop by the SPIEWorks booth in the Career Fair and gain access to our proprietary resume database at no charge.
- Post jobs for free. That's right, there's no charge to post jobs to the Defense+Security Career Fair. Go to [spieworks.com](http://spieworks.com), create an account and sign-in to post jobs online. Your free job(s) will be live 17-23 March.

For information on future recruiting events contact Dave Baggenstos at +1 360 715 3705 or email [sales@spieworks.com](mailto:sales@spieworks.com)



## Essential Skills for Engineering Project Leaders

WS846

**Course level: Introductory**  
**CEU .35 \$315 / \$365 USD**  
**Tuesday 1:00 to 5:00 pm**

Students  
Save 50%!

This workshop teaches skills needed to lead technical projects, drive innovation, and influence others. Attendees learn the difference between leadership and management, and how to develop specific leadership skills that are important to technical professionals who lead projects or need assistance from others to get things done. Participants engage in exercises that assess their individual leadership abilities and provide guidance for further skill development.

### INSTRUCTOR

**Gary Hinkle** is President and founder of Auxilium, Inc.

## The Craft of Scientific Presentations: A Workshop on Technical Presentations

WS667

**Course level: Introductory**  
**CEU .35 \$125 / \$175 USD**  
**Wednesday 8:30 am to 12:30 pm**

Free for  
Students!

*You must register to attend.*

This course provides attendees with an overview of what distinguishes the best scientific presentations. The course introduces a new design for presentation slides that is both more memorable and persuasive from what is typically shown at conferences.

### INSTRUCTOR

**Michael Alley** teaches writing and speaking to engineering students at Penn State.

COURSE PRICE INCLUDES the text *The Craft of Scientific Presentations* by the instructor.

## The Craft of Scientific Writing: A Workshop on Technical Writing

WS668

**Course level: Introductory**  
**CEU .35 \$125 / \$175 USD**  
**Wednesday 1:30 to 5:30 pm**

Free for  
Students!

*You must register to attend.*

This course provides an overview on writing a scientific paper. The course focuses on the structure, language, and illustration of scientific papers.

### INSTRUCTOR

**Michael Alley** teaches writing and speaking to engineering students at Penn State.

COURSE PRICE INCLUDES the text *The Craft of Scientific Writing* by the instructor.

**Registration is Required.**  
See SPIE Cashier to Register.



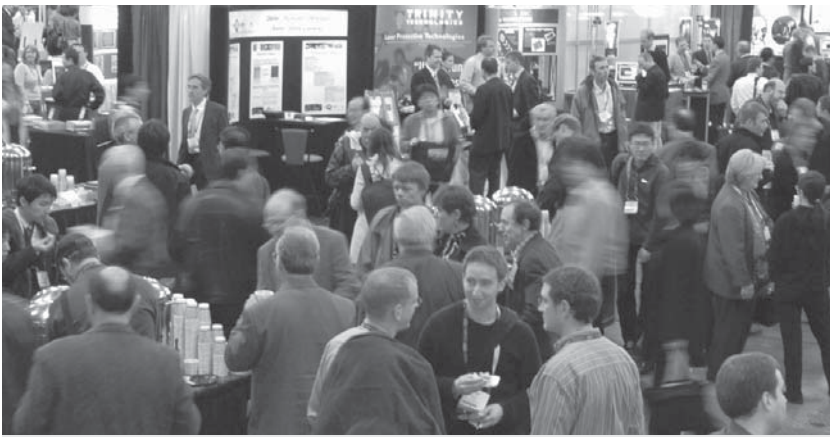
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# Launch Your Career

## SPIE Early Career Professional Program

[spie.org/ecp](http://spie.org/ecp)





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# FLORIDA INNOVATION SHOWCASE 2008



University  
Partnership Opportunities  
for Your Organization

*19–20 March 2008*

*Co-located with SPIE Defense+Security*

## **Florida Innovation Showcase Registration**

*Location: Royal Palm*

Wednesday 18 March . . . . . Noon to 5:00 pm

Thursday 19 March . . . . . 7:00 to 11:00 am

The Florida Innovation Showcase 2008 is your opportunity to discover Florida's hottest university technologies and research competencies for leveraging your research and development efforts. This technology development and partnership conference is presented by the Florida Research Consortium, a not-for-profit strategic partner between Florida's universities, the business community and state government to introduce you to the many exciting discoveries being generated as a result of the tremendous volume of research taking place throughout the state of Florida.

On Wednesday afternoon, 19 March, attendees will be welcomed and given a high level briefing (Governor Crist invited) on "Florida's Progression as a Technological Leader". This overview will be followed by an informative panel of experts covering ways to engage and leverage universities in the commercial enterprise. The day will end with a cocktail reception featuring tasty Florida treats and opportunities to mingle with top Florida business, economic development and academic leaders.

On Thursday, 20 March a hosted continental breakfast, followed by breakout sessions and university/institute briefings that give you the opportunity to discuss trends in technology transfer and discover new developments in hot growth areas such as:

- Physical and Chemical Sensor and Diagnostic Technologies
- Data Mining and Analysis Technologies
- Imaging System Technologies
- Biomedical Technologies with Homeland Security and Defense Applications
- Biosensors and Diagnostic Technologies
- Materials Technologies
- Agriculture and Food Source Protection Technologies
- Modeling and Simulation Technologies

Plenty of time will be allowed for networking breaks throughout the day.



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Recruiters (as of 14 February 2008)

# SPIE Works



[spieworks.com](http://spieworks.com)

## Make your way to the SPIEWorks Career Fair!

TWO DAYS ONLY · FREE ADMISSION · REGISTRATION REQUIRED

Tuesday 18 March . . . . . 11:00 am to 3:00 pm

Wednesday 19 March . . . . . 11:00 am to 3:00 pm

Top employers are coming together to interview and hire talented engineers and scientists like you! The SPIEWorks Career Fair at SPIE Defense+Security is a great way to:

- **Get face-to-face time with employers and interview on the spot**
- **Learn more about the jobs available in our industry**
- **Network!**

Whether you are looking for a better job, re-entering the workforce or just beginning your career, the SPIEWorks Career Fair is a great place to start!



# Don't Miss the FREE Exhibition!



## Moving Technology to Market™

**Exhibition: 18–20 March 2008**  
Orlando, Florida USA

### Exhibition Hours

Tuesday 18 March . . . . . 10:00 am to 5:00 pm  
Wednesday 19 March . . . . . 10:00 am to 5:00 pm  
Thursday 20 March . . . . . 10:00 am to 2:00 pm

### *The largest showcase of unclassified defense and security equipment*

Visit the number one event in the world for infrared imaging, optics, and sensor equipment—SPIE Defense+Security. See exhibitors displaying the latest advances in laser and sensor technologies and systems, forensic technologies, unmanned vehicles, and more. SPIE Defense+Security is the place to connect with the right people and discover where the industry is going.

#### *Exhibitors as of 15 February 2008*

4D Technology Corp  
A.J. Tuck Co.  
AB WIBE  
ABB  
AccuCoat, Inc.  
Acktar Ltd.  
Active Silicon Ltd.  
Aculight Corp.  
Acutronic USA, Inc.  
Adimec  
AdTech Ceramics  
Advanced Imaging Magazine/  
AdvancedImagingPro.com  
Aerotech, Inc.  
Agilent Technologies, Inc.  
AIM Infrarot-Module GmbH

Air Force Research Lab.  
ALIO Industries  
Ambric, Inc.  
Ametek HCC Industries  
Ametek Precitech, Inc. - see  
Precitech, Inc.  
Ampex Data Systems Corp.  
Analog Modules, Inc.  
Andover Corp.  
Angstrom Precision Optics Inc.  
AOPtix Technologies Inc.  
APHOTIK  
Apollo Optical Systems, Inc.  
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Applied Signal Technology, Inc.  
Arcturus UAV  
Arete Associates - Optical  
Systems Research  
ASD Inc. (formerly Analytical  
Spectral Devices)  
ASML Optics  
asphericon GmbH  
Atlantic Positioning Systems  
Autonosys Inc.  
Avo Photonics, Inc.  
Axsys Motion Control Products  
Axsys Technologies Imaging  
Systems  
Axsys Technologies IR Systems  
B&W Tek, Inc.  
BAE Systems  
Barr Associates Inc.  
BaySpec, Inc.  
BEI Precision Systems & Space  
Co.  
Biometrics Task Force  
Bodkin Design & Engineering, LLC  
Bolt Systems, Inc.  
Bookham  
Boston Electronics Corp.  
Boulder Imaging Inc.  
Boulder Nonlinear Systems, Inc.  
Brijot Imaging Systems, Inc.  
Brownell Ltd.  
Brush Wellman Inc.  
CALCULEX, Inc.  
Cantronic Sytems, Inc.  
Carl Zeiss MicroImaging, Inc.  
Carl Zeiss Optronics GmbH  
Carleton Life Support Systems Inc.  
CBC (AMERICA) Corp.  
Cedip Infrared Systems  
Celltron Inc.  
Chardon Tool  
ChemImage Corp.  
Chengdu Ultra Pure Applied  
Materials Co., Ltd.  
CI Systems, Inc.  
Cincinnati Sub-Zero Products, Inc.  
Clear Align  
Cloud Cap Technology, Inc.  
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FREE  
to all Registered  
Attendees

## See the **NEW** Robotics+Unmanned Systems Pavilion

Location: Sago/Sabal Ballrooms

### The Pavilion features:

- Displays and demonstrations from a select group of robotics and unmanned systems vendors
- Differentiation from the larger variety of products on display in the main hall

### On Display:

- Unmanned vehicles from the DARPA Challenge
- Robotic systems used by the Army & Navy
- Unmanned Aerial Vehicles currently being used in Afghanistan and Iraq
- Companies showing the latest technology in IR Imagers, sensors, and optics utilized by Military Robots and Unmanned Systems



Credit: Swift Engineering  
Swift Engineering Killer Bee



Geo Systems "SAM"  
Robot



University of Central Florida  
DARPA Challenge Vehicle



University of Florida  
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Arcturus T-15 UAV



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# SPIE Defense+Security



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# SPIE Courses



KNOWLEDGE – NETWORKING – ADVANCEMENT


## SPIE Foundation Courses

Foundation courses provide an introduction to and overview of the technical area they address. They are an ideal entry point for understanding core concepts and tools if you're new to a field, looking to brush up your knowledge in a specific area, or want to take a closer look at a specialization you're considering pursuing. Courses are taught by instructors with deep knowledge and years of in-the-field experience, and offer the unique opportunity to learn from some of the most accomplished optics professionals in their respective industries.

### Money-back Guarantee

We are confident that once you experience an SPIE course for yourself you will look to SPIE for your future education needs. However, if for any reason you are dissatisfied, SPIE will gladly refund your money. We just ask that you tell us what you did not like; suggestions for improvement are always welcome.

### Continuing Education Units

 SPIE is an authorized provider of Continuing Education Units (CEUs) through IACET—The International Association of Continuing Education and Training. SPIE awards CEUs to participants who successfully attend courses, and complete and return the evaluation form within 30 days of the course presentation. SPIE maintains a record of all CEUs earned for each participant for seven years.

*SPIE reserves the right to cancel a course due to insufficient advance registration.*

## SPIE instructors are the best in the business.

The Society has hand picked some of the top minds from academia and industry to lead a variety of courses at SPIE Defense+Security.

Register for a course:

- ▶ Take advantage of the industry's best instructors
- ▶ Further your career through ongoing education
- ▶ Earn CEUs for your continuing education

For full course descriptions visit the Course Materials Desk located in the Convention Center lower arcade or go online: [spie.org/dss](http://spie.org/dss)



Sunday	Monday	Tuesday	Wednesday	Thursday
16 March	17 March	18 March	19 March	20 March

## Technologies for Homeland Security and Law Enforcement

<p>SC891 <b>NEW</b> <b>Security of Information and Communication Networks</b> (Kartalopoulos) 1:30 to 5:30 pm, \$315 / \$365</p>	<p>SC719 <b>Chemical &amp; Biological Detection: Overview of 2 Point and Standoff Sensing Technologies</b> (Gardner) 1:30 to 5:30 pm, \$315 / \$365</p> <p>FC</p>			
	<p>SC836 <b>Using IR Thermographic Instruments- A Primer for Thermographers</b> (Kaplan) 1:30 to 5:30 pm, \$365 / \$415</p> <p>FC</p>			

**Key:**

Price = SPIE Member / Non-Member

SC000 = Course Number

WS000 = Workshop Number

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## IR Sensors and Systems Engineering

<p>SC134 <b>Optical Design Fundamentals for Infrared Systems</b> (Kampe) 8:30 am to 5:30 pm, \$555 / \$655</p>	<p>SC835 <b>Infrared Systems - Technology &amp; Design</b> (Daniels) 8:30 am to 5:30 pm / 8:30 am to 12:30 pm, \$1105 / \$1145</p>			
<p>SC900 <b>NEW</b> <b>Uncooled Thermal Imaging Detectors and Systems</b> (Hanson) 8:30 am to 5:30 pm, \$555 / \$655</p>	<p>SC178 <b>Introduction to Radiometry and Photometry</b> (McCluney) 8:30 am to 12:30 pm, \$440 / \$540</p> <p>FC</p>	<p>SC152 <b>Infrared Focal Plane Arrays</b> (Dereniak, Hubbs) 8:30 am to 12:30 pm, \$315 / \$365</p>	<p>SC796 <b>Allowable Stresses in Glass and Engineering Ceramics</b> (Pepi) 8:30 am to 12:30 pm, \$315 / \$365</p>	<p>SC789 <b>Introduction to Optical and Infrared Sensor Systems</b> (Shaw) 8:30 am to 5:30 pm, \$520 / \$620</p> <p>FC</p>
	<p>SC896 <b>NEW</b> <b>Optical Testing of Focal Plane Array Imagers- Quick Performance Testing in the UV, Visible, and Near IR Ranges</b> (Gazerro) 8:30 am to 5:30 pm, \$520 / \$620</p>	<p>SC710 <b>NIR and SWIR Imaging Applications</b> (Richards) 8:30 am to 12:30 pm, \$355 / \$415</p>	<p>SC545 <b>Infrared Characterization of Sources and Backgrounds</b> (Jacobs) 8:30 am to 5:30 pm, \$535 / \$635</p>	
	<p>SC180 <b>Imaging Polarimetry</b> (Dereniak, Miles, Sabatke) 1:30 to 5:30 pm, \$315 / \$365</p>	<p>SC278 <b>Infrared Detectors</b> (Dereniak) 1:30 to 5:30 pm, \$395 / \$445</p>		
	<p>SC892 <b>NEW</b> <b>Infrared Search and Track Systems</b> (Schwering) 1:30 to 5:30 pm, \$315 / \$365</p>			
	<p>SC836 <b>Using IR Thermographic Instruments - A Primer for Thermographers</b> (Kaplan) 1:30 to 5:30 pm, \$365 / \$415</p> <p>FC</p>			

## Thermosense

<p>SC836 <b>Using IR Thermographic Instruments- A Primer for Thermographers</b> (Kaplan) 1:30 to 5:30 pm, \$365 / \$415</p> <p>FC</p>	<p>SC710 <b>NIR and SWIR Imaging Applications</b> (Richards) 8:30 am to 12:30 pm, \$355 / \$415</p>
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# Daily Course Schedule

Sunday 16 March	Monday 17 March	Tuesday 18 March	Wednesday 19 March	Thursday 20 March
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## Tactical Sensors and Imagers

SC713 <b>Engineering Approach to Imaging System Design</b> (Holst) 8:30 am to 5:30 pm, \$575 / \$675 FC	SC178 <b>Introduction to Radiometry and Photometry</b> (McCluney) 8:30 am to 12:30 pm, \$440 / \$540 FC	SC901 <b>Sensor Array Signal Processing</b> (Rao) 8:30 am to 5:30 pm, \$520 / \$620 NEW	SC154 <b>Electro-Optical Imaging System Performance</b> (Holst) 8:30 am to 5:30 pm, \$590 / \$690
SC194 <b>Multispectral and Hyperspectral Image Sensors</b> (Lomheim) 1:30 to 5:30 pm, \$315 / \$365	SC157 <b>MTF in Optical and Electro-Optical Systems</b> (Ducharme) 8:30 am to 5:30 pm, \$555 / \$655		SC789 <b>Introduction to Optical and Infrared Sensor Systems</b> (Shaw) 8:30 am to 5:30 pm, \$520 / \$620 FC
	SC896 <b>Optical Testing of Focal Plane Array Imagers- Quick Performance Testing in the UV, Visible, and Near IR Ranges</b> (Gazero) 8:30 am to 5:30 pm, \$520 / \$620 NEW		
	SC067 <b>Testing and Evaluation of E-O Imaging Systems</b> (Holst) 8:30 am to 5:30 pm, \$585 / \$685		
	SC180 <b>Imaging Polarimetry</b> (Dereniak, Miles, Sabatke) 1:30 to 5:30 pm, \$315 / \$365		

For full course descriptions visit the Course Materials Desk located in the Convention Center lower arcade or go online: [spie.org/dss](http://spie.org/dss)

## Laser Sensors and Systems

SC717 <b>3D Visualization Techniques for Laser Radar</b> (Roth) 8:30 am to 12:30 pm, \$315 / \$365	SC160 <b>Precision Stabilization and Laser Pointing Systems</b> (Hilkert) 8:30 am to 5:30 pm, \$520 / \$620
SC784 <b>Fiber Lasers for Defense Applications: Fibers, Components and System Design Considerations</b> (Samson, Torruellas) 8:30 am to 5:30 pm, \$520 / \$620	
SC167 <b>Introduction to Laser Radar</b> (Kammerman) 1:30 to 5:30 pm, \$315 / \$365 FC	

## Intelligent and Unmanned Systems

SC894 <b>Introduction to INS and INS-Based Integrated Navigation</b> (Soloviev) 8:30 am to 5:30 pm, \$520 / \$620 NEW	SC549 <b>Incorporating GPS Technology into Commercial and Military Applications</b> (Uijt de Haag) 8:30 am to 12:30 pm, \$315 / \$465
	SC898 <b>Path Planning for Autonomous Vehicles</b> (Flann) 8:30 am to 12:30 pm, \$315 / \$365 NEW

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## Displays

SC159 <b>Head-Mounted Displays: Design and Applications, Including Night Vision</b> ( <i>Melzer, Browne</i> ) 8:30 am to 5:30 pm, \$520 / \$620
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## Modeling and Simulation

SC783 <b>How to Validate Your Models and Simulations</b> ( <i>Law</i> ) 8:30 am to 5:30 pm, \$640 / \$740
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## Sensor Data Exploitation and Target Recognition

SC174 <b>Multispectral Image Processing</b> ( <i>Schowengerdt</i> ) 8:30 am to 5:30 pm, \$545 / \$645	SC728 <b>Network Centric Target Tracking and Classification</b> ( <i>Drummond</i> ) 8:30 am to 5:30 pm, \$510 / \$620	SC893 <b>SAR Signal Processing Laboratory</b> ( <i>Soumekh</i> ) 8:30 am to 5:30 pm, \$520 / \$620	SC158 <b>Fundamentals of Automatic Target Recognition</b> ( <i>Nasr</i> ) 8:30 am to 5:30 pm, \$520 / \$620
SC162 <b>SAR Signal Processing</b> ( <i>Soumekh</i> ) 8:30 am to 5:30 pm, \$615 / \$715	SC181 <b>Predicting Target Acquisition Performance of Electro-Optical Imagers</b> ( <i>Vollmerhausen</i> ) 8:30 am to 5:30 pm, \$520 / \$620	SC901 <b>Sensor Array Signal Processing</b> ( <i>Rao</i> ) 8:30 am to 5:30 pm, \$520 / \$620	
SC194 <b>Multispectral and Hyperspectral Image Sensors</b> ( <i>Lomheim</i> ) 1:30 to 5:30 pm, \$315 / \$365			

## Information Fusion, Data Mining, and Information Networks Security Related Technologies

SC891 <b>Security of Information and Communication Networks</b> ( <i>Kartalopoulos</i> ) 1:30 to 5:30 pm, \$315 / \$365
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## Signal, Image, and Neural Net Processing

SC197 <b>Fundamentals of Digital Signal/Image Processing</b> ( <i>Dianat</i> ) 8:30 am to 5:30 pm, \$520 / \$620	SC066 <b>Fundamentals of Electronic Image Processing</b> ( <i>Weeks</i> ) 8:30 am to 5:30 pm, \$580 / \$680	SC893 <b>SAR Signal Processing Laboratory</b> ( <i>Soumekh</i> ) 8:30 am to 5:30 pm, \$520 / \$620	SC715 <b>Independent Component Analysis and Beyond: Blind Signal Processing and its Applications</b> ( <i>Lee, Jung</i> ) 8:30 am to 12:30 pm, \$430 / \$490
SC162 <b>SAR Signal Processing</b> ( <i>Soumekh</i> ) 8:30 am to 5:30 pm, \$615 / \$715		SC901 <b>Sensor Array Signal Processing</b> ( <i>Rao</i> ) 8:30 am to 5:30 pm, \$520 / \$620	
SC902 <b>Compressive Sensing</b> ( <i>DeVore, Baraniuk</i> ) 1:30 to 5:30 pm, \$315 / \$365			

# Daily Course Schedule

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## Communications and Networking Technologies and Systems

<p>SC891 <b>Security of Information and Communication Networks</b> (Kartalopoulos) 1:30 to 5:30 pm, \$315 / \$365</p>	<p>SC728 <b>Network Centric Target Tracking and Classification</b> (Drummond) 8:30 am to 5:30 pm, \$520 / \$620</p>	<p>SC901 <b>Sensor Array Signal Processing</b> (Rao) 8:30 am to 5:30 pm, \$520 / \$620</p>
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## Battlespace Technologies

<p>SC719 <b>Chemical &amp; Biological Detection: Overview of Point and Standoff Sensing Technologies</b> (Gardner) 1:30 to 5:30 pm, \$315 / \$365</p>	<p>SC895 <b>Introduction to Cognitive Situation Management for Tactical Operations</b> (Jakobson) 8:30 am to 12:30 pm, \$315 / \$365</p>
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## Optical and Optomechanical Engineering

<p>SC156 <b>Basic Optics for Engineers</b> (Ducharme) 8:30 am to 5:30 pm, \$555 / \$655</p>	<p>SC254 <b>Integrated Opto-Mechanical Analysis</b> (Doyle, Genberg) 8:30 am to 5:30 pm, \$565 / \$665</p>	<p>SC013 <b>Precision Mounting of Optical Components</b> (Yoder, Jr.) 8:30 am to 5:30 pm, \$590 / \$690</p>	<p>SC796 <b>Allowable Stresses in Glass and Engineering Ceramics</b> (Pepi) 8:30 am to 12:30 pm, \$315 / \$365</p>
	<p>SC178 <b>Introduction to Radiometry and Photometry</b> (McCluney) 8:30 am to 12:30 pm, \$440 / \$540</p>		<p>SC781 <b>Optomechanical Analysis</b> (Hatheway) 8:30 am to 5:30 pm, \$520 / \$620</p>
			<p>SC220 <b>Optical Alignment Mechanisms</b> (Guyer) 1:30 to 5:30 pm, \$315 / \$365</p>

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## Industry Workshops

### The Business of Defense

WS639 **Intellectual Property Issues in the Defense and Security Industries** (*Gortych, Stanley, Kauget, Pellenberg*) 8:30 am to 12:30 pm, \$315 / \$365

WS843 **Playing the SBIR Game to Win** (*Patterson*) 1:30 to 5:30 pm, \$315 / \$365

WS845 **Compliance with the International Traffic in Arms Regulations (ITAR)** (*Palmer*) 8:30 am to 12:30 pm, \$315 / \$365

### Professional Development

WS846 **Essential Skills for Engineering Project Leaders** (*Hinkle*) 1:00 to 5:00 pm, \$315 / \$365

WS667 **The Craft of Scientific Presentations: A Workshop on Technical Presentations** (*Alley*) 8:30 am to 12:30 pm, \$125 / \$175

WS668 **The Craft of Scientific Writing: A Workshop on Technical Writing** (*Alley*) 1:30 to 5:30 pm, \$125 / \$175

## Product Tutorial

PT002 **Multispectral Analysis for Defense and Security using ENVI** (*Harris*) 8:30 am to 5:30 pm, \$300

For full course descriptions visit the Course Materials Desk located in the Convention Center lower arcade or go online: [spie.org/dss](http://spie.org/dss)

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*Chairs:*  
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**Peter Tchoryk, Jr.,**  
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## Intelligent and Unmanned Systems



*Chairs:* **Grant R. Gerhart,**  
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Sensors and Information Directorate AFRL

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*This event is held in conjunction with Conference 6964.*

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Chair: **Ivan Kadar**,  
Interlink Systems Sciences, Inc.

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PROGRAM ON

## Information Fusion, Data Mining, and Information Networks Security Related Technologies



Chair: **Belur V. Dasarathy**,  
Consultant

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PROGRAM ON

## Signal, Image, and Neural Net Processing



Chair: **Andrew R. Pirich**,  
ACP Consulting

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PROGRAM ON

## Communications and Networking Technologies and Systems



*Chair: Raghuvver M. Rao,*  
Rochester Institute of Technology

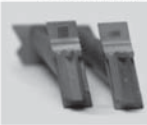
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## Thermosense XXX

*Conference Chairs:* **Vladimir P. Vavilov**, Tomsk Polytechnic Univ. (Russia); **Douglas D. Burleigh**, La Jolla Cove Consulting

*Program Committee:* **Lee R. Allen**, Allen Applied Infrared Technology, Emeritus Member; **Nicolas P. Avdelidis**, EBETAM S.A. (Greece); **Pierre Bremond**, Cedip Infrared Systems (France); **Antonio Colantonio**, Public Works and Government Services Canada (Canada); **Fred P. Colbert**, Colbert Infrared Services; **K. Elliott Cramer**, NASA Langley Research Ctr.; **Ralph B. Dinwiddie**, Oak Ridge National Lab.; **Ermanno G. Grinzato**, Consiglio Nazionale delle Ricerche (Italy); **Sheng-Jen Hsieh**, Texas Agricultural & Mechanical Univ.; **Herbert Kaplan**, Honeyhill Technical Co.; **Timo T. Kauppinen**, VTT (Finland); **Dennis H. LeMieux**, Siemens Corporate Research; **Sven-Åke Ljungberg**, Univ. of Gävle, Emeritus Member (Sweden); **Robert P. Madding**, FLIR Systems, Inc.; **Xavier P. V. Maldague**, Univ. Laval (Canada); **G. Raymond Peacock**, Temperatures.com, Inc.; **Piotr Pregowski**, Pregowski Infrared Services (Poland); **Austin A. Richards**, FLIR Systems; **Andrés E. Rozlosnik**, SI Termografía Infrarroja (Argentina); **Morteza Safai**, The Boeing Co.; **Takahide Sakagami**, Osaka Univ. (Japan); **R. James Seffrin**, Infrasppection Institute; **Steven M. Shepard**, Thermal Wave Imaging, Inc.; **John R. Snell, Jr.**, Snell Infrared; **Gregory R. Stockton**, Stockton Infrared Thermographic Services, Inc.; **Lisa West Åkerblom**, FLIR Systems AB (Sweden)

### THERMOSENSE MISSION STATEMENT

The purpose of Thermosense is to promote the exchange of information pertaining to the use of infrared sensing and imaging instruments for diagnostics and controls. Presentations should address the solutions to problems and their reduction to practice.

### THERMOSENSE BACKGROUND

Thermosense is the oldest and largest international technical meeting focused on scientific, industrial and general uses of Infrared Imaging and Infrared Temperature Measurements. Its regular printed proceedings are found in most scientific and engineering libraries, providing an unequaled depth and breadth of technical information and reference data. Further information regarding Thermosense can be found at: [www.thermosense.org](http://www.thermosense.org)

## Monday 17 March

### Vendor Presentations and Reception IV

Room: Crystal M ..... Mon. 5:00 to 8:00 pm

*Session Chairs:* **Andrés E. Rozlosnik**, SI Termografía Infrarroja (Argentina); **G. Raymond Peacock**, Temperatures.com, Inc.

For the fourth year, in conjunction with the Thermosense XXX conference, hardware and software vendors will give a brief presentation on what is new this year in their product lines that impact thermal imaging practices and applications. All presenting companies have a booth in the exhibition hall.

The intent of this workshop is to bring together Vendors and Early Arrival Thermosense and DSS exhibitors to highlight the newest

products and services being shown at the Exhibition. In this way the busy technical conference attendees can better prioritize their activities when visiting the exhibits. It is also a relaxed opportunity for getting to know one another better and to have informal discussions on matters of mutual interest. A limited time for 10 to 15 minute vendor presentations starts the session, followed by a reception with snacks and soft drinks.

**AVIO-Nippon Avionics Co., Ltd.** (Booth 1417)  
New IR Thermography Products from Nippon Avionics  
*Presenter:* **Yukinori Kimura**, Manager, Partner Business Dept.

**Cantronic Systems, Inc.** (Booth 518)  
Thermal Surveillance Relationship Between Target Distance and Pixels  
*Presenter:* **Jon Chynoweth**, Executive Vice President

**Cedip Infrared Systems** (Booth 1317)  
High-spatial Resolution Thermal Imaging Cameras and Portable Cameras for R&D Applications  
*Presenter:* **Pierre Bremond**, Export Sales Manager, Industrial Applications and Thermography

**Electrophysics Corp.** (Booth 413)  
640 X 480 Thermography Camera with Dual Laser Sighting  
*Presenter:* **Art Stout**, Vice President, Business Development

**FLIR Systems, Inc.-Commercial Vision Systems** (Booth 603)  
FLIR's Commercial Uncooled Cores: Automotive, Fire Fighting, and Military Applications  
*Presenter:* **Jay James**, Vice President of Business Development for Cores and Components

**Infrared Cameras Inc. (Texas Infrared)** (Booth 1105)  
ICI Prodigy and ICI Mirage: Medical, Aerospace, and Petrochemical Applications  
*Presenter:* **Gary Strahan**, President

**IRCAM GmbH** (Booth 17)  
New IRCAM Cameras, Systems and Software for IR Imaging and Thermography  
*Presenter:* **Mónica López Sáenz**, Managing Director and Co-Founder

**Jenoptik-IR** (Booth 1427)  
Infrared Relay Lens for High-magnetic Environment Applications  
*Presenter:* **Ray Watts**, Sales Manager

**NEC Corp.** (Booth 1417)  
New Infrared Detector Module from NEC  
*Presenter:* **Hiroaki Ono**, Assistant Manager

**NEC San-ei Instruments, Ltd.** (Booth 1417)  
Sensor Fusion Solution with TS9230/TS9260-New Fixed-mount Thermal Imaging Network Camera with Ruggedness and Reliability  
*Presenter:* **Tetsuo Tamura**, Senior General Manager, Infrared Systems Dept.

**Santa Barbara Infrared, Inc.** (Booth 503)  
Automated Testing of IR/EO Sensor Systems  
*Presenter:* **Alan Irwin**, Senior Systems Engineer

**SCD-SemiConductor Devices** (Booth 903)  
BIRD640 and SCD's Road Map for Uncooled Products  
*Presenter:* **Fabian Schapiro**, Marketing Manager

**Sensors Unlimited, Inc., (part of Goodrich Corp.)** (Booth 717)  
Extending InGaAs Wavelength Response: Advancements in InGaAs Technology and Applications  
*Presenter:* **Marc Hansen**, Applications Engineer

**StingRay Optics, LLC** (Booth 1311)  
Optics for NIR/SWIR Imaging  
*Presenter:* **Jennifer Myers**, Sales and Marketing Manager

**Surface Optics Corp.** (Booth 907)  
Field Emissivity Measurements Increase Accuracy of Temperature Predictions  
*Presenter:* **Brian Catanzaro**, Consultant

**Therroteknix Systems Ltd.** (Booth 1111)  
Continued Advances in Miricle Increase Thermal Imaging Cameras from Therroteknix  
*Presenter:* **Alistar Brown**, Product Manager, Imaging

**Tuesday 18 March**

**SESSION 1**

**Room: Grand 11** .....Tues. 8:00 to 9:00 am

**Pyrometry, Temperature Measurements, and Calibration I**

*Session Chairs:* **G. Raymond Peacock**, Temperatures.com, Inc.;  
**Robert P. Madding**, FLIR Systems, Inc.

8:00 am: **Infrared micro-thermography of an actively heated preconcentrator device**, Robert Furstenberg, Christopher A. Kendziora, Stanley V. Stepnowski, Robert A. McGill, Naval Research Lab..... [6939-01]

8:20 am: **High-temperature IR-imager with wide dynamic range for industrial process control**, Uwe Hoffmann, Günter Hofmann, Dimitar Wassilew, Norbert Hess, Manfred Zimmerhackl, DIAS Infrared GmbH (Germany)..... [6939-02]

8:40 am: **Emissivity independent low-temperature pyrometry**, Ivan Dolezal, Lubos Hes, Technical Univ. of Liberec (Czech Republic) ..... [6939-03]

**Symposium-Wide Plenary Presentation**

**Room: Palms Ballroom, Canary** .....Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

*See p. 6 for details.*

Coffee Break ..... 10:00 to 10:30 am

**SESSION 2**

**Room: Grand 11** .....Tues. 10:30 to 11:50 am

**Pyrometry, Temperature Measurements, and Calibration II**

*Session Chairs:* **G. Raymond Peacock**, Temperatures.com, Inc.;  
**Robert P. Madding**, FLIR Systems, Inc.

10:30 am: **Spectrally resolved calibration of flat-plate blackbody sources and targets in thermal IR**, Sergey N. Mekhontsev, Vladimir B. Khromchenko, Leonard M. Hanssen, National Institute of Standards and Technology ..... [6939-04]

10:50 am: **Infrared calibration development at Fluke Corporation Hart Scientific Division**, Frank Liebmann, Fluke Corp. .... [6939-05]

11:10 am: **AIRI mid-IR reference pyrometer for near-ambient radiation thermometry**, Vladimir B. Khromchenko, Space Dynamics Lab. and National Institute of Standards and Technology; Sergey N. Mekhontsev, Leonard M. Hanssen, National Institute of Standards and Technology. .... [6939-06]

11:30 am: **IEC 62942-1 TS: first international technical specification on the technical data for radiation thermometers**, Joerg Hollandt, Physikalisch-Technische Bundesanstalt (Germany); O. Struss, HEITRONICS Infrarot Messtechnik GmbH (Germany); Geoff Beynon, Land Instruments; Rien Bosma, NMI-Van Swinden Lab. B.V. (Netherlands); R. Gaertner, Raytek GmbH (Germany); F. Girard, Istituto Nazionale di Ricerca Metrologica (Italy); M. S. Matveyev, D.I. Mendeleev Institute for Metrology (Russia); Helen C. McEvoy, National Physical Lab. (United Kingdom); G. Raymond Peacock, Temperatures.com, Inc.; M. Sadli, Lab. National de Metrologie et d'Essais (France); Fumihiro Sakuma, National Institute of Advanced Industrial Science and Technology (Japan); Howard W. Yoon, National Institute of Standards and Technology; Z. Yuan, National Institute of Metrology (China) ..... [6939-53]

**SESSION 3**

**Room: Grand 11** ..... Tues. 11:50 am to 12:30 pm

**Professional Standards I**

*Session Chairs:* **Lisa West Åkerblom**,  
FLIR Systems AB (Sweden); **Antonio Colantonio**, Public Works and  
Government Services Canada (Canada)

11:50 am: **Do thermographers need a professional association?**, G. Raymond Peacock, Temperatures.com, Inc. .... [6939-07]

12:10 pm: **ASNT-based certification for thermographers**, John R. Snell, Jr., Snell Infrared ..... [6939-08]

Lunch/Exhibition Break ..... 12:30 to 1:30 pm

**SESSION 4**

**Room: Grand 11** .....Tues. 1:30 to 2:50 pm

**Professional Standards II**

*Session Chairs:* **Lisa West Åkerblom**,  
FLIR Systems AB (Sweden); **Antonio Colantonio**, Public Works and  
Government Services Canada (Canada)

1:30 pm: **International standards: thermography, training, and certification**, Lisa West Åkerblom, FLIR Systems AB (Sweden) ..... [6939-09]

1:50 pm: **International standards related to infrared thermography applications for buildings and infrastructure: defined gaps and potential work**, Antonio Colantonio, Public Works and Government Services Canada (Canada) ..... [6939-10]

2:10 pm: **The usefulness of existing standard of qualitative building thermography**, Timo T. Kauppinen, VTT (Finland) ..... [6939-11]

2:30 pm: **The professional thermographer and certification, standards, and liability**, Fred P. Colbert, Colbert Infrared Services ..... [6939-12]

**SESSION 5**

**Room: Grand 11** .....Tues. 2:50 to 3:30 pm

**Thermal Image Fusion**

*Session Chair:* **Herbert Kaplan**, Honeyhill Technical Co.

2:50 pm: **Image fusion: multifocus function and its application**, Yukinori Kimura, Ichikawa Akihiko, Nippon Avionics Co., Ltd. (Japan) ..... [6939-13]

3:10 pm: **IR and ultraviolet image fusion**, Fred P. Colbert, Colbert Infrared Services. .... [6939-14]

Coffee Break ..... 3:30 to 4:00 pm

**SESSION 6**

**Room: Grand 11** .....Tues. 4:00 to 5:00 pm

**IR Neighbors: NIR, Visible, and UV I**

*Session Chairs:* **Herbert Kaplan**, Honeyhill Technical Co.;  
**Jan K. Eklund**, EKLUND INFRARED, Inc.

4:00 pm: **Industrial defect discrimination applying infrared imaging spectroscopy and artificial neural networks**, Pilar Beatriz Garcia-Allende, Olga M. Conde, Francisco J. Madruga, Ana M. Cubillas, Jose M. Lopez-Higuera, Univ. de Cantabria (Spain) ..... [6939-15]

4:20 pm: **Overview of SWIR detectors, cameras, and applications**, Douglas S. Malchow, Marc Hansen, SUI, Goodrich Corp. .... [6939-16]

4:40 pm: **Calibration of visible and near-infrared spectrums for measuring freshness of vegetables**, Faisal Abdullah, Chow Jeng Wong, Mohd Zubir Mat Jafri, Mohamad Suhaimi Jaafar, Univ. Sains Malaysia (Malaysia) ..... [6939-17]

Wednesday 19 March

SESSION 7

Room: Grand 11 ..... Wed. 8:00 to 8:40 am

IR Neighbors: NIR, Visible and UV II

Session Chairs: Herbert Kaplan, Honeyhill Technical Co.; Jan K. Eklund, EKLUND INFRARED, Inc.

8:00 am: High-voltage electrical survey advances using UV/IR, Dan Ninedorf, Ox Creek Energy Associates, Inc. .... [6939-18]

8:20 am: Overview of expanding the longwave NDT into the shortwave spectrum below visible, Jan K. Eklund, EKLUND INFRARED, Inc. .... [6939-19]

SESSION 8

Room: Grand 11 ..... Wed. 8:40 to 10:00 am

Research Topics

Session Chairs: Morteza Safai, The Boeing Co.; Gary L. Orlove, FLIR Systems, Inc.

8:40 am: Thermography investigations and numerical analysis of turbulent and laminar flow at light-weight structures, Ralf W. Arndt, Bundesanstalt für Materialforschung und -prüfung (Germany); Alexander Gaulke, Mike Schlaich, Technische Univ. Berlin (Germany) .... [6939-20]

9:00 am: Electrochromic device for satellite thermal control, Hulya Demiryont, Eclipse Energy Systems, Inc. .... [6939-21]

9:20 am: Using lock-in infrared thermography for the visualization of the hand vascular tree, Nabila Bouzida, Abdelhakim Bendada, Jean-Marc A. Piau, Moulay Akhloufi, Xavier P. V.Maldague, Mathieu Raymond, Univ. Laval (Canada) .... [6939-22]

9:40 am: Active thermography for potato characterization, Sheng-Jen Hsieh, Chih-Chen Sun, Texas Agricultural & Mechanical Univ. .... [6939-23]

Coffee Break ..... 10:00 to 10:30 am

SESSION 9

Room: Grand 11 ..... Wed. 10:30 to 11:10 am

Products and Processes

Session Chairs: Andrés E. Rozlosnik, SI Termografía Infrarroja (Argentina); Gregory R. Stockton, Stockton Infrared Thermographic Services, Inc.

10:30 am: Arc welding quality monitoring by means of near-infrared imaging spectroscopy, Pilar Beatriz García-Allende, Jesus M. Mirapeix, Adolfo Cobo, Olga M. Conde, Jose M. Lopez-Higuera, Univ. de Cantabria (Spain) .... [6939-24]

10:50 am: Infrared thermography applied for outdoor power substations, Laerte dos Santos, Furnas Centrais Elétricas S.A. (Brazil); Edson C. da Costa Bortoni, Luiz E. de Souza, Guilherme S. Bastos, Univ. Federal de Itajubá (Brazil) .... [6939-25]

SESSION 10

Room: Grand 11 ..... Wed. 11:10 to 11:50 am

Environmental Investigations

Session Chairs: Gregory R. Stockton, Stockton Infrared Thermographic Services, Inc.; Andrés E. Rozlosnik, SI Termografía Infrarroja (Argentina)

11:10 am: Aerial measurements of convection cell elements in heated lakes, Eliel Villa-Aleman, Alfred J. Garret, Malcolm M. Pendergast, Timothy B. Brown, Saleem R. Salaymeh, Savannah River National Lab. .... [6939-27]

11:30 am: Direct measurement of heat flux from cooling lake thermal imagery, Alfred J. Garrett, Eliel Villa-Aleman, Robert J. Kurzeja, Malcolm M. Pendergast, Savannah River National Lab.; John Saylor, Clemson Univ. .... [6939-26]

Lunch/Exhibition Break ..... 11:50 am to 1:40 pm

SESSION 11

Room: Grand 11 ..... Wed. 1:40 to 4:50 pm

NDT of Buildings and Civil Structures

Session Chairs: Kathryn M. Knettel, United Space Alliance, LLC; Nicolas P. Avdelidis, EBETAM S.A. (Greece); Timo T. Kauppinen, VTT (Finland)

1:40 pm: Thermography as a tool for building applications and diagnostics, Nicolas P. Avdelidis, EBETAM S.A. (Greece); Timo T. Kauppinen, VTT (Finland) .... [6939-29]

2:00 pm: A nondestructive method for diagnostic of insulated building walls using infrared thermography in real situation, Mohamed Larbi Youcef, Atef Mazhoud, Univ. Paris 12 Val-de-Marne (France); Pierre Bremond, Cedip Infrared Systems (France); Laurent Ibos, Yves Candau, Univ. Paris 12 Val-de-Marne (France); Michel Piro, EDF (France); Alain Filloux, Alphééis (France) .... [6939-30]

2:20 pm: Crack detection and fatigue related delamination in FRP composites applied to concrete, Jeff R. Brown, Robyn Anderson, Rebecca L. Baker, Lisa Kallemeyn, Hope College. .... [6939-31]

2:40 pm: Square-pulse thermography in frequency domain, Ralf W. Arndt, Bundesanstalt für Materialforschung und -prüfung (Germany) .... [6939-32]

Coffee Break ..... 3:00 to 3:30 pm

3:30 pm: Building material characterization by using IR thermography for efficient heating systems, Ermanno G. Grinzato, Paolo G. Bison, Consiglio Nazionale delle Ricerche (Italy) .... [6939-33]

3:50 pm: Defect evaluation based on passive lock-in thermography for concrete structure, Daisuke Sato, Concrete Soft Technical Engineering Corp. (Japan); Takahide Sakagami, Osaka Univ. (Japan); Tatsuhito Komiyama, Concrete Soft Technical Engineering Corp. (Japan); Shiro Kubo, Osaka Univ. (Japan) .... [6939-34]

4:10 pm: Quantitative evaluation of defect depth in concrete structures using Fourier analysis for sequential thermal data, Shiro Nakamura, Sumitomo Osaka Cement Co., Ltd. (Japan); Takahide Sakagami, Osaka Univ. (Japan); Shuusuke Harada, Sumitomo Osaka Cement Co., Ltd. (Japan); Shiro Kubo, Osaka Univ. (Japan) .... [6939-35]

4:30 pm: Localization of wood floor structure in infrared thermography, C. Cochior-Plescanu, Matthieu T. Klein, Clemente Ibarra-Castanedo, Abdel Hakim Bendada, Xavier P. V.Maldague, Univ. Laval (Canada) .... [6939-54]

Thursday 20 March

SESSION 12

Room: Grand 11 ..... Thurs. 8:00 to 10:00 am

NDT Numerical Analysis and Theory

Session Chairs: Vladimir P. Vavilov, Tomsk Polytechnic Univ. (Russia); Douglas D. Burleigh, La Jolla Cove Consulting; K. Elliott Cramer, NASA Langley Research Ctr.

8:00 am: Physics-based processing for static and dynamic industrial thermograms, Mohammed A. Omar, Clemson Univ.; Yi Zhou, Clemson Univ; Tomokazu Okuno, Toyota Motor Engineering & Manufacturing North America, Inc. .... [6939-36]

8:20 am: Accuracy issues in modeling thermal NDT problems, Vladimir P. Vavilov, Denis Nesteruk, Tomsk Polytechnic Univ. (Russia); Sergio Marinetti, Consiglio Nazionale delle Ricerche (Italy) .... [6939-37]

8:40 am: IR-View: a straightforward graphical user interface for basic and advanced signal processing of thermographic infrared sequences, Matthieu T. Klein, Clemente Ibarra-Castanedo, Xavier P. V.Maldague, Abdelhakim Bendada, Univ. Laval (Canada) .... [6939-38]

9:00 am: Thermographic signal processing through correlation operators in pulsed thermography, Matthieu T. Klein, Clemente Ibarra-Castanedo, Abdelhakim Bendada, Xavier P. V.Maldague, Univ. Laval (Canada) .... [6939-39]

9:20 am: Quantitative characterization of delaminations in thick composites using step heating thermography, Adel A. Badghaish, David C. Fleming, Florida Institute of Technology .... [6939-40]

9:40 am: Measurement accuracy in thermographic NDT, Steven M. Shepard, YuLin Hou, Thermal Wave Imaging, Inc. .... [6939-41]

Coffee Break ..... 10:00 to 10:30 am



**SESSION 13**

**Room: Grand 11** .....Thurs. 10:30 am to 12:10 pm

**NDT Methods and Applications**

*Session Chairs:* **Douglas D. Burleigh**, La Jolla Cove Consulting;  
**Vladimir P. Vavilov**, Tomsk Polytechnic Univ. (Russia);  
**Ermanno G. Grinzato**, Consiglio Nazionale delle Ricerche (Italy)

10:30 am: **A study of active thermography approaches for the nondestructive testing and evaluation of aerospace structures**, Nicolas P. Avdelidis, EBETAM S.A. (Greece); Clemente Ibarra-Castanedo, Jean-Marc A. Piau, Abdel Hakim Bendada, Xavier P. V.Maldague, Univ. Laval (Canada). . . . . [6939-42]

10:50 am: **Fuselage inspection of Boeing 737 using lock-in thermography**, Markus Tarin, Movimed and Automation Technology (Germany) and FLIR. . . . . [6939-43]

11:10 am: **Thermal imaging of fatigue damage to composites after low-velocity impact (Presentation Only)**, Jeff R. Brown, Bradley Lininger, David Visser, Hope College. . . . . [6939-44]

11:30 am: **Thermographic nondestructive testing using inductive thermal excitation**, Morteza Safai, The Boeing Co.. . . . . [6939-45]

11:50 am: **Real-time infrared thermography testing on composite materials: through transmission and one-sided techniques**, Marcus R. Harty, Wyle Labs. . . . . [6939-46]

Lunch/Exhibition Break. . . . . 12:10 to 1:30 pm

**SESSION 14**

**Room: Grand 11** .....Thurs. 1:30 to 3:30 pm

**Materials Evaluation: Thermal and Fatigue Properties**

*Session Chairs:* **Takahide Sakagami**, Osaka Univ. (Japan);  
**Pierre Bremond**, Cedip Infrared Systems (France);  
**Jeff R. Brown**, Hope College

1:30 pm: **Nondestructive thermal diffusivity mapping of refractory bricks**, Ralph B. Dinwiddie, James G. Hemrick, Oak Ridge National Lab. . . . . [6939-47]

1:50 pm: **Development of a self-reference lock-in thermography and its applications to nondestructive testing**, Takahide Sakagami, Shiro Kubo, Osaka Univ. (Japan). . . . . [6939-48]

2:10 pm: **Influence of ultrasonic vibration mode on sonic IR**, Manyong Choi, Kisoo Kang, Jeonghak Park, Korea Research Institute of Standards and Science (South Korea); Wontae Kim, Kongju National Univ. (South Korea). . . . . [6939-49]

2:30 pm: **Thermal stress analysis of a circular-holed specimen**, Wontae Kim, Kongju National Univ. (South Korea); Kisoo Kang, Manyong Choi, Jeonghak Park, Korea Research Institute of Standards and Science (South Korea); Koungsuk Kim, Chosun Univ. (South Korea). . . . . [6939-50]

2:50 pm: **Simulating thermal NDT of bonded structures**, Xingwang Guo, Fang Qie, Beihang Univ. (China). . . . . [6939-51]

3:10 pm: **Dimensionless heat transfer model to compress and analyze pulsed thermography data for NDT of composite materials**, Juan-Carlos Ramirez-Granados, Marija Strojnik, Gonzalo Paez, Ctr. de Investigaciones en Óptica, A.C. (Mexico). . . . . [6939-52]

**Related Courses**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC836 **Using IR Thermographic Instruments - A Primer for Thermographers** (Kaplan) Monday, 1:30 to 5:30 pm

SC710 **NIR and SWIR Imaging Applications** (Richards) Tuesday, 8:30 am to 12:30 pm

SC892 **Infrared Search and Track Systems**  
*NEW* (Schwering) Monday, 1:30 to 5:30 pm

SC896 **Optical Testing of Focal Plane Array Imagers-Quick Performance Testing in the UV, Visible, and Near IR Ranges** (Gazerro) Monday, 8:30 am to 5:30 pm

SC900 **Uncooled Thermal Imaging Detectors and Systems**  
*NEW* (Hanson) Sunday, 8:30 am to 5:30 pm

SC134 **Optical Design Fundamentals for Infrared Systems** (Kampe) Sunday, 8:30 am to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (Dereniak, Hubbs) Tuesday, 8:30 am to 12:30 pm

SC180 **Imaging Polarimetry** (Dereniak, Miles, Sabatke) Monday, 1:30 to 5:30 pm

SC278 **Infrared Detectors** (Dereniak) Tuesday, 1:30 to 5:30 pm

SC545 **Infrared Characterization of Sources and Backgrounds** (Jacobs) Wednesday, 8:30 am to 5:30 pm

SC835 **Infrared Systems - Technology & Design** (Daniels) Monday / Tuesday, 8:30 am to 5:30 pm / 8:30 am to 12:30 pm

**Don't Miss These Presentations!**

*Free to all registered attendees.*

**Plenary Presentation, p. 6**



**The Honorable Jay Cohen**  
 Under Secretary for Science and Technology,  
 U.S. Department of Homeland Security

**Innovation and the Wealth of Nations, p. 6**



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# Infrared Technology and Applications XXXIV

*Conference Chairs:* **Bjørn F. Andresen**, Elbit Systems Electro-Optics EIOp Ltd. (Israel); **Gabor F. Fulop**, Maxtech International, Inc.; **Paul R. Norton**, U.S. Army Night Vision & Electronic Sensors Directorate

*Program Committee:* **Christopher Carl Alexay**, StingRay Optics, LLC; **Raymond S. Balcerak**, Defense Advanced Research Projects Agency; **Stefan T. Baur**, Raytheon Vision Systems; **Philippe Francis Bois**, Thales Research & Technology (France); **Wolfgang A. Cabanski**, AIM Infrarot-Module GmbH (Germany); **John T. Caulfield**, Cyan Systems; **Jean-Pierre Chatard**, ULIS (France); **Peter N. J. Dennis**, QinetiQ Ltd. (United Kingdom); **John W. Devitt**, L-3 Communications Cincinnati Electronics, Inc.; **Michael T. Eismann**, Air Force Research Lab.; **Martin H. Ettenberg**, SU1, Goodrich Corp.; **Sarath D. Gunapala**, Jet Propulsion Lab.; **Masafumi Kimata**, Ritsumeikan Univ. (Japan); **Hee Chul Lee**, Korea Advanced Institute of Science and Technology (South Korea); **Paul D. LeVan**, Air Force Research Lab.; **Wei Lu**, Shanghai Institute of Technical Physics (China); **Whitney Mason**, U.S. Army Night Vision & Electronic Sensors Directorate; **Mark A. Massie**, Nova Sensors; **Paul L. McCarley**, Air Force Research Lab.; **R. Kennedy McEwen**, SELEX Sensors and Airborne Systems Ltd. (United Kingdom); **Paul F. McManamon**, Air Force Research Lab.; **John Lester Miller**, FLIR Systems, Inc.; **A. Fenner Milton**, U.S. Army Night Vision & Electronic Sensors Directorate; **Ofer Neshet**, SCD-Semi Conductor Devices (Israel); **Peter W. Norton**, BAE Systems, Inc.; **Herbert K. Pollehn**, Army Research Lab.; **Ingmar G. E. Renhorn**, Swedish Defence Research Agency (Sweden); **Antoni Rogalski**, Wojskowa Akademia Techniczna (Poland); **Myron J. Scholten**, DRS Technologies, Inc.; **Venkataraman S. Swaminathan**, U. S. Army RDECOM-ARDEC; **Meimei Z. Tidrow**, Missile Defense Agency; **Philippe M. Tribolet**, Sofradir (France); **Jay Vizgaitis**, U.S. Army Night Vision & Electronic Sensors Directorate; **Kadri Vural**, Teledyne Scientific Co.

## Monday 17 March

Room: Grand 8A ..... Mon. 8:30 to 8:40 am

### Opening Remarks

*Session Chair:* **Gabor F. Fulop**, Maxtech International, Inc.

**Sessions 1-2 run concurrently with sessions 6-7.**

### SESSION 1

Room: Grand 8A ..... Mon. 8:40 to 11:10 am

#### QWIP, QDIP, DWELL and QWISP FPAs with Applications

*Session Chairs:* **Philippe Francis Bois**, Thales Research & Technology (France); **Sarath D. Gunapala**, Jet Propulsion Lab.

8:40 am: **Voltage mediated tuning of the detection wavelength in quantum dots-in-a-well infrared photodetectors**, Linda Höglund, Acreo AB (Sweden); Per O. Holtz, Linköpings Univ. (Sweden); Carl Asplund, IRnova AB (Sweden); Qin Wang, Susanne Almqvist, Erik Pettrini, Acreo AB (Sweden); Håkan Pettersson, Halmstad Univ. (Sweden); Jan Y. Andersson, Acreo AB (Sweden) ..... [6940-01]

9:00 am: **Spectral characterization of two novel single-bump two-color quantum dots-in-a-well (DWELL) infrared focal plane arrays**, Thomas E. Vandervelde, Michael C. Lenz II, Sanjay Krishna, The Univ. of New Mexico ..... [6940-02]

9:20 am: **Comparison of the performance limit of quantum dot and other types of infrared photodetectors**, Antoni Rogalski, Wojskowa Akademia Techniczna (Poland) ..... [6940-03]

9:40 am: **Multiband infrared arrays for imaging spectrometers**, Sumith V. Bandara, Sarath D. Gunapala, David Z. Ting, John K. Liu, Jason M. Mumolo, Jet Propulsion Lab. .... [6940-04]

Coffee Break ..... 10:00 to 10:30 am

10:30 am: **Quantum well intrasubband photodetector (QWISP): prospects for large-format far-infrared focal plane arrays**, David Z. Ting, Jet Propulsion Lab.; Yia-Chung Chang, Univ. of Illinois at Urbana-Champaign; Sumith V. Bandara, Sarath D. Gunapala, Jet Propulsion Lab. .... [6940-05]

10:50 am: **A voltage-tunable multiband quantum dot infrared focal plane array with high photodetectivity**, Xuejun Lu, Univ. of Massachusetts/Lowell; Mark J. Meisner, Raytheon Missile Systems. .... [6940-06]

*Standby Paper:* **QWIP development status at Thales**, E. E. Belhaire, P. Marquet, V. Besnard, Thales Optronique SA (France); E. M. Costard, A. Nedelcu, P. F. Bois, Alcatel-Thales-III-Vlab (France); R. Craig, W. Johnston, Thales Optronics Ltd. (United Kingdom); A. Manissadjian, Y. Guinche, Sofradir (France). .... [6940-127]

### SESSION 2

Room: Grand 8A ..... Mon. 11:10 to 11:50 am

#### Emerging FPAs I

*Session Chairs:* **Meimei Z. Tidrow**, Missile Defense Agency; **Venkataraman S. Swaminathan**, U. S. Army RDECOM

11:10 am: **Recent advances in LWIR Type-II InAs/GaSb superlattice photodetectors and focal plane arrays at the Center for Quantum Devices (Invited Paper)**, Manijeh Razeghi, Binh Minh Nguyen, Pierre-Yves Delaunay, Darin M. Hoffman, Northwestern Univ.; Meimei Z. Tidrow, Missile Defense Agency ..... [6940-07]

11:30 am: **Antimony based superlattices for high-performance infrared imagers**, Robert H. Rehm, Martin Walther, Johannes Schmitz, Frank Rutz, Joachim Fleissner, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany); Johann Ziegler, AIM Infrarot-Module GmbH (Germany). .... [6940-08]

Lunch Break ..... 11:50 am to 1:00 pm

### SESSION 6

Room: Grand 8B ..... Mon. 9:00 to 10:00 am

#### Advanced IR Materials

*Session Chairs:* **Christopher Carl Alexay**, StingRay Optics, LLC; **Jay Vizgaitis**, U.S. Army Night Vision & Electronic Sensors Directorate

9:00 am: **Optical and thermo-mechanical properties of infrared glasses**, Yann M. Guimond, Umicore IR Glass (France). .... [6940-22]

9:20 am: **Amorphous materials molded IR lens progress report**, Ray A. Hilton, Sr., James McCord, Ronald Timm, Amorphous Materials Inc. .... [6940-23]

9:40 am: **An innovative getter coating for IR dewars and cold shields**, Dina Katsir, Daniel Feinman, Acktar Advanced Coatings Ltd. (Israel). ... [6940-24]

Coffee Break ..... 10:00 to 10:30 am

### SESSION 7

Room: Grand 8B ..... Mon. 10:30 to 11:50 am

#### IR Optics for 3rd Generation Systems I

*Session Chairs:* **Jay Vizgaitis**, U.S. Army Night Vision & Electronic Sensors Directorate; **Christopher Carl Alexay**, StingRay Optics, LLC

10:30 am: **Third-generation infrared optics**, Jay Vizgaitis, U.S. Army Night Vision & Electronic Sensors Directorate ..... [6940-25]

10:50 am: **Dual-band antireflection coatings for the infrared**, Thomas D. Rahmlow, Jr., Jeanne E. Lazo-Wasem, Rugate Technologies, Inc. .... [6940-26]

11:10 am: **Third-generation FLIR demonstrator**, Jay Vizgaitis, U.S. Army Night Vision & Electronic Sensors Directorate; John M. Hall, OASYS Technology, LLC; Jason Miller, U.S. Army Night Vision & Electronic Sensors Directorate .. [6940-27]

11:30 am: **Third-generation infrared system calibration using dual-band thermoelectric reference sources and thermoelectric test systems to calibrate uncooled IRFPAs**, David K. Finrock, William L. Kolander, Marlow Industries, Inc. .... [6940-28]

Lunch Break ..... 11:50 am to 1:00 pm

**Sessions 3-4-5 run concurrently with sessions 8-9.**

**SESSION 3**

**Room: Grand 8A . . . . . Mon. 1:00 to 2:20 pm**

**Emerging FPAs II**

*Session Chairs: Meimei Z. Tidrow, Missile Defense Agency; Venkataraman S. Swaminathan, U. S. Army RDECOM*

- 1:00 pm: **Design optimization of superlattice type-II IR-detection modules with coincident integration in two-spectral ranges**, Rainer Breiter, R. Scheibner, Joachim C. Wendler, Johann Ziegler, AIM Infrarot-Module GmbH (Germany); Robert H. Rehm, Martin Walther, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany) . . . . . [6940-09]
- 1:20 pm: **Infrared imaging arrays based on superlattice photodiodes**, Cory J. Hill, Alexander Soibel, Sam A. Keo, Jason M. Mumolo, Sarath D. Gunapala, Jet Propulsion Lab.; David R. Rhiger, Robert E. Kvaas, Sean F. Harris, Raytheon Vision Systems . . . . . [6940-10]
- 1:40 pm: **GaSb/InAsSb heterostructure MWIR detector for high-temperature operation**, Yaakov Sharabani, Yossi Paltiel, Ariel Sher, Arie Raizman, Avigdor Zussman, Soreq Nuclear Research Ctr. (Israel) . . . . . [6940-11]
- 2:00 pm: **Reduction of leakage currents in nBn-based long-wave infrared detectors using type-II InAs/GaSb superlattices**, Elena A. Plis, Jean-Baptiste Rodriguez, Greg Bishop, Ha Sul Kim, Aezou Khoshaklagh, Yagyadeva D. Sharma, Ralph L. Dawson, Sanjay Krishna, The Univ. of New Mexico . . [6940-12]

**SESSION 4**

**Room: Grand 8A . . . . . Mon. 2:20 to 4:10 pm**

**Advanced HgCdTe FPAs and Applications**

*Session Chair: Philippe M. Tribolet, Sofradir (France)*

- 2:20 pm: **Realization and performance of HgCdTe LWIR arsenic-implanted planar p-on-n photodiodes**, Laurent Mollard, Johan Rothman, Nicholas Baier, Philippe Ballet, Franck Henry, Sylvain Gout, Guillaume Bourgeois, Jean-Paul Chamonal, Commissariat à l’Energie Atomique (France); Christine Cassillo, Christophe Pautet, SOFRADIR (France) . . . . . [6940-13]
- 2:40 pm: **LW IRFPAs made from HgCdTe grown by MOVPE for use in hyperspectral imaging**, Leslie G. Hipwood, Chris L. Jones, Ian M. Baker, Chris D. Maxey, Hon Wo Lau, Jonathan Fitzmaurice, Mark C. Wilson, Peter Knowles, SELEX Sensors and Airborne Systems Infrared Ltd. (United Kingdom) . . [6940-14]
- Coffee Break . . . . . 3:00 to 3:30 pm
- 3:30 pm: **IR detector design and approach for tactical applications with high reliability without maintenance**, Xavier Brenière, SOFRADIR (France) . [6940-15]
- 3:50 pm: **State-of-the-art of mass production: challenges for low-cost and application benefits of high-performances small-pitch IR detectors**, Emmanuel Bercier, Xavier Brenière, Jerome Sevenier, SOFRADIR (France) . . . . . [6940-16]

**SESSION 5**

**Room: Grand 8A . . . . . Mon. 4:10 to 5:50 pm**

**Short Wave IR and Applications**

*Session Chair: Martin H. Ettenberg, Sensors Unlimited, Inc., part of Goodrich Corp.*

- 4:10 pm: **Development of a miniature InGaAs camera for wide operating temperature range using a temperature-parameterized uniformity correction**, Timothy C. Bakker, Devon Turner, Jesse Battaglia, SUI, Goodrich Corp. [6940-17]
- 4:30 pm: **Performance of very low dark-current SWIR PIN arrays**, Joseph C. Boisvert, Takahiro Isshiki, Rengarajan Sudharsanan, Ping Yuan, Paul A. McDonald, Spectrolab, Inc. . . . . [6940-18]
- 4:50 pm: **Design and development of SiGe-based infrared imaging sensor**, Ashok K. Sood, Robert A. Richwine, Yash R. Puri, Magnolia Optical Technologies, Inc.; Judy L. Hoyt, Tayo I. Akinwande, Massachusetts Institute of Technology . . . . . [6940-19]
- 5:10 pm: **Monolithic germanium SWIR imaging array**, Conor S. Rafferty, Clifford A. King, Bryan D. Ackland, Ingvar Aberg, T. S. Sriram, Jay H. O’Neill, NoblePeak Vision . . . . . [6940-20]
- 5:30 pm: **Performance of high-resolution visible-InGaAs imager for day/night vision**, Marlon D. Enriquez, Michael A. Blessinger, Joseph V. Groppe, Thomas M. Sudol, Jesse Battaglia, Joseph Passe, Mark Stern, Bora M. Onat, SUI, Goodrich Corp. . . . . [6940-21]

**SESSION 8**

**Room: Grand 8B . . . . . Mon. 1:00 to 2:40 pm**

**IR Optics for 3rd Generation Systems II**

*Session Chairs: Jay Vizgaitis, U.S. Army Night Vision & Electronic Sensors Directorate; Christopher Carl Alexay, StingRay Optics, LLC*

- 1:00 pm: **Etching of chalcogenide glass for IR optics**, John G. Smith, MEMS Optical, Inc. . . . . [6940-29]
- 1:20 pm: **Design and fabrication of efficient miniature retroreflectors for the infrared**, Bruce E. Bernacki, Norman C. Anheier, Jr., Kannan Krishnaswami, Bret D. Cannon, Pacific Northwest National Lab. . . . . [6940-30]
- 1:40 pm: **High-performance radiation-hard antireflective microstructures for HgCdTe focal plane arrays**, Bruce D. MacLeod, Douglas S. Hobbs, TelAztec LLC . . . . . [6940-31]
- 2:00 pm: **Novel filter providing human eye and optical sensors protection from the visible into the IR**, Ariela Donval, KiloLambda Technologies, Ltd. (Israel); Tali Fisher, KiloLambda Technologies, Ltd. (Israel); Boaz A. Nemet, Ram Oron, Moshe Oron, Regina Shvartz, KiloLambda Technologies, Ltd. (Israel); Berndt Eberle, Gunnar Ritt, Reinhard R. Ebert, FGAN-FOM (Germany) . [6940-124]
- 2:20 pm: **Anamorphic imaging spectrometer**, Rand Swanson, Casey Smith, Michael Kehoe, Thomas S. Moon, Resonon Inc.; Steven W. Brown, Keith R. Lykke, National Institute of Standards and Technology . . . . . [6940-32]

*Poster/Oral Standby Presentations*

**A new method to estimate the absorption coefficient for uncooled infrared detectors**, Tayfun Akin, Yusuf Tanrikulu, Fehmi Civitci, Middle East Technical Univ. (Turkey) . . . . . [6940-122]

**SESSION 9**

**Room: Grand 8B . . . . . Mon. 2:40 to 5:50 pm**

**Novel Uncooled Technologies**

*Session Chair: Whitney Mason, U.S. Army Night Vision & Electronic Sensors Directorate*

- 2:40 pm: **Amorphous Si-Ge-O thin film for uncooled infrared detection**, Qi Cheng, Mahmoud F. Almasri, Univ. of Missouri/Columbia . . . . . [6940-33]
- Coffee Break . . . . . 3:00 to 3:30 pm
- 3:30 pm: **Uncooled dual-band MWIR/LWIR optical readout imager**, Matthew Erdtmann, Lei Zhang, Guanghai Jin, Agiltron, Inc. . . . . [6940-34]
- 3:50 pm: **Development and optimization of microcantilever-based IR imaging arrays**, Scott R. Hunter, Gregory S. Maurer, Gregory Simelgor, Shankar Radhakrishnan, John Gray, Martin L. Bauer, Multispectral Imaging, Inc.. [6940-35]
- 4:10 pm: **A high fill-factor uncooled infrared detector with low-noise characteristic**, Il Woong Kwon, Jong Eun Kim, Chi Ho Hwang, Yong Soo Lee, Hee Chul Lee, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6940-36]
- 4:30 pm: **Thermal-to-visible transducer (TVT) for thermal-IR imaging**, Allen M. Flusberg, Stephen D. Swartz, Science Research Lab., Inc.; Michael A. Huff, Steven J. Gross, CNRI MEMS Exchange . . . . . [6940-37]
- 4:50 pm: **Solid state optical thermal imaging: performance update**, Matthias Wagner, RedShift Systems Corp. . . . . [6940-38]
- 5:10 pm: **Carbon nanotube-based color IR detectors**, Ning Xi, Michigan State Univ. . . . . [6940-39]
- 5:30 pm: **Thermopile infrared detector released through XeF<sub>2</sub> etching technique**, Hengzhao Yang, Bin Xiong, Yuelin Wang, Shanghai Institute of Microsystem and Information Technology (China) . . . . . [6940-40]

Tuesday 18 March

Session 10 runs concurrently with sessions 12.

**SESSION 10**

Room: Grand 8A .....Tues. 8:10 to 8:50 am

**Infrared Search and Track (IRST)-Related Systems and Technologies**

Session Chairs: **Ingmar G. E. Renhorn**, Swedish Defence Research Agency (Sweden); **Gil A. Tidhar**, Optigo Systems, Ltd. (Israel)

- 8:10 am: **Spherical sensor configurations**, Ryan D. Riel, Lucid Dimensions ..... [6940-41]
- 8:30 am: **IR panomorph lens imager and applications**, Simon Thibault, ImmerVision (Canada) ..... [6940-42]
- Coffee Break ..... 10:00 to 10:30 am

**SESSION 12**

Room: Grand 8B.....Tues. 8:10 to 8:50 am

**Uncooled FPAs: The French Connection**

Session Chairs: **Jean-Luc Tissot**, ULIS (France); **Whitney Mason**, U.S. Army Night Vision & Electronic Sensors Directorate

- 8:10 am: **Design trade-offs in ADC architectures dedicated to uncooled focal plane arrays**, Benoit Dupont, Patrick Robert, ULIS (France) ..... [6940-59]
- 8:30 am: **Uncooled amorphous silicon 1/4 VGA IRFPA with 25 µm pixel-pitch for high end applications**, Jean-Luc Tissot, Michel Vilain, Olivier Legras, Sebastien Tinnes, Christophe Minassian, Bruno Fieque, Patrick Robert, ULIS (France) ..... [6940-60]
- Coffee Break ..... 10:00 to 10:30 am

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am**

**The Honorable Jay Cohen**,  
 Under Secretary for Science and Technology,  
 U.S. Dept. of Homeland Security

*See p. 6 for details.*

**SESSION 10 (Continued)**

Room: Grand 8A ..... Tues. 10:30 am to 12:00 pm

**Infrared Search and Track (IRST)-Related Systems and Technologies**

Session Chairs: **Ingmar G. E. Renhorn**, Swedish Defence Research Agency (Sweden); **Gil A. Tidhar**, Optigo Systems, Ltd. (Israel)

- 10:30 am: **Third-generation naval IRST using the step and stare architecture**, Pierre-Olivier Nougues II, Sagem Defense Securite (France) ..... [6940-43]
- 10:50 am: **Navy staring IRST system development and testing** (*Invited Paper, Presentation Only*), James R. Waterman, Naval Research Lab. .... [6940-44]
- 11:20 am: **Large format IR camera technology**, John W. Devitt, Phillip Henry, David P. Forrai, Richard L. Rawe, Jr., Mark E. Greiner, L-3 Communications Cincinnati Electronics, Inc.; Michael T. Eismann, Kenneth Barnard, Air Force Research Lab. .... [6940-45]
- 11:40 am: **IRST infrared background analysis of bay environments**, Piet B. W.Schwering, TNO (Netherlands) ..... [6940-46]

*Standby Paper*

**QWIP development status at Thales**, E. E. Belhaire, P. Marquet, V. Besnard, Thales Optronique SA (France); E. M. Costard, A. Nedelcu, P. F. Bois, Alcatel-Thales-III-VIab (France); R. Craig, W. Johnston, Thales Optronics Ltd. (United Kingdom); A. Manissadjian, Y. Guinche, Sofradir (France) ..... [6940-127]

Lunch/Exhibition Break ..... 12:00 to 1:30 pm

**SESSION 12 (Continued)**

Room: Grand 8B.....Tues. 10:30 to 11:50 am

**Uncooled FPAs: The French Connection**

Session Chairs: **Jean-Luc Tissot**, ULIS (France); **Whitney Mason**, U.S. Army Night Vision & Electronic Sensors Directorate

- 10:30 am: **Latest amorphous silicon microbolometer developments at LETI LIR**, Jean-Jacques Yon, Eric E. M.Mottin, Commissariat à l'Energie Atomique (France) ..... [6940-61]
- 10:50 am: **Uncooled amorphous silicon XVGA IRFPA with 17 µm pixel-pitch for high-resolution applications**, Jean-Luc Tissot, Michel Vilain, Olivier Legras, Patrick Robert, Christophe Minassian, Benoit Dupont, ULIS (France); Jean-Jacques Yon, Commissariat à l'Energie Atomique (France) ..... [6940-62]
- 11:10 am: **Innovative on-chip packaging applied to uncooled IRFPA**, Agnès Arnaud, Commissariat à l'Energie Atomique (France)..... [6940-63]
- 11:30 am: **Uncooled amorphous silicon TEC-less 1/4 VGA IRFPA with 25 µm pixel-pitch for high-volume applications**, Jean-Luc Tissot, Michel Vilain, Olivier Legras, Sebastien Tinnes, Christophe Minassian, Bruno Fieque, Jean-Marc Chiappa, Aurelie Touvignon, ULIS (France) ..... [6940-64]
- Lunch/Exhibition Break ..... 11:50 am to 1:30 pm

**Session 11 runs concurrently with sessions 13-14.**

**SESSION 11**

**Room: Grand 8A** .....Tues. 1:30 to 6:00 pm

**Target Acquisition Systems**

*Session Chairs:* **Wolfgang A. Cabanski**, AIM Infrarot-Module GmbH (Germany); **Michael T. Eismann**, Air Force Research Lab.

1:30 pm: **Near-field observation platform**, Harry H. Schlemmer, Constantin Baeurle, Holger Vogel, Carl Zeiss Optronics GmbH (Germany) ..... [6940-47]

1:50 pm: **Comparison between a low-light-level visible channel and an IR channel for spaceborne night imaging**, Guy Raz, Meira Citroen, Michael J. Berger, Elbit Systems Electro-Optics ElOp Ltd. (Israel) ..... [6940-48]

2:10 pm: **OPUS H: a new navigational and targeting observation device**, Jörg Fritze, Uwe Schwarzkopf, Matthias Spranz, Carl Zeiss Optronics GmbH (Germany); Friedel Kohlmeier, Johan van der Merwe, Carl Zeiss Optronics (Pty) Ltd. (South Africa) ..... [6940-49]

2:30 pm: **IR technology for enhanced force protection by AIM**, Rainer Breiter, Tobias Ihle, Karl-Heinz Mauk, Joachim C. Wendler, Johann Ziegler, AIM Infrarot-Module GmbH (Germany) ..... [6940-50]

2:50 pm: **Thermal weapon sights with integrated fire control computers: algorithms and experiences**, Hendrik Rothe, Helmut-Schmidt Univ. (Germany); Rainer Breiter, AIM Infrarot-Module GmbH (Germany) ..... [6940-51]

Coffee Break ..... 3:10 to 3:40 pm

3:40 pm: **Three-dimensional scene reconstruction from IR image sequences for image-based navigation update and target detection of an autonomous airborne system**, Stefan Lang, Klaus J. Jaeger, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany) ..... [6940-52]

4:00 pm: **SWIR imager design and building blocks for automatic detection systems**, Gil A. Tidhar, Yuval Ben-Horin, Ran Manor, Optigo Systems, Ltd. (Israel) ..... [6940-53]

4:20 pm: **Novel approach for low-cost muzzle flash detection system**, Asher A. Voskoboinik, Israel Defense Forces (Israel) ..... [6940-54]

4:40 pm: **Fast multichannel radiometer for diagnosing munition flashes**, Adam D. Devir, Michael Y. Engel, Ilan Mendelevicz, Sahar Vilan, Institute for Advanced Research and Development (Israel); Dario Cabib, Amir Gil, CI Systems (Israel) Ltd. (Israel) ..... [6940-55]

5:00 pm: **Hyperspectral imager research and development at ARL**, Neelam Gupta, Army Research Lab. .... [6940-56]

5:20 pm: **Comparison of QWIP to HgCd Te detectors for gas imaging**, Michele Hinrichs, Pacific Advanced Technology, Inc.; Neelam Gupta, Army Research Lab. .... [6940-57]

5:40 pm: **Progress on characterization of a dualband IR imaging spectrometer**, Brian P. Beecken, Bethel Univ.; Paul D. LeVan, Air Force Research Lab. .... [6940-58]

*Standby Paper*

**QWIP development status at Thales**, E. E. Belhaire, P. Marquet, V. Besnard, Thales Optronique SA (France); E. M. Costard, A. Nedelcu, P. F. Bois, Alcatel-Thales-III-Vlab (France); R. Craig, W. Johnston, Thales Optronics Ltd. (United Kingdom); A. Manissadjian, Y. Guinche, Sofradir (France) ..... [6940-127]

**SESSION 13**

**Room: Grand 8B** .....Tues. 1:30 to 4:40 pm

**Uncooled FPAs and Applications**

*Session Chairs:* **Stefan T. Baur**, Raytheon Vision Systems; **Charles M. Hanson**, L-3 Communications Infrared Products

1:30 pm: **New features and development directions in SCD's  $\mu$ -bolometer technology**, Avraham R. Fraenkel, Udi Mizrahi, Leonid Bikov, Avihoo Giladi, Amnon Adin, Niv Shiloah, Eyal Malkinson, Tomer Czyzewski, Asaf Amsterdam, Yehuda Sinai, Semiconductor Devices (Israel) ..... [6940-65]

1:50 pm: **Uncooled VO<sub>x</sub> thermal imaging systems**, Michael D. Joswick, BAE Systems ..... [6940-66]

2:20 pm: **RVS uncooled sensor development for tactical applications** (*Invited Paper*), Todd E. Sessler, Michael Ray, Jessica Wyles, Charles Hewitt, Richard Wyles, Eli E. Gordon, Kenneth Almada, Stefan T. Baur, Matthew Kuiken, Donald D. Chi, Stephen H. Black, Raytheon Vision Systems ..... [6940-67]

2:50 pm: **Amorphous silicon-based large-format uncooled FPA microbolometer technology**, Thomas R. Schimert, John Brady, Charles M. Hanson, Micheal Taylor, Roland W. Gooch, William L. McCardel, Athanasios Syllaios, Thomas Fagan, Sameer Ajmera, L-3 Communications Infrared Products ..... [6940-68]

Coffee Break ..... 3:10 to 3:40 pm

3:40 pm: **Enhanced performance PIR security sensors**, Kevin C. Liddiard, Electro-optic Sensor Design (Australia) ..... [6940-70]

4:00 pm: **Uncooled thermal imaging with thin-film ferroelectric detectors**, Charles M. Hanson, Howard R. Beratan, Diane L. Arbuthnot, L-3 Communications Infrared Products ..... [6940-71]

4:20 pm: **A low-power readout circuit approach for uncooled resistive microbolometer FPAs**, Tayfun Akin, Murat Tepegoz, Alperen Toprak, Middle East Technical Univ. (Turkey) ..... [6940-72]

*Poster/Oral Standby Presentations*

**An optimum reference detector design for uncooled resistive microbolometer FPAs**, Tayfun Akin, Murat Tepegoz, Fehmi Civitci, Middle East Technical Univ. (Turkey) ..... [6940-123]

**SESSION 14**

**Room: Grand 8B** .....Tues. 4:40 to 5:40 pm

**Sensor Vibrations: Sources, Effects, and Elimination**

*Session Chair:* **Alexander M. Veprik**, RICOR-Cryogenic & Vacuum Systems (Israel)

4:40 pm: **Finite element design of vibration protective pads for portable cryogenically cooled infrared imagers**, Michel M. Azoulay, Loughborough Univ. (United Kingdom); Alexander M. Veprik, RICOR-Cryogenic & Vacuum Systems (Israel); Vladimir I. Babitsky, Loughborough Univ. (United Kingdom) ..... [6940-73]

5:00 pm: **Optimal design of a snubbed vibration isolator for vibration sensitive electro-optic payload**, Alexander M. Veprik, RICOR-Cryogenic & Vacuum Systems (Israel); Shlomo Djerassi, RAFAEL Armament Development Authority Ltd. (Israel) ..... [6940-74]

5:20 pm: **Ultra-low vibration linear split Stirling cryogenic refrigerator for demanding electro-optic instrumentation**, Sergey V. Riabzev, Alexander M. Veprik, Herman S. Vilenchik, Nachman Pundak, RICOR-Cryogenic & Vacuum Systems (Israel); E. Castiel, National Instruments (Israel) ..... [6940-125]

**POSTERS-Tuesday**

**Room: Palms Ballroom-Royal . . . . .Tues. 6:00 to 7:30 pm**

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**Low-frequency noise in LWIR HgCdTe staring imager**, Konstantin O. Boltar, Igor D. Burlakov, Anatoly M. Filachev, Vladimir V. Poluneev, Vladimir P. Ponomarenko, Natalia Yakovleva, Orion Research and Production Association (Russia) . . . . . [6940-114]

**A design of high-performance IRST system using dual-band 1D sensors**, Shichang Joung, Byungin Choi, Changan Park, Samsung Thales Co., Ltd. (South Korea) . . . . . [6940-115]

**A MEMS-based infrared array emitter for combat identification**, Haisheng San, Xuyuan Chen, Xiamen Univ. (China) . . . . . [6940-116]

**CMOS readout integrated circuit involving pixel-level ADC for microbolometer FPAs**, Chi Ho Hwang, Il Woong Kwon, Yong Soo Lee, Hee Chul Lee, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6940-118]

**Simulated and measured performance of small-pitched MWIR and LWIR HgCdTe photodiodes**, Mikhail S. Nikitin, Galina V. Chekanova, Alpha (Russia); Albina A. Drugova, Viacheslav A. Kholodnov, Institute of Radio-engineering and Electronics (Russia) . . . . . [6940-119]

**High-photosensitive nanocrystalline lead chalcogenide films for IR applications**, Zinovi Dashevsky, Vladimir Kasiyan, Ben-Gurion Univ. of the Negev (Israel); Leonid Chernyak, Univ. of Central Florida; Konstantin Gartsman, Weizmann Institute of Science (Israel) . . . . . [6940-120]

**Posters/Oral Standby Presentations**

**Room: Palms Ballroom-Royal . . . . .Tues. 6:00 to 7:30 pm**

**An optimum reference detector design for uncooled resistive microbolometer FPAs**, Tayfun Akin, Murat Tepegöz, Fehmi Civitci, Middle East Technical Univ. (Turkey) . . . . . [6940-123]

**A new method to estimate the absorption coefficient for uncooled infrared detectors**, Tayfun Akin, Yusuf Tanrikulu, Fehmi Civitci, Middle East Technical Univ. (Turkey) . . . . . [6940-122]

**Wednesday 19 March**

**SESSION 15**

**Room: Grand 8A . . . . .Wed. 8:00 to 11:00 am**

**Smart Processing for 3rd Generation Systems**

*Session Chairs: Paul L. McCarley*, Air Force Research Lab.; **John T. Caulfield**, Cyan Systems

8:00 am: **An overview of developments in biologically inspired sensory information processing**, Paul L. McCarley, Air Force Research Lab. . . [6940-128]

8:20 am: **Integration of IR focal plane array with massively parallel processor**, Pashang Esfandiari, Paul Koskey, Missile Defense Agency; Csaba Rekeczky, Akos Zarandy, Euteucus Inc.; Brian Krejca, Solid State Scientific Corp.; Walter R. Buchwald, Kenneth Vaccaro, Frank Clarck, Air Force Research Lab. . . . [6940-75]

8:40 am: **CMOS architectures and circuits for high-speed decision making from image flows**, Angel B. Rodríguez-Vázquez, Anafocus (Spain) . . . . [6940-77]

9:00 am: **Single-frame image processing techniques for low-SNR infrared imagery**, Richard P. Edmondson, Polaris Sensor Technologies, Inc.; Hegegerre S. Ranganath, The Univ. of Alabama in Huntsville; Michele R. Banish, Michael H. Rodgers, Polaris Sensor Technologies, Inc. . . . . [6940-78]

9:20 am: **An information-theoretic model of target discrimination using hyperspectral and multisensor data**, Niclas Wadströmer, Ingmar G. E. Renhorn, Swedish Defence Research Agency (Sweden) . . . . . [6940-79]

9:40 am: **Vision sensor arrays with applications to robotics** (*Presentation Only, Invited Paper*), Geoffrey L. Barrows, Centeye, Inc. . . . . [6940-126]

Coffee Break . . . . . 10:10 to 10:40 am

10:40 am: **A high-speed MWIR reference source for FPA non-uniformity correction using negative luminescence**, Neil T. Gordon, James W. Edwards, Jean Giess, Andrew Graham, Mary K. Haigh, Janet E. Hails, David J. Hall, Alan J. Hydes, Stuart J. Smith, QinetiQ Ltd. (United Kingdom) . . . . . [6940-81]

**SESSION 16**

**Room: Grand 8A . . . . .Wed. 11:00 to 11:20 am**

**Keynote Session**

*Session Chair: Paul R. Norton*,  
**U.S. Army Night Vision & Electronic Sensors Directorate**

11:00 am: **Future Army applications for IR focal plane arrays** (*Invited Paper, Presentation Only*), Donald A. Reago, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6940-82]

**SESSION 17**

**Room: Grand 8A . . . . .Wed. 11:20 am to 12:00 pm**

**Active Imaging I**

*Session Chair: R. Kennedy McEwen*,  
SELEX Sensors and Airborne Systems Ltd. (United Kingdom)

11:20 am: **Advanced infrared detectors for multimode active and passive imaging applications**, Ian M. Baker, Keith J. Trundle, Daniel Owton, SELEX Sensors and Airborne Systems Infrared Ltd. (United Kingdom); Kevin Storie, Stuart S. Duncan, SELEX Sensors and Airborne Systems Ltd. (United Kingdom) . . . . . [6940-83]

11:40 am: **Advanced pixel design for infrared 3D ladar imaging**, Fabrice Guellec, Michael Tchagaspanian, Pierre Castelein, Commissariat à l'Énergie Atomique (France) . . . . . [6940-84]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

**SESSION 18**

**Room: Grand 8A** ..... **Wed. 1:30 to 2:10 pm**

**Active Imaging II**

*Session Chair: R. Kennedy McEwen,*  
SELEX Sensors and Airborne Systems Ltd. (United Kingdom)

- 1:30 pm: **HgCdTe APD focal plane array development at CEA LETI Minatec,** Johan Rothman, Gwladys M. Perrais, Pierre Castelein, Nicholas Baier, Michael Tchagaspanian, Philippe Ballet, Laurent Mollard, Sylvain Gout, André Perez, Eric De Borniol, Jean-Paul Chamonal, Gérard L. Destefanis, Commissariat à l'Energie Atomique (France); Philippe M. Tribolet, SOFRADIR (France) ..... [6940-85]
- 1:50 pm: **Ultra-high sensitivity APD-based 3D lidar sensors,** Michael D. Jack, Steven L. Bailey, Raytheon Vision Systems ..... [6940-86]

**SESSION 19**

**Room: Grand 8A** ..... **Wed. 2:10 to 4:40 pm**

**Advanced FPAs with Selected 3rd Generation Properties**

*Session Chairs: Peter N. J. Dennis,* QinetiQ Ltd. (United Kingdom);  
*Joseph G. Pellegrino,* U.S. Army Night Vision & Electronic Sensors Directorate

- 2:10 pm: **Advanced HgCdTe technologies and dual-band developments,** Philippe M. Tribolet, SOFRADIR (France); Gérard L. Destefanis, Commissariat à l'Energie Atomique (France) ..... [6940-87]
- 2:30 pm: **Dual waveband MW/LW focal plane arrays grown by MOVPE on silicon substrates,** David J. Hall, James W. Edwards, Jean Giess, Neil T. Gordon, Andrew Graham, Janet E. Hails, Alan J. Hydes, David J. Lees, QinetiQ Ltd. (United Kingdom) ..... [6940-88]
- 2:50 pm: **3rd generation MW/LWIR sensor engine for advanced tactical systems,** Donald F. King, Jason S. Graham, Adam M. Kennedy, Richard N. Mullins, John Tucker, Jeffrey C. McQuitty, William A. Radford, Raytheon Vision Systems; Thomas J. Kostrzewa, Raytheon Space and Airborne Systems; Elizabeth A. Patten, Thomas F. McEwan, James G. Vodicka, Raytheon Vision Systems; John J. Wootan, Raytheon Space and Airborne Systems ..... [6940-89]
- Coffee Break ..... 3:10 to 3:40 pm
- 3:40 pm: **Two-color (MW/LW) IRFPAs made from HgCdTe grown by MOVPE,** Chris L. Jones, Jim P. Price, Leslie G. Hipwood, Chris J. Shaw, Paul Abbot, Chris D. Maxey, Hon Wo Lau, Jonathan Fitzmaurice, Rose A. Catchpole, Mike Ordish, Peter Thorne, Harald J. Weller, Raman C. Mistry, Kerren Hoade, Peter Knowles, SELEX Sensors and Airborne Systems Infrared Ltd. (United Kingdom) . . [6940-90]
- 4:00 pm: **Megapixel dual-band QWIP focal plane array,** Sarath D. Gunapala, Jet Propulsion Lab. .... [6940-91]
- 4:20 pm: **Barrier photodetectors for high-sensitivity and high-operating temperature infrared sensors,** Philip C. Klipstein, Semiconductor Devices (Israel) ..... [6940-92]

**SESSION 20**

**Room: Grand 8A** ..... **Wed. 4:40 to 5:40 pm**

**ROIC Developments**

*Session Chair: Paul R. Norton,*  
U.S. Army Night Vision & Electronic Sensors Directorate

- 4:40 pm: **Development of linear array ROIC for machine vision and spectroscopy using InGaAs detector arrays with wavelength response to 1.7, 2.2 and 2.6 micron wavelengths,** Douglas S. Malchow, Robert M. Brubaker, Kevin J. Flynn, Hai Nguyen, SUI, Goodrich Corp. .... [6940-93]
- 5:00 pm: **New readout integrated circuit using continuous time fixed-pattern noise correction,** Michael Tchagaspanian, Gilles Chammings, Bertrand Dupont, Gaelle Rapellin, Benoit Dupont, Jean-Jacques Yon, Commissariat à l'Energie Atomique (France); Jean-Luc Tissot, ULIS (France) ..... [6940-94]
- 5:20 pm: **Advanced ROICs design associated with HgCdTe technology,** Michel Zecri, Patrick Maillart, Eric Sanson, Gilbert Decaens, Xavier Lefoul, Laurent Baud, SOFRADIR (France) ..... [6940-95]

**Thursday 20 March**

**SESSION 21**

**Room: Grand 8A** ..... **Thurs. 8:30 to 10:10 am**

**Infrared Activities in Japan**

*Session Chair: Masafumi Kimata,* Ritsumeikan Univ. (Japan)

- 8:30 am: **Detection of terahertz radiation from quantum cascade laser using vanadium oxide microbolometer focal plane arrays,** Naoki Oda, Hajime Yoneyama, Tokuhito Sasaki, Masahiko Sano, NEC Corp. (Japan); Iwao Hosako, Norihiko Sekine, National Institute of Information and Communications Technology (Japan); Takayuki Sudoh, Nippon Avionics Co., Ltd. (Japan); Tomoko Irie, NEC San'ei Instruments, Ltd. (Japan) ..... [6940-96]
- 8:50 am: **IR2 camera on board PLANET-C Mission,** Munetaka Ueno, The Univ. of Tokyo (Japan); Takehiko Satoh, Kazunori Uemizu, Takeshi Imamura, Masato Nakamura, Japan Aerospace Exploration Agency (Japan); Naomoto Iwagami, The Univ. of Tokyo (Japan); Hirofumi Yagi, Makoto Kawai, Masashi Ueno, Munehisa Takeda, Mitsubishi Electric Corp. (Japan); Masafumi Kimata, Ritsumeikan Univ. (Japan) ..... [6940-97]
- 9:10 am: **Development of the longwave infrared imager (LIR) onboard PLANET-C,** Tetsuya Fukuhara, Japan Aerospace Exploration Agency (Japan); Makoto Taguchi, National Institute for Polar Research (Japan); Takeshi Imamura, Masato Nakamura, Japan Aerospace Exploration Agency (Japan); Naomoto Iwagami, Munetaka Ueno, The Univ. of Tokyo (Japan); Makoto Suzuki, Japan Aerospace Exploration Agency (Japan); George Hashimoto, Kobe Univ. (Japan); Mitsuteru Sato, Tohoku Univ. (Japan); Atsushi Yamazaki, Kazuhide Noguchi, Ryoichi Kashikawa, NEC TOSHIBA Space Systems, Ltd. (Japan); Isamu Higashino, Japan Aerospace Exploration Agency (Japan) ..... [6940-98]
- 9:30 am: **Infrared position sensitive detector (IRPSD),** Akihiro Takahata, Yoshiharu Shimada, Fumio Yoshioka, Masashi Yoshida, Kodenshi Corp. (Japan); Masafumi Kimata, Takashi Ota, Ritsumeikan Univ. (Japan) ..... [6940-99]
- 9:50 am: **Low-cost thermo-electric infrared FPAs and their automotive application (Invited Paper),** Masaki Hirota, Yoshimi Ohta, Yasuhiro Fukuyama, Nissan Motor Co. (Japan) ..... [6940-100]
- Coffee Break ..... 10:10 to 10:40 am

**SESSION 22**

**Room: Grand 8A** ..... **Thurs. 10:40 am to 12:00 pm**

**Selected Application Presentations I**

*Session Chairs: John Lester Miller,* FLIR Systems, Inc.  
*John W. Devitt,* L-3 Communications Cincinnati Electronics, Inc.

- 10:40 am: **Multiple human tracking using wireless distributed pyro-electric sensors,** Nanxiang Li, Qi Hao, The Univ. of Alabama ..... [6940-101]
- 10:50 am: **Multiple walker recognition using wireless distributed pyro-electric sensors,** Nanxiang Li, Qi Hao, The Univ. of Alabama ..... [6940-102]
- 11:00 am: **Two-channel IR vibration sensor based on dynamic gratings in semiconductors and pyro-electrics,** Nickolai V. Kukhtarev, Tatiana V. Kukhtareva, Alabama A&M Univ.; H. John Caulfield, Fisk Univ.; Phillip P. Land, Alabama A&M Univ.; Yurii P. Gnatenko, Institute of Physics (Ukraine); Alexander A. Grabar, Uzhgorod National Univ. (Ukraine); Roman V. Gamernyk, Lviv National Univ. (Ukraine); Peter Bukovskij, Institute of Physics (Ukraine); Todd W. Murray, Boston Univ. .... [6940-103]
- 11:20 am: **Low NEP pyroelectric radiometer standards,** George P. Eppeldauer, Howard W. Yoon, National Institute of Standards and Technology . . . [6940-104]
- 11:40 am: **The development of, and applications for extended response (0.7 to 1.7µm) InGaAs focal plane arrays,** Devon Turner, Timothy C. Bakker, SUI, Goodrich Corp. .... [6940-105]
- Lunch Break ..... 12:00 to 1:30 pm

**SESSION 23**

**Room: Grand 8A** ..... **Thurs. 1:30 to 2:10 pm**

**Selected Application Presentations II**

*Session Chairs:* **John Lester Miller**, FLIR Systems, Inc.;  
**John W. Devitt**, L-3 Communications Cincinnati Electronics, Inc.

1:30 pm: **Measurement of thermal radiation using regular glass optics and short-wave infrared detectors**, Howard W. Yoon, National Institute of Standards and Technology. .... [6940-106]

1:50 pm: **Multispectral radiometers for temporal flares intensity emission and target-background discrimination measurements**, Dario Cabib, Amir Gil, CI Systems (Israel) Ltd. (Israel); Adam D. Devir, Michael Y. Engel, Ilan Mendelevicz, Sahar Vilan, Yossi Bushlin, Institute for Advanced Research and Development (Israel) ..... [6940-107]

**SESSION 24**

**Room: Grand 8A** ..... **Thurs. 2:10 to 3:30 pm**

**Selected Technology Presentations**

*Session Chair:* **Michael J. Berger**,  
Elbit Systems Electro-Optics ElOp Ltd. (Israel)

2:10 pm: **High-speed LWIR transparent flexible electronics**, Xuejun Lu, Univ. of Massachusetts/Lowell; Xuliang Han, Brewer Science, Inc. .... [6940-108]

2:30 pm: **Formation and characterization of rare-earth upconverting nanoparticles using laser vaporization controlled condensation**, Garry P. Glaspell, John E. Anderson, James R. Wilkins, Samy S. El-Shall, Virginia Commonwealth Univ. .... [6940-109]

2:50 pm: **FPA development: from InGaAs, InSb, to HgCdTe**, Henry H. Yuan, Gary W. Appgar, Jongwoo Kim, Joyce G. Laquindanum, Joseph Kimchi, Ted Wong, Judson Technologies LLC. .... [6940-111]

3:10 pm: **High-operability VLWIR array via interdigitated pixel utilization**, Arvind I. D'Souza, Maryn G. Stapelbroek, Larry C. Dawson, Dale E. Molyneux, DRS Sensors & Targeting Systems, Inc. .... [6940-112]

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- IR Company News
- New IR Applications (Commercial & Military)
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Tuesday 18 March. .... 10:00 am to 5:00 pm  
Wednesday 19 March. .... 10:00 am to 5:00 pm  
Thursday 20 March. .... 10:00 am to 2:00 pm

**Don't miss the NEW  
Robotics+Unmanned Systems Pavilion.**  
*See pp. 18-21 for exhibition details.*



# Conference 6941 · Room: Grand 9/10

Tuesday-Wednesday 18-19 March 2008 • Proceedings of SPIE Vol. 6941

## Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XIX

Conference Chair: **Gerald C. Holst**, JCD Publishing

Program Committee: **Piet Bijl**, TNO Human Factors (Netherlands); **Dieter Clement**, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany); **Ronald G. Driggers**, U.S. Army Night Vision & Electronic Sensors Directorate; **David P. Forrai**, L-3 Communications Cincinnati Electronics, Inc.; **Alan Irwin**, Santa Barbara Infrared, Inc.; **Keith A. Krapels**, Office of Naval Research; **Terrence S. Lomheim**, The Aerospace Corp.; **Luanne P. Obert**, U.S. Army RDECOM CERDEC NVESD; **Hector M. Reyes**, Raytheon Co.; **Endre Repasi**, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany); **Joseph P. Reynolds**, U.S. Army RDECOM CERDEC NVESD; **Ronald B. Sartain**, Army Research Lab.; **Michael A. Soel**, FLIR Systems, Inc.; **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C.; **Curtis M. Webb**, Northrop Grumman Corp.

### Tuesday 18 March

#### Introductory Remarks

Room: Grand 9/10. . . . . Tues. 8:10 to 8:15 am

Session Chair: **Gerald C. Holst**, JCD Publishing

#### SESSION 1

Room: Grand 9/10. . . . . Tues. 8:15 to 9:05 am

#### Modeling I

Session Chairs: **Maarten A. Hogervorst**, TNO Human Factors (Netherlands); **Ronald G. Driggers**, U.S. Army Night Vision & Electronic Sensors Directorate; **David P. Forrai**, L-3 Communications Cincinnati Electronics, Inc.

8:15 am: **What causes sampling artifacts?** (*Invited Paper*), Gerald C. Holst, JCD Publishing . . . . . [6941-01]

8:45 am: **Modeling panchromatic performance of color filter arrays**, Joseph P. Reynolds, Stephen D. Burks, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-02]

#### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break . . . . . 10:00 to 10:30 am

#### SESSION 2

Room: Grand 9/10. . . . . Tues. 10:30 am to 12:30 pm

#### Modeling II

Session Chairs: **Maarten A. Hogervorst**, TNO Human Factors (Netherlands); **Ronald G. Driggers**, U.S. Army Night Vision & Electronic Sensors Directorate; **David P. Forrai**, L-3 Communications Cincinnati Electronics, Inc.

10:30 am: **Enhancing illumination for IR/CCD camera**, James B. Van Anda, Christopher Douglass, ICx Imaging Systems . . . . . [6941-03]

10:50 am: **Modeling the benefit of color in target acquisition**, Richard H. Vollmerhausen, Joseph P. Reynolds, Jeffrey T. Olson, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6941-04]

11:10 am: **Assessment of a resolution enhancement technique applied to an uncooled microbolometer array**, John Sadi, Lightnics (France); Arnaud Crastes, ULIS (France). . . . . [6941-05]

11:30 am: **Effects of video compression on target acquisition performance**, Richard L. Espinola, Jae H. Cha, Joseph P. Reynolds, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6941-06]

11:50 am: **Short-wave infrared sensor performance modeling: small craft identification discrimination criteria for maritime security**, Keith A. Krapels, Office of Naval Research; Ronald G. Driggers, U.S. Army Night Vision & Electronic Sensors Directorate; Paul Larson, Office of Naval Research . . . . . [6941-07]

12:10 pm: **An image scene registration using wavelets**, Eric P. Lam, ThalesRaytheonSystems. . . . . [6941-08]

Lunch/Exhibition Break . . . . . 12:30 to 1:30 pm

#### SESSION 3

Room: Grand 9/10. . . . . Tues. 1:30 to 3:10 pm

#### Modeling III

Session Chairs: **Keith A. Krapels**, Office of Naval Research; **Hector M. Reyes**, Raytheon Co.; **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C.

1:30 pm: **Monotonic correlation analysis of image quality measures for image fusion**, Lance M. Kaplan, Army Research Lab.; Stephen D. Burks, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6941-09]

1:50 pm: **Comparison of human visual discrimination of vehicle silhouettes and shape metrics**, Srikant K. Chari, Carl E. Halford, The Univ. of Memphis . . . . . [6941-10]

2:10 pm: **Target acquisition performance: effects of target aspect angle, dynamic imaging, and signal processing**, Jaap A. Beintema, Piet Bijl, Maarten A. Hogervorst, TNO Human Factors (Netherlands); Judith Dijk, TNO-FEL (Netherlands). . . . . [6941-11]

2:30 pm: **Infrared sensor modeling for discrimination of ground-based human activity**, Eric A. Flug, Dawne M. Deaver, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-12]

2:50 pm: **Modular target acquisition model and visualization tool**, Piet Bijl, Maarten A. Hogervorst, Wouter K. Vos, TNO Human Factors (Netherlands). . . . . [6941-13]

Coffee Break . . . . . 3:10 to 3:40 pm

#### SESSION 4

Room: Grand 9/10. . . . . Tues. 3:40 to 6:00 pm

#### Modeling IV

Session Chairs: **Keith A. Krapels**, Office of Naval Research; **Luanne P. Obert**, U.S. Army Night Vision & Electronic Sensors Directorate; **Ronald B. Sartain**, Army Research Lab.

3:40 pm: **Effect of image bit depth on target acquisition modeling**, Brian P. Teaney, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6941-14]

4:00 pm: **Human activity discrimination for maritime applications**, Evelyn J. Boettcher, DCS Corp.; Dawne M. Deaver, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-15]

4:20 pm: **Application of compressive sensing theory in infrared imaging systems**, Jing Zheng, Eddie L. Jacobs, The Univ. of Memphis . . . . . [6941-16]

4:40 pm: **Optical component analysis for a sparse sensor detection system**, Karl K. Klett, Jr., Ronald B. Sartain, Keith Aliberti, Army Research Lab. . [6941-17]

5:00 pm: **Optical signature modeling in urban environments**, J. Michael Cathcart, Brian Koehler, Ken Camann, Georgia Institute of Technology . [6941-18]

5:20 pm: **IR-system field-performance effect of local-area contrast enhancement**, Todd W. Du Bosq, Jonathan D. Fanning, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6941-19]

5:40 pm: **The impact of spatio-temporal focal plane array nonuniformity noise on target search and identification performance**, Richard L. Espinola, Jason G. Zeibel, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-20]

# Conference 6941 · Room: Grand 9/10

## POSTERS-Tuesday

Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**Infrared imaging spectroscopic system based on a PGP spectrograph and a monochrome infrared camera**, Pilar Beatriz Garcia-Allende, Francisco Anabitarte, Olga M. Conde, Francisco J. Madruga, Mauro Lomer, Jose M. Lopez-Higuera, Univ. de Cantabria (Spain) . . . . . [6941-45]

**Elimination algorithm of fixed pattern noise for infrared image system**, Changhan Park, Jungsoo Han, Samsung Thales Co., Ltd. (South Korea) [6941-47]

**Suite of proposed imaging performance metrics and test methods for fire service thermal imaging cameras**, Francine K. Amon, National Institute of Standards and Technology . . . . . [6941-48]

**Infrared hyperspectral imager for ground and airborne use: performance testing results and examples of measurements and applications**, Dario Cabib, Robert A. Buckwald, Amir Gil, CI Systems (Israel) Ltd. (Israel) . . . . . [6941-49]

**Application of spatial frequency response as a criteria for evaluating thermal imaging camera performance**, Andrew Lock, Francine K. Amon, Anthony Hamins, National Institute of Standards and Technology. . . . . [6941-50]

**Using extended surfaces to reduce thermal signatures of military assets**, Jeffrey G. Marchetta, Edward H. Perry, Matthew D. Schultz, Brian A. Butler, Mark Grizzard, The Univ. of Memphis . . . . . [6941-51]

**Applications of superresolution to practical sensors**, S. S. Young, Army Research Lab.; S. R. F. Sims, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; K. A. Krapels, Office of Naval Research; J. R. Waterman, L. Smith, Naval Research Lab.; E. L. Jacobs, The Univ. of Memphis; T. Corbin, L. Larsen, R. G. Driggers, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-53]

## Wednesday 19 March

### SESSION 5

Room: Grand 9/10. . . . . Wed. 8:00 to 10:00 am

#### Modeling V

Session Chairs: **Ronald G. Driggers**, U.S. Army Night Vision & Electronic Sensors Directorate; **Terrence S. Lomheim**, The Aerospace Corp.; **Joseph P. Reynolds**, U.S. Army Night Vision & Electronic Sensors Directorate

8:00 am: **Modeling diffraction MTF**, Melvin Friedman, Jay Vizgaitis, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6941-21]

8:20 am: **Target identification performance of superresolution versus dither**, Jonathan D. Fanning, Joseph P. Reynolds, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-22]

8:40 am: **Applications of evolving performance models**, Jeanne A. Atwell, Brent P. Canova, Ball Aerospace & Technologies Corp. . . . . [6941-23]

9:00 am: **Modeling impact of magnification on observer performance**, Brian P. Teaney, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-24]

9:20 am: **MWIR persistent surveillance performance for human backtracking**, Ronald G. Driggers, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-25]

9:40 am: **Low- to mid-altitude tracking resolution requirements for urban vehicles**, Aaron L. Robinson, The Univ. of Memphis; Brian S. Miller, Philip I. Richardson, Chun Ra, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-26]

Coffee Break . . . . . 10:00 to 10:30 am

### SESSION 6

Room: Grand 9/10. . . . . Wed. 10:30 am to 12:10 pm

#### Atmospheric Effects

Session Chairs: **Dieter Clement**, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany); **Endre Repasi**, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany); **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

10:30 am: **Analysis of image distortions by atmospheric turbulence and computer simulation of turbulence effects**, Endre Repasi, Robert Weiss, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany) . . . . . [6941-27]

10:50 am: **Perception range prediction for IR pilot sight**, Robert Weiss, Wolfgang Wittenstein, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany) . . . . . [6941-28]

11:10 am: **Dust and dew affecting infrared signatures**, Yossi Bushlin, Alexander B. Lessin, Arcady Reinov, Dieter Clement, Institute for Advanced Research and Development (Israel) . . . . . [6941-29]

11:30 am: **CACAMO: computer-aided camouflage assessment of moving objects**, Markus Müller, Thomas Mueller, Fraunhofer-Institut für Informations-und Datenverarbeitung (Germany) . . . . . [6941-30]

11:50 am: **Adapting speckle imaging for field use in real-time IR-video applications**, Fernando E. Ortiz, EM Photonics, Inc.; Carmen J. Carrano, Lawrence Livermore National Lab.; Petersen F. Curt, Michael R. Bodnar, EM Photonics, Inc. . . . . [6941-31]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

### SESSION 7

Room: Grand 9/10. . . . . Wed. 1:30 to 3:10 pm

#### Systems and Testing I

Session Chairs: **Alan Irwin**, Santa Barbara Infrared, Inc.; **Michael A. Soel**, FLIR Systems, Inc.; **Curtis M. Webb**, Northrop Grumman Corp.

1:30 pm: **Modulation transfer function measurement on QWIP focal plane array**, Don B. Rafol, Eric Cho, Diversified Electronics Corp. . . . . [6941-32]

1:50 pm: **Comparison of Fourier transform methods for calculating MTF**, Joseph D. LaVeigne, Santa Barbara Infrared, Inc.; Stephen D. Burks, U.S. Army Night Vision & Electronic Sensors Directorate; Brian Nehring, Santa Barbara Infrared, Inc. . . . . [6941-33]

2:10 pm: **Edge response revisited**, Shimshon N. Lashansky, Shlomo Mansbach, Michael J. Berger, Elbit Systems Electro-Optics ELOP Ltd. (Israel); Tehila Kirsik, Moran Ben-Nun, Machon Tal (Israel). . . . . [6941-34]

2:30 pm: **Infrared lens characterization using common undersampled systems**, Colin A. Nichols, StingRay Optics, LLC . . . . . [6941-35]

2:50 pm: **A means for calculating the optics MTF of an under-sampled IR imaging system**, Stephen D. Burks, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6941-36]

Coffee Break . . . . . 3:10 to 3:40 pm

## SESSION 8

Room: Grand 9/10. . . . . Wed. 3:40 to 5:40 pm

### Systems and Testing II

Session Chairs: **Alan Irwin**, Santa Barbara Infrared, Inc.;  
**Michael A. Soel**, FLIR Systems, Inc.;  
**Curtis M. Webb**, Northrop Grumman Corp.

3:40 pm: **Model-based Tec-Less FPN correction with bolometric resistance prediction**, Benoit Dupont, Aurelie Touvignon, ULIS (France); Antoine Dupret, Univ. Paris-Sud-XI (France); Patrick Villard, Commissariat à l'Energie Atomique (France) . . . . . [6941-37]

4:00 pm: **Measurement of effective temperature range of fire service thermal imaging cameras**, Francine K. Amon, Nelson P. Bryner, National Institute of Standards and Technology . . . . . [6941-38]

4:20 pm: **Practical measurement and analysis of the nonuniformity of thermal imaging cameras for first responders**, Andrew Lock, Francine K. Amon, Anthony Hamins, National Institute of Standards and Technology . . . . . [6941-39]

4:40 pm: **New automatic testing system for today's airborne laser sensors**, Dario Cabib, CI Systems (Israel) Ltd. (Israel) . . . . . [6941-40]

5:00 pm: **Relative color delineation testing of visible camera systems**, Jason A. Mazzetta, Stephen D. Scopatz, Fred Ennerson, Electro Optical Industries, Inc. . . . . [6941-41]

5:20 pm: **Clutter and signatures from near-infrared testbed sensor**, Richard B. Sanderson, Air Force Research Lab.; Joel B. Montgomery, M & M Aviation; John F. McCalmont, Air Force Research Lab. . . . . [6941-42]

### Related Courses

#### Registration is required.

See SPIE Cashier for full course description or to Register.

SC892 **Infrared Search and Track Systems** (*Schwering*)  
*NEW* Monday, 1:30 to 5:30 pm

SC896 **Optical Testing of Focal Plane Array Imagers-**  
*NEW Quick Performance Testing in the UV, Visible, and Near IR Ranges*  
(*Gazero*) Monday, 8:30 am to 5:30 pm

SC900 **Uncooled Thermal Imaging Detectors and Systems** (Hanson) Sunday,  
8:30 am to 5:30 pm

SC134 **Optical Design Fundamentals for Infrared Systems** (*Kampe*) Sunday,  
8:30 am to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (*Dereniak, Hubbs*) Tuesday, 8:30 am to  
12:30 pm

SC278 **Infrared Detectors** (*Dereniak*) Tuesday, 1:30 to 5:30 pm

SC545 **Infrared Characterization of Sources and Backgrounds** (*Jacobs*)  
Wednesday, 8:30 am to 5:30 pm

SC835 **Infrared Systems - Technology & Design** (*Daniels*) Monday / Tuesday,  
8:30 am to 5:30 pm / 8:30 am to 12:30 pm

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# Technologies for Synthetic Environments: Hardware-in-the-Loop Testing XIII

Conference Chair: **Robert Lee Murrer, Jr.**, Millennium Engineering and Integration Co.

Conference Co-Chair: **James A. Buford, Jr.**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

Program Committee: **Mary A. Amick**, U.S. Air Force; **David Brett Beasley**, Optical Sciences Corp.; **Paul T. Bryant**, Left Coast Consulting; **Charles F. Coker**, Air Force Research Lab.; **David S. Cosby**, U.S. Army Research, Development and Engineering Command; **Naresh C. Das**, Army Research Lab.; **George C. Goldsmith II**, U.S. Air Force; **Alexander G. Hayes**, MIT Lincoln Lab.; **Jay B. James**, FLIR Systems, Inc.; **John M. Lannon**, RTI International; **Heard S. Lowry**, Aerospace Testing Alliance; **Scott B. Mobley**, U.S. Army Aviation and Missile Command; **Randy A. Nicholson**, Aerospace Testing Alliance; **Robert M. Patchan**, The Johns Hopkins Univ. Applied Physics Lab.; **Donald R. Snyder**, Air Force Research Lab.; **Steven L. Solomon**, Acumen Scientific; **Rhoe A. Thompson**, Air Force Research Lab.; **Owen M. Williams**, Defence Science and Technology Organisation (Australia)

## Monday 17 March

### SESSION 1

Room: Grand 2 ..... Mon. 8:30 to 10:10 am

#### Flight Motion Simulators, Facilities, and LADAR

Session Chairs: **James A. Buford, Jr.**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Donald R. Snyder**, Air Force Research Lab.; **Mary A. Amick**, U.S. Air Force

8:30 am: **Major specification discriminators affecting advanced motion simulator configurations**, Robert W. Mitchell, Ideal Aeromsmith, Inc. . . . [6942-01]

8:50 am: **Keeping up with dynamics of next generation missiles**, Michael Warden, Robin Hauser, Peter Hofstetter, Martin Kägi, ACUTRONIC Schweiz AG (Switzerland) . . . . . [6942-02]

9:10 am: **An object-oriented simulation architecture for utilizing hardware-in-the-loop simulation within a many-on-many engagement scenario**, Ryan N. Brindley, Jeffrey P. Gareri, Simulation Technologies, Inc.; Scott B. Mobley, U.S. Army Aviation and Missile Command . . . . . [6942-03]

9:30 am: **Geographical-distributed stimulation architecture for system of system HWIL sensor and weapon facilities**, James A. Buford, Jr., Bernard W. Vatz II, M. Joshua Williams, Thomas C. Barnett, Cliff Burson, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6942-04]

9:50 am: **Ladar projector calibration sensor for the HWIL simulation development**, Hajin J. Kim, U.S. Army Aviation and Missile Command; Michael C. Cornell, Optical Sciences Corp. . . . . [6942-05]

Coffee Break . . . . . 10:10 to 10:40 am

### SESSION 2

Room: Grand 2 ..... Mon. 10:40 am to 12:00 pm

#### Scene Projector Systems I

Session Chairs: **Robert Lee Murrer, Jr.**, Millennium Engineering and Integration Co.; **George C. Goldsmith II**, U.S. Air Force; **Rhoe A. Thompson**, Air Force Research Lab.

10:40 am: **Development of infrared scene projectors for fire-fighter cameras**, Jorge E. Neira, Joseph P. Rice, Francine K. Amon, National Institute of Standards and Technology. . . . . [6942-06]

11:00 am: **Two-band DMD-based infrared scene simulator**, Julia R. Dupuis, David J. Mansur, Robert M. Vaillancourt, OPTRA, Inc. . . . . [6942-07]

11:20 am: **Design of NIR and LWIR projector systems to support the AMRDEC Multi-Spectral Simulation HWIL Facility**, Daniel A. Saylor, Optical Sciences Corp. . . . . [6942-08]

11:40 am: **High-temperature resistor pixels**, Steven L. Solomon, Robert P. Ginn, Acumen Scientific; Stephen A. Campbell, Maryam Jalali, Univ. of Minnesota . . . . . [6942-09]

Lunch Break . . . . . 12:00 to 1:00 pm

### SESSION 3

Room: Grand 2 ..... Mon. 1:00 to 2:00 pm

#### Scene Projector Systems II

Session Chairs: **Robert M. Patchan**, The Johns Hopkins Univ. Applied Physics Lab.; **George C. Goldsmith II**, U.S. Air Force; **Rhoe A. Thompson**, Air Force Research Lab.

1:00 pm: **Plasma TVs for bugs**, Steven L. Solomon, Robert P. Ginn, Acumen Scientific . . . . . [6942-10]

1:20 pm: **Development of photonic crystal-based scene projection technology**, John T. Caulfield, Cyan Systems . . . . . [6942-11]

1:40 pm: **Testing and results of an infrared polarized scene generator concept demonstrator**, Peter S. Erbach, Larry Pezzaniti, David B. Chenault, Polaris Sensor Technologies, Inc. . . . . [6942-12]

### SESSION 4

Room: Grand 2 ..... Mon. 2:00 to 4:20 pm

#### Diode-Based Scene Projector Systems

Session Chairs: **Heard S. Lowry**, Aerospace Testing Alliance; **David Brett Beasley**, Optical Sciences Corp.; **Paul T. Bryant**, Left Coast Consulting

2:00 pm: **Thermal simulations of packaged IR LED arrays**, John Lawler, Joseph Currano, Advanced Thermal and Environmental Concepts, Inc. . [6942-13]

2:20 pm: **Room temperature operated GaSb-based type-I quantum well light-emitting diodes**, Sergey D. Suchalkin, Power Photonic Corp.; Gela Kipshidze, Leon Shterengas, Takashi Hosoda, Stony Brook Univ.; David Westerfeld, Power Photonic Corp.; Gregory L. Belenky, Stony Brook Univ. . . . . [6942-14]

2:40 pm: **Development of a mid-infrared interband cascade LED array**, John L. Bradshaw, John D. Bruno, Frederick J. Towner, Christi A. Shiner, John T. Pham, Maxion Technologies, Inc.; Sergey D. Suchalkin, Gregory L. Belenky, Stony Brook Univ. . . . . [6942-15]

Coffee Break . . . . . 3:00 to 3:20 pm

3:20 pm: **Design and fabrication of 2D long wave (8-micron) light-emitting device arrays for IR scene projection**, Naresh C. Das, Army Research Lab.; John L. Bradshaw, Frederick J. Towner, Maxion Technologies, Inc. . . . . [6942-16]

3:40 pm: **Performance of 64x64 MWIR super lattice light-emitting diode (SLED) array for IR scene generation**, Naresh C. Das, Army Research Lab.; Fouad Kimilev, Univ. of Delaware; Thomas F. Boggess, The Univ. of Iowa. . . . . [6942-17]

4:00 pm: **Hybrid infrared scene projector (HIRSP): a high dynamic range infrared scene projector**, Thomas M. Canteay, David B. Beasley, Optical Sciences Corp.; Gary H. Ballard, U.S. Army Aviation and Missile Command; David S. Cosby, U.S. Army Research, Development and Engineering Command . . . . . [6942-18]

**SESSION 5**

**Room: Grand 2** ..... **Mon. 4:20 to 5:00 pm**

**Scene Generation Technologies**

*Session Chairs:* **David S. Cosby**, U.S. Army Research, Development and Engineering Command; **Charles F. Coker**, Air Force Research Lab.

4:20 pm: **Real-time dynamic PC image generation techniques for high-performance and high-dynamic range fidelity**, Dennis H. Bunfield, AMRDEC; Joseph W. Morris, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; Gary H. Ballard, U.S. Army Aviation and Missile Command; Darian E. Trimble, Thomas K. Fronckowiak, AMRDEC. .... [6942-19]

4:40 pm: **Polarization measurements made on LFRA and OASIS emitter arrays**, Jon C. Geske, Aerius Photonics, LLC ..... [6942-28]

**Tuesday 18 March**

**SESSION 6**

**Room: Grand 2** ..... **Tues. 8:00 to 9:00 am**

**Scene Projector Calibration and Characterization I**

*Session Chairs:* **Owen M. Williams**, Defence Science and Technology Organisation (Australia); **Naresh C. Das**, Army Research Lab.; **Scott B. Mobley**, U.S. Army Aviation and Missile Command

8:00 am: **Technical issues in the development of scene-projection systems for sensor calibration, characterization, and HWIL testing at AEDC**, Heard S. Lowry, Dustin H. Crider, Mary F. Breeden, Randy A. Nicholson, Aerospace Testing Alliance. .... [6942-21]

8:20 am: **Resistor array infrared projector nonuniformity correction: search for performance improvement III**, Robert A. Joyce, Leszek Swierkowski, Owen M. Williams, Defence Science and Technology Organisation (Australia) . [6942-22]

8:40 am: **Calibration and characterization of the seeker experimental system's cryogenic scene-projection system**, Matthew G. Brown, Fino J. Caraco, Anthony Gabrielson, David C. Harrison, Jonathan M. Swenson, MIT Lincoln Lab. .... [6942-23]

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary** ..... **Tues. 9:15 to 10:00 am**  
**The Honorable Jay Cohen,**  
 Under Secretary for Science and Technology,  
 U.S. Dept. of Homeland Security  
*See p. 6 for details.*

Coffee Break ..... 10:00 to 10:30 am

**SESSION 7**

**Room: Grand 2** ..... **Tues. 10:30 to 11:30 am**

**Scene Projector Calibration and Characterization II**

*Session Chairs:* **Owen M. Williams**, Defence Science and Technology Organisation (Australia); **Naresh C. Das**, Army Research Lab.; **Scott B. Mobley**, U.S. Army Aviation and Missile Command

10:30 am: **LWIR AutoNUC performance issues for resistor arrays**, Jack R. Lippert, Dynetics, Inc. .... [6942-25]

10:50 am: **AMRDEC FMS projector gradient reduction**, Daniel A. Saylor, Optical Sciences Corp. .... [6942-26]

11:10 am: **Performance improvements in resistive arrays**, Joseph D. Laveigne, Santa Barbara Infrared, Inc. .... [6942-27]

**Related Courses**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC892 **Infrared Search and Track Systems** (*Schwering*)  
*NEW* Monday, 1:30 to 5:30 pm

SC896 **Optical Testing of Focal Plane Array Imagers- Quick Performance Testing in the UV, Visible, and Near IR Ranges** (*Gazerro*) Monday, 8:30 am to 5:30 pm

SC900 **Uncooled Thermal Imaging Detectors and Systems**  
*NEW* (*Hanson*) Sunday, 8:30 am to 5:30 pm

SC134 **Optical Design Fundamentals for Infrared Systems** (*Kampe*) Sunday, 8:30 am to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (*Dereniak, Hubbs*) Tuesday, 8:30 am to 12:30 pm

SC278 **Infrared Detectors** (*Dereniak*) Tuesday, 1:30 to 5:30 pm

SC545 **Infrared Characterization of Sources and Backgrounds** (*Jacobs*) Wednesday, 8:30 am to 5:30 pm

SC835 **Infrared Systems - Technology & Design** (*Daniels*) Monday / Tuesday, 8:30 am to 5:30 pm / 8:30 am to 12:30 pm



# Sensors, and Command, Control, Communications, and Intelligence (C3I) Technologies for Homeland Security and Homeland Defense VII

Conference Chair: **Edward M. Carapezza**, Univ. of Connecticut and DARPA

Program Committee: **John G. Blich**, ARACAR: Alliance for Robot Assisted Crisis Assessment and Response; **George V. Cybenko**, Dartmouth College; **Mildred A. Donlon**, Defense Advanced Research Projects Agency; **John S. Eicke**, Army Research Lab.; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Kurt A. Henry**, U.S. Navy Medical Corps.; **Todd M. Hintz**, Space & Naval Warfare Systems Command, San Diego; **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command; **Bahram Javidi**, Univ. of Connecticut; **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Pradeep K. Khosla**, Carnegie Mellon Univ.; **David Knowles**, U.S. Secret Service; **Michael A. Kolodny**, Army Research Lab.; **Parsa Mirhaji**, The Univ. of Texas Health Science Ctr. at Houston; **Paul F. Morgan**, U.S. Special Operations Command; **Tien Pham**, Army Research Lab.; **Dennis J. Reimer**, National Memorial Institute for the Prevention of Terrorism; **Nino Srour**, Army Research Lab.; **Glenn T. Shwaery**, Univ. of New Hampshire

## Monday 17 March

### SESSION 1

Room: Grand 13 ..... Mon. 8:00 to 8:40 am

#### Keynote Session

Session Chair: **Edward M. Carapezza**, Univ. of Connecticut and DARPA

8:00 am: **Enhanced cyber security with CyLab Technologies** (Keynote Presentation), Pradeep K. Khosla, Carnegie Mellon Univ. .... [6943-01]

### SESSION 2

Room: Grand 13 ..... Mon. 8:40 to 9:40 am

#### Cybercrimes and Cyberterrorism Technologies and Systems

Session Chairs: **Edward M. Carapezza**, Univ. of Connecticut and DARPA; **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSSYSCEN

8:40 am: **Behavioral biometrics for verification and recognition of malicious software agents**, Roman V. Yampolskiy, Venu Govindaraju, Univ. at Buffalo ..... [6943-02]

9:00 am: **Development of network attack characterization modeling and simulation testbed**, Alexander P. Barzilov, Phillip C. Womble, Bruce Kessler, Uta Ziegler, Ivan Novikov, Jonathon Paschal, Ronald Hopper, Western Kentucky Univ. .... [6943-03]

9:20 am: **Recognition of coordinated adversarial behaviors from multi-source information**, Georgiy M. Levchuk, Aptima, Inc.; Djuana Lea, Air Force Research Lab.; Krishna R. Pattipati, Univ. of Connecticut ..... [6943-04]

Coffee Break ..... 9:40 to 10:20 am

### SESSION 3

Room: Grand 13 ..... Mon. 10:20 am to 12:20 pm

#### Robotic and Mobile Sensor Technologies and Systems

Session Chairs: **Edward M. Carapezza**, Univ. of Connecticut and DARPA; **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSSYSCEN

10:20 am: **SMARBot: a modular miniature mobile robot platform**, Yan Meng, Kerry Johnson, Brian Simms, Matthew Conforth, Stevens Institute of Technology ..... [6943-05]

10:40 am: **Inexpensive semi-autonomous ground vehicles for defusing IED's**, Christopher Davenport, Phillip C. Womble, James Lodmell, Kyle Moss, Alexander P. Barzilov, Jonathon Paschal, Robert Hernandez, Western Kentucky Univ. .... [6943-06]

11:00 am: **Mobility control in mobile wireless ad hoc based unmanned ground vehicles**, Pedro M. Wightman, Daladier Jabba Molinares, Miguel A. Labrador, Univ. of South Florida ..... [6943-07]

11:20 am: **Performance of sensors mounted on a robotic platform for personnel detection**, Thyagaraju R. Damarla, Army Research Lab. .... [6943-08]

11:40 am: **Stress-resolved and cockroach-friendly piezoelectric sensors**, Rodrigo A. Cooper, Hyungoo Lee, Stephanie J. Butler, Bartek Mika, David Clayton, Ke Wang, Texas A&M Univ.; Jingang Yi, San Diego State Univ.; Hong Liang, Texas A&M Univ. .... [6943-09]

12:00 pm: **Three-dimensional modeling of environments contaminated with chemical, biological, radiological, and nuclear (CBRN) agents**, Piotr Jasiobedzki, Ho-Kong Ng, Michel Bondy, MacDonald, Dettwiler and Associates Ltd. (Canada); Carl McDiarmid, Royal Canadian Mounted Police (Canada) ..... [6943-10]

Lunch Break ..... 12:20 to 1:30 pm

### SESSION 4

Room: Grand 13 ..... Mon. 1:30 to 4:50 pm

#### Biological and Chemical Agent Sensor Technologies and Systems

Session Chairs: **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSSYSCEN; **Stanley A. Erickson**, National Institute of Justice

1:30 pm: **National Institute of Justice (NIJ): current R&D in biometrics** (Invited Paper), Stanley A. Erickson, National Institute of Justice. .... [6943-11]

2:00 pm: **Localization to potential chemical/biological event using acoustics on a moving platform**, Sachi V. Desai, U.S. Army Research, Development and Engineering Command ..... [6943-12]

2:20 pm: **Further studies on the detection of chemical agents using an alkaline energy cell**, John Shewchun, Wayne State Univ. .... [6943-13]

2:40 pm: **Distributed intrinsic chemical sensors for terrorist countermeasures**, Robert A. Lieberman, Steven R. Cordero, Jeff Iida, Intelligent Optical Systems, Inc. .... [6943-14]

Coffee Break ..... 3:00 to 3:30 pm

3:30 pm: **Noise phenomena in porous silicon gas sensors**, Vladimir M. Aroutiounian, Zara O. Mkhitarian, Arkadi A. Shatveryan, Yerevan State Univ. (Armenia) ..... [6943-15]

3:50 pm: **Porous-silicon room-temperature nanosensor covered by TiO<sub>2</sub> or ZnO thin films**, Vladimir M. Aroutiounian, Valery M. Arakelyan, Vardan Galstyan, Khachatur Martirosyan, Yerevan State Univ. (Armenia) ..... [6943-16]

4:10 pm: **Design and build a compact Raman sensor for identification of chemical composition**, Christopher S. Garcia, Old Dominion Univ.; M. Nurul Abedin, Syed Ismail, NASA Langley Research Ctr.; Shiv K. Sharma, Anupam K. Misra, Univ. of Hawai'i at Manoa; Stephen P. Sandford, NASA Langley Research Ctr.; Hani E. Elsayed-Ali, Old Dominion Univ. .... [6943-17]

4:30 pm: **Tin dioxide thin film hydrogen nanosensor**, Vladimir M. Aroutiounian, Arsen Adamyan, Zaven N. Adamyan, Artsrun H. Arakelyan, Yerevan State Univ. (Armenia) ..... [6943-18]

**Tuesday 18 March**

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am**  
**The Honorable Jay Cohen,**  
 Under Secretary for Science and Technology,  
 U.S. Dept. of Homeland Security  
*See p. 6 for details.*

Coffee Break . . . . . 10:00 to 10:30 am

**SESSION 5**  
**Room: Grand 7A . . . . . Tues. 10:30 to 11:50 am**  
**Keynote Session**  
*Session Chairs: Edward M. Carapezza, Univ. of Connecticut and DARPA; Todd M. Hintz, Space & Naval Warfare Systems Command SPAWARSYSCEN*

Joint session with conference 6963.

10:30 am: **Models of processing in the visual cortex** (*Keynote Presentation*), James S. Albus, National Institute of Standards and Technology. . . . . [6943-19]  
 11:10 am: **Photon counting 3D passive sensing and processing for target recognition** (*Keynote Presentation*) (*Invited Paper*), S. Yeom, Daegu Univ. (South Korea); Bahram Javidi, Univ. of Connecticut; Edward A. Watson, Air Force Research Lab. . . . . [6963-21]

Lunch/Exhibition Break . . . . . 11:50 am to 1:10 pm

**SESSION 6**  
**Room: Grand 13 . . . . . Tues. 1:10 to 1:50 pm**  
**Keynote Session**  
*Session Chair: Edward M. Carapezza, Univ. of Connecticut and DARPA*

1:10 pm: **Integrative bio-surveillance for bio-terrorism and disaster preparedness: a semantic web approach** (*Keynote Presentation*), Parsa Mirhaji, The Univ. of Texas Health Science Ctr. at Houston . . . . . [6943-20]

**SESSION 7**  
**Room: Grand 13 . . . . . Tues. 1:50 to 2:50 pm**  
**Command, Control, Communications, and Intelligence (C3I)**  
*Session Chairs: Parsa Mirhaji, The Univ. of Texas Health Science Ctr. at Houston; Edward M. Carapezza, Univ. of Connecticut and DARPA*

1:50 pm: **Information integration for public safety officers**, Scott A. Valcourt, Pushpa Datla, Kent Chamberlin, Benjamin McMahon, Univ. of New Hampshire. . . . . [6943-21]  
 2:10 pm: **Cognitive feedback and adaptation in multi-agent systems for disaster situation management**, Gabriel Jakobson, Altusys Corp.; John F. Buford, Avaya Inc.; Lundy M. Lewis, Southern New Hampshire Univ. . . . . [6943-22]  
 2:30 pm: **Bayesian performance metrics of binary sensors in homeland security applications**, Tomasz P. Jansson, Thomas C. Forrester, Physical Optics Corp. . . . . [6943-24]  
 Coffee Break . . . . . 2:50 to 3:30 pm

**SESSION 8**

**Room: Grand 13 . . . . . Tues. 3:30 to 5:10 pm**

**Radar and Through-the-Wall Sensor Systems**

*Session Chair: Todd M. Hintz, Space & Naval Warfare Systems Command SPAWARSYSCEN*

- 3:30 pm: **Holographic radar imaging privacy techniques utilizing dual-frequency implementation**, Douglas L. McMakin, Thomas E. Hall, David M. Sheen, Pacific Northwest National Lab. . . . . [6943-25]  
 3:50 pm: **Benefits of wide-area intrusion detection systems using FMCW radar**, Pierre Poitevin, ICx Technologies, Inc. (Canada); Walker Butler, John Bjornholt, ICx Technologies, Inc. . . . . [6943-26]  
 4:10 pm: **Distance range of human detection by active Doppler and passive ultrasonic methods**, Alexander E. Ekimov, James M. Sabatier, The Univ. of Mississippi. . . . . [6943-27]  
 4:30 pm: **Waveform design for through-the-wall radar imaging applications**, Habib Estephan, Moeness G. Amin, Konstantin M. Yemelyanov, Villanova Univ. . . . . [6943-28]  
 4:50 pm: **Interpretation of through-the-wall radar imagery by probabilistic volume model building**, Bijan G. Mobasser, Zachary Rosenbaum, Villanova Univ. . . . . [6943-29]

**Wednesday 19 March**

**SESSION 9**  
**Room: Grand 7A . . . . . Wed. 8:00 to 9:20 am**  
**Keynote Session**  
*Session Chair: Edward M. Carapezza, Univ. of Connecticut and DARPA*

Joint session with conference 6963.

8:00 am: **Design of trustworthy fielded sensor networks** (*Keynote Presentation*), Gregory J. Pottie, Univ. of California/Los Angeles. . . [6943-30]  
 8:40 am: **MEMS and NEMS technologies for sensor applications** (*Keynote Presentation*), Panos G. Datskos, Oak Ridge National Lab. . . . . [6943-31]

**SESSION 10**  
**Room: Grand 13 . . . . . Wed. 9:20 am to 12:00 pm**

**Security and Surveillance Systems I**

*Session Chair: Todd M. Hintz, Space & Naval Warfare Systems Command SPAWARSYSCEN*

- 9:20 am: **WaterWATCH program overview**, Gerald W. Driggers, Miltec Systems Co. and U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; Mark Umansky, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; Tammy Cleveland, Lisa M. Araujo, Robert Spohr, Miltec Systems Co. . . . . [6943-32]  
 9:40 am: **Submarine imaging systems: developing improved capabilities and technologies**, David M. Duryea, Naval Sea Systems Command; Carl E. Lindstrom, Naval Undersea Warfare Ctr.; Riad Sayegh, Naval Sea Systems Command . . . . . [6943-33]  
 Coffee Break . . . . . 10:00 to 10:30 am  
 10:30 am: **Results of optical detection trials in harbor environment**, Rob A. W.Kemp, TNO (Netherlands). . . . . [6943-34]  
 10:50 am: **Maritime acoustic detection of aircrafts to increase flight safety and homeland security: an experimental study**, Leng Sim, Latasha Solomon, Steve Tenney, Army Research Lab. . . . . [6943-35]  
 11:10 am: **Real-time processing of a distributed phase-sensitive fiber optic sensor**, Christi K. Madsen, Tim Snider, Texas Agricultural & Mechanical Univ. . . . . [6943-36]  
 11:30 am: **Systems and technologies for enhanced coastal maritime security**, Edward M. Carapezza, Univ. of Connecticut and DARPA . . . . . [6943-37]  
 Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

**SESSION 11**

**Room: Grand 13** ..... **Wed. 1:30 to 3:30 pm**

**Security and Surveillance Systems II**

*Session Chairs:* **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSSYSCEN; **Edward M. Carapezza**, Univ. of Connecticut and DARPA

1:30 pm: **A Compton telescope for locating radioactive material**, James M. Ryan, John R. Macri, Justin R. Baker, Mark L. McConnell, Univ. of New Hampshire; Richard Carnade, Neva Ridge Technologies, Inc. .... [6943-38]

1:50 pm: **Fusion-based multi target tracking and localization for intelligent surveillance systems**, Haroun Rababaah, Amir H. Shirkhodaie, Tennessee State Univ. .... [6943-39]

2:10 pm: **Advanced border monitoring sensor system**, Ronald A. Knobler, Mark A. Winston, McQ, Inc. .... [6943-40]

2:30 pm: **A wireless electronic monitoring system for securing milk from farm to processor**, Phillip C. Womble, Western Kentucky Univ.; Fred A. Payne, Univ. of Kentucky; Suraj Alexander, Univ. of Louisville; Chris Thompson, Univ. of Kentucky; Ryan Moore, Western Kentucky Univ.; Brian Luck, Univ. of Kentucky; Jonathon Paschal, Western Kentucky Univ.; Timothy S. Stombaugh, William Crist, Univ. of Kentucky .... [6943-41]

2:50 pm: **A demonstrator for an integrated subway protection system**, Edoardo Detoma, SEPA (Italy). .... [6943-42]

3:10 pm: **Zero false alarm seismic detection and identification systems**, Alex Pakhomov, E. Timothy Goldburt, General Sensing Systems LLC ..... [6943-52]

Coffee Break ..... 3:30 to 4:00 pm

**SESSION 12**

**Room: Grand 13** ..... **Wed. 4:00 to 5:00 pm**

**Counter-sniper Systems**

*Session Chairs:* **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSSYSCEN; **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command

4:00 pm: **Acoustic gunshot location in complex environments: concepts and results**, Robert L. Showen, Robert B. Calhoun, Wai C. Chu, ShotSpotter, Inc. .... [6943-43]

4:20 pm: **Unattended acoustic sensors for mortar classification**, Sachi V. Desai, U.S. Army Research, Development and Engineering Command. . . [6943-44]

4:40 pm: **Identification of localized mortar events as either launch/impact**, Sachi V. Desai, U.S. Army Research, Development and Engineering Command ..... [6943-45]

**Thursday 20 March**

**SESSION 13**

**Room: Grand 13** ..... **Thurs. 8:40 to 11:10 am**

**Intelligence Exploitation Systems and Technologies**

*Session Chair:* **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSSYSCEN

8:40 am: **JPEG 2000: fast access to large grayscale images**, Margaret A. Lepley, The MITRE Corp. .... [6943-46]

9:00 am: **Massive-scale video anti-piracy monitoring**, Paul S. Cadaret, UNICON Inc. .... [6943-47]

9:20 am: **Parallel implementation of high-speed phase diverse atmospheric turbulence compensation method on a neural network-based architecture**, William W. Arrasmith, Sean Sullivan, Florida Institute of Technology. . . . [6943-48]

Coffee Break ..... 9:40 to 10:10 am

10:10 am: **Dynamic building visualization for first responders**, Nathan T. Denny, 21st Century Systems, Inc. .... [6943-49]

10:30 am: **Computational acceleration using neural networks**, Paul S. Cadaret, UNICON Inc. .... [6943-50]

10:50 am: **Reactive transmitter**, Akbar Rahmani Nejad, Civil Aviation Organization (Iran) ..... [6943-51]

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# Biometric Technology for Human Identification V

Conference Chairs: **B. V. K. Vijaya Kumar**, Carnegie Mellon Univ.; **Salil Prabhakar**, Digital Persona Inc.; **Arun A. Ross**, West Virginia Univ

Program Committee: **Besma R. Abidi**, The Univ. of Tennessee; **Andy Adler**, Carleton Univ. (Canada); **George N. Bebis**, Univ. of Nevada/Reno; **Reza Derakhshani**, Univ. of Missouri/Kansas City; **Jean-Luc E. Dugelay**, Institut Eurécom (France); **Julian Fierrez-Aguilar**, Univ. Autónoma de Madrid (Spain); **Patrick J. Flynn**, Univ. of Notre Dame; **Vincent Hsu**, Identix Inc.; **Anil K. Jain**, Michigan State Univ.; **Jaihie Kim**, Yonsei Univ. (South Korea); **Javier Ortega-Garcia**, Univ. Autónoma de Madrid (Spain); **Josef Kittler**, Univ. of Surrey (United Kingdom); **Ajay Kumar**, Indian Institute of Technology Delhi (India); **Stan Z. Li**, Chinese Academy of Sciences (China); **David Maltoni**, Univ. degli Studi di Bologna (Italy); **D. M. Monro**, Univ. of Bath (United Kingdom); **Lisa Ann Osadciw**, Syracuse Univ.; **Sharath Pankanti**, IBM Thomas J. Watson Research Ctr.; **Jonathan Phillips**, National Institute of Standards and Technology; **Norman Poh**, Univ. of Surrey (United Kingdom); **Douglas A. Reynolds**, MIT Lincoln Lab.; **Sudeep Sarkar**, Univ. of South Florida; **Marios Savvides**, Carnegie Mellon Univ.; **Michael E. Schuckers**, St. Lawrence Univ.; **Diego A. Socolinsky**, Equinox Corp.; **Colin Soutar**, Bioscrypt Inc. (Canada); **Nicole A. Spaun**, Federal Bureau of Investigation; **Zhenan Sun**, Institute of Automation (China); **Elham Tabassi**, National Institute of Standards and Technology; **Umut Uludag**, Lumidigm, Inc.; **Damon Woodard**, Clemson Univ.

## Tuesday 18 March

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am**

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

*See p. 6 for details.*

Coffee Break . . . . . 10:00 to 10:30 am

### SESSION 1

**Room: Grand 12 . . . . . Tues. 10:30 to 11:50 am**

#### Face I

*Session Chair: B. V. K. Vijaya Kumar*, Carnegie Mellon Univ.

10:30 am: **FAAD: face at a distance**, Terrance E. Boulton, Walter J. Scheirer, Univ. of Colorado/Colorado Springs; Robert Woodworth, Securics, Inc. . . . . [6944-01]

10:50 am: **Three-dimensional face identification: experiments toward a large gallery**, Dirk J. Colbry, Arizona State Univ.; Folarin Oki, George Stockman, Michigan State Univ. . . . . [6944-02]

11:10 am: 2:00 pm: **Generation of artificial biometric data enhanced with contextual information for game strategy based behavioral biometrics**, Roman V. Yampolskiy, Venu Govindaraju, Univ. at Buffalo . . . . . [6944-22]

Lunch/Exhibition Break . . . . . 11:50 am to 1:10 pm

### SESSION 2

**Room: Grand 12 . . . . . Tues. 1:10 to 2:10 pm**

#### Iris and Signature

*Session Chair: B. V. K. Vijaya Kumar*, Carnegie Mellon Univ.

1:10 pm: **Standoff iris recognition using non-iterative polar-based segmentation**, Rida Hamza, Rand Whillock, Honeywell Corp. . . . . [6944-04]

1:30 pm: **Self-adaptive iris image acquisition system**, Wenbo Dong, Zhenan Sun, Tieniu Tan, Xianchao Qiu, Institute of Automation (China) . . . . . [6944-05]

1:50 pm: **An individuality model for online signatures**, Alisher Kholmatov, Berrin Yanikoglu, Sabanci Univ. (Turkey) . . . . . [6944-06]

### SESSION 3

**Room: Grand 12 . . . . . Tues. 2:10 to 3:30 pm**

#### Face II

*Session Chair: Arun A. Ross*, West Virginia Univ

2:10 pm: **A three-step cancelable framework: a hybrid approach for face template protection**, Y. C. Feng, Pong C. Yuen, Hong Kong Baptist Univ. (Hong Kong China); Anil K. Jain, Michigan State Univ. . . . . [6944-07]

2:30 pm: **A robust spatio-temporal face modelling approach using 3D multimodal fusion for biometric security applications**, Girija Chetty, Michael Wagner, Univ. of Canberra (Australia) . . . . . [6944-08]

2:50 pm: **Robust albedo estimation from face image under unknown illumination**, Xuan Zou, Josef Kittler, Miroslav Hamouz, Jose R. Tena, Univ. of Surrey (United Kingdom) . . . . . [6944-09]

3:10 pm: **A novel incremental image reduction principal component analysis and its application for face recognition**, Satnam S. Dlay, Wai L. Woo, Risco M. Mutelo, Univ. of Newcastle Upon Tyne (United Kingdom) . . . . . [6944-10]

Coffee Break . . . . . 3:30 to 4:00 pm

### SESSION 4

**Room: Grand 12 . . . . . Tues. 4:00 to 5:00 pm**

#### Hand and Palmprint

*Session Chair: Arun A. Ross*, West Virginia Univ

4:00 pm: **A multimodal biometric authentication system based on 2D and 3D palmprint**, Vivek Kanhangad, David Zhang, Nan Luo, The Hong Kong Polytechnic Univ. (Hong Kong China) . . . . . [6944-11]

4:20 pm: **A palmprint-based cryptosystem using double encryption**, Ajay Kumar, Amioy Kumar, Indian Institute of Technology Delhi (India) . . . . . [6944-12]

4:40 pm: **Personal authentication using hand vein triangulation**, Ajay Kumar, K. Venkata Prathyusha, Indian Institute of Technology Delhi (India) . . . . . [6944-13]

# Conference 6944 · Room: Grand 12

## POSTERS-Tuesday

**Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm**

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

- Modeling biometric systems using the general pareto distribution (GPD)**, Zhixin Shi, Univ. at Buffalo; Frederick Kiefer, John Schneider, Ultra-Scan Corp.; Venu Govindaraju, Univ. at Buffalo . . . . . [6944-23]
- Characteristics of thermal-type fingerprint sensor**, Hirobumi Han, Yasuhiro Koshimoto, Wakayama Univ. (Japan) . . . . . [6944-25]
- Combining cascade PCA and face shape models for robust registration**, Guangpeng Zhang, Yunhong Wang, Beihang Univ. (China) . . . . . [6944-26]
- Intelligent two-step sampling design for face recognition**, Yanjun Yan, Lisa A. Osadciw, Syracuse Univ. . . . . [6944-27]
- Frontal sinus recognition for human identification**, Aparecido N. Marana, Juan R. Falguera, Fernanda P. S.Falguera, Univ. Estadual Paulista Júlio de Mesquita Filho (Brazil) . . . . . [6944-28]
- Identifying discriminatory information content within the iris**, Randy P. Broussard, Lauren R. Kennell, Robert W. Ives, U.S. Naval Academy . . . . . [6944-29]
- Selecting optimal classification features for SVM-based elimination of incorrectly matched minutiae**, Praveer Mansukhani, Venu Govindaraju, Univ. at Buffalo . . . . . [6944-32]
- Identify human motions using micro-doppler radar**, Chao Lu, Yinan Yang, Wen Xue Zhang, Towson Univ. . . . . [6944-34]

## Wednesday 19 March

### SESSION 5

**Room: Grand 12 . . . . . Wed. 9:00 to 10:00 am**

#### Privacy and Forensics

*Session Chair: Salil Prabhakar, Digital Persona Inc.*

- 9:00 am: **Biometrics and privacy** (*Invited Paper, Presentation Only*), Latanya Sweeney, Carnegie Mellon Univ. . . . . [6944-14]
- 9:40 am: **Forensic biometrics from images and videos at the Federal Bureau of Investigation** (*Invited Paper, Presentation Only*), Nicole A. Spaun, Federal Bureau of Investigation . . . . . [6944-15]

Coffee Break . . . . . 10:00 to 10:30 am

### SESSION 6

**Room: Grand 12 . . . . . Wed. 10:30 to 11:30 am**

#### Fusion

*Session Chair: Salil Prabhakar, Digital Persona Inc.*

- 10:30 am: **Identification based on fusion of cardiovascular function measurements**, Steven A. Israel, John M. Irvine, Mark D. Wiederhold, Science Applications International Corp.; Brenda K. Wiederhold, Virtual Reality Medical Ctr. . . . . [6944-16]
- 10:50 am: **Multimodal biometric templates for verification using fingerprint and voice**, Eren Camlikaya, Alisher Kholmatov, Berrin Yanikoglu, Sabanci Univ. (Turkey) . . . . . [6944-17]
- 11:10 am: **Dealing with sensor interoperability in multi-biometrics: the UPM experience at the BioSecure Multimodal Evaluation 2007**, Fernando Alonso-Fernandez, Julian Fierrez-Aguilar, Daniel Ramos, Javier Ortega-Garcia, Univ. Autónoma de Madrid (Spain) . . . . . [6944-18]
- Lunch/Exhibition Break . . . . . 11:30 am to 1:00 pm

### SESSION 7

**Room: Grand 12 . . . . . Wed. 1:00 to 2:00 pm**

#### Fingerprints

*Session Chair: Arun A. Ross, West Virginia Univ*

- 1:00 pm: **Novel fingerprint verification system using SIFT**, Unsang Park, Sharath Pankanti, IBM Thomas J. Watson Research Ctr.; Anil K. Jain, Michigan State Univ. . . . . [6944-19]
- 1:20 pm: **Estimate singular point rotation by analytical models**, Yi Wang, Jiankun Hu, Royal Melbourne Institute of Technology (Australia) . . . . . [6944-20]
- 1:40 pm: **Three-dimensional imaging of artificial fingerprint by optical coherence tomography**, Kirill V. Larin, Yezeng Cheng, Univ. of Houston . . . . . [6944-21]

### Related Courses

**Registration is required.**

See SPIE Cashier for full course description or to Register.

- SC891 **Security of Information and Communication**  
*NEW Networks (Kartalopoulos)* Sunday, 1:30 to 5:30 pm
- SC719 **Chemical & Biological Detection: Overview of Point and Standoff Sensing Technologies** (*Gardner*) Monday, 1:30 to 5:30 pm
- SC836 **Using IR Thermographic Instruments - A Primer for Thermographers** (*Kaplan*) Sunday, 1:30 to 5:30 pm

### Make time for the Defense+Security Exhibition

Orlando World Center Marriott Resort & Convention Center  
Cypress/Sago/Sabel Ballrooms

Tuesday 18 March . . . . . 10:00 am to 5:00 pm  
Wednesday 19 March . . . . . 10:00 am to 5:00 pm  
Thursday 20 March . . . . . 10:00 am to 2:00 pm

**Don't miss the NEW Robotics+Unmanned Systems Pavilion.**  
See pp. 18-21 for exhibition details.

# Conference 6945 · Room: Crystal G1

Monday-Thursday 17-20 March 2008 • Proceedings of SPIE Vol. 6945

## Optics and Photonics in Global Homeland Security IV

**Conference Chairs:** **Craig S. Halvorson**, Lawrence Livermore National Lab.; **Daniel Lehrfeld**, Photonic Products Group, Inc.; **Theodore T. Saito**, Lawrence Livermore National Lab.

**Program Committee:** **Michael J. DeWeert**, BAE Systems; **Refael Gatt**, Global Security Devices (Israel); **Jeffrey S. Gordon**, GE Global Research; **Susan F. Hallowell**, Transportation Security Lab.; **Dan J. Kroll**, Hach Co., Inc.; **Han Q. Le**, Univ. of Houston; **Ashok K. Sood**, Magnolia Optical Technologies, Inc.; **Sarka O. Southern**, GAIA Medical Institute

### Monday 17 March

#### Chair Overview

**Room: Crystal G1** ..... **Mon. 1:00 to 1:30 pm**

**Session Chairs:** **Craig S. Halvorson**, Lawrence Livermore National Lab.; **Jeffrey S. Gordon**, GE Global Research

The Chair Overview will be a guide to this year's conference. We will briefly summarize the goals of the conference, describe the ten different sessions, and point out some of the most exciting talks that will be presented over the next few days.

#### SESSION 1

**Room: Crystal G1** ..... **Mon. 1:30 to 5:10 pm**

#### Radiation Detection

**Session Chair:** **Jeffrey S. Gordon**, GE Global Research

1:30 pm: **Strategic technology roadmap for radiation detection** (*Invited Paper*), Anu P. Bowman, U.S. Dept. of Homeland Security ..... [6945-01]

2:00 pm: **Iodine based compound semiconductors for room temperature gamma-ray spectroscopy**, Azaree T. Lintereur, Wei Qiu, Juan C. Nino, James E. Baciak, Jr., Univ. of Florida ..... [6945-02]

2:20 pm: **An equivalent n-source for WGPu derived from a spectrum-shifted PuBe source**, Gabriel M. Ghita, Glenn E. Sjoden, James E. Baciak, Jr., Scottie Walker, V. S. Cornelison, Univ. of Florida ..... [6945-03]

2:40 pm: **Detection of illicit substances through neutron interrogation and Compton imaging**, Reynold J. Cooper, Andrew J. Boston, Helen C. Boston, Matthew R. Dimmock, Paul J. Nolan, The Univ. of Liverpool (United Kingdom); Malcolm Joyce, Robert Mackin, Bob D'Mellow, Michael Aspinall, Lancaster Univ. (United Kingdom); Anthony J. Peyton, Roelof G. van Silfhout, The Univ. of Manchester (United Kingdom) ..... [6945-04]

3:00 pm: **A new integrated neutron/gamma radio isotope identification device evaluated under mixed radiation fields**, Adrian Ivan, Brent A. Clothier, Daniel B. McDevitt, GE Global Research; James Williams, GE Energy .. [6945-05]

Coffee Break ..... 3:20 to 3:50 pm

3:50 pm: **Improved plutonium identification and characterization results with NaI(Tl) detector using ASEDRA**, Rebecca S. Detwiler, Glenn E. Sjoden, Eric Lavigne, James E. Baciak, Jr., Univ. of Florida ..... [6945-06]

4:10 pm: **<sup>3</sup>He neutron detector design for active interrogation of cargo containers**, Daniel B. McDevitt, Jeffrey W. Eberhard, Scott Zelakiewicz, Aaron Maschinot, GE Global Research ..... [6945-07]

4:30 pm: **Development and performance of the Fast Neutron Imaging Telescope for SNM detection**, James M. Ryan, Ulisse M. Bravar, John R. Macri, Mark L. McConnell, Richard L. Woolf, Univ. of New Hampshire ..... [6945-08]

4:50 pm: **Enhancements to large area x-ray detectors for cargo radiography**, Clifford Bueno, Forrest Hopkins, William R. Ross, William M. Leue, Robert A. Kaucic, Donald E. Castleberry, Jeffrey Shaw, Edward J. Nieters, Douglas Albagli, Daniel B. McDevitt, John E. McLeod, Bernhard E. H.Claus, GE Global Research; Joseph Bendahan, GE Homeland Protection, Inc. .... [6945-60]

#### Global Homeland Security Technical Meeting

*Monday 17 March · 5:15 to 6:00 pm · Room: Crystal G1*

**Chair:** **Craig S. Halvorson**, Lawrence Livermore National Lab.

Please join us to discuss the following questions in relation to the conference on Optics and Photonics in Global Homeland Security (OPGHS):

- How should the technology needs of first responders be addressed?
- Are there ways to increase international involvement?
- Does OPGHS have the optimal balance between presentations from sponsors and presentations from researchers?
- How might corporate sponsors participate in bringing university researchers to the conference?
- Are there any particular researchers or sponsors that should be invited to present at Defense & Security 2009?
- Are there suggestions for possible symposium plenary speakers for Defense & Security 2009?

Interested attendees are welcome to attend.

### Tuesday 18 March

#### SESSION 2

**Room: Crystal G1** ..... **Tues. 8:00 to 9:10 am**

#### Bio-chem Countermeasures I

**Session Chair:** **Sarka O. Southern**, GAIA Medical Institute

8:00 am: **Integrated nano-bio-chip sensor systems: from bio-terrorism to humanitarian applications** (*Invited Paper*), John T. McDevitt, The Univ. of Texas at Austin ..... [6945-09]

8:30 am: **Point-of-care detection of bacterial and viral pathogens using oral samples**, Daniel Malamud, New York Univ. .... [6945-10]

8:50 am: **Utility of POC test devices for infectious disease testing of blood and oral fluid and application to rapid testing in the field**, Stephen R. Lee, Keith Kardos, Graham Yearwood, Geraldine Guillon, Lisa Kurtz, Mark Fischl, Vijaya Mokkapaty, OraSure Technologies, Inc. .... [6945-11]

#### Symposium-Wide Plenary Presentation

**Room: Palms Ballroom, Canary** ..... **Tues. 9:15 to 10:00 am**

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

*See p. 6 for details.*

Coffee Break ..... 10:00 to 10:30 am

# Conference 6945 · Room: Crystal G1

## SESSION 3

Room: Crystal G1 ..... Tues. 10:30 am to 12:10 pm

### Bio-chem Countermeasures II

Session Chair: **Sarka O. Southern**, GAIA Medical Institute

10:30 am: **Integrated microfluidic platform for oral diagnostics (IMPOD)**, Anup K. Singh, Sandia National Labs. .... [6945-12]

10:50 am: **Stress response profiling: a new tool for early detection of high-consequence health threats**, Sarka O. Southern, GAIA Medical Institute ..... [6945-13]

11:10 am: **Pushing rapid point-of-need testing technologies to the limits: emerging technologies that facilitate highly sensitive, quantitative, field use rapid tests for the detection of biological threats**, Brendan O'Farrell, Diagnostic Consulting Network. .... [6945-14]

11:30 am: **Handheld and portable test systems for immunodiagnostics and nucleic acid detection**, Konrad Faulstich, Klaus Haberstroh, Roman Gruler, Michael Eberhard, Thomas Wiest, Dirk Lentzsch, Embedded System Engineering GmbH (Germany). .... [6945-15]

11:50 am: **Wide area restoration following biological contamination**, Lynn Yang, Donna M. Edwards, David O. Franco, Julia A. Fruetel, Sandia National Labs.; Wilthea J. Hibbard, Robert J. Greenwalt, Robin R. Miles, Lawrence Livermore National Lab. .... [6945-16]

Lunch/Exhibition Break ..... 12:10 to 1:10 pm

## SESSION 4

Room: Crystal G1 ..... Tues. 1:10 to 5:00 pm

### Bio-chem Countermeasures III

Session Chair: **Sarka O. Southern**, GAIA Medical Institute

1:10 pm: **Biodection technologies to meet defense and security needs**, Cynthia J. Bruckner-Lea, Pacific Northwest National Lab. .... [6945-17]

1:30 pm: **Qualification metrics for chemical and biological sensors**, Leora Peltz, The Boeing Co. .... [6945-18]

1:50 pm: **Organic thin film field effect transistors for vapor and aqueous sensing applications**, Zhenan Bao, Stanford Univ. .... [6945-19]

2:10 pm: **Bioluminescent bioreporter assays for targeted detection of chemical and biological agents**, Steven A. Ripp, Patricia Jegier, Scott Moser, Courtney Johnson, Syed Islam, Gary S. Saylor, The Univ. of Tennessee. .... [6945-20]

2:30 pm: **Considerations in detecting CDC select agents under field conditions**, Charles B. Spinelli, The Boeing Co.; Scott Soelberg, Univ. of Washington; Nathaneal Swanson, Seattle Sensor Systems, Inc.; Clement E. Furlong, Univ. of Washington; Paul Baker, Seattle Sensor Systems, Inc. .... [6945-21]

2:50 pm: **A simple nucleic acid dipstick for rapid influenza detection: towards the development of a real time diagnostic assay at point-of-care (POC)**, Hong Cai, Xiaoyun Lu, David T. Fox, Los Alamos National Lab. .... [6945-22]

Coffee Break ..... 3:10 to 3:40 pm

3:40 pm: **Class identification of pathogens based on native fluorescence spectroscopy on-a-chip**, Peter Kiesel, Markus Beck, Michael Bassler, Oliver Schmidt, Noble M. Johnson, Tobias Buerger, Palo Alto Research Ctr., Inc. .... [6945-23]

4:00 pm: **Biosensing with semiconductor quantum dot conjugates**, Igor L. Medintz, Hedi Mattoussi, Naval Research Lab. .... [6945-24]

4:20 pm: **Analysis of flow-cytometer scattering and fluorescence data to identify particle mixtures**, Thomas A. Reichardt, Scott E. Bisson, Robert W. Crocker, Thomas J. Kulp, Sandia National Labs. .... [6945-25]

4:40 pm: **Confirmatory measurement channels for LIF-based bioaerosol instrumentation**, Scott E. Bisson, Robert W. Crocker, Thomas J. Kulp, Thomas A. Reichardt, Sandia National Labs.; Peter T. Reilly, William B. Whitten, Oak Ridge National Lab. .... [6945-26]

## SESSION 5

Room: Crystal G1 ..... Tues. 5:00 to 5:40 pm

### Maritime Domain Awareness

Session Chair: **Chung-Hye Read**, National Geospatial-Intelligence Agency

5:00 pm: **Ship signature development**, Hans C. Graber, Univ. of Miami; Michael Mignone, U.S. Dept. of Defense ..... [6945-62]

5:20 pm: **Enhanced ship detection from overhead imagery**, Heidi L. Buck, Elan Sharghi, Chessa F. Guilas, John Stastny, William Morgart, Brian Schalcosky, Space and Naval Warfare Systems Ctr., San Diego; Keith Pifko, Univ. of Pennsylvania ..... [6945-63]

## POSTERS-Tuesday

Room: Palms Ballroom-Royal ..... Tues. 6:00 to 7:30 pm

*All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.*

*Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.*

**Detection of residual traces of explosives by surface enhanced Raman scattering using gold coated substrates produced by nanospheres imprint technique**, Fernando A. Calzzani, Jr., R. Silesh, Aschalew S. Kassu, Jean Michel Taguenang, A. Chowdhury, Anup Sharma, Alabama A&M Univ.; Paul B. Ruffin, Christina L. Brantley, Eugene Edwards, U.S. Army Research, Development and Engineering Command ..... [6945-55]

**Two step signal processing of optical fiber mesh for intruder detection**, Il-Bum Kwon, Dae-Cheol Seo, Chi-Yeop Kim, Dong-Jin Yoon, Korea Research Institute of Standards and Science (South Korea) ..... [6945-56]

**Nuclear material detection technologies**, James F. Christian, Purushottam Dokhale, Irina Shestakova, Vivek V. Nagarkar, Kanai S. Shah, Michael R. Squillante, Radia Sia, Radiation Monitoring Devices, Inc.; James M. Ryan, John R. Macri, Ulisse M. Bravar, Univ. of New Hampshire; Ka-Ngo Leung, Lawrence Berkeley National Lab. .... [6945-57]

**Carbosilane polymers with hydrogen bond acidic functionalization for chemical preconcentrator applications**, Duane L. Simonson, Robert A. McGill, Bernadette A. Higgins, Naval Research Lab. .... [6945-58]

**Rotationally resolved spectral signatures for RDX-based explosives in the 3 micron region**, Sindhu Kaimal, William A. Burns, Alan R. Ford, Scott W. Reeve, Arkansas State Univ. .... [6945-59]

**Neu-VISION™ an explosives detection system for transportation security**, David G. Penn, L. Kieffer Warman, Applied Signal Technology, Inc. .... [6945-61]

**Wednesday 19 March**

**SESSION 6**

**Room: Crystal G1** ..... **Wed. 8:00 am to 12:10 pm**

**Maritime Security**

*Session Chair: Michael J. DeWeert, BAE Systems*

- 8:00 am: **Small maritime target detection through false color fusion**, Alexander Toet, TNO Human Factors (Netherlands); Tirui Wu II, Jiangsu Univ. of Science and Technology (China). . . . . [6945-27]
- 8:20 am: **Anomaly detection in the maritime domain**, Jean Roy, Defence Research and Development Canada (Canada). . . . . [6945-28]
- 8:40 am: **A comparison of MWIR and LWIR polarimetric imaging for surface swimmer detection**, John S. Harchanko, Larry Pezzaniti, David B. Chenault, Graham Eades, Polaris Sensor Technologies, Inc. . . . . [6945-29]
- 9:00 am: **Ocean color remote sensing: approaches for the waters' edge**, Patty D. Pratt, Northrop Grumman Space Technology . . . . . [6945-30]
- 9:20 am: **Flight test capabilities for real time multiple target detection and tracking for airborne surveillance and maritime domain awareness**, Brian A. Gorin, BAE Systems; Allen M. Waxman, BAE Systems Advanced Information Technologies . . . . . [6945-31]
- 9:40 am: **Information visualization for enhanced maritime domain awareness**, Alain Bouchard, Defence R&D Canada/Valcartier (Canada); Anna-Liesia S. Lapinski, Defence R&D Canada/Atlantic (Canada) . . . . . [6945-32]
- Coffee Break . . . . . 10:00 to 10:30 am
- 10:30 am: **Automatic sensor management: challenges and possible solutions**, Tanja Y. C.van Valkenburg-Haarst, Wilbert van Norden, Fok Bolderheij, Royal Netherlands Navy (Netherlands) . . . . . [6945-33]
- 10:50 am: **SeaSpider: automated information gathering on vessel movements in support of marine intelligence, surveillance, and reconnaissance**, Serhan Tatar, David Chapman, Defence Research and Development Canada (Canada) . . . . . [6945-34]
- 11:10 am: **Passive acoustic threat detection in estuarine environments**, Brian S. Borowski, Alexander M. Sutin, Heui-Seol Roh, Barry J. Bunin II, Stevens Institute of Technology . . . . . [6945-35]
- 11:30 am: **Combination of acoustic measurements with video surveillance for estuarine threat detection**, Barry J. Bunin II, Heui-Seol Roh, Alexander M. Sutin, George Kamberov, Stevens Institute of Technology . . . . . [6945-36]
- 11:50 am: **Variability of SCUBA diver acoustic emission**, Dimitri M. Donskoy, Nikolay Sedunov, Alexander Sedunov, Michael Tsionskiy, Stevens Institute of Technology . . . . . [6945-37]
- Lunch/Exhibition Break . . . . . 12:10 to 1:10 pm

**SESSION 7**

**Room: Crystal G1** ..... **Wed. 1:10 to 3:10 pm**

**Explosives Detection**

*Session Chair: Refael Gatt, Global Security Devices (Israel)*

- 1:10 pm: **X-ray backscatter imaging (Invited Paper)**, Dan-Cristian Dinca, Jeffrey R. Schubert, Joseph Callerame, American Science and Engineering, Inc.[6945-38]
- 1:30 pm: **Differential spectroscopic imaging of particulate explosives residue**, Bruce E. Bernacki, Nicolas Ho, Pacific Northwest National Lab. . . . . [6945-39]
- 1:50 pm: **Megavolt CT for air cargo container inspection**, Joseph Bendahan, GE Homeland Protection, Inc. . . . . [6945-40]
- 2:10 pm: **High efficiency angular selective detection of thermal and cold neutrons**, Anton S. Tremsin, Jason B. McPhate, John V. Vallerga, Oswald H. W.Siegmund, Univ. of California/Berkeley; Bruce Feller, Nova Scientific, Inc.; Lowell Crow, Ron Cooper, Oak Ridge National Lab. . . . . [6945-41]
- 2:30 pm: **Rotationally resolved spectral signatures for volatile impurities in TNT-based explosives**, Tabetha Osborn, Scott W. Reeve, Alan R. Ford, Arkansas State Univ. . . . . [6945-42]
- 2:50 pm: **Employee screening at U.S. airports (Invited Paper)**, Charles Chambers, Airport Council International-North America; Charlotte Bryan, Global Security Devices Inc. . . . . [6945-43]
- Coffee Break . . . . . 3:10 to 3:40 pm

**SESSION 8**

**Room: Crystal G1** ..... **Wed. 3:40 to 5:20 pm**

**Transportation Security**

*Session Chair: Daniel Lehrfeld, Photonic Products Group, Inc.*

- 3:40 pm: **DHS Counter-MANPADS Program update (Presentation Only)**, Kerry D. Wilson, U.S. Dept. of Homeland Security. . . . . [6945-44]
- 4:00 pm: **JETEYE™: commercial airliner IR missile protection system (Presentation Only)**, Ernest Keirstead, BAE Systems North America . . . . . [6945-45]
- 4:20 pm: **Northrop Grumman Guardian™ System Counter-MANPADS Program: protecting commercial aircraft for the Department of Homeland Security (Presentation Only)**, Leo Danielides, Northrop Grumman Corp. [6945-46]
- 4:40 pm: **Ground based laser for defense against MANPADS**, Josef Shwartz, Northrop Grumman Corp. . . . . [6945-47]
- 5:00 pm: **Detection of security relevant substances within the cooperative project SAFE XUV**, Elisabeth Schramm, GSF-Forschungszentrum für Umwelt und Gesundheit, GmbH (Germany); Andreas J. Görtler, Coherent GmbH (Germany); Thomas Heindl, Technische Univ. München (Germany); Alexander McNeish, Smiths Heimann GmbH (Germany); Stefan Mitschke, GSF-Forschungszentrum für Umwelt und Gesundheit, GmbH (Germany); Andrei Morozov, Technische Univ. München (Germany); Fabian Mühlberger, GSF-Forschungszentrum für Umwelt und Gesundheit, GmbH (Germany); Michael Pütz, Federal Criminal Police Office (Germany); Gerd Reichardt, BESSY GmbH (Germany); Hermann Ries, Patricia Schall, Smiths Heimann GmbH (Germany); Rasmus Schulte-Ladbeck, Federal Criminal Police Office (BKA) (Germany); Rainer H. Schultze, Optimare GmbH (Germany); Martin Sklorz, GSF-Forschungszentrum für Umwelt und Gesundheit, GmbH (Germany); Roman Trebbe, Federal Office of Civil Protection and Disaster Assistance (Germany); Andreas Ulrich, Technische Univ. München (Germany); Jochen Wieser, Coherent GmbH (Germany); Ralf Zimmermann, GSF-Forschungszentrum für Umwelt und Gesundheit, GmbH (Germany) . . . . . [6945-48]

**Thursday 20 March**

**SESSION 9**

**Room: Crystal G1** ..... **Thurs. 9:00 to 10:00 am**

**Water Security**

*Session Chair: Dan J. Kroll, Hach Co., Inc.*

- 9:00 am: **Requirements of biological detection technologies by municipal water laboratories: pathogens of interest and hardware requirements**, Tammy Spain, The Pinellas County Utilities Lab. . . . . [6945-49]
- 9:20 am: **Microorganism identification utilizing image-based software algorithms**, Kent A. Peterson, Fluid Imaging Technologies. . . . . [6945-50]
- 9:40 am: **A true real-time, on-line security system for waterborne pathogen surveillance**, John A. Adams, JMAR Technologies, Inc. . . . . [6945-51]
- Coffee Break . . . . . 10:00 to 10:30 am

**SESSION 10**

**Room: Crystal G1** ..... **Thurs. 10:30 to 11:30 am**

**Border Security**

*Session Chair: Ashok K. Sood, Magnolia Optical Technologies, Inc.*

- 10:30 am: **Diffraction-based optical sensor detection system for capture-restricted environments**, Rahul M. Khandekar, Vladimir V. Nikulin, Binghamton Univ. . . . . [6945-52]
- 10:50 am: **Rapid 3D measurement of human faces for biometric application**, Gottfried J. Frankowski, Christian Benderoth, GFMesstechnik GmbH (Germany) . . . . . [6945-53]
- 11:10 am: **Development of UV image intensifier tube with GaN photocathode**, Itaru Mizuno, Tokuaki Nihashi, Toshimitsu Nagai, Minoru Niigaki, Yusuke Shimizu, Kenshi Shimano, Kazumasa Kato, Tsuneo Ihara, Kazuyoshi Okano, Masayuki Matsumoto, Masumi Tachino, Hamamatsu Photonics K.K. (Japan). . . . . [6945-54]

**Panel Discussion on Border Security**  
**Room: Crystal G1** ..... **Thurs. 11:30 am to 12:30 pm**  
*Panel Moderator: Ashok K. Sood, Magnolia Optical Technologies, Inc.*

# Airborne Intelligence, Surveillance, Reconnaissance (ISR) Systems and Applications V

Conference Chair: Daniel J. Henry, Recon/Optical, Inc.

## Monday 17 March

### SESSION 1

Room: Crystal K ..... Mon. 8:30 am to 12:20 pm

#### Multispectral ISR Sensors

Session Chair: Daniel J. Henry, Recon/Optical, Inc.

8:30 am: **Operational hyperspectral in Recce**, Serge Larroque, Thales Optronique (France). ..... [6946-01]

8:50 am: **Compact low-cost multispectral imaging for target detection on UAVs**, Michael F. Crowley, Joseph J. Dirbas, Tim Schoenmackers, Elisa Berver, Adam Davies, PAR Government Systems Corp.; Jon S. Schoonmaker, Advanced Coherent Technologies LLC; Denise Runnels, Radiance Technologies, Inc.; Raymond S. Kwok, Innovative Intuitive Technology, Inc.; Michael Klausen, PAR Government Systems Corp. .... [6946-02]

9:10 am: **Real-time multispectral data collection, processing downlink and display: test and demonstration**, Denise Runnels, Chad Leflore, Radiance Technologies, Inc.; Paula Henderson, PAR Government Systems Corp.; Jonathan Powell, Addison Martin, Radiance Technologies, Inc.; Jon S. Schoonmaker, Advanced Coherent Technologies LLC; Adam Davies, Joseph J. Dirbas, Michael F. Crowley, PAR Government Systems Corp.; Scott Peterman, Radiance Technologies, Inc. .... [6946-03]

9:30 am: **Overcoming adverse weather conditions with a common optical path, multiple sensor, and intelligent image fusion system**, Joseph Ng, Panavision Federal Systems; Michael Piacentino, Sarnoff Corp.; Brian Caldwell, Panavision Federal Systems. .... [6946-04]

9:50 am: **Spectral detection and monitoring of marine mammals**, Jon S. Schoonmaker, Yuliya Podobna, Irina M. Petrosyuk, Gary D. Gilbert, Joseph J. Dirbas, Advanced Coherent Technologies LLC ..... [6946-05]

Coffee Break ..... 10:10 to 10:40 am

10:40 am: **DUSTER: an integrated LWIR and L-band SAR imaging system**, Michael L. Wilson, Dale C. Linne von Berg, Melvin R. Kruer, Naval Research Lab.; Niel S. Holt, Scott A. Anderson, Space Dynamics Lab.; David G. Long, Brigham Young Univ.; Yuly Margulis, ARTEMIS, Inc. .... [6946-06]

11:00 am: **Near infrared missile warning testbed**, Joel B. Montgomery, M & M Aviation; John F. McCalmont, Richard B. Sanderson, Air Force Research Lab.; Randy Johnson, MacAulay-Brown, Inc. .... [6946-07]

11:20 am: **Performance analysis of a multispectral framing camera for detecting mines in the littoral zone and beach zone**, Eric Louchard, BAE Systems. .... [6946-08]

11:40 am: **Color in perceptual tracking using low frame rate motion imagery**, Tariq Bakir, Harris Corp.; Michelle Brennan, Moriarty and Associates, Inc. .... [6946-09]

12:00 pm: **The importance of balance in a gimbaled sensor platform**, Dan Otlowski, Kurt Wiener, Paul Kennedy, Brandon Rathbun, Space Electronics LLC ..... [6946-10]

Lunch Break ..... 12:20 to 1:40 pm

### SESSION 2

Room: Crystal K ..... Mon. 1:40 to 2:20 pm

#### 3D ISR Sensors

Session Chair: Daniel J. Henry, Recon/Optical, Inc.

1:40 pm: **A high definition 3D laser scanner for autonomous vehicle applications**, Bruce Hall, Michael Dunbar, Velodyne Acoustics, Inc. . . . [6946-11]

2:00 pm: **3D rapid mapping**, Folke Isaksson, Johan Borg, Leif Haglund, Saab Bofors Dynamics AB (Sweden) ..... [6946-12]

### SESSION 3

Room: Crystal K ..... Mon. 2:20 to 4:50 pm

#### ISR Processing

Session Chair: Daniel J. Henry, Recon/Optical, Inc.

2:20 pm: **A complete passive or imaging-based sensor system for unmanned air vehicle taking off and landing operations**, Steven X. Yi, Technest Holdings, Inc. .... [6946-13]

2:40 pm: **SmartCapture: a highly compact video capture technology for UAVs**, Pankaj Topiwala, FastVDO LLC ..... [6946-14]

Coffee Break ..... 3:00 to 3:30 pm

3:30 pm: **Automatic image exploitation system for small UAVs**, Norbert F. Heinze, Martin Esswein, Wolfgang Krüger, Günter M. Saur, Fraunhofer-Institut für Informations-und Datenverarbeitung (Germany). .... [6946-15]

3:50 pm: **VideoQuest: managing large-scale aerial video database through automated content extraction**, Hui Cheng, Sarnoff Corp. .... [6946-16]

4:10 pm: **A content-based retrieval system for UAV-like video and associated metadata**, Noel E. O'Connor, Paul Ferguson, Cathal Gurrin, Gareth Jones, Hyowon Lee, Alan F. Smeaton, Ke Zhang, Dublin City Univ. (Ireland) . . . [6946-17]

4:30 pm: **Real-time aerial video exploitation station for small unmanned aerial vehicles**, Jason B. Gregga, Art Pope, Kathy Kielmeyer, Yang Ran, SET Corp. .... [6946-18]

### Related Course

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC160 **Precision Stabilization and Laser Pointing Systems** (Hilkert)  
Wednesday, 8:30 am to 5:30 pm

# Conference 6947 · Room: Crystal K

Tuesday-Wednesday 18-19 March 2008 • Proceedings of SPIE Vol. 6947

## Radar Sensor Technology XII

Conference Chairs: **Kenneth I. Ranney**, Army Research Lab.; **Armin W. Doerry**, Sandia National Labs.

Program Committee: **Olga Boric-Lubecke**, Univ. of Hawaii at Manoa; **John E. Gray**, Naval Surface Warfare Ctr.; **Ryan K. Hersey**, Georgia Institute of Technology; **Todd A. Kastle**, Air Force Research Lab.; **James L. Kurtz**, Univ. of Florida; **Jenshan Lin**, Univ. of Florida; **Victor M. Lubecke**, Univ. of Hawaii at Manoa; **Jeffrey P. Sichina**, Army Research Lab.; **Jerry Silvius**, Army Research Lab.; **Robert J. Tan**, Army Research Lab.; **Lars M. Wells**, Sandia National Labs.

### Tuesday 18 March

<p><b>Symposium-Wide Plenary Presentation</b> <b>Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am</b></p> <p><b>The Honorable Jay Cohen</b>, Under Secretary for Science and Technology, U.S. Dept. of Homeland Security</p> <p><i>See p. 6 for details.</i></p>
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Coffee Break . . . . . 10:00 to 10:30 am

#### SESSION 1

**Room: Crystal K . . . . . Tues. 10:30 to 11:50 am**

##### Phenomenology

Session Chair: **Kenneth I. Ranney**, Army Research Lab.

10:30 am: **The results of snow and bare soil, waded water surface and soil vegetation microwave reflective and emissive characteristics spatio-temporally combined measurements at 37GHz**, Artashes K. Arakelyan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia). . . . . [6947-01]

10:50 am: **Measurements of bare and vegetated soil, snow and waded water surface microwave reflective and emissive characteristics at 5.6GHz**, Astghik K. Hambaryan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia) . [6947-02]

11:10 am: **Ka-band clutter measurements of urban environments**, Robert J. Tan, Thomas J. Pizzillo, Army Research Lab. . . . . [6947-03]

11:30 am: **Ultra-wideband signal propagation experiments in liquid media**, Rastko Selmic, Louisiana Tech Univ.; Atindra K. Mitra, Air Force Research Lab. . . . . [6947-04]

Lunch/Exhibition Break . . . . . 11:50 am to 1:20 pm

#### SESSION 2

**Room: Crystal K . . . . . Tues. 1:20 to 3:00 pm**

##### Radar Signal and Image Processing

Session Chair: **Armin W. Doerry**, Sandia National Labs.

1:20 pm: **SAR data collection and processing requirements for high quality coherent change detection**, Armin W. Doerry, Sandia National Labs. . . [6947-05]

1:40 pm: **Recovering shape from shadows in synthetic aperture radar imagery**, Fred M. Dickey, Armin W. Doerry, Sandia National Labs. . . . . [6947-06]

2:00 pm: **Recent MTI experiments using ARL's synchronous impulse reconstruction (SIRE) radar**, Kenneth I. Ranney, Lam H. Nguyen, Brian Stanton, Marc A. Ressler, David C. Wong, Francois Koenig, Chi N. Tran, Gregory D. Smith, Karl A. Kappra, Getachew A. Kirose, Jeffrey P. Sichina, Army Research Lab. . . . . [6947-07]

2:20 pm: **Moving target localization using dual-frequency radar arrays**, Yimin Zhang, Fauzia Ahmad, Moeness G. Amin, Villanova Univ. . . . . [6947-08]

2:40 pm: **Change detection using the synchronous impulse reconstruction (SIRE) radar**, Kenneth I. Ranney, Lam H. Nguyen, Marc A. Ressler, Brian Stanton, David C. Wong, Francois Koenig, Chi N. Tran, Getachew A. Kirose, Gregory D. Smith, Jeffrey P. Sichina, Anthony Martone, Army Research Lab. . . . . [6947-09]

Coffee Break . . . . . 3:00 to 3:30 pm

#### SESSION 3

**Room: Crystal K . . . . . Tues. 3:30 to 5:10 pm**

##### Sensing Through-the-Wall (STTW)

Session Chair: **Robert J. Tan**, Army Research Lab.

3:30 pm: **Sensing through-the-wall imaging using the Army Research Lab Ultra-Wideband Synchronous Impulse Reconstruction (UWB SIRE) radar**, Lam H. Nguyen, Army Research Lab. . . . . [6947-10]

3:50 pm: **High resolution through-the-wall radar image based on beamspace eigenstructure subspace methods**, Yeo-Sun Yoon, Moeness G. Amin, Villanova Univ. . . . . [6947-11]

4:10 pm: **Wall characterization for through-the-wall radar applications**, Eugene F. Grenaker III, Georgia Tech Research Institute and RADAR Flashlight, LLC; Ekkehart O. Rausch, Georgia Tech Research Institute . . . . . [6947-12]

4:30 pm: **Urban structures imaging with sparse arrays**, Roberto Innocenti, Army Research Lab. . . . . [6947-13]

4:50 pm: **Xaver: through wall imager**, Amir Beerli, Camero Tech Ltd. (Israel) . . . . . [6947-14]

#### POSTERS-Tuesday

**Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm**

*All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.*

*Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.*

**The interaction of RF energy with wall materials and objects of interest**, Douglas Cohen, Mark J. Farwell, U.S. Army Communications-Electronics Command; David Sheby, Michael Brennan, CACI Technologies Inc. . . . [6947-19]

# Conference 6947 · Room: Crystal K

## Wednesday 19 March

### SESSION 4

Room: Crystal K ..... Wed. 9:10 to 10:30 am

#### Radar Systems and Biometric Sensing

Session Chair: Robert J. Tan, Army Research Lab.

9:10 am: **A survey of antennas for ultra-wideband applications**, Maysam Sarfaraz, Amir H. Shirkhodaie, Tennessee State Univ. .... [6947-15]

9:30 am: **Low sidelobe nonlinear stepped-frequency waveforms**, Dmitry Chebanov, The City College of New York. .... [6947-16]

9:50 am: **Range and azimuth resolution enhancement for 94 GHz real-beam radar**, Guoqing Liu, Ken Yang, Brian Sykora, Imad Salha, BAE Systems [6947-17]

10:10 am: **Battlefield triage life signs detection techniques**, Olga Boric-Lubecke, Anders Host-Madsen, Victor M. Lubecke, Univ. of Hawai'i at Manoa; Jenshan Lin, Univ. of Florida; Byung-Kwon Park, Univ. of Hawai'i at Manoa ..... [6947-18]

Coffee Break ..... 10:30 to 11:00 am

#### Tactical Sensors and Imagers Plenary Presentation

Room: Crystal M. .... Wed. 11:00 to 11:45 am

#### Radar Horizons

Joseph R. Guerci, Consultant

See p. 9 for details.

#### Related Courses

##### Registration is required.

See SPIE Cashier for full course description or to Register.

SC893 **SAR Signal Processing Laboratory** (*Soumekh*)

**NEW** Tuesday, 8:30 am to 5:30 pm

SC162 **SAR Signal Processing** (*Soumekh*) Sunday, 8:30 am to 5:30 pm

### Don't Miss These Presentations!

*Free to all registered attendees.*

#### Plenary Presentation, p. 6



##### The Honorable Jay Cohen

Under Secretary for Science and Technology,  
U.S. Department of Homeland Security

#### Innovation and the Wealth of Nations, p. 6



##### Sir John Chisholm

Chairman of QinetiQ



## Passive Millimeter-Wave Imaging Technology XI

Conference Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

Program Committee: **Dennis W. Prather**, Univ. of Delaware; **Christopher A. Schuetz**, Univ. of Delaware

### Tuesday 18 March

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am**

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

*See p. 6 for details.*

Coffee Break . . . . . 10:00 to 10:30 am

#### SESSION 1

**Room: Crystal J1 . . . . . Tues. 10:30 am to 12:10 pm**

##### Systems

*Session Chair: Christopher A. Martin*, Trex Enterprises Corp.

10:30 am: **Millimeter wave case study of operational deployments: retail, airport, military, courthouse, and customs**, Gary V. Tryon, Brijot Imaging Systems, Inc. . . . . [6948-01]

10:50 am: **Multispectral mm-wave imaging: materials and images**, Naomi E. Alexander, Carlos Callejero Andrés, Alfa Imaging (Spain); Ramón Gonzalo, Univ. Pública de Navarra (Spain) . . . . . [6948-02]

11:10 am: **Far field millimeter-wave imaging via optical upconversion**, Jesse P. Samluk, Christopher A. Schuetz, Edwin L. Stein, Jr., Andrew Robbins, Richard D. Martin, Caihua Chen, Dennis W. Prather, Univ. of Delaware . . . . . [6948-03]

11:30 am: **Two-dimensional snapshot distributed aperture millimeter-wave imaging using optical upconversion**, Richard D. Martin, Christopher A. Schuetz, Caihua Chen, Indraneil Biswas, Jesse P. Samluk, Edwin L. Stein, Jr., Univ. of Delaware; Mark S. Mirotznik, The Catholic Univ. of America; Dennis W. Prather, Univ. of Delaware . . . . . [6948-04]

11:50 am: **Imaging with modular linear arrays of cryogenic Nb microbolometers**, Erich N. Grossman, National Institute of Standards and Technology; Charles R. Dietlein, National Institute of Standards and Technology and Univ. of Colorado at Boulder; Mabel E. Ramirez, Univ. of Colorado at Boulder; Arttu R. M. Luukanen, Mikko M. Leivo, Panu Helisto, VTT Technical Research Ctr. of Finland (Finland); Jari Penttillä, Aivon Oy (Finland) . . . . . [6948-05]

Lunch/Exhibition Break . . . . . 12:10 to 1:10 pm

#### SESSION 2

**Room: Crystal J1 . . . . . Tues. 1:10 to 4:20 pm**

##### Enabling Technology

*Session Chair: David A. Wikner*, Army Research Lab.

1:10 pm: **A wideband and scalable radiometer module for an unamplified direct detection W-band imaging array**, James H. Schaffner, Jonathan J. Lynch, Keith V. Guinn, Joel N. Schulman, Harris P. Moyer, HRL Labs., LLC . . . . . [6948-06]

1:30 pm: **Design, fabrication and characterization of LiNbO<sub>3</sub> optical modulator for high-sensitivity mmW imaging system**, Peng Yao, Christopher A. Schuetz, Rowan Shireen, Julien Macario, Shouyuan Shi, Dennis W. Prather, Univ. of Delaware . . . . . [6948-07]

1:50 pm: **Development of a low cost 94GHz imaging receiver using multi-layer liquid crystal polymer technology**, Paul Rice, Mark Black, MMIC Solutions Ltd. (United Kingdom); Paul D. Munday, Katherine L. Adamson, Lee Smethurst, QinetiQ Ltd. (United Kingdom) . . . . . [6948-08]

2:10 pm: **Unintended illumination for PMMW systems**, Albert N. Pergande, Lockheed Martin Missiles and Fire Control. . . . . [6948-24]

2:30 pm: **Wideband fractal antennas for holographic imaging and rectenna applications**, Kyle J. Bunch, Douglas L. McMakin, David M. Sheen, Pacific Northwest National Lab. . . . . [6948-10]

2:50 pm: **Extended depth of field imaging at 94-GHz**, Joseph N. Mait, David A. Wikner, Army Research Lab.; Mark S. Mirotznik, The Catholic Univ. of America; Joseph van der Gracht, Holospex, Inc.; Greg P. Behrmann, Brandon L. Good, Scott A. Mathews, The Catholic Univ. of America . . . . . [6948-11]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **Ultra wide band antenna coupled direct detectors for millimeter wave imaging**, Hooman Kazemi, Teledyne Scientific Co. . . . . [6948-12]

4:00 pm: **Balance of absorption, scattering, transmission, and reflection for clothing and expanded polystyrene in the millimeter-wave and terahertz frequency range**, Charles R. Dietlein, Univ. of Colorado at Boulder and National Institute of Standards and Technology; Zoya Popovic, Univ. of Colorado at Boulder; Erich N. Grossman, National Institute of Standards and Technology . . . . . [6948-13]

#### SESSION 3

**Room: Crystal J1 . . . . . Tues. 4:20 to 5:20 pm**

##### Image Processing

*Session Chair: Dennis W. Prather*, Univ. of Delaware

4:20 pm: **A novel approach to automatic threat detection in MMW imagery of people scanned in portals**, Nitin M. Vaidya, Thomas D. Williams, Millivision Technologies . . . . . [6948-14]

4:40 pm: **Overview of techniques for improving millimeter wave imaging through advanced signal processing and their implementation in practical defense systems**, Fernando E. Ortiz, Petersen F. Curt, Eric J. Kelmelis, EM Photonics, Inc. . . . . [6948-15]

5:00 pm: **Resolving R and B functions in ultra-resolution problem**, Evgeni N. Terentiev, M.V. Lomonosov Moscow State Univ. (Russia); Nikolai E. Terentiev, Quest Software (Russia) . . . . . [6948-16]

### Wednesday 19 March

#### SESSION 4

**Room: Crystal J1 . . . . . Wed. 8:00 to 10:20 am**

##### Security

*Session Chair: Roger Appleby*, QinetiQ Ltd. (United Kingdom)

8:00 am: **Millimetre-wave, sub-millimetre-wave and terahertz technology for the detection of concealed objects: a review**, Michael C. Kemp, Iconal Technology Ltd. (United Kingdom) . . . . . [6948-17]

8:20 am: **Rapid passive MMW security screening portal**, Christopher A. Martin, John A. Lovberg, Trex Enterprises Corp.; Carlos E. García González, Univ. Complutense de Madrid (Spain) . . . . . [6948-18]

8:40 am: **The monitoring of critical infrastructures using microwave radiometers**, Markus Peichl, Stephan Dill, Matthias Jirousek, Helmut Suess, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6948-19]

9:00 am: **Standoff detection of concealed handguns and knives**, Nicholas J. Bowring, Nacer Rezgui, Manchester Metropolitan Univ. (United Kingdom); Stuart W. Harmer, Queen Mary Univ. of London (United Kingdom); David A. Andrews, Matthew Southgate, Manchester Metropolitan Univ. (United Kingdom) . . . . . [6948-20]

9:20 am: **Active imaging at 350 GHz for security applications**, David M. Sheen, Douglas L. McMakin, Thomas E. Hall, Ronald H. Severson, Pacific Northwest National Lab. . . . . [6948-21]

# Conference 6948 · Room: Crystal J1

9:40 am: **mmWave imaging for concealed weapon detection and surveillance at up to 220GHz**, Stephan Stanko, Denis Nötel, Johann Huck, Stefan Wirtz, Frank Klöppel, Helmut Essen, FGAN-FHR (Germany) . . . . . [6948-22]

10:00 am: **Passive THz imaging system for stand-off identification of concealed objects: results from a turn-key 16 pixel imager**, Arttu R. M.Luukanen, Millimetre Waver Lab. of Finland (Finland) and VTT Technical Research Ctr. of Finland (Finland); Panu Helistö, Mikko M. Leivo, VTT Technical Research Ctr. of Finland (Finland); Jari S. Penttilä, Aivon Oy (Finland); Charles R. Dietlein, Univ. of Colorado at Boulder and National Institute of Standards and Technology; Mabel E. Ramirez, Univ. of Colorado at Boulder; Erich N. Grossman, National Institute of Standards and Technology. . . . . [6948-23]

Coffee Break . . . . . 10:20 to 11:00 am

**Tactical Sensors and Imagers Plenary Presentation**  
**Room: Crystal M. . . . . Wed. 11:00 to 11:45 am**

**Radar Horizons**  
**Joseph R. Guerci**, Consultant  
*See p. 9 for details.*

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# Conference 6949 · Room: Crystal M

Tuesday-Wednesday 18-19 March 2008 • Proceedings of SPIE Vol. 6949

## Terahertz for Military and Security Applications VI

Conference Chairs: **James O. Jensen**, U.S. Army Edgewood Chemical Biological Ctr.; **Hong-Liang Cui**, Stevens Institute of Technology

Conference Co-Chairs: **Dwight L. Woolard**, U.S. Army Research Office; **R. Jennifer Hwu**, INNOSYS Inc.

Program Committee: **Torsten Löffler**, Johann-Wolfgang-Goethe-Univ. (Germany); **Daniel J. Radack**, Institute for Defense Analyses

### Tuesday 18 March

#### POSTERS-Tuesday

Room: Palms Ballroom-Royal ..... Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

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**Super-resolution reconstruction of terahertz images**, Yue Li, Li Li, Andrew D. Hellicar, Jay Guo, Commonwealth Scientific and Industrial Research Organisation (Australia) ..... [6949-17]

### Wednesday 19 March

#### SESSION 1

Room: Crystal M ..... Wed. 8:00 to 10:30 am

#### THz Sensing and Phenomenology

Session Chair: **Hong-Liang Cui**, Stevens Institute of Technology

8:00 am: **Imaging terahertz radar for security applications** (Invited Paper), Alexei D. Semenov, Huebers Heinz-Wilhelm, Richter Heiko, Boettger Ute, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) ..... [6949-01]

8:30 am: **Fingerprinting malathion vapor: a simulant for VX nerve agent**, Renbo Song, Yujie J. Ding, Lehigh Univ.; Yuliya B. Zotova, ArkLight, Inc. [6949-02]

8:50 am: **Manufacturing process effects on the terahertz spectra of RDX**, John Wilkinson, Stanley M. Caulder, Naval Surface Warfare Ctr.; Alessia Portieri, TeraView Ltd. (United Kingdom) ..... [6949-03]

9:10 am: **Terahertz imaging of concealed objects by acoustic phase detection**, Federico F. Buergens, Guillermo Acuna, Roland Kersting, Ludwig-Maximilians-Univ. München (Germany) ..... [6949-04]

9:30 am: **Terahertz target illumination fluctuation estimates derived from field measurements of atmospheric water vapor**, Sean G. O'Brien, David H. Tofsted, Army Research Lab. .... [6949-05]

9:50 am: **Scattering effects in terahertz reflection spectroscopy**, Lisa M. Zurk, Scott Schecklman, Garth Sundberg, Portland State Univ.; Zhen Zhou, Antao Chen, Eric I. Thorsos, Dale P. Winebrenner, Univ. of Washington ..... [6949-06]

10:10 am: **A quantitative study of the practical sensitivity limit of a THz absorption spectrometer**, Jon E. Bjarnason, National Institute of Standards and Technology; Charles R. Dietlein, National Institute of Standards and Technology and Univ. of Colorado at Boulder; Erich N. Grossman, National Institute of Standards and Technology ..... [6949-07]

Coffee Break ..... 10:30 to 11:00 am

**Tactical Sensors and Imagers Plenary Presentation**  
Room: Crystal M. .... Wed. 11:00 to 11:45 am

#### Radar Horizons

**Joseph R. Guerci**, Consultant

See p. 9 for details.

Lunch/Exhibition Break ..... 11:45 am to 1:15 pm

#### SESSION 2

Room: Crystal M ..... Wed. 1:15 to 3:05 pm

#### THz Technology and Methodology

Session Chair: **James O. Jensen**,

U.S. Army Edgewood Chemical Biological Ctr.

1:15 pm: **A coherent frequency-domain THz spectrometer with a signal-to-noise ratio of 60dB at 1 THz** (Invited Paper), Joseph R. Demers, Ronald T. Logan, Jr., EMCORE Corp. .... [6949-08]

1:45 pm: **Analysis of a device for single pixel terahertz imaging**, Eddie L. Jacobs, Orges Furxhi, The Univ. of Memphis. .... [6949-09]

2:05 pm: **Quantitative measurement of laminar material properties and structure using time domain reflection imaging**, David A. Zimdars, Jeffrey S. White, Greg Fichter, Artur Chernovsky, Picometrix, LLC ..... [6949-10]

2:25 pm: **Passive stand-off terahertz imaging with 1 hertz frame rate**, Torsten May, Solveig Anders, Viatcheslav Zakosarenko, Hans-Georg Meyer, IPHT Jena (Germany); Michael Starkloff, Supracon AG (Germany); Günter Thorwirth, Jena-Optronik GmbH (Germany); Ernst Kreysa, Max-Planck-Institut für Radioastronomie (Germany) ..... [6949-11]

2:45 pm: **THz imaging based on water-concentration contrast**, Zach D. Taylor, R. S. Singh, J. Suen, Elliott R. Brown, Univ. of California/Santa Barbara. [6949-12]

Coffee Break ..... 3:05 to 3:35 pm

#### SESSION 3

Room: Crystal M ..... Wed. 3:35 to 5:15 pm

#### THz Devices and Components

Session Chair: **R. Jennifer Hwu**, INNOSYS Inc.

3:35 pm: **An HTS detector for terahertz imaging**, Andrew D. Hellicar, Jia Du, Stephen Hanham, Commonwealth Scientific and Industrial Research Organisation (Australia) ..... [6949-13]

3:55 pm: **Quantum 1/f noise in all-epitaxial metal-semiconductor diodes**, Peter H. Handel, Univ. of Missouri/St. Louis. .... [6949-14]

4:15 pm: **Correcting the secondary focus of Fresnel zone plate antennas**, James C. Wiltse, Georgia Institute of Technology ..... [6949-15]

4:35 pm: **Aplanatic THz imaging**, Steven T. Griffin, The Univ. of Memphis; Keith A. Krapels, Office of Naval Research ..... [6949-18]

4:55 pm: **1/f noise and phase noise in AlGaSb/InAs/AlGaSb double-barrier RTD oscillators**, Peter H. Handel, Univ. of Missouri/St. Louis. .... [6949-16]

# Conference 6950 · Room: Crystal C

Wednesday-Thursday 19-20 March 2008 • Proceedings of SPIE Vol. 6950

## Laser Radar Technology and Applications XIII

*Conference Chairs:* **Monte D. Turner**, Defense Advanced Research Projects Agency; **Gary W. Kamerman**, FastMetrix, Inc.

*Program Committee:* **Ravil R. Agishev**, Kazan State Univ. (Russia); **Phillip Gatt**, Lockheed Martin Coherent Technologies; **Jeffrey W. Grantham**, Northrop Grumman Corp.; **Clarke E. Harris**, FastMetrix, Inc.; **Robert O. Hauge**, National Reconnaissance Office; **Richard M. Heinrichs**, MIT Lincoln Lab.; **James C. Lamoreux**, NASA Johnson Space Ctr.; **Vasyl Molebny**, National Taras Shevchenko Univ. of Kyiv (Ukraine); **William A. Neuman**, Lawrence Livermore National Lab.; **Vladimir L. Pavlovitch**, Polyus Research and Development Institute (Russia); **C. Russell Philbrick**, The Pennsylvania State Univ.; **Michael W. Roth**, Johns Hopkins Univ.; **Jean-Robert Simard**, Defence Research and Development Canada (Canada); **Upendra N. Singh**, NASA Langley Research Ctr.; **Bevan D. Staple**, Ball Aerospace & Technologies Corp.; **Ove K. Steinvall**, Swedish Defence Research Agency (Sweden); **David M. Tratt**, The Aerospace Corp.

### Wednesday 19 March

#### SESSION 1

Room: Crystal C ..... Wed. 8:30 to 10:30 am

##### 3D Imaging Lidar Systems

*Session Chair:* **Monte D. Turner**,  
Defense Advanced Research Projects Agency

8:30 am: **High resolution laser radar using time correlated photon counting**, Ove K. Steinvall, Markus Henriksson, Per Jonsson, Lars J. Sjöqvist, Swedish Defence Research Agency (Sweden) ..... [6950-01]

8:50 am: **Real-time 3D color imaging of scenes using the Eyesafe lidar test-bed**, Robert T. Pack, Rollin R. Fullmer, Scott E. Budge, Paul Israelsen, Brad Petersen, Utah State Univ.; Thomas D. Cook, Naval Air Warfare Ctr. . . . [6950-02]

9:10 am: **Three dimensional imaging laser radar system for short-range target detection and identification**, Ping Li, Kun Li, Huimin Chen, Beijing Institute of Technology (China) ..... [6950-03]

9:30 am: **Lidar surface elevation and digital elevation map (DEM) of the CALIPSO lidar data over Penang, Malaysia**, Azrul Nizam Alias, Mohd Zubir Mat Jafri, Hwee-San Lim, Nasirun Mohd. Saleh, Univ. Sains Malaysia (Malaysia) . . . . . [6950-04]

9:50 am: **Ball laser spot tracking and 3D imaging sensor (LST-3D)**, Rex M. Craig, Ball Aerospace & Technologies Corp. . . . . [6950-05]

10:10 am: **Inflight performance of a second-generation, photon-counting, 3D IMAGING lidar**, John J. Degnan, Sigma Space Corp. . . . . [6950-06]

Coffee Break ..... 10:30 to 11:00 am

#### SESSION 2

Room: Crystal C ..... Wed. 11:00 am to 12:20 pm

##### Coherent Lidar Applications I

*Session Chair:* **Phillip Gatt**, Lockheed Martin Coherent Technologies

11:00 am: **Ultra-fast coherent optical system for active remote sensing applications**, Shubhashish Datta, Abhay M. Joshi, Donald A. Becker, Roy L. Howard, Discovery Semiconductors, Inc. . . . . [6950-07]

11:20 am: **Coherent lidar imaging of dust clouds: four waveform comparison**, Douglas G. Youmans, SPARTA, Inc. . . . . [6950-08]

11:40 am: **Resonance Raman measurements utilizing a tunable deep UV source**, Adam H. Willitsford, The Pennsylvania State Univ.; C. Todd Chadwick, Hans D. Hallen, North Carolina State Univ.; C. Russell Philbrick, The Pennsylvania State Univ. . . . . [6950-09]

12:00 pm: **Supercontinuum lidar applications for measurements of atmospheric constituents**, David M. Brown, Zhiwen Liu, C. Russell Philbrick, The Pennsylvania State Univ. . . . . [6950-10]

Lunch/Exhibition Break ..... 12:20 to 1:50 pm

#### SESSION 3

Room: Crystal C ..... Wed. 1:50 to 2:30 pm

##### Coherent Lidar Applications II

*Session Chair:* **Phillip Gatt**, Lockheed Martin Coherent Technologies

1:50 pm: **Integrating real-time airborne Doppler lidar wind measurements with operational mesoscale models and decision aides**, George D. Emmitt, Sidney A. Wood, Jr., Steven Greco, Simpson Weather Associates, Inc.; Yansen Wang, Army Research Lab. . . . . [6950-11]

2:10 pm: **Imaging backscattering detection of explosives by using mid-infrared quantum cascade lasers**, Frank Fuchs, Christoph Wild, Quankui Yang, Wolfgang Bronner, Klaus Köhler, Hans-Joachim Wagner, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany) . . . . . [6950-12]

#### SESSION 4

Room: Crystal C ..... Wed. 2:30 to 5:40 pm

##### Ladar System Modeling and Calibration

*Session Chair:* **Ove K. Steinvall**,  
Swedish Defence Research Agency (Sweden)

2:30 pm: **Modeling the detection of optical sights using retroreflection**, Arjan L. Mieremet, Ric H. Schleijsen, TNO Defence, Security and Safety (Netherlands); Pierre-Nicolas Pouchelle, ENSIETA (France) . . . . . [6950-15]

2:50 pm: **Multiscale target manifold characterization for 3D imaging lidar**, Estille Whittenberger, Donald E. Waagen, Nitesh N. Shah, Donald R. Hulsey, Raytheon Missile Systems . . . . . [6950-16]

Coffee Break ..... 3:10 to 3:40 pm

3:40 pm: **A new development for laser rangefinder testing**, Kenn S. Bates, Raytheon Co. . . . . [6950-18]

4:00 pm: **Calibration of full-waveform airborne laser scanning data for object classification**, Andreas Ullrich, RIEGL Laser Measurement Systems GmbH (Austria); Andreas Roncat, Wolfgang Wagner, Christian Briese, Technische Univ. Wien (Austria); Martin Pfennigbauer, RIEGL Laser Measurement Systems GmbH (Austria) . . . . . [6950-19]

4:20 pm: **Simulation of a new 3D imaging sensor for identifying difficult military targets**, Christophe R. J. Harvey, Jonathon J. Wood, Peter N. Randall, Gilbert W. Smith, QinetiQ Ltd. (United Kingdom) . . . . . [6950-20]

4:40 pm: **ASTM E57 3D Imaging Systems Committee: an update**, Geraldine S. Cheok, Alan M. Lytle, Kamel S. Saidi, National Institute of Standards and Technology . . . . . [6950-32]

5:00 pm: **Real time processing enables fast 3D imaging at single photon level**, I. Bakalski, Lidar Technologies Inc.; J. P. Pereira do Carmo, European Space Agency (Netherlands); S. J. Bellis, SensL (Ireland); R. Bond, ABSL Power Solutions Ltd. (United Kingdom); M. Humphries, Sula Systems Ltd. (United Kingdom) . . . . . [6950-33]

5:20 pm: **Overview of LMCT's advanced lidar signal simulator (ALASS)**, D. Jacob, P. Gatt, T. Nichols, Lockheed Martin Coherent Technologies . [6950-34]

## Thursday 20 March

### SESSION 5

Room: Crystal C ..... Thurs. 8:30 to 10:30 am

#### Emerging Technologies for Lidar

Session Chair: **Gary W. Kamerman**, FastMetrix, Inc.

8:30 am: **Application of holographic optical elements for detection and imaging tasks**, Olha Asmolova, Kiev Polytechnic Univ. .... [6950-21]

8:50 am: **Single photon counting Geiger mode InGaAs/InP avalanche photodiode arrays for 3D imaging**, Rengarajan Sudharsanan, Ping Yuan, Joseph C. Boisvert, Paul A. McDonald, Takahiro Isshiki, Shoghig Mesropian, Eduardo Labios, Spectrolab, Inc.; Michael Salisbury, Boeing SVS, Inc. . [6950-22]

9:10 am: **Large-area high-speed InGaAs photodetectors**, Henry H. Yuan, Jongwoo Kim, Gary W. Apgar, Joyce G. Laquindanum, Joseph Kimchi, Ted Wong, Judson Technologies LLC..... [6950-23]

9:30 am: **Low-cost lidar imagers**, Stefan A. Vasile, Jerold Lipson, aPeak, Inc..... [6950-24]

9:50 am: **Single photon sensitive linear mode APD lidar receiver developments**, George M. Williams, Jr., Voxel, Inc..... [6950-25]

10:10 am: **Fast and ultra-fast laser sensing and counter-sensing capabilities**, Michael K. Rafailov, RICHER Int. LLC. .... [6950-31]

Coffee Break ..... 10:30 to 10:50 am

### SESSION 6

Room: Crystal C ..... Thurs. 10:50 am to 12:30 pm

#### Imaging Through Obscurants

Session Chair: **Gary W. Kamerman**, FastMetrix, Inc.

10:50 am: **An approach to target detection and recognition in forested scenes**, Christina A. Grönwall, Gustav Tolt, Tomas R. Chevalier, Swedish Defence Research Agency (Sweden); Pierre Andersson, Saab Bofors Dynamics AB (Sweden) ..... [6950-26]

11:10 am: **Lidar for obstacle detection during helicopter landing**, Xiang Zhu, Philip M. Church, Martin Labrie, Neptec Design Group Ltd. (Canada) ... [6950-27]

11:30 am: **Three-dimensional laser scanners with echo digitization**, Andreas Ullrich, Martin Pfennigbauer, RIEGL Laser Measurement Systems GmbH (Austria) ..... [6950-28]

11:50 am: **Experimental validation of ship identification with a laser range profiler**, Johan C. van den Heuvel, Herman Bekman, Frank J. M.van Putten, Ric H. Schlijpen, TNO (Netherlands) ..... [6950-29]

12:10 pm: **Search-lidar demonstrator for detection of small sea-surface targets**, Johan C. van den Heuvel, Herman Bekman, Frank J. M.van Putten, Leo H. Cohen, Ric H. Schlijpen, TNO (Netherlands) ..... [6950-30]

### Related Courses

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC160 **Precision Stabilization and Laser Pointing Systems** (Hilkert) Wednesday, 8:30 am to 5:30 pm

SC167 **Introduction to Laser Radar** (Kamerman) Tuesday, 1:30 to 5:30 pm

SC180 **Imaging Polarimetry** (Dereniak, Miles, Sabatke) Monday, 1:30 to 5:30 pm

SC1717 **3D Visualization Techniques for Laser Radar** (Roth) Tuesday, 8:30 am to 12:30 pm

SC784 **Fiber Lasers for Defense Applications: Fibers, Components and System Design Considerations** (Samson, Torruellas) Tuesday, 8:30 am to 5:30 pm

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# Conference 6951 · Room: Crystal D

Tuesday-Thursday 18-20 March 2008 • Proceedings of SPIE Vol. 6951

## Atmospheric Propagation V

Conference Chairs: **G. Charmaine Gilbreath**, Naval Research Lab.; **Linda M. Wasiczko**, Naval Research Lab.

Program Committee: **Larry C. Andrews**, Univ. of Central Florida; **Gary J. Baker**, Lockheed Martin Advanced Technology Ctr.; **Harris Rayvon Burris, Jr.**, Naval Research Lab.; **Frank D. Eaton**, Air Force Research Lab.; **Gary G. Gimmestad**, Georgia Tech Research Institute; **Kenneth John Grant**, Defence Science and Technology Organisation (Australia); **Chadwick Todd Hawley**, Signatures Program Management Office; **Norman S. Kopeika**, Ben-Gurion Univ. of the Negev (Israel); **Martin Kruger**, Office of Naval Research; **Christopher I. Moore**, Naval Research Lab.; **Sergio Raffaele Restaino**, Naval Research Lab.; **Jennifer C. Ricklin**, Defense Advanced Research Projects Agency; **Jonathan M. Saint Clair**, The Boeing Co.; **Ove K. Steinvall**, Swedish Defence Research Agency (Sweden); **Cynthia Y. Young**, Univ. of Central Florida

### Tuesday 18 March

#### POSTERS-Tuesday

Room: Palms Ballroom-Royal ..... Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**A study of retrieving aerosol optical depth from day-exposed horizontal surface broadband direct solar radiation**, Xiaofeng Xu, Nanjing Univ. of Information Science & Technology (China) and Institute of Atmospheric Physics (China); Jinhuan Qiu, Institute of Atmospheric Physics (China); Shengjie Niu, Nanjing Univ. of Information Science & Technology (China) ..... [6951-06]

### Wednesday 19 March

#### Atmospheric Propagation Opening Remarks

Room: Crystal D ..... Wed. 8:30 to 8:50 am

Session Chairs: **G. Charmaine Gilbreath**, Naval Research Lab.;  
**Linda M. Wasiczko**, Naval Research Lab.

#### SESSION 1

Room: Crystal D ..... Wed. 8:50 to 11:50 am

##### Theoretical Studies

Session Chair: **Jonathan M. Saint Clair**, The Boeing Co.

8:50 am: **FSO communications: atmospheric effects for an airborne backbone** (Invited Paper), Ronald L. Phillips, Larry C. Andrews, Univ. of Central Florida ..... [6951-01]

9:20 am: **An analysis of the spatio-temporal evolution of the far field irradiance distribution from a Gaussian beam due to atmospheric turbulence in the boundary layer**, Raymond J. Oermann, Defence Science and Technology Organisation (Australia) ..... [6951-02]

9:40 am: **Turbulent thermal blooming**, Kyle Petrowski, Johns Hopkins Univ.; Curtis Menyuk, Univ. of Maryland/Baltimore County; Richard I. Joseph, Michael E. Thomas, William E. Torruellas, The Johns Hopkins Univ. Applied Physics Lab. .... [6951-03]

Coffee Break ..... 10:00 to 10:30 am

10:30 am: **Branch point detection and correction using the branch point potential method**, Kevin Murphy, Ruth Mackey, Christopher Dainty, National Univ. of Ireland/Galway (Ireland) ..... [6951-04]

10:50 am: **Simulated impact of aero-optical effects on a 200 km air-to-air lasercomm link**, Kevin R. Bock, Gary J. Baker, Lockheed Martin Advanced Technology Ctr. .... [6951-05]

11:10 am: **Exploiting physical randomness for secret sharing**, N. C. Donangelo, The MITRE Corp. .... [6951-31]

11:30 am: **Testing of LIDAR system for turbulence profiles**, Gary G. Gimmestad, Georgia Tech Research Institute; David W. Roberts, John M. Stewart, Jack W. Wood, Georgia Institute of Technology; Frank D. Eaton, Air Force Research Lab. .... [6951-32]

Lunch/Exhibition Break ..... 11:50 am to 1:10 pm

#### SESSION 2

Room: Crystal D ..... Wed. 1:10 to 3:00 pm

##### Theory and Experiment I

Session Chair: **Harris Rayvon Burris, Jr.**, Naval Research Lab.

1:10 pm: **Channel capacity limits for free-space optical links** (Invited Paper), Don M. Boroson, MIT Lincoln Lab. .... [6951-07]

1:40 pm: **High power laser system figure of merit improvement with adaptive compensation**, William E. Torruellas, The Johns Hopkins Univ. Applied Physics Lab.; Curtis Menyuk, Univ. of Maryland/Baltimore County. .... [6951-08]

2:00 pm: **Phase trajectories for parameters: laser beam propagation problems for turbulent medium**, Evgeni N. Terentiev, Fedor V. Shugaev, Ludmila S. Shtemenko, M.V. Lomonosov Moscow State Univ. (Russia) ..... [6951-09]

2:20 pm: **Angle of arrival fluctuations: theory vs. experiment**, Cynthia Y. Young, Todd Smith, Univ. of Central Florida ..... [6951-10]

2:40 pm: **Algorithm for haze determination using digital camera images**, Chow Jeng Wong, Mohd Zubir Mat Jafri, Khiruddin Abdullah, Hwee San Lim, Univ. Sains Malaysia (Malaysia) ..... [6951-11]

Coffee Break ..... 3:00 to 3:30 pm

#### SESSION 3

Room: Crystal D ..... Wed. 3:30 to 5:10 pm

##### Theory and Experiment II

Session Chair: **Cynthia Y. Young**, Univ. of Central Florida

3:30 pm: **An initial assessment of the CALIPSO Lidar data on stratospheric aerosol backscatter profiles over Penang, Malaysia**, Azrul Nizam Alias, Mohd Zubir Mat Jafri, Hwee-San Lim, Nasirun Mohd. Saleh, Univ. Sains Malaysia (Malaysia) ..... [6951-13]

3:50 pm: **Propagation variability assessments of ship defense HEL and HPM performance in worldwide maritime boundary layer environments at wavelengths of 1.0642µm, 2.141µm, 3.16mm and 2.3cm**, Steven T. Fiorino, Richard J. Bartell, Matthew J. Krizo, Salvatore J. Cusumano, Air Force Institute of Technology ..... [6951-14]

4:10 pm: **Real-time scintillation noise mitigation for free space optical transmission of analogue and digital signals**, Kenneth J. Grant, Bradley A. Clare, Kerry Mudge, Ben M. Sprey, Raymond J. Oermann, Defence Science and Technology Organisation (Australia) ..... [6951-15]

4:30 pm: **Development of the polarization tracking scheme for free-space quantum cryptography**, Morio Toyoshima, Yoshihisa Takayama, Hiroo Kunimori, Masahiro Takeoka, Mikio Fujiwara, Masahide Sasaki, National Institute of Information and Communications Technology (Japan). . . . . [6951-16]

4:50 pm: **Enhanced performance for ultrafast lasers in heavy scattering medium, experimental evidence for theoretical predictions**, John Cabaniss, Georgia Institute of Technology; Thomas M. Chaffee, Attochron, LLC . . . [6951-17]

**Thursday 20 March**

**SESSION 4**

**Room: Crystal D . . . . . Thurs. 8:30 to 10:20 am**

**Experimental Studies I**

*Session Chair: Gary J. Baker,*  
Lockheed Martin Advanced Technology Ctr.

8:30 am: **A history of free-space laser communications** (*Invited Paper*), David L. Begley, Ball Aerospace & Technologies Corp. . . . . [6951-18]

9:00 am: **A tabletop turbulence generator**, Jonathan M. Saint Clair, The Boeing Co.; David C. Soreide, Optimal Aerospace. . . . . [6951-19]

9:20 am: **Optical communications receiver array**, Jonathan M. Saint Clair, The Boeing Co.; David C. Soreide, Optimal Aerospace; Eric Y. Chan, Dennis G. Koshinz, Stephen K. Wilcken, The Boeing Co.; Atul Joshi, Hakan Durmus, Teledyne Imaging Sensors . . . . . [6951-20]

9:40 am: **Maximizing receiver misalignment tolerance in a hybrid wireless network**, Peter G. LoPresti, Casey Kiister, Univ. of Tulsa; Hazem Refai, Univ. of Oklahoma . . . . . [6951-21]

10:00 am: **Laser propagation through the atmosphere, as derived from near earth space missions, applied to laser communications**, David L. Begley, Robert G. Marshalek, Paul A. Lightsey, Carl S. Weimer, David M. Giltner, Ball Aerospace & Technologies Corp. . . . . [6951-29]

Coffee Break . . . . . 10:20 to 10:50 am

**SESSION 5**

**Room: Crystal D . . . . . Thurs. 10:50 am to 12:20 pm**

**Experimental Studies II**

*Session Chair: Gary G. Gimmestad,* Georgia Tech Research Institute

10:50 am: **Measurement of optical refraction across the Chesapeake Bay** (*Invited Paper*), William P. Hooper, Naval Research Lab. . . . . [6951-25]

11:20 am: **A comparative study of 3.6µm and 1.55µm atmospheric transmission**, Rita Mahon, L-3 Communications Titan Group; Harris R. Burris, Jr., Mike S. Ferraro, Christopher I. Moore, William S. Rabinovich, Michele R. Suite, Naval Research Lab. . . . . [6951-23]

11:40 am: **Characterization of 1550nm laser propagation in the maritime atmosphere**, Linda M. Wasiczko, Christopher I. Moore, Harris R. Burris, Jr., Michele R. Suite, Naval Research Lab. . . . . [6951-24]

12:00 pm: **Analog frequency modulation of 20 mile free space optical links at the NRL lasercomm test facility**, Christopher I. Moore, Harris R. Burris, Jr., Michele R. Suite, Linda M. Wasiczko, Frank Bucholtz, William S. Rabinovich, Naval Research Lab.; Rita Mahon, L-3 Communications Titan Group; James L. Murphy, Mike S. Ferraro, Naval Research Lab.; Kenneth J. Grant, Defence Science and Technology Organisation (Australia); G. Charmaine Gilbreath, Naval Research Lab. . . . . [6951-26]

Lunch/Exhibition Break . . . . . 12:20 to 2:00 pm

**SESSION 6**

**Room: Crystal D . . . . . Thurs. 2:00 to 3:10 pm**

**Experimental Studies III**

*Session Chair: Linda M. Wasiczko,* Naval Research Lab.

2:00 pm: **Atmospheric propagation of novel MWIR lasers for emerging free-space applications** (*Invited Paper*), Anna M. Tabirian, Northrop Grumman Laser System . . . . . [6951-22]

2:30 pm: **Results from long term studies of packet testing at the U.S. Naval Research Laboratory free-space lasercomm test facility**, Michele R. Suite, Christopher I. Moore, Harris R. Burris, Jr., Linda M. Wasiczko, Naval Research Lab.; Rita Mahon, L-3 Communications Titan Group; William S. Rabinovich, Naval Research Lab. . . . . [6951-27]

2:50 pm: **High speed lasercomm data transfer in the Seahawk 2007 exercise**, Harris R. Burris, Jr., Christopher I. Moore, Michele R. Suite, Linda M. Wasiczko, James R. Waterman, Naval Research Lab.; Kenneth M. Vilardebo, V Systems, Inc.; William S. Rabinovich, Naval Research Lab.; Rita Mahon, L-3 Communications Titan Group; Mike S. Ferraro, Naval Research Lab.; Eric Saint Georges, Stan Uecker, NOVASOL . . . . . [6951-28]

Coffee Break . . . . . 3:10 to 3:40 pm

**SESSION 7**

**Room: Crystal D . . . . . Thurs. 3:40 to 5:10 pm**

**Freespace Lasercomm Systems**

*Session Chair: G. Charmaine Gilbreath,* Naval Research Lab.

3:40 pm: **Lasercomm** (*Keynote Presentation*), Larry B. Stotts, Defense Advanced Research Projects Agency . . . . . [6951-30]

**Panel Discussion**

**Room: Crystal D . . . . . Thurs. 4:10 pm**

**Freespace Lasercomm:**

**Today's Readiness and Challenges Ahead**

**Larry B. Stotts**, Defense Advanced Research Projects Agency;  
**David L. Begley**, Ball Aerospace & Technologies Corp.;  
**Don M. Boroson**, MIT Lincoln Lab.;  
**Ronald L. Phillips, Larry C. Andrews**, Univ. of Central Florida;  
**Michael G. Lovern**, Space and Naval Warfare Systems Ctr., San Diego

**Related Course**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC167 **Introduction to Laser Radar** (*Kammerman*) Tuesday, 1:30 to 5:30 pm

# Conference 6952 · Room: Crystal D

Monday-Tuesday 17-18 March 2008 • Proceedings of SPIE Vol. 6952

## Laser Source Technology for Defense and Security IV

Conference Chairs: **Mark Dubinskii**, Army Research Lab.; **Gary L. Wood**, Army Research Lab.

Program Committee: **Steven R. Bowman**, Naval Research Lab.; **Andrew J. W. Brown**, Aculight Corp.; **Joseph Mangano**, Defense Advanced Research Projects Agency; **Mark W. Neice**, High Energy Laser Joint Technology Office; **Stephen G. Post**, Missile Defense Agency

### Monday 17 March

#### SESSION 1

Room: Crystal D ..... Mon. 1:00 to 3:10 pm

#### Fiber Lasers

Session Chair: **Andrew J. W. Brown**, Aculight Corp.

1:00 pm: **Overview of Sandia's fiber laser program** (*Invited Paper*), Dahv A. V. Kliner, Sandia National Labs. .... [6952-01]

1:30 pm: **Single-frequency cw and pulsed master-oscillator fiber power amplifiers**, Clifford Headley III, Marc D. Mermelstein, David J. DiGiovanni, OFS Labs.; Igor E. Trofimov, PTAC, Inc.; Robert F. Sellers, Applied Optonics [6952-02]

1:50 pm: **Compact, high-power, eye safe fiber laser for LADAR**, Mark S. Bowers, Andrew J. W. Brown, Jason Henrie, Aculight Corp. .... [6952-03]

2:10 pm: **Resonantly cladding-pumped, low-quantum-defect operation of Er-doped LMA fiber amplifier: 1480-nm versus 1530-nm diode pumping case**, Mark Dubinskii, Jun Zhang, Army Research Lab.; Igor Kudryashov, Princeton Lightwave Corp. .... [6952-04]

2:30 pm: **Parametric generation in optical fibers in the 900-950nm spectral band**, William E. Torruellas, Michael L. Dennis, Jeffery W. Warren, The Johns Hopkins Univ. Applied Physics Lab. .... [6952-05]

2:50 pm: **Comparison of spectral beam combining approaches for high power fiber laser systems**, Pratheepan Madasamy, Alison M. Thomas, Pat Jones, Eric C. Honea, Aculight Corp. .... [6952-06]

Coffee Break ..... 3:10 to 3:40 pm

#### SESSION 2

Room: Crystal D ..... Mon. 3:40 to 5:40 pm

#### Diode Lasers

Session Chair: **Steven R. Bowman**, Naval Research Lab.

3:40 pm: **High brightness semiconductor lasers from 780-1800nm**, Paul T. Rudy, Jeffrey E. Ungar, Mark L. Osowski, Robert M. Lammert, Thomas S. Stakelon, Wentao Hu, QPC Lasers, Inc. .... [6952-07]

4:00 pm: **Diode laser pumping sources for cryogenically-cooled solid-state lasers**, Mikhail A. Maiorov, Igor E. Trofimov, PTAC, Inc.; Robert F. Sellers, Applied Optonics. .... [6952-08]

4:20 pm: **High-brightness laser diode modules for Yb and Er fiber lasers**, Igor E. Trofimov, Mikhail A. Maiorov, PTAC, Inc.; Robert F. Sellers, Applied Optonics. .... [6952-09]

4:40 pm: **High-power, very high brightness fiber-coupled diode laser arrays**, Daniel M. Grasso, S. David Roh, Coherent Direct Diode Systems. .... [6952-10]

5:00 pm: **Mode control for high performance laser diode sources**, Paul O. Leisher, Raymond K. Price, Shabbir A. Bashar, Steve Patterson, Ling Bao, Hua Huang, Jun Wang, Damian Wise, Mark DeFranza, Aaron L. Hodges, Utsu Trifan, Shiguo Zhang, Suhit Das, Weimin Dong, Mike Grimshaw, Mark A. DeVito, Jake Bell, Robert J. Martinsen, Jason Farmer, nLight Corp. .... [6952-11]

5:20 pm: **High power volume Bragg laser bar with 10 GHz spectral bandwidth**, George B. Venus, Alex Gourevitch, College of Optics & Photonics/Univ. of Central Florida; Vadim I. Smirnov, OptiGrate; Leonid B. Glebov, College of Optics & Photonics/Univ. of Central Florida. .... [6952-12]

### Tuesday 18 March

#### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

#### The Honorable Jay Cohen,

Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break ..... 10:00 to 10:30 am

#### SESSION 3

Room: Crystal D ..... Tues. 10:30 am to 12:20 pm

#### Advanced Laser Concepts

Session Chair: **Gary L. Wood**, Army Research Lab.

10:30 am: **Thermal conductivity model of optical materials** (*Invited Paper*), Takunori Taira, Yoichi Sato, Institute for Molecular Science (Japan) ... [6952-13]

11:00 am: **Synthesis and properties of novel eye-safe and mid-IR single crystal, ceramic, and optical fiber sources**, Joseph W. Kolis, John M. Ballato, Colin D. McMillen, Baris Kokuoz, Basak Kokuoz, Karn Serivalsatit, Paul R. Foy, Thomas W. Hawkins, Exley McCormick, Clemson Univ. .... [6952-14]

11:20 am: **Single-frequency-mode Q-switched Nd:YAG laser controlled by volume Bragg gratings**, Nikolai S. Vorobiev, College of Optics & Photonics/Univ. of Central Florida; Vadim I. Smirnov, OptiGrate; Leon Glebov, College of Optics & Photonics/Univ. of Central Florida. .... [6952-15]

11:40 am: **Design and fabrication for efficient collimation and focusing optics for mid-IR quantum cascade lasers**, Bruce E. Bernacki, Kannan Krishnaswami, Norman C. Anheier, Jr., Bret D. Cannon, Pacific Northwest National Lab. [6952-16]

12:00 pm: **Cohering of multiple polariton lasers for sensing applications**, Richard L. Fork, Luke A. Burgess, The Univ. of Alabama in Huntsville. ... [6952-17]

Lunch/Exhibition Break ..... 12:20 to 1:30 pm

#### SESSION 4

Room: Crystal D ..... Tues. 1:30 to 3:10 pm

#### High Power SSL

Session Chair: **Mark W. Neice**,  
High Energy Laser Joint Technology Office

1:30 pm: **Strategic illuminator laser (SILL): provides state-of-the-art power and beam quality at 5kHz**, Glenn P. Brossus, Northrop Grumman Space Technology. .... [6952-18]

1:50 pm: **Kilowatt class high-power CW Yb:YAG cryogenic laser**, David C. Brown, Joseph M. Singley, Evan D. Yager, Katie A. Kowalewski, Brett J. Lotito, James W. Guelzow, Jerry W. Kuper, Snake Creek Lasers, LLC. .... [6952-19]

2:10 pm: **High power silicon carbide face-cooled ceramic Nd:YAG laser**, George A. Newburgh, Mark Dubinskii, Army Research Lab. .... [6952-20]

2:30 pm: **Tensile strength and elastic moduli of composite solid state laser media**, Huai-Chuan Lee, Helmuth E. Meissner, Onyx Optics Inc. .... [6952-21]

2:50 pm: **High-power diode lasers operating at 1800-2100-nm for LADAR and direct use IRCM applications**, Paul O. Leisher, Steve Patterson, Kirk Price, Keith Kennedy, Weimin Dong, Mike Grimshaw, Shiguo Zhang, Jason Patterson, Suhit Das, Scott R. Karlson, Robert J. Martinsen, Jake Bell, nLight Corp. .... [6952-36]

Coffee Break ..... 3:10 to 3:40 pm



**SESSION 5**

**Room: Crystal D . . . . . Tues. 3:40 to 5:30 pm**

**Visible, Eye-Safe and Mid-IR Lasers**

*Session Chair: Stephen G. Post, Missile Defense Agency*

- 3:40 pm: **First laser performance of Er<sup>3+</sup>-doped scandia (Sc2O3) ceramic** (*Invited Paper*), Mark Dubinskii, Nikolay Ter-Gabrielyan, Larry D. Merkle, George A. Newburgh, Army Research Lab.; Akio Ikesue, World Lab Co., Ltd. . . . . [6952-23]
- 4:10 pm: **Thermo-optical model for Er<sup>3+</sup>:YAG gain media**, Marc Eichhorn, French-German Research Institute of Saint-Louis (France) . . . . . [6952-24]
- 4:30 pm: **Design of walk-off corrected biaxial crystal composites**, Huai-Chuan Lee, Helmuth E. Meissner, Onyx Optics Inc. . . . . [6952-25]
- 4:50 pm: **Miniature solid-state lasers for pointing, illumination, and warning devices**, David C. Brown, Snake Creek Lasers, LLC . . . . . [6952-26]
- 5:10 pm: **Thulium fiber laser-pumped mid-IR OPO**, Daniel Creedon, BAE Systems; Min Jiang, Spectrode, LLC; Peter A. Budni, Peter A. Ketteridge, Scott D. Setzler, York E. Young, John C. McCarthy, Peter G. Schunemann, Thomas M. Pollak, BAE Systems; Parviz Tayebati, Spectrode, LLC; Evan P. Chicklis, BAE Systems. . . . . [6952-28]

**POSTERS-Tuesday**

**Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm**

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*Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.*

- Nonlinear optical device for middle infrared generation**, Navin B. Patel, Univ. of Campinas (Brazil) . . . . . [6952-30]
- 300kW, eye-safe intracavity OPO transmitter**, Waldemar Zenzian, Wojskowa Akademia Tehniczna (Poland); Jan K. Jabczynski, Jacek Kwiatkowski, Krzysztof Kopczyński, Wojskowa Akademia Techniczna (Poland) . . . . . [6952-31]
- Passively Q-switched epitaxially grown Cr<sup>4+</sup>:YAG/Yb<sup>3+</sup>:YAG and cw Yb: doped YAG, KGW, KYW, KYbW microchip lasers**, Krzysztof Kopczyński, Jaroslaw Mlynczak, Zygmunt Mierczyk, Wojskowa Akademia Techniczna (Poland); Jerzy Samecki, Jerzy Skwarcz, Instytut Technologii Materiałów Elektronicznych (Poland); Andrzej Majchrowski, Wojskowa Akademia Techniczna (Poland) . . . . . [6952-32]
- High-power diode lasers operating around 1500 nm for eyesafe applications**, Steve Patterson, Paul O. Leisher, Kirk Price, Keith Kennedy, Weimin Dong, Mike Grimshaw, Shiguo Zhang, Jason Patterson, Suhit Das, Scott R. Karlisen, Robert J. Martinsen, Jake Bell, nLight Corp. . . . . [6952-35]
- 1.8-kW continuous operation cryogenic Yb:YAG laser**, Jason K. Bresseur, Akheesh K. Abeeeluck, Andrew R. Awtry, Lei S. Meng, Kevin E. Shortoff, Nicholas J. Miller, Richard K. Hampton, Michael H. Cuchiara, David K. Neumann, Directed Energy Solutions. . . . . [6952-37]

**Related Courses**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

- SC160 **Precision Stabilization and Laser Pointing Systems** (*Hilkert*) Wednesday, 8:30 am to 5:30 pm
- SC167 **Introduction to Laser Radar** (*Kammerman*) Tuesday, 1:30 to 5:30 pm
- SC784 **Fiber Lasers for Defense Applications: Fibers, Components and System Design Considerations** (*Samson, Torruellas*) Tuesday, 8:30 am to 5:30 pm

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# Detection and Sensing of Mines, Explosive Objects, and Obscured Targets XIII

*Conference Chairs:* **Russell S. Harmon**, U.S. Army Research Office; **J. Thomas Broach**, U.S. Army Night Vision & Electronic Sensors Directorate; **John H. Holloway, Jr.**, Naval Surface Warfare Ctr., Panama City

*Program Committee:* **Leslie M. Collins**, Duke Univ.; **Yogadhis Das**, Defence Research and Development Canada (Canada); **Gerald J. Dobeck**, Naval Surface Warfare Ctr., Panama City; **Paul D. Gader**, Univ. of Florida; **John E. McFee**, Defence Research and Development Canada (Canada); **Nicola Ann Playle**, Defence Science and Technology Lab. (United Kingdom); **James M. Sabatier**, The Univ. of Mississippi; **Motoyuki Sato IV**, Tohoku Univ. (Japan); **Miranda A. Schatten**, U.S. Army Night RDECOM CERDEC NVESD; **Waymond R. Scott, Jr.**, Georgia Institute of Technology; **Richard C. Weaver**, U.S. Army RDECOM CERDEC NVESD

## Monday 17 March

### Opening Remarks

**Room: Grand 3** ..... **Mon. 10:30 to 10:40 am**

*Session Chairs:* **Russell S. Harmon**, U.S. Army Research Office; **J. Thomas Broach**, U.S. Army Night Vision & Electronic Sensors Directorate; **John H. Holloway, Jr.**, Naval Surface Warfare Ctr.

### SESSION 1

**Room: Grand 3** ..... **Mon. 10:40 am to 12:00 pm**

#### Electromagnetic Induction Sensing and Detection I

*Session Chairs:* **Al Wexler**, Quantic EMC Inc. (Canada);

**Francis Navish III**, U.S. Army Night Vision & Electronic Sensors Directorate

10:40 am: **Study of the influence of the plastic casing on the electromagnetic induction response of a buried landmine**, Yogadhis Das, Defence Research and Development Canada (Canada) ..... [6953-01]

11:00 am: **Application of the NSMC model to the multi-axis time domain EMI data**, Fridon Shubitidze, Dartmouth College and Sky Research, Inc.; Benjamin E. Barrowes, U.S. Army Engineer Research and Development Ctr.; Irma Shamatava, Sky Research, Inc. and Dartmouth College; Kevin A. O'Neill, U.S. Army Engineer Research and Development Ctr. .... [6953-02]

11:20 am: **Performance comparison of frequency domain quadrapole and dipole electromagnetic induction sensors in a landmine detection application**, Eric Fails, Peter A. Torriano, Leslie M. Collins, Duke Univ. . [6953-03]

11:40 am: **Combining dipole and mixed models approaches for UXO discrimination**, Fridon Shubitidze, Dartmouth College and Sky Research, Inc.; Alex Bijamov, Eugene Demidenko, Dartmouth College; Irma Shamatava, Sky Research, Inc. and Dartmouth College ..... [6953-04]

Lunch Break ..... 12:00 to 2:00 pm

### SESSION 2

**Room: Grand 3** ..... **Mon. 2:00 to 3:00 pm**

#### Electromagnetic Induction Sensing and Detection II

*Session Chairs:* **Yogadhis Das**, Defence Research and Development Canada (Canada); **Fridon Shubitidze**, Dartmouth College

2:00 pm: **High-definition impedance imaging: of mines and tunnels**, Al Wexler, Patrick A. O'Connor, Quantic Electroscan Inc. (Canada); John E. McFee, Defence Research and Development Canada (Canada) ..... [6953-05]

2:20 pm: **Improvements based on ground penetration radar field evaluations in Angola**, Francis Navish III, U.S. Army Night Vision & Electronic Sensors Directorate ..... [6953-06]

2:40 pm: **Detection of buried objects using ultra-wideband radar: newly launched mine detection project in South Korea**, Kyungrul Kam, Kangwook Kim, Gwangju Institute of Science and Technology (South Korea) ..... [6953-07]

Coffee Break ..... 3:00 to 3:30 pm

## SESSION 3

**Room: Grand 3** ..... **Mon. 3:30 to 5:30 pm**

### Sensing and Detection Potpourri

*Session Chair:* **James B. Spicer**, Johns Hopkins Univ.; **Hernan Moreno**, New Mexico Institute of Mining and Technology

3:30 pm: **Substrate-related effects on molecular and atomic emission in LIBS of explosives**, James B. Spicer, Caroline McEnnis, Johns Hopkins Univ. .... [6953-09]

3:50 pm: **Mathematical modeling of the transport of explosive related compounds**, Maik Irrazábal-Aguilera, Samuel P. Hernandez-Rivera, Julio G. Briano, Univ. de Puerto Rico Mayagüez ..... [6953-10]

4:10 pm: **Electron-beam injected into ground generates subsoil x-rays that may deactivate concealed electronics used to trigger explosive devices**, Michael W. Retsky, Electron Optics Development Co., LLC ..... [6953-11]

4:30 pm: **Humanitarian IED clearance in Colombia**, Hernan Moreno, New Mexico Institute of Mining and Technology; Ruben D. Hernandez, Escuela de Ingenieria de Antioquia (Colombia); Alejandro Molina, Univ. Nacional de Colombia (Colombia); Jan M. H.Hendrickx, New Mexico Institute of Mining and Technology; Mark Grasmueck, Univ. of Miami ..... [6953-12]

4:50 pm: **Preliminary experimental validation of a landmine detection system based on localized heating and sensing**, Marco Balsi, Massimo Corcione, Pierpaolo Dell'Omo, Salvatore Esposito, Lorenzo Magliocchetti, Univ. degli Studi di Roma/La Sapienza (Italy) ..... [6953-56]

5:10 pm: **Achievements and bottlenecks in humanitarian demining EU-funded research: final results from the EC DELVE project**, Hichem Sahli, Vrije Univ. Brussel (Belgium); Claudio Bruschini, CBR Scientific Consulting (Switzerland); Luc M. van Kempen, Vrije Univ. Brussel (Belgium); Ric H. Schleijsen, Eric den Breejen, TNO (Netherlands) ..... [6953-57]

## Tuesday 18 March

### Symposium-Wide Plenary Presentation

**Room: Palms Ballroom, Canary** ..... **Tues. 9:15 to 10:00 am**

**The Honorable Jay Cohen,**

Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

*See p. 6 for details.*

Coffee Break ..... 10:00 to 10:30 am

**SESSION 4**

**Room: Grand 3 . . . . . Tues. 10:30 to 11:50 am**

**Littoral Sensing and Detection I**

*Session Chairs: John H. Holloway, Jr., Naval Surface Warfare Ctr.; James Tory Cobb, Naval Surface Warfare Ctr.*

- 10:30 am: **Automated sea mine detection, classification, and fusion in sonar data**, Gerald J. Dobeck, Naval Surface Warfare Ctr. . . . . [6953-13]
- 10:50 am: **Through-the-sensor environmental adaptation for computer-aided detection/computer-aided classification (CAD/CAC) algorithms**, Charles M. Ciary, William C. Zurawski, Raytheon Co. . . . . [6953-14]
- 11:10 am: **Enhanced ATR algorithm for high-resolution multi-band sonar imagery**, Tom Aridgides, Manuel F. Fernández, Lockheed Martin Corp.. [6953-15]
- 11:30 am: **Multitask semi-supervised underwater mine detection**, Lawrence Carin, Duke Univ.; Jason R. Stack, Naval Surface Warfare Ctr. . . . . [6953-16]
- Lunch/Exhibition Break . . . . . 11:50 am to 1:40 pm

**SESSION 5**

**Room: Grand 3 . . . . . Tues. 1:40 to 3:40 pm**

**Littoral Sensing and Detection II**

*Session Chairs: Gerald J. Dobeck, Naval Surface Warfare Ctr.; Tom Aridgides, Lockheed Martin Corp.*

- 1:40 pm: **Target detection and classification from multiple side-scan sonar platforms using canonical correlations**, James D. Tucker, Mahmood Azimi-Sadjadi, Colorado State Univ.; Gerald J. Dobeck, Naval Surface Warfare Ctr. . . . . [6953-18]
- 2:00 pm: **Statistical properties of synthetic aperture sonar image textures**, James T. Cobb, Naval Surface Warfare Ctr. . . . . [6953-19]
- 2:20 pm: **Gaussian Markov random field modeling of textures in high-frequency synthetic aperture sonar**, Simon Y. Foo, Florida State Univ.; James T. Cobb, Jason R. Stack, Naval Surface Warfare Ctr. . . . . [6953-20]
- 2:40 pm: **Underwater UXO detection and discrimination: understanding EMI scattering phenomena in a conducting environment**, Fridon Shubitidze, Dartmouth College and Sky Research, Inc.; Irma Shamatava, Sky Research, Inc. and Dartmouth College; Benjamin E. Barowes, Kevin A. O'Neill, U.S. Army Engineer Research and Development Ctr. . . . . [6953-21]
- 3:00 pm: **TacMSI: a novel multi-look multispectral imager for maritime mine detection**, Carrie L. Leonard, Chong Wai Chan, Tamara Cottis, Michael J. DeWeert, Brian P. Farm, Daniel Kokubun, Reid Noguchi, Dugan Yoon, Eric Louchard, BAE Systems . . . . . [6953-22]
- 3:20 pm: **Electrical impedance tomography for underwater mine detection**, Gail Bouchette, Stephane Gagnon, Philip M. Church, Tim Luu, Neptec Design Group Ltd. (Canada); John E. McFee, Defence Research and Development Canada (Canada) . . . . . [6953-23]

**Wednesday 19 March**

**SESSION 6**

**Room: Grand 3 . . . . . Wed. 9:00 to 11:50 am**

**Optical Sensing and Detection**

*Session Chairs: J. Michael Cathcart, Georgia Institute of Technology; Peter Howard, U.S. Army Night Vision & Electronic Sensors Directorate*

- 9:00 am: **UXO detection and characterization using vision-based robotic systems**, Saed Amer, Amir H. Shirkhodaei, Haroun Rababaah, Tennessee State Univ. . . . . [6953-24]
- 9:20 am: **Phenomenology of thermal signatures of disturbed and undisturbed soils**, George G. Keonig, U.S. Army Engineer Research and Development Ctr. . . . . [6953-25]
- 9:40 am: **Spectral methods to detect surface mines**, Edwin M. Winter, Technical Research Associates, Inc.; Miranda A. Schatten, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6953-26]
- Coffee Break . . . . . 10:00 to 10:30 am

- 10:30 am: **Exposure effects on optical properties of building materials**, J. Michael Cathcart, Sarah Lane, J. Timothy Harrell, Georgia Institute of Technology . . . . . [6953-27]
- 10:50 am: **Adaptive spatial sampling schemes for the detection of mine fields in hyperspectral imagery**, Alan Thomas, J. Michael Cathcart, Georgia Institute of Technology . . . . . [6953-28]
- 11:10 am: **Comparative performance between compressed and uncompressed airborne imagery**, Chung D. Phan, Ronald R. Rupp, Anh H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate; Sanjeev Agarwal, Univ. of Missouri/Rolla . . . . . [6953-29]
- 11:30 am: **Automated determination of scale and orientation of mine field grid**, Alan Thomas, J. Michael Cathcart, Georgia Institute of Technology [6953-30]
- Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

**SESSION 7**

**Room: Grand 3 . . . . . Wed. 1:30 to 3:10 pm**

**Environmental Effects on Sensing and Detection**

*Session Chairs: Yogadhis Das, Defence Research and Development Canada (Canada); Russell S. Harmon, U.S. Army Research Office*

- 1:30 pm: **Investigation of soil processes on radar signature of landmines**, Deborah T. Abrams, Univ. de Puerto Rico Mayagüez and U.S. Army Engineer Research and Development Ctr.; Gary Koh, U.S. Army Engineer Research and Development Ctr. . . . . [6953-31]
- 1:50 pm: **Radar attenuation in desert soil**, Gary Koh, U.S. Army Engineer Research and Development Ctr. . . . . [6953-32]
- 2:10 pm: **Global prediction of thermal regimes in bare soils**, Hernan Moreno, Jan M. H.Hendrickx, New Mexico Institute of Mining and Technology; Hongjie Xie, The Univ. of Texas at San Antonio; Jirka Simunek, Univ. of California/Riverside . . . . . [6953-33]
- 2:30 pm: **Toward a model for predicting magnetic susceptibility of bedrock regolith and soils**, Remke L. Van Dam, Michigan State Univ.; Jan M. H.Hendrickx, Bruce J. Harrison, New Mexico Institute of Mining and Technology; Russell S. Harmon, U.S. Army Research Office; Samer Hariri, Michigan State Univ. . . . . [6953-34]
- 2:50 pm: **Improving detection and discrimination of buried metallic objects in magnetic geologic settings by modeling the background soil response**, Leonard R. Pasion, The Univ. of British Columbia (Canada) and Sky Research, Inc. (Canada); Douglas W. Oldenburg, The Univ. of British Columbia (Canada); Nicolas Lhomme, Stephen D. Billings, Sky Research, Inc. (Canada) . . . . [6953-35]
- Coffee Break . . . . . 3:10 to 3:40 pm

**SESSION 8**

**Room: Grand 3 . . . . . Wed. 3:40 to 5:20 pm**

**Multisystem Sensing**

*Session Chairs: Motoyuki Sato IV, Tohoku Univ. (Japan); Mehmet Sezgin, TÜBITAK Marmara Research Ctr. (Turkey)*

- 3:40 pm: **Hand-held dual-sensor ALIS and its evaluation tests**, Motoyuki Sato IV, Tohoku Univ. (Japan); Kazunori Takahashi, Bundesanstalt für Materialforschung und -prüfung (Germany) . . . . . [6953-36]
- 4:00 pm: **HSTAMIDS operational field evaluation, Cambodia**, Roger Cresci, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6953-37]
- 4:20 pm: **Determining object depth using radar, metal detectors, and magnetometers**, Jay A. Marble, U.S. Army Night Vision & Electronic Sensors Directorate. . . . . [6953-39]
- 4:40 pm: **On the registration of FLGPR and IR data for the forward-looking landmine detection system and its use in eliminating FLGPR false alarms**, Kevin Stone, James M. Keller, Mark A. Busch, Dominic K. C.Ho, Univ. of Missouri/Columbia; Paul D. Gader, Univ. of Florida . . . . . [6953-40]
- 5:00 pm: **Sensor management for landmine detection using correlated sensor observations**, Mark P. Kolba, Leslie M. Collins, Duke Univ. . . . . [6953-41]

Thursday 20 March

SESSION 9

Room: Grand 3 ..... Thurs. 8:40 to 10:00 am

EOIR Signal Processing

Session Chairs: George G. Keonig, U.S. Army Engineer Research and Development Ctr.; Edwin M. Winter, Technical Research Associates, Inc.

8:40 am: FastKRX: a fast approximation for kernel RX anomaly detection, Spandan Tiwari, Sanjeev Agarwal, Univ. of Missouri/Rolla; Anh H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate. .... [6953-42]

9:00 am: Exploiting mineness for scatterable minefield detection, Anh H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate; Sanjeev Agarwal, Univ. of Missouri/Rolla; Thomas Broach, Thomas E. Smith, U.S. Army Night Vision & Electronic Sensors Directorate. .... [6953-43]

9:20 am: HAMD: a software system for surface and buried mine detections, Bo Ling, Migma Systems, Inc.; Anh H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate. .... [6953-44]

9:40 am: Application of context-based classifier to remotely sensed imagery for mine detection, Jeremy Bolton, Paul D. Gader, Univ. of Florida. .... [6953-45]

Coffee Break ..... 10:00 to 10:30 am

SESSION 10

Room: Grand 3 ..... Thurs. 10:30 to 11:50 am

GPR for Detection and Algorithm Fusion I

Session Chairs: Paul D. Gader, Univ. of Florida; Lawrence Carin, Duke Univ.

10:30 am: Data fusion of vehicle-mounted countermeasure sensors, Robert M. Deas, Nigel G. Davidson, Nicola A. Playle, Defence Science and Technology Lab. (United Kingdom); Tom Riley, Mark Bernhardt, Moira I. Smith, Waterfall Solutions Ltd. (United Kingdom). .... [6953-46]

10:50 am: Application of Markov random fields to landmine detection in ground-penetrating radar data, Peter A. Torrione, Leslie M. Collins, Duke Univ. .... [6953-47]

11:10 am: Landmine detection with ground penetrating radar using discrete hidden Markov models with symbol dependent features, Hichem Frigui, Oualid Missaoui, Univ. of Louisville; Paul D. Gader, Univ. of Florida. .... [6953-48]

11:30 am: Subspace processing of GPR signals for vehicle-based landmine detection system, Dominic K. C.Ho, Univ. of Missouri/Columbia; Paul D. Gader, Joseph N. Wilson, Univ. of Florida; Hichem Frigui, Univ. of Louisville. .... [6953-49]

Lunch/Exhibition Break ..... 11:50 pm to 1:30 am

SESSION 11

Room: Grand 3 ..... Thurs. 1:30 to 3:10 pm

GPR for Detection and Algorithm Fusion II

Session Chairs: Peter A. Torrione, Duke Univ.; Anh H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate

1:30 pm: Use of rank-based decision level fusion in landmine discrimination, Joseph N. Wilson, Univ. of Florida. .... [6953-50]

1:50 pm: A generic framework for context-dependent fusion with application to landmine detection, Hichem Frigui, Univ. of Louisville; Paul D. Gader, Univ. of Florida; Ahmed Chamseddine, Univ. of Louisville. .... [6953-51]

2:10 pm: The model-based generalized SEA and a statistical signal processing approach for UXO discrimination, Irma Shamatava, Fridon Shubitidze, Dartmouth College and Sky Research, Inc.; Eugene Demidenko, Dartmouth College; Benjamin E. Barrowes, Kevin A. O'Neill, U.S. Army Engineer Research and Development Ctr. .... [6953-53]

2:30 pm: A data-derived time-domain SEA for UXO identification using the MPV sensor, Juan P. Fernández, Dartmouth College; Benjamin E. Barrowes, Kevin A. O'Neill, U.S. Army Engineer Research and Development Ctr.; Irma Shamatava, Fridon Shubitidze, Dartmouth College. .... [6953-54]

2:50 pm: Inversion of frequency domain data collected in a magnetic setting for the detection of UXO, Nicolas Lhomme, Leonard R. Pasion, Sky Research, Inc. (Canada) and The Univ. of British Columbia (Canada); Stephen D. Billings, Sky Research, Inc. (Canada); Douglas W. Oldenburg, The Univ. of British Columbia (Canada). .... [6953-55]

Related Course

Registration is required.

See SPIE Cashier for full course description or to Register.

SC180 Imaging Polarimetry (Dereniak, Miles, Sabatke) Monday, 1:30 to 5:30 pm

# Chemical Biological Radiological Nuclear and Explosives (CBRNE) Sensing IX

*Conference Chairs:* **Augustus Way Fountain III**, U.S. Army Edgewood Chemical Biological Ctr.; **Patrick J. Gardner**, Western Carolina Univ

*Program Committee:* **Jerome J. Braun**, MIT Lincoln Lab.; **John C. Carrano**, Luminex Corp.; **Christopher C. Carter**, The Johns Hopkins Univ. Applied Physics Lab.; **Vernon Davis**, National Nuclear Security Administration; **Matthew Todd Griffin**, General Dynamics Armament and Technical Products; **Harry Ing**, Bubble Technology Industries, Inc. (Canada); **Harold R. McHugh**, U.S. Dept. of Energy; **Brian E. Moretti**, U.S. Military Academy; **Paul M. Pellegrino**, Army Research Lab.; **Michael Peters**, Intelagard; **Michael W. P. Petryk**, Defence Research and Development Canada (Canada); **Michael A. Strauss**, General Dynamics Armament and Technical Products; **Cynthia R. Swim**, U.S. Army Edgewood Chemical Biological Ctr.

## Tuesday 18 March

### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break ..... 10:00 to 10:30 am

### SESSION 1

Room: Grand 2 ..... Tues. 1:40 to 4:50 pm

#### Explosives Sensing

*Session Chair:* **Augustus Way Fountain III**,  
U.S. Army Edgewood Chemical Biological Ctr.

1:40 pm: **Explosives signatures and analysis**, Augustus W. Fountain III, U.S. Army Edgewood Chemical Biological Ctr. .... [6954-01]

2:00 pm: **LIBS plasma enhancement for standoff detection applications**, Dennis K. Killinger, Univ. of South Florida; Susan D. Allen, Arkansas State Univ.; Robert D. Waterbury, Chris Stefano, Edwin L. Dottery, Alaka'i Consulting & Engineering, Inc. .... [6954-02]

2:20 pm: **Gamma-ray imaging for explosives detection**, Georgia A. DeNolfo, Stanley D. Hunter, Seunghye Son, Jason T. Link, NASA Goddard Space Flight Ctr. .... [6954-03]

2:40 pm: **Combining hyperspectral imaging and Raman spectroscopy for remote chemical sensing**, John M. Ingram, U.S. Military Academy. .... [6954-04]

Coffee Break ..... 3:00 to 3:30 pm

3:30 pm: **Standoff explosive detection using broadly tunable mid-infrared external cavity quantum cascade lasers**, Tim Rayner, Timothy Day, Michael B. Pushkarsky, Miles J. Weida, Eric Takeuchi, Daylight Solutions, Inc. .... [6954-05]

3:50 pm: **Experimental demonstration of remote optical detection of trace explosives**, Charles M. Wynn, Roderick R. Kunz, Mordechai Rothschild, John J. Zayhowski, Stephen T. Palmacci, MIT Lincoln Lab. .... [6954-06]

4:10 pm: **Characterization of near-infrared low-energy ultra-short laser pulses for portable applications of laser-induced breakdown spectroscopy**, Paul M. Pellegrino, Alexander W. Schill IV, Dimitra N. Stratis-Cullum, Army Research Lab. .... [6954-07]

4:30 pm: **Standoff LIBS and Raman measurements of energetic materials using a single UV excitation laser**, Robert D. Waterbury, Alaka'i Consulting & Engineering, Inc.; Dennis K. Killinger, Univ. of South Florida; Jeremy D. Rose, Edwin L. Dottery, Guy P. Ontai, Alaka'i Consulting & Engineering, Inc. .... [6954-08]

## Wednesday 19 March

### SESSION 2

Room: Grand 2 ..... Wed. 8:00 am to 12:30 pm

#### Chemical Sensing I

*Session Chair:* **Paul M. Pellegrino**, Army Research Lab.

8:00 am: **"Light Flight": a new approach for chemical sensing using optical fibers sensorial system, design validation and calibration of an original device**, Antonio M. Calabro, Ctr. Italiano Ricerche Aerospaziali (Italy); Luca Mazzola, Univ. degli Studi di Roma Tre (Italy). .... [6954-09]

8:20 am: **Evaluating performance enhancements for a Raman hyperspectral imaging sensor**, Patrick J. Treado, Jason H. Neiss, Matthew P. Nelson, ChemImage Corp. .... [6954-10]

8:40 am: **Extending lifetime of plasmonic silver structures designed for high-resolution chemical imaging or chemical and biological sensing**, Carlos A. Barrios, Andrey V. Malkovskiy, Ryan D. Hartschuh, Scott R. Hamilton, Alexander M. Kisliuk, Alexei P. Sokolov, Mark D. Foster, The Univ. of Akron ..... [6954-11]

9:00 am: **Multidimensional molecular identification by laser control mass spectrometry**, Marcos M. Dantus, Michigan State Univ. .... [6954-12]

9:20 am: **Large-area cold plasma applicator for decontamination**, Gregory A. Konesky, K-Plasma Ltd. .... [6954-13]

9:40 am: **Recent advances toward a fiber optic sensor for nerve agent**, Steven R. Cordero, Robert A. Lieberman, Intelligent Optical Systems, Inc. .... [6954-14]

Coffee Break ..... 10:00 to 10:30 am

10:30 am: **Remote identification of liquid surface contamination by imaging Fourier transform spectrometry**, Roland Harig, Technische Univ. Hamburg-Harburg (Germany) .... [6954-15]

10:50 am: **DMS-IMS2, GC-DMS, DMS-MS: DMS hybrid devices combining orthogonal principles of separation for challenging applications**, Andrew Anderson, Kenneth Markoski, Quan Shi, Stephen Coy, Evgeny Krylov, Erkinjon Nazarov, Sionex Corp. .... [6954-16]

11:10 am: **A new miniature, hand-held, solar-blind, reagentless standoff chemical, biological and explosives (CBE) sensor**, William F. Hug, Ray D. Reid, Photon Systems, Inc.; Rohit Bhartia, Arthur L. Lane, Jet Propulsion Lab. .... [6954-17]

11:30 am: **Fingerprinting CBRNE materials**, Jane F. Bertone, Kevin M. Spencer, EIC Labs., Inc. .... [6954-18]

11:50 am: **Sensing characteristics of carbon nanotubes for chlorine**, Ahalapitiya H. Jayatissa, Univ. of Toledo ..... [6954-19]

12:10 pm: **Active hyperspectral imaging system for the detection of liquids**, Chris R. Howle, Defence Science and Technology Lab. (United Kingdom); David J. Stothard, Cameron F. Rae, Mark Ross, Univ. of St. Andrews (United Kingdom); Benjamin Truscott, Defence Science and Technology Lab. (United Kingdom); Malcolm H. Dunn, Univ. of St. Andrews (United Kingdom). .... [6954-46]

Lunch/Exhibition Break ..... 12:30 to 1:40 pm

# Conference 6954 · Room: Grand 2

## SESSION 3

Room: Grand 2 ..... Wed. 1:40 to 4:30 pm

### Chemical Sensing II

*Session Chair: Michael W. P. Petryk,*  
Defence Research and Development Canada (Canada)

- 1:40 pm: **Airborne measurements in the longwave infrared using a FIRST imaging hyperspectral sensor**, Alexandre Vallières, Jean-Pierre Allard, Martin Chamberland, Vincent Farley, André Villemaire, Telops, Inc. (Canada) . . . [6954-20]
- 2:00 pm: **Computational models and spectroscopic studies in the near-infrared and visible regions**, Michael W. P. Petryk, Defence Research and Development Canada (Canada) . . . [6954-21]
- 2:20 pm: **Imaging open-path Fourier transform infrared spectrometer for 3D cloud profiling**, Julia R. Dupuis, David J. Mansur, James R. Engel, Robert M. Vaillancourt, OPTRA, Inc.; Lori A. Todd, Kathleen Mottus, The Univ. of North Carolina at Chapel Hill. . . . . [6954-22]
- 2:40 pm: **Identification and localization of potential chemical/biological events on the move**, Sachi V. Desai, Myron E. Hohil, U.S. Army Research, Development and Engineering Command . . . . . [6954-23]
- Coffee Break . . . . . 3:00 to 3:30 pm
- 3:30 pm: **Detection of chemicals at a standoff >10 m distance based on single-beam coherent anti-Stokes Raman scattering**, Marcos M. Dantus, Michigan State Univ. . . . . [6954-24]
- 3:50 pm: **CATSI EDM: recent advances on the development and validation of a ruggedized passive standoff CWAs sensor**, Hugo Lavoie, Jean-Marc Theriault, Francois Bouffard, Eldon Puckrin, Caroline S. Turcotte, Defence Research and Development Canada (Canada); Paul Lacasse, AEREX Avionics Inc. (Canada) . . . . . [6954-25]
- 4:10 pm: **Detection of gas plumes in cluttered environments using long-wave infrared hyperspectral sensors**, Joshua Broadwater, Thomas S. Spisz, The Johns Hopkins Univ. Applied Physics Lab. . . . . [6954-26]

## SESSION 4

Room: Grand 2 ..... Wed. 4:30 to 5:30 pm

### Venture Capital Considerations for CBRNE

*Session Chair: Patrick J. Gardner,* Western Carolina Univ.

- 4:30 pm: **Chart Venture Partners investment considerations for CBRNE products and opportunities**, Cole Van Nice, Chart Venture Partners; Patrick J. Gardner, Western Carolina Univ. . . . . [6954-27]
- 4:50 pm: **In-Q-Tel investment considerations for CBRNE products and opportunities**, Sydney J. Ulvick, In-Q-Tel; Patrick J. Gardner, Western Carolina Univ. . . . . [6954-28]
- 5:10 pm: **Arch Venture Partners investment considerations for CBRNE products and opportunities**, Keith L. Crandell, ARCH Venture Partners; Patrick J. Gardner, Western Carolina Univ. . . . . [6954-29]

## Thursday 20 March

## SESSION 5

Room: Grand 2 ..... Thurs. 8:20 to 10:00 am

### Biological Sensing I

*Session Chair: Christopher C. Carter,*  
The Johns Hopkins Univ. Applied Physics Lab.

- 8:20 am: **Development of a standardized differential-reflective bio-assay for microbial pathogens**, Jay Wilhelm, J. R. X. Auld, James E. Smith, West Virginia Univ. . . . . [6954-30]
- 8:40 am: **Shape characteristics of biological spores**, Richard I. Joseph, Alison K. Lazarevich, The Johns Hopkins Univ. Applied Physics Lab. . . . . [6954-31]
- 9:00 am: **Refractive index measurement of biological particles in visible region**, Diane Limsui, Marc B. Airola, The Johns Hopkins Univ. Applied Physics Lab. . . . . [6954-32]
- 9:20 am: **Extinction and backscatter cross sections of biological materials**, Michael E. Thomas, Diane Limsui, The Johns Hopkins Univ. Applied Physics Lab. . . . . [6954-33]
- 9:40 am: **Surface imaging microscope**, Eric W. Rogala, Isaac N. Bankman, The Johns Hopkins Univ. Applied Physics Lab. . . . . [6954-34]
- Coffee Break . . . . . 10:00 to 10:30 am

## SESSION 6

Room: Grand 2 ..... Thurs. 10:30 to 11:50 am

### Biological Sensing II

*Session Chair: Jerome J. Braun,* MIT Lincoln Lab.

- 10:30 am: **Short non-coding RNAs as biowarfare agent identifiers detected by surface plasmon resonance enhanced common path interferometry**, Charles Greef, Viatcheslav Petropavlovskikh, Oyvind Nilsen, Bilge Hacioglu, AlphaSniffer LLC; John Hall, Hall Stable Lasers, LLC; Patrick J. Gardner, Western Carolina Univ. . . . . [6954-35]
- 10:50 am: **DMS-prefiltered mass spectrometry for the detection of biomarkers**, Stephen Coy, Evgeny Krylov, Erkinjon Nazarov, Sionex Corp. . . . . [6954-36]
- 11:10 am: **Automated species and strain identification of bacteria in complex matrices using FTIR spectroscopy**, Kenneth A. Puzey, QuantaSpec Inc.; Patrick J. Gardner, Western Carolina Univ. . . . . [6954-37]
- 11:30 am: **Classification of category A pathogenic bacteria**, A. Peter Snyder, U.S. Army Edgewood Chemical Biological Ctr.; Ashish Tripathi, Science Applications International Corp.; Diane St. Amant, U.S. Army Edgewood Chemical Biological Ctr.; Mark Campbell, U.S. Dept. of Agriculture; Jennifer Minter, Science and Technology Corp.; Darren K. Emge, Alan C. Samuels, U.S. Army Edgewood Chemical Biological Ctr. . . . . [6954-38]
- Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

## SESSION 7

Room: Grand 2 ..... Thurs. 1:30 to 3:50 pm

### Radiological and Nuclear Sensing

*Session Chair: Vernon Davis,* National Nuclear Security Administration

- 1:30 pm: **Growth and characterization of bismuth iodide crystals grown by the Bridgman method**, Wei Qiu, Juan C. Nino, Azaree T. Lintereur, James E. Baciak, Jr., Univ. of Florida. . . . . [6954-39]
- 1:50 pm: **Neutron imaging camera**, Stanley D. Hunter, Georgia A. DeNolfo, Seunghee Son, Jason T. Link, NASA Goddard Space Flight Ctr.; Noel A. Guardala, Naval Surface Warfare Ctr. . . . . [6954-40]
- 2:10 pm: **Extraordinary improvement in scintillation detectors via post-processing with ASEDRA: solution to a 50-year-old problem**, Eric LaVigne, Glenn E. Sjoden, James E. Baciak, Jr., Rebecca S. Detwiler, Univ. of Florida . . . . . [6954-41]
- 2:30 pm: **Polymer composites for gamma photon detection**, Qibing Pei, Univ. of California/Los Angeles . . . . . [6954-42]
- 2:50 pm: **Research and application of digital image processing technique in cobalt 60-based container inspection system**, Bo Sun, Beijing Normal Univ. (China); Yun Liu, Beijing Energy Detection Technology Inc. (China); Jun He, Beijing Normal Univ. (China) . . . . . [6954-43]
- 3:10 pm: **A new electronic neutron dosimeter (END) for reliable personal dosimetry**, Harry Ing, Hugh R. Andrews, Rachid Machrafi, Alexey Voevodskiy, Kevin Zhang, Bubble Technology Industries, Inc. (Canada); Thomas Cousins, Carey Larsson, Roger Hugron, Jason Brown, Defence Research and Development Canada (Canada) . . . . . [6954-44]
- 3:30 pm: **Unattended sensors for nuclear threat detection**, Robert C. Runkle, Lindsay Todd, Scott J. Morris, Scott Kiff, John S. Rohrer, Michael T. Batdorf, Brion J. Burghard, Kenneth Jarman, Pacific Northwest National Lab. . . . . [6954-45]

## Related Courses

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC719 **Chemical & Biological Detection: Overview of Point and Standoff Sensing Technologies** (Gardner) Monday, 1:30 to 5:30 pm

# Conference 6955 · Room: Atlanta/Boston

Monday-Tuesday 17-18 March 2008 • Proceedings of SPIE Vol. 6955

## Head- and Helmet-Mounted Displays XIII: Design and Applications

Conference Chair: **Randall W. Brown**, Air Force Research Lab.; **Peter L. Marasco**, Air Force Research Lab.

Conference Co-Chair: **Thomas H. Harding**, U.S. Army Aeromedical Research Lab.; **Sion A. Jennings**, National Research Council Canada (Canada)

Program Committee: **Randall E. Bailey**, NASA Langley Research Ctr.; **Laurence Durnell**, QinetiQ Ltd. (United Kingdom); **Paul R. Havig**, Air Force Research Lab.

### Monday 17 March

#### Welcome & Introductions

Room: Atlanta/Boston ..... Mon. 8:30 to 8:40 am

Session Chair: **Randall W. Brown**, Air Force Research Lab.

#### SESSION 1

Room: Atlanta/Boston ..... Mon. 8:40 to 10:00 am

#### Systems

Session Chair: **Thomas H. Harding**,  
U.S. Army Aeromedical Research Lab.

8:40 am: **The development of the HMD with wide FOV and high-resolution using shuttle optical system**, Kazutaka Inoguchi, Motomi Matsunaga, Shoichi Yamazaki, Canon Inc. (Japan) ..... [6955-01]

9:00 am: **Head-mounted display upgrade for the US Army's AVCATT simulation program**, James E. Melzer, James Porter, Rockwell Collins Optronics ..... [6955-02]

9:20 am: **The Cobra HMD system for Gripen**, Jorgen Larsson, Tommy Blomqvist, SAAB AB (Sweden) ..... [6955-03]

9:40 am: **TopOwl night vision improvements**, Olivier Lemoine, Manuel Kabache, Frédéric Saviot, Marie Charbonneau, Bruno Coumert, Thales Avionics S.A. (France) ..... [6955-04]

Coffee Break ..... 10:00 to 10:30 am

#### Display Track Plenary

Room: Atlanta/Boston ..... Mon. 10:30 to 11:30 am

Display content in advanced NVG and HMD systems: a pilot/flight surgeon's concerns (*Invited Paper*), Joseph C. Antonio, Naval Air Warfare Ctr. .... [6955-05]

Lunch Break ..... 11:30 am to 1:20 pm

#### SESSION 2

Room: Atlanta/Boston ..... Mon. 1:20 to 3:00 pm

#### HMD Components

Session Chair: **Sion A. Jennings**,  
National Research Council Canada (Canada)

1:20 pm: **All solid-state electrochromic device for helmet-mounted displays**, Hulya Demiryont, Kenneth C. Shannon III, Eclipse Energy Systems, Inc.; Sharon Dixon, Alan R. Pinkus, Air Force Research Lab. .... [6955-06]

1:40 pm: **Active matrix organic light emitting diode (OLED)-XL life test results**, David A. Fellowes, Michael V. Wood, U.S. Army Night Vision & Electronic Sensors Directorate; Amalkumar P. Ghosh, Olivier Prache, eMagin Corp. .... [6955-07]

2:00 pm: **Accurate eye-tracking in a high-G environment**, Richard A. Hutchin, Optical Physics Co. .... [6955-08]

2:20 pm: **A new optical HMT system based on image processing**, Kazuho Tawada, Ken Hirooka, Shimadzu Corp. (Japan) ..... [6955-10]

2:40 pm: **A full color, SXGA AMLCD for military head mounted displays (HMDs) and other viewer applications**, Ollie C. Woodard, Jason Lo, Murshed Khandaker, Frederick Herrmann, Hiap L. Ong, Kopin Corp.; Colin Reese, U.S. Army Night Vision & Electronic Sensors Directorate. .... [6955-11]

Coffee Break ..... 3:00 to 3:30 pm

#### SESSION 3

Room: Atlanta/Boston ..... Mon. 3:30 to 5:10 pm

#### Design Issues

Session Chair: **Peter L. Marasco**, Air Force Research Lab.

3:30 pm: **Visual issues associated with the use of the integrated helmet and display sighting system (IHADSS) in the Apache helicopter: three decades in review**, Keith L. Hiatt, U.S. Army Research Institute of Environmental Medicine; Clarence E. Rash, U.S. Army Aeromedical Research Lab.; Kevin Heinecke, U.S. Army-2nd Aviation Flight Detachment ..... [6955-12]

3:50 pm: **Visual perceptual issues of the integrated helmet and display sighting system (IHADSS): four expert perspectives**, Clarence E. Rash, U.S. Army Aeromedical Research Lab.; Kevin Heinecke, U.S. Army-2nd Aviation Flight Detachment; Gregory Francis, Purdue Univ.; Keith L. Hiatt, U.S. Army Research Institute of Environmental Medicine ..... [6955-13]

4:10 pm: **Determining good contrast requirements for HMD see-through imagery**, Thomas H. Harding, John S. Martin, Clarence E. Rash, U.S. Army Aeromedical Research Lab. .... [6955-14]

4:30 pm: **Perceptual design tradeoff considerations for viewing**, Melvyn E. Kalich, Thomas H. Harding, Clarence E. Rash, U.S. Army Aeromedical Research Lab. .... [6955-15]

4:50 pm: **Spatial constraints for 3D perception in helmet-mounted displays**, Anne-Emmanuelle Priot, Institut de Médecine Aéronautique du Service de Santé des Armées (France); Marie Charbonneau, Thales Avionics S.A. (France); D. Paille, Essilor International (France) ..... [6955-28]

### Tuesday 18 March

#### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break ..... 10:00 to 10:30 am

#### SESSION 4

Room: Atlanta/Boston ..... Tues. 10:30 am to 12:10 pm

#### Human Factors

Session Chair: **Paul R. Havig**, Air Force Research Lab.

10:30 am: **Effects of field of view on human locomotion**, Alexander Toet, Marieke van der Hoeven, Nico J. Delleman, TNO Human Factors (Netherlands) ..... [6955-16]

10:50 am: **Aurally-aided visual search performance in a dynamic environment**, John McIntire, Consortium Research Fellows Program; Paul R. Havig, Air Force Research Lab.; Scott Watamaniuk, Robert Gilkey, Wright State Univ. .... [6955-17]

11:10 am: **Comparative effects of vergence/accommodation conflicts with different interocular separation and viewing distance**, Marie Charbonneau, Thales Avionics S.A. (France); Anne-Emmanuelle Priot, Roumes Corinne, Institut de Médecine Aéronautique du Service de Santé des Armées (France); Alain Leger, Thales Avionics S.A. (France) ..... [6955-18]

11:30 am: **The yaw, pitch, and roll of the head when straight ahead**, Leonard A. Temme, David L. Still, Adrianus J. Houtsma, U.S. Army Aeromedical Research Lab. .... [6955-19]

11:50 am: **Toward the HMD as a cognitive prosthesis**, James E. Melzer, Rockwell Collins Optronics ..... [6955-20]

Lunch/Exhibition Break ..... 12:10 to 1:10 pm

# Conference 6955 · Room: Atlanta/Boston

## SESSION 5

Room: Atlanta/Boston .....Tues. 1:10 to 2:10 pm

### Testing

*Session Chair: Randall W. Brown, Air Force Research Lab.*

1:10 pm: **Civilian rotorcraft NVG contrast testing**, Sion A. Jennings, Greg Craig, National Research Council Canada (Canada) ..... [6955-21]

1:30 pm: **Development of NVG test maneuvers for civilian aircraft**, Sion A. Jennings, National Research Council Canada (Canada) ..... [6955-22]

1:50 pm: **Safety qualification and operational assessment of a night vision cueing and display system**, James M. Barnaba, Cary W. Wilson, Melina Baez-Vazquez, U.S. Air Force ..... [6955-23]

## SESSION 6

Room: Atlanta/Boston .....Tues. 2:10 to 3:30 pm

### Augmented/Virtual Reality

*Session Chair: Randall E. Bailey, NASA Langley Research Ctr.*

2:10 pm: **Stereoscopic helmet mounted system for real time 3D environment reconstruction and indoor ego-motion estimation**, Giuseppe Donato, Joint Research Ctr. (Italy) and Brunel Univ. (United Kingdom); Vitor Sequeira, Joint Research Ctr. (Italy); Abdul Sadka, Brunel Univ. (United Kingdom) ..... [6955-24]

2:30 pm: **Virtual reality: a reality for future military pilotage?**, Gary L. Martinsen, Peter L. Marasco, Mathew W. Swinney, Jonathon S. Hosket, Air Force Research Lab. .... [6955-25]

2:50 pm: **Evaluation of tangible user interfaces for command and control in virtual environments**, Paul R. Havig, George A. Reis, Eric Heft, Air Force Research Lab.; John McIntire, Lisa Douglas, Consortium Research Fellows Program. .... [6955-26]

3:10 pm: **A survey of robot application based on augmented reality**, Yahui Liu, Qingxuan Jia, Beijing Univ. of Posts and Telecommunications (China); Jie Su, Harbin Univ. of Science and Technology (China) ..... [6955-27]

### Related Course

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC159 **Head-Mounted Displays: Design and Applications, Including Night Vision** (*Melze, Browne*) Wednesday, 8:30 am to 5:30 pm

### *Make time for the* **Defense+Security Exhibition**

*Orlando World Center Marriott Resort & Convention Center  
Cypress/Sago/Sabel Ballrooms*

Tuesday 18 March ..... 10:00 am to 5:00 pm

Wednesday 19 March ..... 10:00 am to 5:00 pm

Thursday 20 March ..... 10:00 am to 2:00 pm

**Don't miss the NEW  
Robotics+Unmanned Systems Pavilion.**

*See pp. 18-21 for exhibition details.*



# Display Technologies & Applications for Defense, Security, and Avionics II

Conference Chair: **John Tudor Thomas**, General Dynamics Canada Ltd. (Canada); **Andrew Malloy**, Naval Research Lab.

Program Committee: **Daniel D. Desjardins**, Consultant; **Eric W. Forsythe**, Army Research Lab.; **Grzegorz J. Grabski**, Korry Electronics Co.; **David C. Huffman**, L-3 Communications Display Systems; **Kalluri R. Sarma**, Honeywell International, Inc.; **Murray Trakalo**, General Dynamics Canada Ltd. (Canada)

## Monday 17 March

### Display Track Plenary

Room: Atlanta/Boston ..... Mon. 10:30 to 11:30 am

Display content in advanced NVG and HMD systems: a pilot/flight surgeon's concerns (Invited Paper), Joseph C. Antonio, Naval Air Warfare Ctr. .... [6955-05]

## Tuesday 18 March

### POSTERS-Tuesday

Room: Palms Ballroom-Royal ..... Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

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Analysis of reconstructed hologram image resolution which consists of different hologram pattern numbers generated using a picked-up image by integral imaging technique, Sang-Hyun Lee, Seung-Cheol Kim, Eun Soo Kim, Kwangwoon Univ. (South Korea) .... [6956-25]

Efficient generation of computer generated holographic video using novel look-up table, Jung-Hoon Yoon, Seung-Cheol Kim, Eun Soo Kim, Kwangwoon Univ. (South Korea) .... [6956-26]

## Thursday 20 March

### SESSION 1

Room: Grand 5 ..... Thurs. 8:00 to 9:00 am

#### Surveillance & Information Extraction

Session Chair: **Andrew Malloy**, Naval Research Lab.

8:00 am: **Displays for future intermediate unmanned aerial vehicle**, Daniel D. Desjardins, James Metzler, Courtney Rister, David Blakesley, Abdul-Razak Nuhu, Air Force Research Lab. .... [6956-01]

8:20 am: **The advanced linked extended reconnaissance & targeting technology demonstration project**, Mark J. Edwards, General Dynamics Canada Ltd. (Canada) .... [6956-03]

8:40 am: **Content-based image exploitation for situational awareness**, David Gains, General Dynamics Canada Ltd. (Canada) .... [6956-04]

### SESSION 2

Room: Grand 5 ..... Thurs. 9:00 to 10:00 am

#### Human/Display Interaction

Session Chair: **Daniel D. Desjardins**, Consultant

9:00 am: **Tactile target discrimination**, Alexander Toet, Eric L. Groen, Marjolaine Oosterbeek, TNO Human Factors (Netherlands) .... [6956-05]

9:20 am: **Fused quad audio/visual and tracking data collection to enhance mobile robot and operator performance analyses**, Brian A. Weiss, Brian Antonishek, Richard Norcross, National Institute of Standards and Technology .... [6956-06]

9:40 am: **Hover training display, rationale, and implementation**, David L. Still, Leonard A. Temme, U.S. Army Aeromedical Research Lab. .... [6956-07]

Coffee Break ..... 10:00 to 10:40 am

### SESSION 3

Room: Grand 5 ..... Thurs. 10:40 to 11:40 am

#### NVG Compatibility

Session Chair: **Kalluri R. Sarma**, Honeywell International, Inc.

10:40 am: **Automated image intensifier tube measuring system**, Jonathan Partee, Carl Paul, The Pennsylvania State Univ.; Mark Sartor, RDIS; James West, Nicholas Wichowski, Brian McIntyre, The Pennsylvania State Univ. .... [6956-10]

11:00 am: **Adapting deployed touch screen displays for NVG Compatibility**, Claude Gaudette, Wamco, Inc. .... [6956-11]

11:20 am: **Short-wave infrared imager cockpit lighting radiance limits**, Peter L. Marasco, Air Force Research Lab. .... [6956-08]

Lunch Break ..... 11:40 am to 1:00 pm

### SESSION 4

Room: Grand 5 ..... Thurs. 1:00 to 2:20 pm

#### 3D System-Level Perspectives

Session Chair: **David C. Huffman**, L-3 Communications Display Systems

1:00 pm: **3D displays and applications (Invited Paper)**, Patrick J. Green, Scott D. Robinson, Planar Systems, Inc. .... [6956-12]

1:40 pm: **Investigations into optimal color and shape primitives using the Perspecta 3D volumetric display**, George A. Reis, Paul R. Havig, Eric Heft, Air Force Research Lab.; John McIntire, Consortium Research Fellows Program. .... [6956-13]

2:00 pm: **Comparison of 3D displays using objective metrics**, Paul R. Havig, George A. Reis, Jason Moore, Air Force Research Lab.; John McIntire, Consortium Research Fellows Program .... [6956-14]

# Conference 6956 · Room: Grand 5

## SESSION 5

Room: Grand 5 ..... Thurs. 2:20 to 3:00 pm

### 3D Display Hardware

Session Chair: **David C. Huffman**,  
L-3 Communications Display Systems

- 2:20 pm: **3D vision system for manned and unmanned vehicles**, David B. Chenault, Richard P. Edmondson, J. Larry Pezzaniti, Polaris Sensor Technologies, Inc. .... [6956-15]
- 2:40 pm: **Autostereoscopic multiperspective display using temporal multiplexing**, Vladimir B. Markov, Stephen A. Kupiec, MetroLaser, Inc.; Darrel G. Hopper, Gurdial B. Saini, Air Force Research Lab. .... [6956-16]
- Coffee Break ..... 3:00 to 3:20 pm

## SESSION 6

Room: Grand 5 ..... Thurs. 3:20 to 4:20 pm

### Display Design

Session Chair: **Grzegorz J. Grabski**, Korry Electronics Corp.

- 3:20 pm: **Ruggedized flat panel displays using COTS components**, Robert Smith-Gillespie, E3 Displays ..... [6956-17]
- 3:40 pm: **15.1-inch touch tactical avionics display**, Tracy J. Barnidge, Bruce D. Hufnagel, Joseph Tchou, Rockwell Collins, Inc. .... [6956-18]
- 4:00 pm: **Designing display enhancement windows for commercial and military applications**, Michael J. Dent, Optical Filters USA LLC ..... [6956-19]

## SESSION 7

Room: Grand 5 ..... Thurs. 4:20 to 5:20 pm

### LCD Backlighting

Session Chair: **Murray Trakalo**,  
General Dynamics Canada Ltd. (Canada)

- 4:20 pm: **High-performance RGB LED backlight in high-temperature environment**, Grzegorz J. Grabski, Walter L. Gurr, John R. Green, Korry Electronics Co. .... [6956-20]
- 4:40 pm: **Advanced flat panel display backlighting techniques**, Robert D. Smith-Gillespie, E3 Displays ..... [6956-21]
- 5:00 pm: **High-performance display backlighting**, Richard P. Webster, LCD Lighting Inc. .... [6956-22]

## SESSION 8

Room: Grand 5 ..... Thurs. 5:20 to 6:00 pm

### OLED Display Applications

Session Chair: **John Tudor Thomas**,  
General Dynamics Canada Ltd. (Canada)

- 5:20 pm: **The use of OLED display technology in military applications**, Murray Trakalo, Sean Lorimer, General Dynamics Canada Ltd. (Canada) [6956-24]
- 5:40 pm: **OLED displays in a ground mobile application**, John T. Thomas, Sean Lorimer, General Dynamics Canada Ltd. (Canada) ..... [6956-27]

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SC159 **Head-Mounted Displays: Design and Applications, Including Night Vision** (Melze, Browne) Wednesday, 8:30 am to 5:30 pm

## Don't Miss These Presentations!

Free to all registered attendees.

### Plenary Presentation, p. 6



**The Honorable Jay Cohen**  
Under Secretary for Science and Technology,  
U.S. Department of Homeland Security

### Innovation and the Wealth of Nations, p. 6



**Sir John Chisholm**  
Chairman of QinetiQ

# Conference 6957 · Room: Atlanta/Boston

Wednesday-Thursday 19-20 March 2008 • Proceedings of SPIE Vol. 6957

## Enhanced and Synthetic Vision 2008

Conference Chair: **Jeff J. Güell**, The Boeing Co.; **Maarten Uijt de Haag**, Ohio Univ.

Program Committee: **Guy A. French**, Air Force Research Lab.; **Bernd R. Korn**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Michael C. Lightfoot**, NASA Langley Research Ctr.; **Jens Schiefele**, Jeppesen GmbH (Germany); **Jacques G. Verly**, Univ. de Liège (Belgium); **Kenneth L. Bernier**, The Boeing Co.

### Monday 17 March

#### Display Track Plenary

Room: Atlanta/Boston. . . . . Mon. 10:30 to 11:30 am

Display content in advanced NVG and HMD systems: a pilot/flight surgeon's concerns (Invited Paper), Joseph C. Antonio, Naval Air Warfare Ctr. . . . . [6955-05]

### Tuesday 18 March

#### POSTERS-Tuesday

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An approach to instrument qualified visual range and the perceived-flicker problem, Benoit Courtade, Ecole Supérieure d'Ingénieurs en Electronique et Electrotechnique (France); David A. Schimon, Harvey Mudd College . . . [6957-24]

### Wednesday 19 March

#### SESSION 1

Room: Atlanta/Boston. . . . . Wed. 8:30 to 10:10 am

Session Chairs: **Jeff J. Güell**, The Boeing Co.;

**Kenneth L. Bernier**, The Boeing Co.;

**Michael C. Lightfoot**, NASA Langley Research Ctr.

8:30 am: **Runway infrared range concept for EVS**, James R. Kerr, Max-Viz, Inc. . . . . [6957-01]

8:50 am: **Enhanced detection of LED runway/approach lights for EVS**, James R. Kerr, Max-Viz, Inc. . . . . [6957-02]

9:10 am: **"Stereo radar": reconstructing 3D data from 2D radar**, Sven Schmerwitz, Hans-Ullrich Döhler, Bernd R. Korn, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [6957-03]

9:30 am: **Next generation enhanced vision systems processing**, Tom Riley, Catherine Cowell, Mark Bernhardt, Waterfall Solutions Ltd. (United Kingdom); Paul K. Kimber, SELEX Sensors and Airborne Systems Ltd. (United Kingdom); Karen M. Brosseau, Waterfall Solutions Ltd. (United Kingdom) . . . . . [6957-04]

9:50 am: **Synthetic vision for lunar landing vehicles**, Steven P. Williams, Jarvis J. Arthur, Kevin J. Shelton, NASA Langley Research Ctr.; Robert M. Norman, The Boeing Co.; Lawrence J. Prinzel III, NASA Langley Research Ctr. . . . . [6957-05]

Coffee Break . . . . . 10:10 to 10:40 am

#### SESSION 2

Room: Atlanta/Boston. . . . . Wed. 10:40 am to 12:20 pm

Session Chairs: **Jacques G. Verly**, Univ. de Liège (Belgium);

**Michael C. Lightfoot**, NASA Langley Research Ctr.;

**Guy A. French**, Air Force Research Lab.

10:40 am: **Operational landing credit with EVS head down display: crew procedure and human factors evaluation**, Bernd R. Korn, Marcus Biella, Helge Lenz, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [6957-06]

11:00 am: **Synthetic vision primary flight displays for helicopters**, Gang He, Thea Feyereisen, Blake Wilson, Honeywell International, Inc. . . . . [6957-07]

11:20 am: **An efficient real-time superresolution ASIC system**, Dikpal Reddy, Zhanfeng Yue, Pankaj Topiwala, FastVDO LLC . . . . . [6957-08]

11:40 am: **Dynamic region of interest computer vision**, Tracy D. McSheery, PhaseSpace, Inc. . . . . [6957-09]

12:00 pm: **Design of a synthetic vision overlay for UAV autoland monitoring**, Jochum Tadema, Netherlands Defence Academy (Netherlands); Eric Theunissen, Technische Univ. Delft (Netherlands) . . . . . [6957-10]

Lunch/Exhibition Break . . . . . 12:20 to 1:50 pm

#### SESSION 3

Room: Atlanta/Boston. . . . . Wed. 1:50 to 3:30 pm

Session Chairs: **Maarten Uijt de Haag**, Ohio Univ.;

**Guy A. French**, Air Force Research Lab.; **Bernd R. Korn**,

Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

1:50 pm: **3D display and vision system for enhanced situational awareness**, David B. Chenault, Richard P. Edmondson, J. Larry Pezzaniti, Polarix Sensor Technologies, Inc. . . . . [6957-11]

2:10 pm: **Hazard detection on runways using image processing techniques**, Girish S. Rajput, Zia-Ur Rahman, Old Dominion Univ. . . . . [6957-12]

2:30 pm: **Ultra-violet sensor as integrity monitor for enhanced flight vision system approaches to CAT II RVR conditions**, John B. McKinley, Roger B. Pierson, Mehmet C. Ertem, Norris J. Krone, Jr., Univ. Research Foundation . . . . . [6957-13]

2:50 pm: **Sensor classification and obstacle detection for aircraft external hazard monitoring**, Mark A. Smearcheck, Ananth Vadlamani, Maarten Uijt de Haag, Ohio Univ. . . . . [6957-14]

3:10 pm: **Concept for an onboard runway incursion alerting system based on emerging advanced traffic surveillance technologies**, Christoph Vernaleken, Carole Urvoy, Uwe Klingauf, Technische Univ. Darmstadt (Germany) . . . [6957-15]

Coffee Break . . . . . 3:30 to 4:00 pm

# Conference 6957 · Room: Room: Atlanta/Boston

## SESSION 4

**Room: Atlanta/Boston** ..... **Wed. 4:00 to 5:20 pm**

*Session Chairs:* **Jens Schiefele**, Jeppesen GmbH (Germany);  
**Jeff J. Güell**, The Boeing Co.;  
**Jacques G. Verly**, Univ. de Liège (Belgium)

4:00 pm: **Real-time panoramic of multiple sensors**, Jason R. Beauvais, Octec Ltd. (United Kingdom) ..... [6957-16]

4:20 pm: **Enhanced and synthetic vision system (ESVS) flight demonstration**, Jack N. Sanders-Reed, Boeing SVS, Inc.; Kenneth L. Bernier, Jeff J. Guell, The Boeing Co. .... [6957-17]

4:40 pm: **Down-to-the-runway enhanced flight vision system approach test results**, John B. McKinley, Eric Heidhausen, James A. Cramer, Norris J. Krone, Jr., Univ. Research Foundation ..... [6957-18]

5:00 pm: **Simulation evaluation of synthetic vision as an enabling technology for equivalent visual operations**, Lynda J. Kramer, Steven P. Williams, Randall E. Bailey, NASA Langley Research Ctr. .... [6957-19]

## Thursday 20 March

## SESSION 5

**Room: Atlanta/Boston** ..... **Thurs. 8:30 to 10:10 am**

*Session Chairs:* **Kenneth L. Bernier**, The Boeing Co.;  
**Maarten Uijt de Haag**, Ohio Univ.; **Bernd R. Korn**,  
Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

8:30 am: **Simulation of imaging radar using graphics hardware acceleration**, Niklas Peinecke, Bernd R. Korn, Hans-Ullrich Döhler, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) ..... [6957-20]

8:50 am: **Considerations on symbology, data requirements, and operational concept for integral NOTAM visualization on airport moving map displays**, Christoph Vernaleken, Carole Urvoy, Katja Koch, Uwe Klingauf, Technische Univ. Darmstadt (Germany) ..... [6957-22]

9:10 am: **Embedded formats for airport mapping databases**, Christian Pschierer, Jens Schiefele, Jeppesen GmbH (Germany) ..... [6957-23]

9:30 am: **A digital head-up display system as part of an integrated autonomous landing system concept**, Paul L. Wisely, BAE Systems plc (United Kingdom) ..... [6957-26]

9:50 am: **Cybersickness determines the affective appraisal of a virtual environment**, Alexander Toet, TNO Human Factors (Netherlands); Joske Houtkamp, Univ. Utrecht (Netherlands); Erik van der Spek, TNO Human Factors (Netherlands) ..... [6957-21]

### Related Course

#### Registration is required.

See SPIE Cashier for full course description or to Register.

SC159 **Head-Mounted Displays: Design and Applications, Including Night Vision** (Melze, Browne) Wednesday, 8:30 am to 5:30 pm



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# Conference 6958 · Room: Crystal C

Monday-Tuesday 17-18 March 2008 • Proceedings of SPIE Vol. 6958

## Sensors and Systems for Space Applications II

Conference Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Pejmun Motaghedi**, The Boeing Co.

Program Committee: **Edmund C. Baroth**, Jet Propulsion Lab.; **Brian Buckley**, Consultant; **Richard Cohn**, Air Force Research Lab.; **Michael D. Cornelius**, ATK Thiokol; **N. Glenn Creamer**, Naval Research Lab.; **Michael E. Dobbs**, ITT Industries, Inc.; **Charles J. Finley**, Air Force Research Lab.; **Sivaram P. Gogineni**, Innovative Scientific Solutions, Inc.; **Stephen R. Granade**, Advanced Optical Systems, Inc.; **Shahid Habib**, NASA Goddard Space Flight Ctr.; **Scott Hyde**, ATK Mission Research; **Jeffrey L. Janicik**, Innoflight Inc.; **Valentin Korman**, Madison Research Corp.; **Daniel Leo Lau**, Univ. of Kentucky; **Eric M. Miller**, General Dynamics Advanced Information Systems; **Simon Nolet**, Massachusetts Institute of Technology; **Robert D. Richards**, Optech, Inc. (Canada); **Timothy E. Rumford**, Orbital Sciences Corp.; **Sam Sims**, SMC Det 12 Space Test Program; **Robert H. Smith**, General Dynamics C4 Systems; **Lon M. Stevens**, ATK Thiokol; **Stanley D. Straight**, Air Force Research Lab.; **Amanda Vaughn**, Air Force SMC/SYZ; **Michael D. Watson**, NASA Marshall Space Flight Ctr.; **John T. Wiley, Jr.**, NASA Marshall Space Flight Ctr.

### Monday 17 March

**Space Technologies and Operations Track Plenary Presentation**  
Room: Crystal C ..... Mon. 8:00 to 9:00 am

Session Chair: **Wolfgang Fink**, California Institute of Technology

**Deep space flight of Hayabusa asteroid explorer**

**Hitoshi Kuninaka, Junichiro Kawaguchi,**  
Japan Aerospace Exploration Agency (Japan)

#### SESSION 1

Room: Crystal C ..... Mon. 9:00 am to 12:20 pm

##### Orbital Express I

Session Chair: **Manny R. Leinz**, The Boeing Co.

9:00 am: **Keynote Presentation (Presentation Only)**, Fred Kennedy, Defense Advanced Research Projects Agency. .... [6958-01]

Coffee Break ..... 10:00 to 10:30 am

10:30 am: **Orbital Express program summary and mission overview (Invited Paper)**, Bob Friend, The Boeing Co. .... [6958-02]

11:00 am: **Orbital Express mission operations: flight director's perspective**, Randy J. Rubens, Tracey Espero, The Boeing Co. .... [6958-03]

11:20 am: **Scripted variant autonomy for experimental spacecraft**, Ray Barrington, Rick Brunet, The Charles Stark Draper Lab., Inc.; Pejmun Motaghedi, The Boeing Co. .... [6958-04]

11:40 am: **The Orbital Express flight software and simulation solution**, Joseph M. Hansen, Richard J. Gerardi, The Boeing Co. .... [6958-05]

12:00 pm: **Orbital Express mission operations planning and resource management using ASPEN**, Caroline Chouinard, Russell Knight, Grailing Jones, Daniel Tran, Jet Propulsion Lab. .... [6958-06]

Lunch Break ..... 12:20 to 1:30 pm

#### SESSION 2

Room: Crystal C ..... Mon. 1:30 to 4:40 pm

##### Orbital Express II

Session Chair: **Pejmun Motaghedi**, The Boeing Co.

1:30 pm: **Orbital Express NextSat mission operations experiences**, Christopher Randall, Kenny Epstein, Brad Porter, David Kaufman, Ball Aerospace & Technologies Corp. .... [6958-07]

1:50 pm: **Orbital Express fluid transfer demonstration system**, Scott J. Rotenberger, David SooHoo, Gabriel Abraham, Northrop Grumman Space Technology ..... [6958-08]

2:10 pm: **Autonomous robotic operations for on-orbit satellite servicing**, Andrew Ogilvie, Justin Allport, Michael Hannah, John Lymer, MacDonald, Dettwiler and Associates Ltd. (Canada) ..... [6958-09]

2:30 pm: **Orbital Express autonomous rendezvous and capture sensor system (ARCSS): flight test results overview**, Manny R. Leinz, The Boeing Co. .... [6958-10]

2:50 pm: **Ground processing of Orbital Express autonomous rendezvous capture sensor system telemetry**, Clyde C. Helms, The Boeing Co. .... [6958-11]

Coffee Break ..... 3:10 to 3:40 pm

3:40 pm: **Modeling, simulation, testing, and verification of the Orbital Express autonomous rendezvous and capture sensor system (ARCSS)**, Manny R. Leinz, The Boeing Co. .... [6958-12]

4:00 pm: **Comparison of navigation solutions for autonomous spacecraft from multiple sensor systems**, Richard T. Howard, NASA Marshall Space Flight Ctr.; Jerry E. LeCroy, Dean S. Hallmark, Peter Scott, The Boeing Co. .... [6958-13]

4:20 pm: **On-orbit performance of the Orbital Express capture system**, Pejmun Motaghedi, The Boeing Co. .... [6958-14]

#### SESSION 3

Room: Crystal C ..... Mon. 4:40 to 5:20 pm

##### Sensor Development I

Session Chair: **Richard T. Howard**, NASA Marshall Space Flight Ctr.

4:40 pm: **A fully packaged thermal electrically cooled quantum dot infrared photodetector**, Xuejun Lu, Univ. of Massachusetts/Lowell. .... [6958-15]

5:00 pm: **A tunneling quantum dot infrared photodetector with monolithically integrated avalanche amplifier for ultra-sensitivity LWIR sensing**, Xuejun Lu, Univ. of Massachusetts/Lowell. .... [6958-16]

### Tuesday 18 March

**Space Technologies and Operations Track Plenary Presentation**  
Room: Crystal C ..... Tues. 8:00 to 9:00 am

Session Chair: **Wolfgang Fink**, California Institute of Technology

**Protecting the Moon's environment**

**Jeffrey M. Maclure**, International Academy of Astronautics and  
International Institute of Space Law

**Symposium-Wide Plenary Presentation**  
Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

## SESSION 4

Room: Crystal C ..... Tues. 10:30 am to 12:10 pm

### Video and Space Data Processing

*Session Chair: Pejmun Motaghedi, The Boeing Co.*

10:30 am: **Three-dimensional position and velocity vector computations of objects jettisoned from the International Space Station using close-range photogrammetry approach**, Valer O. Papanyan, Edward Oshel, Jacobs Technology; Daniel Adamo, United Space Alliance, LLC ..... [6958-17]

10:50 am: **ULTOR(r) passive pose and position engine (P3E) for space craft relative navigation**, Joel S. Hannah, Michael K. Balch, Advanced Optical Systems, Inc. .... [6958-18]

11:10 am: **Optical SAR processor for space applications**, Pascal Bourqui, Institut National d'Optique (Canada); Bernd Harnisch, European Space Agency (Netherlands); Linda E. Marchese, Alain Bergeron, Institut National d'Optique (Canada) ..... [6958-19]

11:30 am: **Phase retrieval in sparse aperture systems with phase diversity: an image quality study**, Brian Daniel, Rochester Institute of Technology; Matthew R. Bolcar, Univ. of Rochester ..... [6958-20]

11:50 am: **Aerosol retrieval at South China Sea by AVHRR image**, Hou Guan Ng, Chow Jeng Wong, Mohd Zubir Mat Jafri, Khiruddin Abdullah, Hwee San Lim, Univ. Sains Malaysia (Malaysia) ..... [6958-21]

Lunch/Exhibition Break ..... 12:10 to 1:40 pm

## SESSION 5

Room: Crystal C ..... Tues. 1:40 to 3:00 pm

### Sensor Development II

*Session Chair: Stephen R. Granade, Advanced Optical Systems, Inc.*

1:40 pm: **Fiber optic sensor technologies for detection of hydrogen in space application**, Alex A. Kazemi, The Boeing Co. .... [6958-22]

2:00 pm: **Optical detection of formaldehyde**, Kira D. Patty, Don A. Gregory, The Univ. of Alabama in Huntsville. .... [6958-23]

2:20 pm: **A radiation-hardened high-resolution optical encoder for use in aerospace applications**, Scott Sandruck, MicroE Systems ..... [6958-24]

2:40 pm: **Uncooled detector development for space application**, Wilfried Rabaud, Commissariat à l'Energie Atomique (France); Olivier Legras, ULLIS (France); Gordon R. Hopkinson, Surrey Satellite Technology Ltd. (United Kingdom); Mark Bentley, Stefan Kraft, cosine Research B.V. (Netherlands); Jérôme Meilhan, Commissariat à l'Energie Atomique (France) ..... [6958-25]

Coffee Break ..... 3:00 to 3:30 pm

## SESSION 6

Room: Crystal C ..... Tues. 3:30 to 4:50 pm

### Spacecraft: Sensors, Testing, and Control

*Session Chair: Jeffrey W. Tripp, Optech, Inc. (Canada)*

3:30 pm: **Design and characterization of uniform spectral radiance source for test and calibration of radiometers used for KOMPSAT-3**, Vikrant Mahajan, Labsphere, Inc.; Dae-Jun Jung, Korea Aerospace Research Institute (South Korea) ..... [6958-26]

3:50 pm: **Ground testing the Hydra AR&D sensor system**, Stephen R. Granade, Joel D. Burcham, Fred Roe, Advanced Optical Systems, Inc. .... [6958-27]

4:10 pm: **Rendezvous lidar sensor system for terminal rendezvous, capture, and berthing to the International Space Station**, Andrew C. M. Allen, Raja Mukherji, Christopher Langley, Manickam Umasuthan, MacDonald, Dettwiler and Associates Ltd. (Canada) ..... [6958-28]

4:30 pm: **Space telemetric panomorph imaging system for micro/nano satellite applications**, Simon Thibault, ImmerVision (Canada) ..... [6958-30]

## Related Course

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC159 **Head-Mounted Displays: Design and Applications, Including Night Vision** (Melze, Browne) Wednesday, 8:30 am to 5:30 pm

# Micro (MEMS) and Nanotechnologies for Space, Defense, and Security III

Conference Chairs: **Thomas George**, ViaLogy Corp.; **Zhongyang Cheng**, Auburn Univ.

Program Committee: **Debjyoti Banerjee**, Texas A&M Univ.; **Steve Blair**, The Univ. of Utah; **Richard W. Cernosek**, Sandia National Labs.; **Xuyuan Chen**, Vestfold Univ. College (Norway); **Scott D. Collins**, Univ. of Maine; **Xudong Fan**, Univ. of Missouri/Columbia; **Ernest J. Garcia**, Sandia National Labs.; **Stephanie A. Getty**, NASA Goddard Space Flight Ctr.; **Edward A. Johnson**, Ion Optics Inc.; **Mary J. Li**, NASA Goddard Space Flight Ctr.; **Cheng Luo**, Louisiana Tech Univ.; **Dan Luo**, Cornell Univ.; **Harish M. Manohara**, Jet Propulsion Lab.; **Nosang V. Myung**; **Gregory P. Nordin**, Brigham Young Univ.; **Ashok K. Sood**, Magnolia Optical Technologies, Inc.; **Kyung-ah Son**, Jet Propulsion Lab.; **Thomas G. Thundat**, Oak Ridge National Lab.; **David V. Wick**, Sandia National Labs.; **Eui-Hyeok Yang**, Stevens Institute of Technology

## Monday 17 March

**Space Technologies and Operations Track Plenary Presentation**  
Room: Crystal C. . . . . Mon. 8:00 to 9:00 am

Session Chair: **Wolfgang Fink**, California Institute of Technology

**Deep space flight of Hayabusa asteroid explorer**

**Hitoshi Kuninaka, Junichiro Kawaguchi**,  
Japan Aerospace Exploration Agency (Japan)

## Tuesday 18 March

**Space Technologies and Operations Track Plenary Presentation**  
Room: Crystal C. . . . . Tues. 8:00 to 9:00 am

Session Chair: **Wolfgang Fink**, California Institute of Technology

**Protecting the Moon's environment**

**Jeffrey M. Maclure**, International Academy of Astronautics and  
International Institute of Space Law

**Symposium-Wide Plenary Presentation**  
Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break . . . . . 10:00 to 10:30 am

Room: Crystal B . . . . . Tues. 1:00 to 2:00 pm

### Keynote Session I

Session Chair: **Ashok K. Sood**, Magnolia Optical Technologies, Inc.

1:00 pm: **Nano-enabled defense opportunities (Keynote Presentation)**,  
**Dennis L. Polla**, Defense Advanced Research Projects Agency . . . [6959-01]

### SESSION 2

Room: Crystal B . . . . . Tues. 2:00 to 5:30 pm

#### Nanowires and Nanotubes

Session Chairs: **Harish M. Manohara**, Jet Propulsion Lab.;

**Stephanie A. Getty**, NAS Session Chair: A Goddard Space Flight Ctr.

2:00 pm: **Wide-bandgap nanowire sensors (Invited Paper)**, **Stephen J. Pearton**,  
**Fan Ren**, **Jenshan Lin**, **David P. Norton**, Univ. of Florida . . . . . [6959-02]

2:30 pm: **Cadmium zinc telluride (CZT) nanowire sensors for detection of low-energy gamma-ray detection**, **Thulasidharan Gandhi**, **Krishnan S. Raja**,  
**Manoranjan Misra**, Univ. of Nevada/Reno . . . . . [6959-03]

2:50 pm: **Controlled growth of ZnO nanorod arrays and their PL properties**,  
**Minqiang Wang**, **Zhou Xu**, **Zhiguang Wang**, **Jiefei Zhu**, Xi'an Jiaotong Univ.  
(China) . . . . . [6959-04]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **Application specific electrode-integrated nanotube cathodes (ASINCs) for miniature analytical instruments for space exploration (Invited Paper)**, **Harish M. Manohara**, **Michael J. Bronikowski**, **Risaku Toda**, **Eduardo R. Urgiles**, Jet Propulsion Lab. . . . . [6959-05]

4:10 pm: **Life testing of patterned CNT field emitters for the electron impact ionization source of a time-of-flight mass spectrometer**, **Stephanie A. Getty**, **NASA Goddard Space Flight Ctr.**; **Rachael Bis**, Univ. of Michigan; **Stacy E. Snyder**, **Lehigh Univ.**; **Todd T. King**, **Patrick A. Roman**, **Paul R. Mahaffy**, **NASA Goddard Space Flight Ctr.** . . . . . [6959-06]

4:30 pm: **Carbon nanotube (CNT) growth and substrate adhesion for CNT-based materials**, **Michael J. Bronikowski**, **Harish M. Manohara**, **Eric W. Wong**, **Edward M. Luong**, Jet Propulsion Lab. . . . . [6959-07]

4:50 pm: **Carbon nanotube NEM switches for extreme environment space applications**, **Anupama B. Kaul**, **Eric W. Wong**, **Larry W. Epp**, Jet Propulsion Lab. . . . . [6959-08]

5:10 pm: **Fabrication of amorphous magnetostrictive nanowires and nanotubes**, **Kewei Zhang**, Auburn Univ. . . . . [6959-46]

### POSTERS-Tuesday

Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**Domain wall resistance in AlFe nanocontact**, **Peng Xu**, **Haisheng San**, **Xiamen Univ.** (China); **Xuyuan Chen**, Vestfold Univ. College (Norway) . . . . . [6959-42]

**Internationalization of gold and nickel nanowires of different lengths by living cells**, **Hui Yu**, **Eui-Hyeok Yang**, Stevens Institute of Technology . . . . . [6959-43]

**Theory of nanoelectromechanical quantum tunneling frequency multipliers**, **Hector J. De Los Santos**, NanoMEMS Research, LLC. . . . . [6959-44]

**ZnO nanostructures for optoelectronic applications**, **Ashok K. Sood**, Magnolia Optical Technologies, Inc.; **Zhong L. Wang**, Georgia Institute of Technology; **Dennis L. Polla**, Defense Advanced Research Projects Agency; **Martin B. Soprano**, U.S. Army. . . . . [6959-45]

**Modeling nanoscale ink transport in dip pen nanolithography**, **Omkar Nafday**, Nanolnk, Inc.; **Mark W. Vaughn**, **Brandon L. Weeks**, Texas Tech Univ.; **Jason R. Haaheim**, Nanolnk, Inc. . . . . [6959-47]

## Wednesday 19 March

### Keynote Session II

Room: Crystal B ..... Wed. 8:00 to 9:00 am

8:00 am: **Emerging sensors and electron devices for army applications** (Keynote Presentation), John M. Pellegrino, Army Research Lab. . [6959-09]

### SESSION 4

Room: Crystal B ..... Wed. 9:00 to 11:40 am

#### Complex MEMS

Session Chairs: **Mary J. Li, Murzy D. Jhabvala,**  
NASA Goddard Space Flight Ctr.

9:00 am: **Development and operation of the microshutter array system** (Invited Paper), Murzy D. Jhabvala, David E. Franz, Todd T. King, NASA Goddard Space Flight Ctr.; Gunther Kletetschka, The Catholic Univ. of America; Alexander S. Kutryev, Univ. of Maryland/College Park; Mary J. Li, Stephen E. Meyer, Samuel Moseley, D. Scott Schwinger, NASA Goddard Space Flight Ctr. .... [6959-10]

9:30 am: **Texas Instruments' DLP® products massively paralleled MOEMS arrays for display applications: a distant second to Mother Nature** (Invited Paper), Patrick I. Oden, Texas Instruments Inc. .... [6959-12]

Coffee Break ..... 10:00 to 10:30 am

10:30 am: **Simulation and testing of a miniature low-power time-of-flight mass spectrometer for in situ analysis of planetary atmospheres** (Invited Paper), Todd T. King, Stephanie A. Getty, Rachael A. Bis, NASA Goddard Space Flight Ctr.; Stacy E. Snyder, Lehigh Univ.; Bernard A. Lynch, Patrick A. Roman, Paul R. Mahaffy, NASA Goddard Space Flight Ctr. .... [6959-13]

11:00 am: **Carbon nanotube vacuum gauges**, Anupama B. Kaul, Harish M. Manohara, Jet Propulsion Lab. .... [6959-14]

11:20 am: **A miniature MEMS/NEMS enabled time-of-flight mass spectrometer for investigations in planetary science**, Patrick A. Roman, Stephanie A. Getty, Federico Herrero, Ron Hu, Hollis H. Jones, Duncan M. Kahle, Todd T. King, Paul R. Mahaffy, NASA Goddard Space Flight Ctr. .... [6959-15]

Lunch/Exhibition Break ..... 11:40 am to 1:30 pm

### SESSION 5

Room: Crystal B ..... Wed. 1:30 to 3:20 pm

#### Dip Pen Nanolithography

Session Chairs: **Debjyoti Banerjee,** Texas A&M Univ.;  
**Gail J. Brown,** Air Force Research Lab.

1:30 pm: **Overview of nanoscience and technology at the Air Force Research Laboratory** (Invited Paper), Gail J. Brown, Air Force Research Lab. .... [6959-16]

2:00 pm: **Commercially available high-throughput Dip Pen Nanolithography®**, Jason R. Haaheim, Emma Tevaarwerk, Joeseeph Fragala, Roger Shile, NanoInk, Inc. .... [6959-17]

2:20 pm: **Application of solid-phase direct-write (SPDW) via scanning force microscopy for electrical devices and sensors**, Patrick S. Spinney, Scott D. Collins, Rosemary Smith, Univ. of Maine ..... [6959-18]

2:40 pm: **Room-temperature synthesis of carbon nanotubes using Dip Pen Nanolithography (DPN)**, Rohit Gargate, Debjyoti Banerjee, Texas A&M Univ. .... [6959-19]

3:00 pm: **Dip Pen Nanolithography® of silver nanoparticle inks for printed electronics**, Mohammed Parpia, Emma Tevaarwerk, Nabil A. Amro, Jason R. Haaheim, Sergey Rozhok, Terry Renner, Mike Nelson, Tom Levesque, NanoInk, Inc. .... [6959-20]

Coffee Break ..... 3:20 to 3:50 pm

### SESSION 6

Room: Crystal B ..... Wed. 3:50 to 5:40 pm

#### Advanced MEMS Devices and Fabrication

Session Chairs: **Orlando Auciello,** Argonne National Lab.;  
**Scott D. Collins,** Univ. of Maine

3:50 pm: **Science and technology of piezoelectric/diamond heterostructures for monolithically integrated high-performance MEMS/NEMS/CMOS devices** (Invited Paper), Orlando Auciello, Anirudha V. Sumant, Jon C. Hiller, Bernd Kabius, Derrick C. Mancini, Argonne National Lab.; Zhenqiang Ma, Univ. of Wisconsin/Madison; Gianluca Piazza, Robert W. Carpick, Univ. of Pennsylvania; Sudarsan Srinivasan, Intel Corp. .... [6959-21]

4:20 pm: **Micromechanical sensors based on conformational change of proteins**, Haifeng Ji, Louisiana Tech Univ. .... [6959-22]

4:40 pm: **An integrated multisensor for three-axis accelerometer, absolute pressure, and temperature in MIMU**, Yulong Zhao, Zhuangde Jiang, Xi'an Jiaotong Univ. (China) ..... [6959-23]

5:00 pm: **Control of MEMS disc resonance gyroscope (DRG) using an FPGA platform**, Didier Keymeulen, Jet Propulsion Lab. .... [6959-24]

5:20 pm: **Fabrication of an electrostatically levitated rotating gyro**, Charles Ellis, Bogdan Wilamowski, Auburn Univ. .... [6959-25]

## Thursday 20 March

### SESSION 7

Room: Crystal B ..... Thurs. 8:00 to 10:10 am

#### Nano-bio-info Technologies

Session Chairs: **Ashok K. Sood,** Magnolia Optical Technologies, Inc.;  
**Xuyuan Chen,** Vestfold Univ. College (Norway)

8:00 am: **Organic nano-, bio-, and info-technologies and systems in medicine** (Invited Paper), Vijay K. Varadan, Univ. of Arkansas ..... [6959-26]

8:30 am: **Experimental results of chemical recording using thermally sensitive liposomes**, Maria E. Tanner, Duke Univ.; Elizabeth Vasievich, The Univ. of North Carolina at Chapel Hill; Jonathan Protz, Duke Univ. .... [6959-27]

8:50 am: **X-ray luminescence of nanophosphors and their applications for radiation detection**, Wei Chen, The Univ. of Texas at Arlington ..... [6959-28]

9:10 am: **ZnO-based nanogenerators and nanopiezotronics** (Invited Paper), Zhong L. Wang, Georgia Institute of Technology ..... [6959-29]

9:40 am: **CNT-based sensors and applications** (Invited Paper), Tayo I. Akinwande, Massachusetts Institute of Technology ..... [6959-30]

Coffee Break ..... 10:10 to 10:40 am

### SESSION 8

Room: Crystal B ..... Thurs. 10:40 am to 12:20 pm

#### Biosensors

Session Chairs: **Mohammed M. Zourob,** Biophage Pharna Inc. (Canada);  
**Romel D. Gomez,** Univ. of Maryland/College Park

10:40 am: **A versatile biomolecular sensor using oxide-gated carbon nanotube transistor arrays** (Invited Paper), Romel D. Gomez, Herman Pandana, Konrad Aschenbach, Jookyung Lee, Daniel Lenski, Michael Fuhrer, Univ. of Maryland/College Park; Javed Khan, National Institutes of Health ..... [6959-31]

11:10 am: **Using cellular and molecular approaches with micro- and nanotechnology for chemical and biological sensors**, Philip R. LeDuc, Carnegie Mellon Univ. .... [6959-32]

11:30 am: **Development and characterization of a microheater array device for real-time DNA mutation detection**, Layne D. Williams, The Univ. of Utah; Murat Okandan, Sandia National Labs.; Alex Chagovetz, Steve Blair, The Univ. of Utah. .... [6959-33]

11:50 am: **Recent developments in sensors and microsystems for bacterial detection** (Invited Paper), Mohammed M. Zourob, Biophage Pharma Inc. (Canada) ..... [6959-34]

Lunch Break ..... 12:20 to 1:50 pm



**SESSION 9**

**Room: Crystal B** . . . . . **Thurs. 1:50 to 3:30 pm**

**Photonic Sensors**

*Session Chairs:* **Brian T. Cunningham**, Univ. of Illinois at Urbana-Champaign; **Reuven Gordon**, Univ. of Victoria (Canada)

1:50 pm: **Photonic crystal biosensors** (*Invited Paper*), Brian T. Cunningham, Univ. of Illinois at Urbana-Champaign . . . . . [6959-35]

2:20 pm: **Fine tune localized surface plasmon resonance for chemical and biological sensors**, Junxue Fu, Yiping Zhao, The Univ. of Georgia . . . . . [6959-36]

2:40 pm: **Passivation of aluminum for micromachining silicon sensors**, Ani Duan, Vestfold Univ. College (Norway); Xuyuan Chen, Vestfold Univ. College (Norway) and Xiamen Univ. (China) . . . . . [6959-37]

3:00 pm: **Plasmonic sensors based on nano-holes: technology and integration** (*Invited Paper*), Reuven Gordon, Univ. of Victoria (Canada) . [6959-38]

Coffee Break . . . . . 3:30 to 4:00 pm

**SESSION 10**

**Room: Crystal B** . . . . . **Thurs. 4:00 to 5:20 pm**

**Adaptive Optics**

*Session Chairs:* **Thomas G. Bifano**, Boston Univ.; **Scot S. Olivier**, Lawrence Livermore National Lab.

4:00 pm: **MEMS deformable mirrors for space and defense applications** (*Invited Paper*), Thomas G. Bifano, Boston Univ.; Steven A. Cornelissen, Boston Micromachines Corp. . . . . [6959-39]

4:30 pm: **Wiregrid micro-polarizers for mid-infrared applications**, Andrew M. Sarangan, Aziz F. Mahfoud, Zhi Wu, Qiwen Zhan, Univ. of Dayton; David P. Forrai, Darrel W. Endres, John W. Devitt, L-3 Communications Cincinnati Electronics, Inc.; Robert T. Mack, James S. Harris, Air Force Research Lab. . . . . [6959-40]

4:50 pm: **Progress in MEMS for adaptive optics** (*Invited Paper*), Scot S. Olivier, Lawrence Livermore National Lab. . . . . [6959-41]

**Make time for the  
Defense+Security Exhibition**  
*Orlando World Center Marriott Resort & Convention Center  
Cypress/Sago/Sabel Ballrooms*  
Tuesday 18 March . . . . . 10:00 am to 5:00 pm  
Wednesday 19 March . . . . . 10:00 am to 5:00 pm  
Thursday 20 March . . . . . 10:00 am to 2:00 pm

**Don't miss the NEW  
Robotics+Unmanned Systems Pavilion.**  
*See pp. 18-21 for exhibition details.*

# Conference 6960 · Room: Crystal A

Monday-Tuesday 17-18 March 2008 • Proceedings of SPIE Vol. 6960

## Space Exploration Technologies

Conference Chair: **Wolfgang Fink**, California Institute of Technology

Program Committee: **Danilo F. Bassi**, Univ. de Santiago de Chile (Chile); **Bernard Foing**, International Lunar Exploration Working Group (ILEWG) (Netherlands); **Roberto Furfaro**, The Univ. of Arizona; **Jeffrey S. Kargel**, The Univ. of Arizona

### Monday 17 March

**Space Technologies and Operations Track Plenary Presentation**  
Room: Crystal C. . . . . Mon. 8:00 to 9:00 am

Session Chair: **Wolfgang Fink**, California Institute of Technology

#### Deep space flight of Hayabusa asteroid explorer

**Hitoshi Kuninaka, Junichiro Kawaguchi**,  
Japan Aerospace Exploration Agency (Japan)

### SESSION 1

Room: Crystal A . . . . . Mon. 9:20 am to 12:00 pm

#### Lunar and Planetary Exploration Technologies

Session Chairs: **Bernard Foing**,

European Space Research and Technology Ctr. (Netherlands);  
**Wolfgang Fink**, California Institute of Technology

9:20 am: **Full-scale testing and platform stabilization of a scanning lidar system for planetary landing**, Manny Nimelman, Andrew C. M. Allen, Christopher Langley, MDA Space Missions (Canada); Jeffrey W. Tripp, Optech Inc. (Canada); Jean de Lafontaine, NGC Aerospace Ltd. (Canada) . . . . . [6960-01]

9:40 am: **Pico-satellite capabilities for telecommunication and Earth observation**, Klaus-Juergen Schilling, Marco Schmidt, Univ. Würzburg (Germany) . . . . . [6960-02]

10:00 am: **Extreme environment technologies for space and terrestrial applications**, Tibor S. Balint, James A. Cutts, Elizabeth A. Kolawa, Craig E. Peterson, Jet Propulsion Lab. . . . . [6960-03]

Coffee Break . . . . . 10:20 to 10:50 am

10:50 am: **SMART-1 results and future lunar exploration**, Bernard Foing, ILEWG (Netherlands) . . . . . [6960-04]

11:10 am: **ILEWG technology roadmap for Moon exploration (Invited Paper)**, Bernard Foing, ILEWG (Netherlands) . . . . . [6960-05]

11:40 am: **Lunar landers and sample return: science and technologies**, Bernard Foing, ILEWG (Netherlands) . . . . . [6960-06]

### Tuesday 18 March

**Space Technologies and Operations Track Plenary Presentation**  
Room: Crystal C. . . . . Tues. 8:00 to 9:00 am

Session Chair: **Wolfgang Fink**, California Institute of Technology

#### Protecting the Moon's environment

**Jeffrey M. Maclure**, International Academy of Astronautics and International Institute of Space Law

#### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break . . . . . 10:00 to 10:30 am

### SESSION 2

Room: Crystal A . . . . . Tues. 10:20 am to 12:20 pm

#### Airborne Platforms and Autonomous Navigation

Session Chairs: **Danilo F. Bassi**, Univ. de Santiago de Chile (Chile);  
**Wolfgang Fink**, California Institute of Technology

10:20 am: **Intelligent systems for the autonomous exploration of Titan and Enceladus (Invited Paper)**, Roberto Furfaro, Jonathan I. Lunine, Jeffrey S. Kargel, The Univ. of Arizona; Wolfgang Fink, California Institute of Technology . [6960-07]

10:50 am: **Multilevel control structure for autonomous robotic aircraft operation (Invited Paper)**, Danilo F. Bassi, Univ. de Santiago de Chile (Chile) . . . . . [6960-08]

11:20 am: **Wind-based navigation of a hot-air balloon on Titan: a feasibility study**, Roberto Furfaro, Jonathan I. Lunine, The Univ. of Arizona; Alberto Elfes, Kim Reh, Jet Propulsion Lab. . . . . [6960-09]

11:40 am: **Rule-based navigation control design for autonomous flight**, Hugo F. Contreras, Danilo F. Bassi, Univ. de Santiago de Chile (Chile) . . . . . [6960-10]

12:00 pm: **Aerodynamic and control design for efficient low-altitude autonomous flights**, Marcelo Martinez, Nostramo Defensa S.A (Argentina); Danilo F. Bassi, Univ. de Santiago de Chile (Chile) . . . . . [6960-11]

Lunch/Exhibition Break . . . . . 12:20 to 1:30 pm

### SESSION 3

Room: Crystal A . . . . . Tues. 1:30 to 3:30 pm

#### Robotic Resource Exploration and Low-Gravity Environments

Session Chairs: **Jeffrey S. Kargel**, The Univ. of Arizona;  
**Wolfgang Fink**, California Institute of Technology

1:30 pm: **Robotic resource exploration is a key to human expansion through the cosmos (Invited Paper)**, Jeffrey S. Kargel, The Univ. of Arizona; Wolfgang Fink, California Institute of Technology; Roberto Furfaro, The Univ. of Arizona. . . . . [6960-12]

2:00 pm: **Uniqueness of Martian geochemistry and the opportunity presented by its mineral resources**, Jeffrey S. Kargel, The Univ. of Arizona. . . . . [6960-13]

2:20 pm: **Steerable hopping six-legged robot**, Paulo J. Younse, Jet Propulsion Lab. . . . . [6960-14]

2:40 pm: **Granular processes on Itokawa, a small near-Earth asteroid: implications for resource utilization (Invited Paper)**, Hideaki Miyamoto, The Univ. of Tokyo (Japan); Jeffrey S. Kargel, The Univ. of Arizona . . . . . [6960-15]

3:10 pm: **Launchable and retrievable tetherbot**, Paulo J. Younse, Jet Propulsion Lab. . . . . [6960-16]

Coffee Break . . . . . 3:30 to 3:50 pm

## SESSION 4

Room: Crystal A .....Tues. 3:50 to 6:20 pm

### Intelligent Sensors and Knowledge Discovery

Session Chairs: **Roberto Furfaro**, The Univ. of Arizona;  
**Wolfgang Fink**, California Institute of Technology

3:50 pm: **Reconfigurable imaging spectroscopy and prioritizing data acquisition**, William R. Johnson, Jet Propulsion Lab. .... [6960-17]

4:10 pm: **Evaluating the realism of synthetic hyperspectral imagery for space-based sensor development and surface classification algorithm exploration**, Michael J. Mendenhall, Air Force Institute of Technology; Erzsebet Merenyi, Rice Univ.; John P. Kerekes, Rochester Institute of Technology[6960-18]

4:30 pm: **Intelligent information extraction to aid science decision making in autonomous space exploration (Invited Paper)**, Erzsebet Merenyi, Kadim Tasdemir, Rice Univ.; William H. Farrand, Space Science Institute . . . . [6960-19]

5:00 pm: **Stochastic optimization framework (SOF) for computer-optimized design, engineering, and performance of multidimensional systems and processes (Invited Paper)**, Wolfgang Fink, California Institute of Technology . . . . . [6960-20]

5:30 pm: **Forward and inverse models for photon transport in soil-ice mixtures and their application to the problem of retrieving optical properties of planetary surfaces**, Paolo Picca, Roberto Furfaro, Jeffrey S. Kargel, Barry D. Ganapol, The Univ. of Arizona. .... [6960-21]

5:50 pm: **Spectral unmixing using non-negative basis learning (Invited Paper)**, Mario Parente, Stanford Univ. .... [6960-22]

## POSTERS-Tuesday

Room: Palms Ballroom-Royal .....Tues. 6:00 to 7:30 pm

*All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.*

*Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.*

**A hexapod robot to demonstrate mesh walking in a microgravity environment**, Alberto Behar, Jet Propulsion Lab. .... [6960-23]

**ICA-based multitemporal multispectral remote sensing images change detection**, Juan Gu, Cold and Arid Regions Environmental and Engineering Research Institute (China) . . . . . [6960-24]

**Micro-cameras for space applications**, Stephane Beauvivre, Micro-Cameras & Space Exploration SA (Switzerland) . . . . . [6960-25]

**Path following control strategies for aerial robotic vehicles**, Arturo C. Alvarez, Hugo F. Contreras, Univ. de Santiago de Chile (Chile) . . . . . [6960-26]



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# Conference 6961 · Room: Grand 1

Monday-Tuesday 17-18 March 2008 • Proceedings of SPIE Vol. 6961

## Intelligent Computing: Theory and Applications VI

Conference Chairs: **Kevin L. Priddy**, Air Force Research Lab.; **Emre Ertin**, The Ohio State Univ.

Program Committee: **Eugene Santos, Jr.**, Dartmouth College; **Gianfranco Basti**, Pontificia Univ. Lateranense (Italy); **William S. Hortos**, Associates in Communication Engineering Research and Technology; **Anke Meyer-Bäse**, Florida State Univ.; **Mark E. Oxley**, Air Force Institute of Technology; **Todd V. Rovito**, Air Force Research Lab.; **Robert L. Williams**, Air Force Research Lab.

### Monday 17 March

#### SESSION 1

Room: Grand 1 ..... Mon. 8:30 to 9:50 am

##### Intelligent Sensor Networks

Session Chair: **Kevin L. Priddy**, Air Force Research Lab.

- 8:30 am: **Computation and the design of autonomous intelligent systems**, Robert L. Fry, System Engineering Group, Inc. .... [6961-02]  
8:50 am: **Localized construction of aggregation trees in sensor networks**, Raj K. Bhatnagar, Andra Kalyan, Univ. of Cincinnati. .... [6961-03]  
9:10 am: **Dynamic landscape maps for path planning and target assignment**, Michael L. Larsen, Nikolai F. Rul'kov, Information Systems Labs., Inc. . . . [6961-04]  
9:30 am: **Unsupervised learning in persistent sensing for target recognition by wireless ad hoc networks of ground-based sensors**, William S. Hortos, Associates in Communication Engineering Research and Technology . . [6961-01]  
Coffee Break ..... 9:50 to 10:20 am

#### SESSION 2

Room: Grand 1 ..... Mon. 10:20 am to 12:00 pm

##### Sensor Applications

Session Chair: **William S. Hortos**, Associates in Communication Engineering Research and Technology

- 10:20 am: **Position-adaptive explosive detection concepts for swarming micro-UAVs**, Rastko Selmic, Louisiana Tech Univ.; Atindra K. Mitra, Air Force Research Lab. .... [6961-05]  
10:40 am: **Combining and displaying results from aeronautical smart nodes**, Alex Tarter, Ultra Electronics Ltd. (United Kingdom) and Lancaster Univ. (United Kingdom); Rainer Koeller, European Organisation for the Safety of Air Navigation (Belgium) and Lancaster Univ. (United Kingdom) ..... [6961-06]  
11:00 am: **Human activity recognition in video using two methods for matching shape contexts of silhouettes**, Natasha Kholgade, Andreas E. Savakis, Rochester Institute of Technology ..... [6961-07]  
11:20 am: **Onboard system for synchronizing video and telemetry on a small UAV**, Andres F. Rodriguez, Brigham Young Univ.; Yohannes Aregawi, Ronald Dennis, Todd Jenkins, Air Force Research Lab. .... [6961-08]  
11:40 am: **Analytical approach to cross-layer protocol optimization in wireless sensor networks**, William S. Hortos, Associates in Communication Engineering Research and Technology. .... [6961-09]  
Lunch Break ..... 12:00 to 1:30 pm

#### SESSION 3

Room: Grand 1 ..... Mon. 1:30 to 5:00 pm

##### Theory

Session Chair: **Emre Ertin**, The Ohio State Univ.

- 1:30 pm: **From sensor networks to sensor organizations**, Eric T. Matson, Wright State Univ. .... [6961-11]  
1:50 pm: **Learning spatial models for indoor tracking of wireless nodes**, Emre Ertin, The Ohio State Univ. .... [6961-12]  
2:10 pm: **Distributed caching strategy**, Keum J. Kim, Dartmouth College; Eunice E. Santos, Virginia Polytechnic Institute and State Univ.; Eugene Santos, Jr., Dartmouth College ..... [6961-13]  
2:30 pm: **Multi-threat containment with wireless dynamic neighborhood networks**, Nathan A. Ransom, Harris Corp.; Shanchieh J. Yang, Rochester Institute of Technology ..... [6961-14]  
2:50 pm: **Internalizing intelligent activity**, Jim E. Brander, Interactive Engineering Pty Ltd. (Australia) ..... [6961-10]  
Coffee Break ..... 3:10 to 3:40 pm

3:40 pm: **A self-adapting heuristic for automatically constructing terrain appreciation exercises**, Sanjeeb Nanda, SDS International, Inc.; Carl Lickteig, Peter Schaefer, U.S. Army Research Institute ..... [6961-15]

4:00 pm: **A heuristic for deriving the optimal number and placement of reconnaissance sensors**, Sanjeeb Nanda, SDS International, Inc. . . . [6961-16]

4:20 pm: **Multilevel data registration for persistent sensing**, Sangil Jwa, UmIt OZguner, The Ohio State Univ. .... [6961-17]

4:40 pm: **Exploring approaches to layered image registration**, Ping-Feng Chen, Hamid Krim, North Carolina State Univ.; Olga L. Mendoza, Air Force Research Lab. .... [6961-18]

### Tuesday 18 March

#### SESSION 4

Room: Grand 1 ..... Tues. 8:00 to 9:00 am

##### Applications I

Session Chair: **Anke Meyer-Bäse**, Florida State Univ.

8:00 am: **Intelligent computer-aided diagnosis system for breast MRI combining kinetic and morphological aspects**, Anke Meyer-Bäse, Florida State Univ. .... [6961-19]

8:20 am: **Unsupervised learning for intrusion detection and identification in wireless ad hoc sensor networks**, William S. Hortos, Associates in Communication Engineering Research and Technology ..... [6961-20]

8:40 am: **Neural network internal model process control**, Lifford McLaughlan, Mehrube Mehrubeoglu, Texas A&M Univ. .... [6961-21]

**Symposium-Wide Plenary Presentation**  
Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break ..... 10:00 to 10:30 am

#### SESSION 5

Room: Grand 1 ..... Tues. 10:30 to 11:10 am

##### Applications II

Session Chair: **Anke Meyer-Bäse**, Florida State Univ.

10:30 am: **Developing a cost effective cluster from high-performance personal desktop computers**, Jay Wilhelm, James E. Smith, West Virginia Univ. .... [6961-22]

10:50 am: **Static versus dynamic infrared digital imaging for breast cancer automatic detection by dynamic perceptron algorithm**, Gianfranco Basti, Antonio L. Perrone, Pontificia Univ. Lateranense (Italy) ..... [6961-23]

#### Panel Discussion

Room: Grand 1 ..... Tues. 11:10 am to 12:10 pm

**The Role of Intelligent Systems in a Multilevel Layered Sensing Environment**

Panel Moderators: **Kevin L. Priddy**, Air Force Research Lab.;  
**Emre Ertin**, The Ohio State Univ.

# Conference 6962 · Room: Grand 7B

Monday-Thursday 17-20 March 2008 • Proceedings of SPIE Vol. 6962

## Unmanned Systems Technology X

*Conference Chairs:* **Grant R. Gerhart**, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.; **Douglas W. Gage**, XPM Technologies; **Charles M. Shoemaker**, General Dynamics Robotic Systems

*Program Committee:* **James S. Albus**, National Institute of Standards and Technology; **John G. Blitch**, ARACAR: Alliance for Robot Assisted Crisis Assessment and Response; **Johann Borenstein**, Univ. of Michigan; **Jonathan A. Bornstein**, Army Research Lab.; **Bruce E. Brendle, Jr.**, U.S. Army TARDEC RDECOM; **Bruce Leonard Digney**, Defence Research and Development Canada (Canada); **Rajiv V. Dubey**, Univ. of South Florida; **Hobart Ray Everett**, Space and Naval Warfare Systems Ctr., San Diego; **Scott Fish**, The Univ. of Texas at Austin; **David J. Gorsich**, U.S. Army TARDEC RDECOM; **Helen Greiner**, iRobot Corp.; **Karl D. Iagnemma**, Massachusetts Institute of Technology; **Lawrence D. Jackel**, Defense Advanced Research Projects Agency; **Clinton W. Kelly III**, Science Applications International Corp.; **Gene A. Klager**, U.S. Army Night Vision & Electronic Sensors Directorate; **Andreas F. Koschan**, The Univ. of Tennessee; **James H. Lever**, U.S. Army Corps of Engineers; **Larry Henry Matthies**, Jet Propulsion Lab.; **Elena R. Messina**, National Institute of Standards and Technology; **Kevin L. Moore**, Colorado School of Mines; **Robin R. Murphy**, Univ. of South Florida; **James L. Overholt**, U.S. Army TARDEC RDECOM; **Michael R. Perschbacher**, Rovno Tech; **Marc Raibert**, Boston Dynamics; **Elias J. Rigas**, Army Research Lab.; **Klaus-Juergen Schilling**, Univ. Würzburg (Germany); **Christian Schleippmann**, Bundesamt für Wehrtechnik und Beschaffung (Germany); **Nahid N. Sidki**, Science Applications International Corp.; **Harpreet Singh**, Wayne State Univ.; **Magnús S. Snorrason**, Charles River Analytics, Inc.; **Anthony Stentz**, Carnegie Mellon Univ.; **David L. Stone**, Mechatron Consulting; **Morley O. Stone**, Air Force Research Lab.; **Venkataraman Sundareswaran**, Teledyne Scientific Co.; **David J. Thomas**, U.S. Army Tank-automotive and Armaments Command; **Mel W. Torrie**, Autonomous Solutions, Inc.; **Richard M. Voyles**, Univ. of Minnesota; **Brian H. Wilcox**, Jet Propulsion Lab.; **Robert M. Wilcox**, The Tolliver Group; **Gary Witus**, Turing Associates, Inc.; **Brian M. Yamauchi**, iRobot Corp.

### Monday 17 March

#### SESSION 1

Room: Grand 7B ..... Mon. 1:30 to 5:30 pm

#### Perception

*Session Chairs:* **Magnús S. Snorrason**, Charles River Analytics, Inc.;  
**Larry Henry Matthies**, Jet Propulsion Lab.

1:30 pm: **Detecting personnel around UGVs using stereo vision** (*Invited Paper*), Larry H. Matthies, Andrew B. Howard, Andres Huertas, Arturo L. Rankin, Max Bajracharya, Jet Propulsion Lab. .... [6962-01]

2:00 pm: **All-weather perception for small autonomous UGVs**, Brian M. Yamauchi, iRobot Corp. .... [6962-02]

2:20 pm: **Monocular vision-only 3D localization and mapping**, Gary Witus, Shawn T. Hunt, Turing Associates, Inc. .... [6962-03]

2:40 pm: **A robust real-time structure from motion for situational awareness and moving target recognition**, Minbo Shim, General Dynamics Robotic Systems. .... [6962-04]

3:00 pm: **Correspondence analysis for stable mobile robot navigation solutions**, Christopher Scrapper, Jr., Raj Madhavan, Stephen B. Balakirsky, National Institute of Standards and Technology. .... [6962-05]

Coffee Break ..... 3:20 to 3:50 pm

3:50 pm: **Detecting and tracking moving humans from a moving vehicle**, Barry A. Bodt, Army Research Lab. .... [6962-06]

4:10 pm: **Analysis of laser-ranging technology for sense and avoid operation of unmanned aircraft systems: the tradeoff between resolution and power**, Gary W. Euliss, Alan D. Christiansen, Ravindra A. Athale, The MITRE Corp. .... [6962-07]

4:30 pm: **Track history development by combining watermarking and target tracking**, Bijan G. Mobasser, Preethi Krishnamurthy, Villanova Univ. .... [6962-08]

4:50 pm: **Automatic improvement of x-ray object recognition**, Samuel Itzikowitz, Semion SHERAZIN, College of Management (Israel) .... [6962-09]

5:10 pm: **Three-dimensional vision solutions for consumer and commercial robotics systems**, Ron Buck, Tyzx, Inc. .... [6962-10]

### Tuesday 18 March

#### SESSION 2

Room: Grand 7B ..... Tues. 8:00 to 9:00 am

#### Intelligent and Autonomous Behaviors I

*Session Chairs:* **Robert E. Karlsen**, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.;  
**Brian M. Yamauchi**, iRobot Corp.

8:00 am: **Distributed pheromone-based swarming control of unmanned air and ground vehicles for RSTA**, John A. Sauter, Robert S. Matthews, NewVectors LLC; Joshua S. Robinson, John E. Moody, Augusta Systems, Inc.; Stephanie P. Riddle, Naval Air Systems Command ..... [6962-11]

8:20 am: **Small robot autonomy in an integrated environment**, Barry J. O'Brien, Stuart H. Young, Army Research Lab. .... [6962-12]

8:40 am: **UGV evolution: the human influence/factor**, Kevin L. Conrad, Peter Drewes, Lockheed Martin Corp. .... [6962-13]

#### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break ..... 10:00 to 10:30 am

#### SESSION 3

Room: Grand 7B ..... Tues. 10:30 to 11:50 am

#### Intelligent and Autonomous Behaviors II

*Session Chairs:* **Robert E. Karlsen**, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.;  
**Brian M. Yamauchi**, iRobot Corp.

10:30 am: **Learned trafficability for unmanned ground vehicles**, Gregory S. Broten, Defence Research and Development Canada (Canada) ..... [6962-14]

10:50 am: **PointCom: semi-autonomous UGV control with intuitive interface**, Mitchell M. Rohde, Victor E. Perlin, Quantum Signal LLC; Karl D. Iagnemma, Massachusetts Institute of Technology; Robert M. Lupa, Steven M. Rohde, Quantum Signal LLC; Graham Fiorani, James L. Overholt, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. .... [6962-15]

11:10 am: **Adaptive learning applied to terrain recognition**, Robert E. Karlsen, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.; Gary Witus, Turing Associates, Inc. .... [6962-16]

# Conference 6962 · Room: Grand 7B

11:30 am: **SCOUTS: supervisory controlled operations of UAVs for tracking and surveillance of vehicle targets**, Amber D. Fischer, 21st Century Systems, Inc. . . . . [6962-17]  
Lunch Break . . . . . 11:50 am to 1:30 pm

## SESSION 4

Room: Grand 7B . . . . . Tues. 1:30 to 2:10 pm

### Intelligent and Autonomous Behaviors III

Session Chairs: **Robert E. Karlsen**, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.;  
**Brian M. Yamauchi**, iRobot Corp.

1:30 pm: **Practical problems in sliding scale autonomy: a case study**, Scott R. Lenser, Chris Jones, iRobot Corp. . . . . [6962-19]

1:50 pm: **A tele-operator assistance system for agile small rovers**, Klaus-Juergen Schilling, Daniel Eck, Univ. Würzburg (Germany) . . . . . [6962-20]

## SESSION 5

Room: Grand 7B . . . . . Tues. 2:10 to 6:00 pm

### Mobile Manipulators

Session Chairs: **Kevin L. Moore**, Colorado School of Mines;  
**Gary Witus**, Turing Associates, Inc.

2:10 pm: **Mobile manipulation: a challenge in integration**, Cressel Anderson, Ben Axelrod, Philip Case, Jaeil Choi, Martin Engel, Gaurav Gupta, Florian Hecht, John Hutchinson, Niyant Krishnamurthi, Jin Han Lee, Hai Dai Nguyen, Richard Roberts, John Rogers, Alexander J. B. Trevor, Henrik I. Christensen, Charles Kemp, Georgia Institute of Technology. . . . . [6962-21]

2:30 pm: **Low-cost semi-autonomous manipulation technique for explosive ordnance disposal robots**, Andrew P. Czop, Michael J. Del Signore, Naval Explosive Ordnance Disposal Technology Div. . . . . [6962-22]

2:50 pm: **Intelligent modular manipulation for mobile robots**, Jorgen Pedersen, RE2, Inc. . . . . [6962-23]

Coffee Break . . . . . 3:10 to 3:40 pm

3:40 pm: **Computer-assisted robotic examination swab sampling (CARESS)**, Shawn T. Hunt, Gary Witus, Turing Associates, Inc. . . . . [6962-24]

4:00 pm: **Development and enhancement of mobile robot arms for EOD applications**, Matthew D. Berkemeier, Autonomous Solutions, Inc. . . . . [6962-25]

4:20 pm: **Operator control interface configuration for line-of-sight mobile manipulation**, Ian Lynn, Colorado School of Mines; Jeffrey D. Will, Valparaiso Univ.; Kevin L. Moore, Colorado School of Mines . . . . . [6962-26]

4:40 pm: **Software control of a video and sensor-equipped smart robotic arm for checkpoint vehicle inspection**, Joseph H. Bosworth, Smart Robots, Inc. . . . . [6962-27]

5:00 pm: **Door breaching robotic manipulator**, Erik E. Schoenfeld, iRobot Corp.; Stephan von Muehlen, Lawrence Parrington, Honeybee Robotics . . . . . [6962-28]

5:20 pm: **Remote CBE detection using a robot-based Raman detector**, Charles W. Gardner, ChemImage Corp.; Parag Batavia, Applied Perception, Inc.; Gary R. Gilbert, U.S. Army Medical Research and Material Command . . . . . [6962-29]

5:40 pm: **Visual interfaces for operation of non-line-of-sight mobile manipulation**, Jeffrey D. Will, Valparaiso Univ.; Ian Lynn, Kevin L. Moore, Colorado School of Mines. . . . . [6962-30]

## POSTERS-Tuesday

Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

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**Development of an extendable arm and software architecture for autonomous and tele-operated control for mobile platforms**, Yung-Sen Li, Wayne State Univ.; Shawn T. Hunt, Turing Associates, Inc.; Steven T. Walter, Wayne State Univ.; Gary Witus, Turing Associates, Inc.; R. Darin Ellis, Greg Auner, Abhilash K. Pandya, Wayne State Univ. . . . . [6962-69]

**Weighted singularity robust inverse with criterion function optimization of redundant mobile manipulators in 3D space with defense applications**, Redwan Alqasemi, Rajiv V. Dubey, Univ. of South Florida. . . . . [6962-70]

**Pushing and steering wheelchairs and mobile platforms with non-holonomic constraints using a holonomic mobile robot equipped with a single arm**, Nandagopal S. Methil, Ranjan Mukherjee, Michigan State Univ. . . . . [6962-71]

**Behavior generation strategy of artificial behavioral system by self-learning paradigm for autonomous robot tasks**, Hakan Temeltas, Evren Daglarli, Istanbul Teknik Univ. (Turkey) . . . . . [6962-74]

**Integrated RF modules for cooperative UGV/UAV tandems**, Atindra K. Mitra, Air Force Research Lab. . . . . [6962-75]

**Dexterous manipulation of NLOS manipulators**, Paul L. Muench, Gregory R. Hudias, U.S. Army Research, Development and Engineering Command . [6962-76]

## Wednesday 19 March

### SESSION 3

Room: Grand 7B . . . . . Wed. 8:00 to 10:10 am

### Self-organizing, Collaborative Unmanned ISR Robotic Teams I

Session Chairs: **George Vachtsevanos**, Georgia Institute of Technology; **Venkataraman Sundareswaran**, Teledyne Scientific Co.

Joint session with conference 6981

8:00 am: **Sensors as robots (Invited Paper)**, Michael C. Wicks, Air Force Research Lab. . . . . [6981-11]

8:30 am: **Bringing UAVs to the fight: recent army autonomy research and a vision for the future (Invited Paper)**, Jayashree Moorthy, Keith Arthur, Raymond Higgins, U.S. Army Aviation Applied Technology Directorate . . . . . [6981-12]

9:00 am: **Tactical service-oriented architecture (Invited Paper)**, Brent Rickenbach, General Dynamics Advanced Information Systems. . . . . [6981-13]

9:30 am: **Fault tolerant and lifetime control architecture for autonomous vehicles**, Alexander Bogdanov, Yi-Liang Chen, Venkataraman Sundareswaran, Thomas Altschuler, Teledyne Scientific Co. . . . . [6981-14]

9:50 am: **Global image registration using shape space tracking**, Liangyin Yu, Jose Molinerros, Venkataraman Sundareswaran, Teledyne Scientific Co. [6981-15]

Coffee Break . . . . . 10:10 to 10:40 am

**SESSION 6**

**Room: Grand 7B** ..... **Wed. 10:40 am to 12:10 pm**

**Special Topics Session I**

*Session Chairs:* **Scott Fish**, The Univ. of Texas at Austin;  
**Douglas W. Gage**, XPM Technologies

Joint session with conference 6981

- 10:40 am: **Perspectives on the DARPA Urban Challenge** (*Invited Paper*), Douglas W. Gage, XPM Technologies ..... [6962-31]
- 11:10 am: **FCS-UGV safe operations**, Scott Fish, The Univ. of Texas at Austin; Joshua Ruedin, Science Applications International Corp.; Michael R. Perschbacher, RovnoTech; John E. Bares, Carnegie Mellon Univ. .... [6962-32]
- 11:30 am: **Near-Nash targeting strategies for heterogeneous teams of unmanned combat air vehicles**, David G. Galati, Carnegie Mellon Univ.; Marwan A. Simaan, Univ. of Pittsburgh ..... [6962-33]
- 11:50 am: **Adaptive collaborative control of highly redundant robots**, David A. Handelman, American Android Corp. .... [6962-34]
- Lunch/Exhibition Break ..... 12:10 to 1:30 pm

**SESSION 7**

**Room: Grand 7B** ..... **Wed. 1:30 to 2:50 pm**

**Special Topics Session II**

*Session Chairs:* **Scott Fish**, The Univ. of Texas at Austin;  
**Douglas W. Gage**, XPM Technologies

Joint session with conference 6981

- 1:30 pm: **Skid steer fuel cell-powered unmanned ground vehicle (Burro)**, Jay S. Meldrum, Michigan Technological Univ. .... [6962-35]
- 1:50 pm: **Hands-free device control using sound picked up in the ear canal**, Siddharth Chhatpar, Lester Ngia, Chris Vlach, Dong Lin, Craig Birkhimer, Amit Juneja, Tarun Pruthi, Think-A-Move, Ltd.; Orin Hoffman, Tristan Lewis, iRobot Corp. .... [6962-36]
- 2:10 pm: **Argumentation-based negotiation for automated sensor tasking**, Daniel Gutches, Christopher Mow, Magnus S. Snorrason, Stephen Ho, Charles River Analytics, Inc. .... [6962-37]
- 2:30 pm: **Low-cost robotic arm control**, John R. Rogers, United States Military Academy ..... [6962-38]
- Coffee Break ..... 2:50 to 3:20 pm

**SESSION 8**

**Room: Grand 7B** ..... **Wed. 3:20 to 5:40 pm**

**Self-organizing, Collaborative Unmanned ISR Robotic Teams II**

*Session Chairs:* **Nahid N. Sidki**, Science Applications International Corp.; **Venkataraman Sundareswaran**, Teledyne Scientific Co.; **George Vachtsevanos**, Georgia Institute of Technology

Joint session with conference 6981

- 3:20 pm: **Sagittarius: UAV/UGV cooperation for shared situational awareness in urban environments**, Brian M. Yamauchi, iRobot Corp.; Christopher Geyer, Carnegie Mellon Univ. .... [6962-44]
- 3:40 pm: **Coordination of UAVs with resource constraints using market-based approach**, Bandi B. K.Reddy, Abdollah M. Homaifar, Albert C. Esterlin, Eisa M. Osman, North Carolina A&T State Univ. .... [6962-39]
- 4:00 pm: **Multi-objective optimization to support mission planning for constellations of unmanned aerial systems**, Daniel W. Stouch, Sofya Tenenbaum, Ted Fichtl, Charles River Analytics, Inc. .... [6962-40]
- 4:20 pm: **UAV-UGV collaboration with a PackBot UGV and Raven SUAV for pursuit and tracking of a dynamic target**, Carol Cheung, iRobot Corp.; Ben Grocholsky, Carnegie Mellon Univ. .... [6962-41]
- 4:40 pm: **A novel real-time impact monitoring system for unmanned vehicles**, David C. Zhang, Peter Qing, Shawn J. Beard, Amrita Kumar, Irene Li, Acellent Technologies, Inc.; Fukuo Chang, Stanford Univ. .... [6962-42]
- 5:00 pm: **Modeling and simulation of reliability of unmanned intelligent vehicles**, Harpreet Singh, Arati M. Dixit, Wayne State Univ. .... [6962-45]

**Thursday 20 March**

**SESSION 9**

**Room: Grand 7B** ..... **Thurs. 8:00 to 11:30 am**

**Mobility and Navigation**

*Session Chairs:* **Karl D. Iagnemma**, Massachusetts Institute of Technology; **Mel W. Torrie**, Autonomous Solutions, Inc.

- 8:00 am: **Design and control of an omnidirectional unmanned ground vehicle in rough terrain**, Martin R. Udengaard, Karl D. Iagnemma, Massachusetts Institute of Technology ..... [6962-47]
- 8:20 am: **Remote operation of the Black Knight unmanned combat vehicle**, Jean-Sebastien Valois, Carnegie Mellon Univ.; Timothy J. Pasko, BAE Systems; Herman Herman, John E. Bares, David P. Rice, Carnegie Mellon Univ. .... [6962-48]
- 8:40 am: **Modeling, validation and analysis of a Whegs™ robot in the USARSim environment**, Brian K. Taylor, Case Western Reserve Univ.; Stephen B. Balakirsky, Elena R. Messina, National Institute of Standards and Technology; Roger D. Quinn, Case Western Reserve Univ. .... [6962-49]
- 9:00 am: **Path planning for robotic vehicles using Generalized Field D\***, Leonid Sapronov, Alberto Lacaze, Robotic Research LLC. .... [6962-50]
- 9:20 am: **Cognitive integration of aerial and ground views in remote vehicle operations**, Roger A. Chadwick, New Mexico State Univ. .... [6962-51]
- 9:40 am: **Autonomous robot in unknown environments**, Ali T. Alouani, Aravind M. Sri, Tennessee Technological Univ. .... [6962-52]
- Coffee Break ..... 10:00 to 10:30 am
- 10:30 am: **Design and capture point control of a bipedal walking robot**, Jerry E. Pratt, Institute for Human and Machine Cognition; Benjamin T. Krupp, Yobotics, Inc. .... [6962-53]
- 10:50 am: **Efficient statistical mobility prediction for unmanned ground vehicles**, Gaurav Kewlani, Karl D. Iagnemma, Massachusetts Institute of Technology ..... [6962-54]
- 11:10 am: **Autonomous terrain parameter estimation for wheeled vehicles**, Laura E. Ray, Dartmouth College ..... [6962-55]
- Lunch/Exhibition Break ..... 11:30 am to 1:20 pm

**SESSION 10**

**Room: Grand 7B** ..... **Thurs. 1:20 to 3:30 pm**

**Government Session**

*Session Chairs:* **Jonathan A. Bornstein**, Army Research Lab.; **Charles M. Shoemaker**, General Dynamics; **Jeffrey J. Jaczkowski**, U.S. Army Tank-automotive and Armaments Command

- 1:20 pm: **Robotics technology development at GDRS** (*Invited Paper*), Charles M. Shoemaker, General Dynamics Robotic Systems ..... [6962-56]
- 1:50 pm: **Cooperative robotics: bringing autonomy to EOD robots**, Michael J. Del Signore, Andrew P. Czop, Naval Explosive Ordnance Disposal Technology Div. .... [6962-57]
- 2:10 pm: **Army Research Laboratory robotics collaborative technology alliance**, Jonathan A. Bornstein, Army Research Lab. .... [6962-58]
- 2:30 pm: **UGV and UAV autonomy in Defence R&D Canada**, Bruce L. Digney, Defence Research and Development Canada (Canada) ..... [6962-59]
- 2:50 pm: **Providing tactical behaviors for Army robots**, David G. Knichel, MANSCEN; David J. Bruemmer, Idaho National Lab. .... [6962-60]
- 3:10 pm: **Convoy Active Safety Warfighter experiment I**, Edward W. Schoenherr, U.S. Army Tank-automotive and Armaments Command; Christopher Day, U.S. Army Combined Arms Support Command; Asisat Animashaun, James Davis, Jr., Army Research Lab.; Bernard L. Theisen, U.S. Army Tank-automotive and Armaments Command ..... [6962-61]
- Coffee Break ..... 3:30 to 4:00 pm

## SESSION 11

Room: Grand 7B ..... Thurs. 4:00 to 6:00 pm

### Standards and Metrics

Session Chairs: **Elena R. Messina**, National Institute of Standards and Technology; **Stuart H. Young**, Army Research Lab.

- 4:00 pm: **Performance metrics for a virtual manufacturing competition**, Stephen B. Balakirsky, Christopher Scrapper, Jr., Raj Madhavan, National Institute of Standards and Technology ..... [6962-62]
- 4:20 pm: **Soldier universal robot controller**, Jeffrey A. Hyams, Elizabeth Liao, Andrew Somerville, Parag Batavia, Applied Perception, Inc. .... [6962-63]
- 4:40 pm: **Performance evaluation of cost-based versus fuzzy logic-based prediction approaches in PRIDE**, Craig I. Schlenoff, Zeid Kootbally, Raj Madhavan, National Institute of Standards and Technology; Sebti Fofou, Univ. de Bourgogne (France) ..... [6962-64]
- 5:00 pm: **Spatial ontologies for tactical behaviors**, Chafic BouSaba, Albert C. Esterline, Jr., North Carolina A&T State Univ. .... [6962-65]
- 5:20 pm: **An ontology for tactical behaviors derived from verb frames**, Albert C. Esterline, Jr., Chafic BouSaba, North Carolina A&T State Univ. .... [6962-66]
- 5:40 pm: **libdrdc: Software Standards Library**, David R. Erickson, Defence Research and Development Canada (Canada) ..... [6962-67]

### Related Courses

#### Registration is required.

See SPIE Cashier for full course description or to Register.

- SC894 **Introduction to INS and INS-Based Integrated NEW Navigation (Soloviev)** Sunday, 8:30 am to 5:30 pm
- SC898 **Path Planning for Autonomous Vehicles (Flann)** NEW Monday, 8:30 am to 12:30 pm
- SC549 **Incorporating GPS Technology into Commercial and Military Applications (Uijt de Haag)** Monday, 8:30 am to 12:30 pm

## Don't Miss These Presentations!

*Free to all registered attendees.*

### Plenary Presentation, p. 6



**The Honorable Jay Cohen**  
Under Secretary for Science and Technology,  
U.S. Department of Homeland Security

### Innovation and the Wealth of Nations, p. 6



**Sir John Chisholm**  
Chairman of QinetiQ



# Unattended Ground, Sea, and Air Sensor Technologies and Applications X

Conference Chair: **Edward M. Carapezza**, Univ. of Connecticut and DARPA

Program Committee: **Jacques Bédard**, Defence R&D Canada/Valcartier (Canada); **John G. Blich**, ARACAR: Alliance for Robot Assisted Crisis Assessment and Response; **John C. Carrano**, Luminex Corp.; **Christina J. Deckard**, Space and Naval Warfare Systems Ctr., San Diego; **John S. Eicke**, Army Research Lab.; **Alan J. Gray**, Defence Science and Technology Lab. (United Kingdom); **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSCEN; **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command; **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Michael A. Kolodny**, Army Research Lab.; **Frank Patton**, Defense Advanced Research Projects Agency; **Tien Pham**, Army Research Lab.; **Huib A.J.M. van Hoof**, TNO (Netherlands); **Graeme van Voorthuisen**, TNO-FEL (Netherlands)

## Monday 17 March

### SESSION 1

Room: Grand 7A ..... Mon. 8:20 to 9:00 am

#### Keynote Presentation

Session Chairs: **Edward M. Carapezza**, Univ. of Connecticut and DARPA; **Michael A. Kolodny**, Army Research Lab.

8:20 am: **A vision of network-centric ISTAR and the resulting challenges** (Keynote Presentation) (Invited Paper), Gavin Pearson, Defence Science and Technology Lab. (United Kingdom) ..... [6963-01]

### SESSION 2

Room: Grand 7A ..... Mon. 9:00 am to 12:30 pm

#### Sensor Networking and Communications

Session Chairs: **Tien Pham**, Army Research Lab.; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.

9:00 am: **A family of UGS demonstration**, Jeff Houser, Army Research Lab. .... [6963-02]

9:20 am: **Integration of unattended ground sensors into the tactical radio communications architecture**, Michael T. Cahill, Hironori Sasaki, Harris Corp. .... [6963-03]

9:40 am: **OmniSense unattended ground sensor system**, John McQuiddy, McQ, Inc. .... [6963-04]

Coffee Break ..... 10:00 to 10:30 am

10:30 am: **SCORPION persistent surveillance system with universal gateway**, Michael A. Coster, Jonathan L. Chambers, Michael Winters, Joseph Belesi, Northrop Grumman Corp. .... [6963-05]

10:50 am: **USMC UGS technology advancements**, David C. Hartup, L-3 Communications Nova Engineering ..... [6963-06]

11:10 am: **Sustainable unattended coastal sensor networks: technologies and challenges**, Edward M. Carapezza, Univ. of Connecticut and DARPA. .... [6963-07]

11:30 am: **Near Earth radio frequency propagation: a detailed study**, Robert Wert, Andreas Goroch, Evan Worthington, Vincent Wong, Naval Research Lab. ... [6963-08]

11:50 am: **Improved methods for adaptive antenna elements**, Evan Worthington, SFA Corp.; Robert Wert, Naval Research Lab. .... [6963-09]

12:10 pm: **Achievable data rate for ultraviolet communications through the atmosphere**, Zhengyuan Xu, Gang Chen, Feras Abou-Galala, Univ. of California/ Riverside ..... [6963-10]

Lunch Break ..... 12:30 to 1:30 pm

### SESSION 3

Room: Grand 7A ..... Mon. 1:30 to 3:10 pm

#### Transients Detection

Session Chairs: **Jacques Bédard**, Defence R&D Canada/Valcartier (Canada); **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command

1:30 pm: **Helmet-mounted acoustic array for hostile fire detection and localization in an urban environment**, Michael V. Scanlon, Army Research Lab. .... [6963-11]

1:50 pm: **Acoustic detection and localization of small arms, influence of urban conditions**, Pierre Naz, French-German Research Institute of Saint-Louis (France); Christophe R. Marty, La Délégation Générale pour l'Armement (France); Sébastien Hengy, Pascal Hamery, French-German Research Institute of Saint-Louis (France) ..... [6963-12]

2:10 pm: **Utilizing unattended acoustic sensors for mortar classification**, Sachi V. Desai, U.S. Army Research, Development and Engineering Command ..... [6963-13]

2:30 pm: **Acoustic analysis of explosions in high noise environment**, Hong Man, Stevens Institute of Technology; Sachi V. Desai, David Grasing, Benjamin Ellwood, U.S. Army Research, Development and Engineering Command [6963-14]

2:50 pm: **Three layers of battlefield gunfire protection: building, vehicle and soldier sensors**, Robert L. Showen, Robert B. Calhoun, Wai C. Chu, Jason Dunham, ShotSpotter, Inc. .... [6963-15]

Coffee Break ..... 3:10 to 3:30 pm

### SESSION 4

Room: Grand 7A ..... Mon. 3:30 to 4:50 pm

#### Modeling, Simulation, and Experimentation I

Session Chairs: **Graeme van Voorthuisen**, TNO-FEL (Netherlands); **Alan J. Gray**, Defence Science and Technology Lab. (United Kingdom)

3:30 pm: **Implementing statistical acoustic characterization of urban terrain into a decision support tool**, Harley H. Cudney, D. Keith Wilson, U.S. Army Engineer Research and Development Ctr.; Stephen A. Ketcham, U.S. Army Cold Regions Research and Engineering Lab. .... [6963-16]

3:50 pm: **Non-line-of-sight atmospheric channel modeling and validation in the solar blind ultraviolet regime**, Zhengyuan Xu, Feras Abou-Galala, Gang Chen, Univ. of California/Riverside ..... [6963-18]

4:10 pm: **Signal fading curves from computed urban acoustic wave fields**, Stephen A. Ketcham, D. Keith Wilson, Michael W. Parker, Harley H. Cudney, U.S. Army Engineer Research and Development Ctr. .... [6963-19]

4:30 pm: **Sparse detector sensor model**, Aaron L. Robinson, Carl E. Halford, Edward H. Perry, Thomas E. Wyatt, The Univ. of Memphis ..... [6963-20]

# Conference 6963 · Room: Grand 7A

## Tuesday 18 March

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am**

**The Honorable Jay Cohen,**  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

*See p. 6 for details.*

Coffee Break . . . . . 10:00 to 10:30 am

### SESSION 5

**Room: Grand 7A . . . . . Tues. 10:30 to 11:50 am**

#### Keynote Session

*Session Chairs:* **Edward M. Carapezza**, Univ. of Connecticut and DARPA; **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSYSCEN

Joint session with conference 6943

10:30 am: **Models of processing in the visual cortex** (*Keynote Presentation*) (*Invited Paper*), James S. Albus, National Institute of Standards and Technology. . . . . [6943-19]

11:10 am: **Photon counting 3D passive sensing and processing for target recognition** (*Keynote Presentation*) (*Invited Paper*), S. Yeom, Daegu Univ. (South Korea); Bahram Javidi, Univ. of Connecticut; Edward A. Watson, Air Force Research Lab. . . . . [6963-21]

Lunch/Exhibition Break . . . . . 11:50 am to 1:00 pm

### SESSION 6

**Room: Grand 7A . . . . . Tues. 1:00 to 2:40 pm**

#### Signal Processing I

*Session Chairs:* **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Michael A. Kolodny**, Army Research Lab.

1:00 pm: **Sparse detector sensor: profiling experiments for broad-scale classification**, David J. Russomanno, Matthew E. Smith, The Univ. of Memphis . . . . . [6963-22]

1:20 pm: **Qualitative performance of a local track repair algorithm for video tracking on small UAVs**, Stephen P. DelMarco, BAE Systems Advanced Information Technologies; Todd Jenkins, Air Force Research Lab. . . . . [6963-23]

1:40 pm: **Combining advanced imaging processing and low-cost remote imaging capabilities**, Matthew J. Rohrer, McQ, Inc. . . . . [6963-24]

2:00 pm: **Efficient sensor network vehicle classification using peak harmonics of acoustic emissions**, Peter E. William, Michael W. Hoffman, Univ. of Nebraska/Lincoln . . . . . [6963-25]

2:20 pm: **Profiling sensor for ISR applications**, Ronald B. Sartain, Air Force Research Lab. . . . . [6963-52]

### SESSION 7

**Room: Grand 7A . . . . . Tues. 2:40 to 4:50 pm**

#### Signal Processing II

*Session Chairs:* **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command; **Tien Pham**, Army Research Lab.

2:40 pm: **Multi-objects recognition for distributed intelligent sensor networks**, Haibo He, Stevens Institute of Technology; Sachi V. Desai, Myron E. Hohil, U.S. Army Research, Development and Engineering Command . . . . . [6963-26]

3:00 pm: **Measuring anomaly**, Wanda M. Solano, NASA Stennis Space Ctr.; Jing Peng, Montclair State Univ. . . . . [6963-27]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **Improving temporal coherence to enhance gain and improve detection performance**, Ronald A. Wagstaff, The Univ. of Mississippi . . . . . [6963-28]

4:10 pm: **Coherence and Rayleigh wave analysis of air- and mechanically coupled ground vibrations**, Richard D. Burgett, Planning Systems Inc.; James M. Sabatier, The Univ. of Mississippi . . . . . [6963-29]

4:30 pm: **Range limitation for seismic footstep detection**, James M. Sabatier, Alexander E. Ekimov, The Univ. of Mississippi . . . . . [6963-30]

## Wednesday 19 March

### SESSION 8

**Room: Grand 7A . . . . . Wed. 8:00 to 9:20 am**

#### Keynote Session

*Session Chair:* **Edward M. Carapezza**, Univ. of Connecticut and DARPA

Joint session with conference 6943

8:00 am: **Design of trustworthy fielded sensor networks** (*Keynote Presentation*), Gregory J. Pottie, Univ. of California/Los Angeles . . . . . [6943-30]

8:40 am: **MEMS and NEMS technologies for sensor applications** (*Keynote Presentation*), Panos G. Datskos, Oak Ridge National Lab. . . . . [6943-31]

### SESSION 9

**Room: Grand 7A . . . . . Wed. 9:20 to 11:10 am**

#### Unattended Ground Sensors (UGS)

*Session Chairs:* **Michael A. Kolodny**, Army Research Lab.; **Jacques Bédard**, Defence R&D Canada/Valcartier (Canada)

9:20 am: **Helicopter detection using harmonics and seismic-acoustic coupling**, Thyagaraju R. Damarla, David Ufford, Army Research Lab. . . . . [6963-31]

9:40 am: **Segregation of tracked and wheeled ground vehicle mobility mechanisms through in-situ adaptation of seismic features**, James Fitzgerald, Christopher Park, Dennis Power, Textron Systems Corp. . . . . [6963-32]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **iScout® low-cost UGS system: overview of enhancements and performance characterization**, Mark A. Winston, Ronald A. Knobler, Barry Jones, McQ, Inc. . . . . [6963-34]

10:50 am: **Target activated frame capture**, George M. Roberts, James Fitzgerald, Michael T. McCormack, Robert L. Steadman, Textron Systems Corp. . . . . [6963-35]

Lunch/Exhibition Break . . . . . 11:10 am to 1:00 pm

### SESSION 10

**Room: Grand 7A . . . . . Wed. 1:00 to 2:00 pm**

#### Enabling Technologies (Sensing, Power, Fusion, etc.)

*Session Chairs:* **Alan J. Gray**, Defence Science and Technology Lab. (United Kingdom); **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSYSCEN

1:00 pm: **Stochastic analysis of unattended sensor battery life time**, Rajarathnam Chandramouli, Stevens Institute of Technology; Venkataraman S. Swaminathan, Sachi V. Desai, U.S. Army Research, Development and Engineering Command . . . . . [6963-36]

1:20 pm: **Miniaturization of electronics for a biomimetic acoustic direction finding system**, Allyn E. Hubbard, Howard I. Cohen, Socrates Deligeorges, David Freedman, Tyler Gore, Christian Karl, Marianne Nourzad Karl, Yirong Pu, Shuwan Xue, Boston Univ. . . . . [6963-37]

1:40 pm: **Warning equipment for UGS utilizing human body for data transmission and feeding**, Jaroslav Cechak, Univ. Obrany (Czech Republic) . . . . . [6963-38]

**SESSION 11**

**Room: Grand 7A** ..... **Wed. 2:00 to 3:40 pm**

**Acoustic, Magnetic, and Multi-modal Sensing**

*Session Chairs:* **Graeme van Voorthuysen**, TNO-FEL (Netherlands); **Alan J. Gray**, Defence Science and Technology Lab. (United Kingdom)

- 2:00 pm: **The development of a biomimetic acoustic direction finding system for use on multiple platforms**, Allyn E. Hubbard, The Photonics Ctr. at Boston Univ. .... [6963-39]
- 2:20 pm: **A real-time biomimetic acoustic localizing system using time-shared architecture**, Marianne Nourzad Karl, Christian Karl, Allyn E. Hubbard, Boston Univ. .... [6963-40]
- 2:40 pm: **Advances in magnetometry through miniaturization**, Alan Edelstein, Army Research Lab. .... [6963-41]
- 3:00 pm: **Advanced dynamic magnetometer for UGS/MDA applications**, Adi R. Bulsara, Space and Naval Warfare Systems Command ..... [6963-42]
- 3:20 pm: **Progress with UGS based on MEMs**, Slobodan Rajic, Oak Ridge National Lab. and Univ. of Tennessee ..... [6963-43]
- Coffee Break ..... 3:40 to 4:10 pm

**SESSION 12**

**Room: Grand 7A** ..... **Wed. 4:10 to 5:30 pm**

**Modeling, Simulation, and Experimentation II**

*Session Chairs:* **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Todd M. Hintz**, Space & Naval Warfare Systems Command SPAWARSYSCEN

- 4:10 pm: **Development, integration, testing and evaluation of the U.S. Army Buckeye System to the NAVAIR Arrow UAV**, Rob Fischer, Science Applications International Corp.; Brian G. Kennedy, Ted Gilliland, Neany, Inc.; Mitchell B. Jones, Jeffrey C. Walker, David D. Muresan, Gregory L. Baxter, Mark Flood, Brian D. Follmer, Science Applications International Corp.; Xiuhong Sun, William Chen, Flight Landata, Inc.; Jeffrey G. Ruby, U.S. Army Engineer Research and Development Ctr. .... [6963-44]
- 4:30 pm: **Automated ship image acquisition**, Tim R. Hammond, Sean Webb, Defence Research and Development Canada (Canada) ..... [6963-45]
- 4:50 pm: **ARL multi-modal signatures database**, Kelly Bennett, Army Research Lab.; James Robertson, Clearhaven Technologies LLC. .... [6963-46]
- 5:10 pm: **Spatial and temporal characteristics of cloud to ground lightning in Guizhou Province**, Na Wei, Yanwei Li, Shengjie Niu, Nanjing Univ. of Information Science & Technology (China); Ning Luo, Jifen Wen, Haojuan Huang, Weather Modification Office of Guizhou Province (China) ..... [6963-49]

**Thursday 20 March**

**SESSION 13**

**Room: Grand 7A** ..... **Thurs. 8:30 to 9:00 am**

**UGS Users**

*Session Chair:* **Michael A. Kolodny**, Army Research Lab.

- 8:30 am: **Sensing: the road ahead**, Michael A. Kolodny, Army Research Lab. .... [6963-51]

**Panel Discussion**

**Room: Grand 7A** ..... **Thurs. 9:00 to 11:00 am**

**UGS Users**

*Panel Moderators:* **Michael A. Kolodny**, Army Research Lab.; **Edward M. Carapezza**, Univ. of Connecticut and DARPA; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.

**Related Courses**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

- SC894 **Introduction to INS and INS-Based Integrated NEW Navigation** (Soloviev) Sunday, 8:30 am to 5:30 pm
- SC898 **Path Planning for Autonomous Vehicles** (Flann) **NEW** Monday, 8:30 am to 12:30 pm
- SC549 **Incorporating GPS Technology into Commercial and Military Applications** (Uijt de Haag) Monday, 8:30 am to 12:30 pm



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# Conference 6964 · Room: Crystal L

Monday-Tuesday 17-18 March 2008 • Proceedings of SPIE Vol. 6964

## Evolutionary and Bio-Inspired Computation: Theory and Applications II

Conference Chairs: **Misty Blowers**, Air Force Research Lab.; **Alex F. Sisti**, Air Force Research Lab.

Program Committee: **Robert W. Bird**, Red Lambda, Inc.; **Peter M. LaMonica**, Air Force Research Lab.; **Sushil J. Louis**, Univ. of Nevada/Reno; **Teresa H. O'Donnell**, Air Force Research Lab.; **John C. Sciortino, Jr.**, Naval Research Lab.

### Monday 17 March

#### Welcome

Room: Crystal L ..... Mon. 1:10 to 1:20 pm

Session Chair: **Misty Blowers**, Air Force Research Lab.

#### SESSION 1

Room: Crystal L ..... Mon. 1:20 to 3:00 pm

#### Cognitive/Human Behavior Modeling

Session Chair: **Emily Budlong**, Air Force Research Lab.

1:20 pm: **The Knowledge Instinct: cognitive algorithms for engineering, and modeling of language and cultural evolution (Invited Paper)**, Leonid I. Perlovsky, Air Force Research Lab. and Harvard Univ. .... [6964-01]

2:20 pm: **Bio-Inspiration not Bio-Imitation**, Jim E. Brander, Interactive Engineering Pty Ltd. (Australia) ..... [6964-02]

2:40 pm: **Grid-Group Cm-Alpha: performance prediction using environmental and cultural factors**, Robert Woodley, Warren Noll, 21st Century Systems, Inc.; Katie Grantham Lough, Dan Krus, Univ. of Missouri/Rolla ..... [6964-03]

Coffee Break ..... 3:00 to 3:30 pm

#### SESSION 2

Room: Crystal L ..... Mon. 3:30 to 4:10 pm

#### Evolvable Multiagent Systems

Session Chair: **Barry R. Secrest**, Air Force Institute of Technology

3:30 pm: **A biologically inspired approach to modeling unmanned vehicle teams**, Roger S. Cortesi, Kevin S. Galloway, Eric W. Justh, Naval Research Lab. .... [6964-04]

3:50 pm: **A bio-inspired swarm robot coordination algorithm for multiple target searching**, Yan Meng, Jing Gan, Stevens Institute of Technology; Sachi V. Desai, U.S. Army Research, Development and Engineering Command. . [6964-05]

### Tuesday 18 March

#### SESSION 3

Room: Crystal L ..... Tues. 8:00 to 9:00 am

#### Planning and Resource Allocation

Session Chair: **John C. Sciortino, Jr.**, Naval Research Lab.

8:00 am: **An evolutionary algorithm technique for intelligence, surveillance, and reconnaissance plan optimization**, John T. Langton, Charles River Analytics, Inc.; Joseph A. Caroli, Air Force Research Lab. .... [6964-06]

8:20 am: **Using a multi-objective genetic algorithm for developing aerial sensor team search strategies**, Jeffrey P. Ridder, Innovating Systems, Inc.; John C. Sciortino, Jr., Naval Research Lab.; Christopher R. Rehm, Air Force Research Lab. .... [6964-07]

8:40 am: **Team-based resource allocation using a decentralized social decision making paradigm**, A. Wu, Joshua Hecker, Univ. of Central Florida; Christopher R. Rehm, Air Force Research Lab.; John C. Sciortino, Jr., Naval Research Lab. .... [6964-08]

**Symposium-Wide Plenary Presentation**  
Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break ..... 10:00 to 10:30 am

#### SESSION 4

Room: Crystal L ..... Tues. 10:30 am to 12:30 pm

#### Knowledge Discovery and Exploitation

Session Chair: **Robert W. Bird**, Red Lambda, Inc.

10:30 am: **Data modeling enabled dynamical analysis for blogger state-of-mind modeling and prediction**, Holger M. Jaenisch, Alabama A&M Univ.; Michael J. Coombs, Diplomacy Media Research; James W. Handley, AXIOM Corp.; Jeffrey Fauchaux, SPARTA, Inc.; Matthew E. Edwards, Alabama A&M Univ. .... [6964-09]

10:50 am: **Developing an intelligence analysis process through social network analysis**, Peter M. LaMonica, Todd Waskiewicz, Air Force Research Lab. .... [6964-10]

11:10 am: **Toward a qualia representation of cyberspace**, Timothy H. Lacey, Robert F. Mills, Richard A. Raines, Steven K. Rogers, Air Force Institute of Technology ..... [6964-11]

11:30 am: **Feature selection for anomaly intrusion detection: a multi-objective evolutionary approach**, Hamid Eskandari, Robert W. Bird, Red Lambda, Inc. .... [6964-12]

11:50 am: **Bio-inspired computational technique for the fusion data from multiple sources**, Misty Blowers, Air Force Research Lab.; Jae C. Oh, Syracuse Univ. .... [6964-13]

12:10 pm: **Secure wireless knowledge management for intelligence analysis**, Catherine H. Clark, Vision Systems & Technology, Inc.; John Spina, Air Force Research Lab. .... [6964-19]

Lunch/Exhibition Break ..... 12:30 to 1:40 pm

**SESSION 5**

**Room: Crystal L . . . . . Tues. 1:40 to 3:00 pm**

**System/Component Design and Optimization**

*Session Chair: Teresa H. O'Donnell, Air Force Research Lab.*

1:40 pm: **IR wireless cluster synapses of HYDRA very large neural networks**, Tomasz P. Jansson, Thomas C. Forrester, Physical Optics Corp. . . . . [6964-17]

2:00 pm: **Fitness landscape analysis of evolved image transforms for defense applications**, Michael R. Peterson, Wright State Univ.; Gary Lamont, Air Force Institute of Technology . . . . . [6964-14]

2:20 pm: **A genetic algorithm approach to hyperspectral feature subset selection**, Barry R. Secrest, Air Force Institute of Technology . . . . . [6964-15]

2:40 pm: **Efficient global optimization (EGO) of a limited parameter antenna design**, Teresa H. O'Donnell, Hugh Southall, Edward Altshuler, Bryan Kaanta, Air Force Research Lab. . . . . [6964-16]

Coffee Break . . . . . 3:00 to 3:30 pm

**Panel Discussion**

**Room: Crystal L . . . . . Tues. 3:30 to 4:30 pm**

**Bio-Inspired Computing for Homeland Security:  
Issues and Answers**

*Panel Moderator: Robert W. Bird, Red Lambda, Inc.*

**Closing Remarks/Wrap-up**

**Room: Crystal L . . . . . Tues. 4:30 to 4:40 pm**

*Session Chair: Misty Blowers, Air Force Research Lab.*

**Related Course**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC783 **How to Validate Your Models and Simulations (Law)** Monday, 8:30 am to 5:30 pm

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# Conference 6965 · Room: Grand 14

Wednesday 19 March 2008 • Proceedings of SPIE Vol. 6965

## Modeling and Simulation for Military Operations III

Conference Chair: **Dawn A. Trevisani**, Air Force Research Lab.

Program Committee: **Victoria R. Hahn**, Raytheon Missile Systems; **Michael D. Letherwood**, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.; **Judson McCarty**, Air Force Research Lab.; **Alex F. Sisti**, Air Force Research Lab.

### Wednesday 19 March

#### Introductory Remarks

Room: Grand 14 ..... Wed. 8:10 to 8:20 am  
Dawn A. Trevisani, Air Force Research Lab.

#### SESSION 1

Room: Grand 14 ..... Wed. 8:20 to 10:00 am

#### Behavior Modeling

Session Chair: **Robert Woodley**, 21st Century Systems, Inc.

8:20 am: **A framework for deception detection in adversary intent modeling**, Xiuqing Yuan, Eugene Santos, Jr., Dartmouth College. .... [6965-01]

8:40 am: **Modeling adversarial intent for interactive simulation and gaming: the fused intent system**, Eugene Santos, Jr., Dartmouth College; Bruce R. McQueary, Lee S. Krause, Securborator. .... [6965-02]

9:00 am: **CHAOS: an architecture for human performance modeling**, Emiel Ubink, Frank Aldershoff, TNO Defence, Security and Safety (Netherlands). .... [6965-03]

9:20 am: **Enhancing emotional-based target prediction**, Michael Gosnell, Robert Woodley, 21st Century Systems, Inc. .... [6965-04]

9:40 am: **Self-organizing modeling and simulation structures**, Jim E. Brander, Interactive Engineering Pty Ltd. (Australia). .... [6965-05]

Coffee Break ..... 10:00 to 10:30 am

#### SESSION 2

Room: Grand 14 ..... Wed. 10:30 am to 12:10 pm

#### Sensor Modeling

Session Chair: **Brian Sjoberg**, Naval Research Lab.

10:30 am: **Using stochastic process algebras to estimate the quality of information in military sensor networks**, David J. Thornley, Duncan F. Gillies, Imperial College London (United Kingdom); Chatschik Bisdikian, IBM Thomas J. Watson Research Ctr. .... [6965-06]

10:50 am: **A simulation program for the Firefinder radar**, Eric P. Lam, Boris Abramov, H. Walker Birrell, ThalesRaytheonSystems ..... [6965-07]

11:10 am: **Optimized autonomous search pattern evaluation using the Cerberus framework**, Christopher R. Angell, Mark Bernhardt, Waterfall Solutions Ltd. (United Kingdom); Paul K. Kimber, SELEX Sensors and Airborne Systems Ltd. (United Kingdom); Karen M. Brosseau, Waterfall Solutions Ltd. (United Kingdom). .... [6965-08]

11:30 am: **Irma 5.2 multisensor signature prediction model**, James C. Savage, Air Force Research Lab. .... [6965-09]

11:50 am: **Hyperspectral extensions in the MuSES signature code**, Wellesley E. Pereira, David M. Less, Leonard J. Rodriguez, ThermoAnalytics, Inc.; Uri Bernstein, Yit-Tsi Kwan, Technology Service Corp. .... [6965-10]

Lunch/Exhibition Break ..... 12:10 to 1:40 pm

#### SESSION 3

Room: Grand 14 ..... Wed. 1:40 to 3:20 pm

#### Modeling for Operational Effectiveness

Session Chair: **Eric J. Kelmelis**, EM Photonics, Inc.

1:40 pm: **Methodologies for aggregating large hierarchical simulation models**, June F. D.Rodriguez, John O. Miller, Kenneth W. Bauer, Jr., Robert E. Neher, Jr., Air Force Institute of Technology. .... [6965-11]

2:00 pm: **Formal analytical modeling of blog content as personal narrative**, Michael J. Coombs, Diplomacy Media Research; Holger M. Jaenisch, Alabama A&M Univ.; James Handley, AXIOM Corp.; Jeffrey Faucheaux, SPARTA, Inc.; Matthew E. Edwards, Alabama A&M Univ. .... [6965-12]

2:20 pm: **Designing an evaluation system for operational capacity and effectiveness based on computer simulation**, Jun He, Beijing Normal Univ. (China). .... [6965-13]

2:40 pm: **Accelerated determination of UAV flight envelopes**, Michael R. Bodnar, EM Photonics, Inc.; Lyle N. Long, The Pennsylvania State Univ.; Eric J. Kelmelis, EM Photonics, Inc. .... [6965-14]

3:00 pm: **Modeling, simulation, and evaluation of HE ammunition for counter-RAM systems**, Markus Graswald, Hendrik Rothe, Helmut-Schmidt Univ. (Germany). .... [6965-15]

Coffee Break ..... 3:20 to 3:50 pm

#### SESSION 4

Room: Grand 14 ..... Wed. 3:50 to 5:10 pm

#### Feature Modeling and Visualization

Session Chair: **Andrew Malloy**, Naval Research Lab.

3:50 pm: **Three-dimensional visualization of electronic warfare payloads**, Patricia J. Kirsch, David Tremper, Naval Research Lab. .... [6965-16]

4:10 pm: **Interactive scenario builder**, Andrew Malloy, Brian Sjoberg, Adam Szymanski, Naval Research Lab. .... [6965-17]

4:30 pm: **A Kalman-filter based multisensor terrain profile measurement system: principles, implementation, and validation**, FeiLong Liu, Nicholas Dembski, Ahmed Soliman, Giorgio Rizzoni, The Ohio State Univ.; Brian Thompson, Bowie Vaughn, U.S. Army Yuma Proving Ground. .... [6965-19]

4:50 pm: **Modeling terrain for geo-pairing and casualty assessment in OneTESS**, Wolfgang Baer, Naval Postgraduate School; Todd R. Campbell, William T. Powell, U.S. Army Operational Test Command; Jesse Campos, Applied Research Associates, Inc. .... [6965-20]

# Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XIV

Conference Chairs: **Sylvia S. Shen**, The Aerospace Corp.; **Paul E. Lewis**, National Geospatial-Intelligence Agency

Program Committee: **Gail P. Anderson**, Air Force Research Lab.; **Hsiao-hua K. Burke**, MIT Lincoln Lab.; **Chein-I Chang**, Univ. of Maryland/Baltimore County; **Eustace L. Dereniak**, College of Optical Sciences/The Univ. of Arizona; **Michael T. Eismann**, Air Force Research Lab.; **Glenn E. Healey**, Univ. of California/Irvine; **Robert T. Kroutil**, Los Alamos National Lab.; **Fred A. Kruse**, Horizon Geolmaging, LLC; **Alan P. Schaum**, Naval Research Lab.; **Joel Susskind**, NASA Goddard Space Flight Ctr.; **Grady H. Tuell**, Optech International, Inc.; **Miguel Vélez-Reyes**, Univ. de Puerto Rico Mayagüez

## Monday 17 March

### SESSION 1

Room: Grand 5 ..... Mon. 8:30 to 10:10 am

#### Detection and Identification I

Session Chair: **Sylvia S. Shen**, The Aerospace Corp.

8:30 am: **Constrained basis set expansions for target subspaces in hyperspectral detection and identification**, Steven M. Adler-Golden, John H. Gruninger, Robert L. Sundberg, Spectral Sciences, Inc.; Joao M. Romano, U.S. Army Armament Research, Development and Engineering Ctr. .... [6966-01]

8:50 am: **Hyperspectral anomaly detection based on minimum generalized variance method**, Edisanter Lo, Susquehanna Univ.; John M. Ingram, U.S. Military Academy. .... [6966-02]

9:10 am: **Regularization for spectral matched filter and RX anomaly detector**, Nasser M. Nasrabadi, Army Research Lab. .... [6966-03]

9:30 am: **An adaptive CFAR algorithm for real-time hyperspectral target detection**, Eskandar Ensafi, Alan D. Stocker, Space Computer Corp. ... [6966-04]

9:50 am: **Band selection for hyperspectral target detection based on a multinormal mixture anomaly detection algorithm**, Ingebjørg Kåsen, Torbjørn Skauli, Norwegian Defense Research Establishment (Norway) ..... [6966-05]

Coffee Break ..... 10:10 to 10:30 am

### SESSION 2

Room: Grand 5 ..... Mon. 10:30 am to 12:30 pm

#### Sensor Design, Performance, and Data Analysis Methodologies

Session Chair: **Eustace L. Dereniak**, College of Optical Sciences/The Univ. of Arizona

10:30 am: **High-performance hyperspectral imager using novel acousto-optic tunable filter**, Elliot S. Wachman, ChromoDynamics Inc.; Chris N. Pannell, Optronic Labs., Inc. .... [6966-06]

10:50 am: **Color-augmented target tracking using a liquid crystal tunable filter camera**, Michael Gran, Space Computer Corp. .... [6966-07]

11:10 am: **Design and performance of the VNIR HyperSensor camera system**, David B. Cavanaugh, Mark S. Dombrowski, Surface Optics Corp.; Brian E. Catanzaro, CFE Services ..... [6966-08]

11:30 am: **Hyperspectral image compressive projection algorithm**, Joseph P. Rice, David W. Allen, Jorge E. Neira, National Institute of Standards and Technology ..... [6966-09]

11:50 am: **Solvability and speed improvement in iterative processing with deterministic pseudo-inversions**, Harvey C. Schau, Meridian Systems LLC .... [6966-10]

12:10 pm: **A novel method for illumination suppression in hyperspectral images**, Edward A. Ashton, Brian Wemett, VirtualScopics, Inc.; Robert A. Leathers, Trijntje V. Downes, Naval Research Lab. .... [6966-11]

Lunch Break ..... 12:30 to 1:30 pm

### SESSION 3

Room: Grand 5 ..... Mon. 1:30 to 3:10 pm

#### Clustering and Classification

Session Chair: **Miguel Vélez-Reyes**, Univ. de Puerto Rico Mayagüez

1:30 pm: **A dynamic systems algorithm for unsupervised classification**, William F. Basener, David W. Messinger, Rochester Institute of Technology ..... [6966-12]

1:50 pm: **Using three-dimensional spectral/spatial Gabor filters for hyperspectral region classification**, Glenn E. Healey, Tien Bau, Subhadip Sarkar, Univ. of California/Irvine ..... [6966-13]

2:10 pm: **Unsupervised spectral-spatial classification of hyperspectral imagery using real and complex features and generalized histograms**, Julio M. Duarte-Carvajalino, Univ. de Puerto Rico Mayagüez; Guillermo Sapiro, Univ. of Minnesota; Miguel Vélez-Reyes, Univ. de Puerto Rico Mayagüez ..... [6966-14]

2:30 pm: **Hyperspectral image classification using spectral histograms and semi-supervised learning**, Sol M. Cruz, Vidya B. Manian, Univ. de Puerto Rico Mayagüez ..... [6966-15]

2:50 pm: **Hyperspectral data-processing algorithm combining principal component analysis (PCA) and K nearest neighbours (KNN)**, Pilar Beatriz Garcia-Allende, Olga M. Conde, Marta Amado, Antonio Quintela, Jose M. Lopez-Higuera, Univ. de Cantabria (Spain) ..... [6966-16]

Coffee Break ..... 3:10 to 3:30 pm

### SESSION 4

Room: Grand 5 ..... Mon. 3:30 to 5:50 pm

#### Spectral Methodologies and Applications

Session Chair: **Paul E. Lewis**, National Geospatial-Intelligence Agency

3:30 pm: **Evaluating the use of hyperspectral data to detect and map biological indicators for metal and man-made objects in the littoral environment**, Daria Siciliano, Richard C. Olsen, James R. Blankenship, Naval Postgraduate School. .... [6966-17]

3:50 pm: **Using remotely sensed thermal infrared multispectral data and thermal modeling to estimate lava tube roof thickness at Kilauea Volcano, Hawaii**, Ronald G. Resmini, National Geospatial-Intelligence Agency. ... [6966-18]

4:10 pm: **Linear spectral unmixing approaches to magnetic resonance image analysis**, Eng-Ling Wong, Chein-I Chang, Univ. of Maryland/Baltimore County. .... [6966-19]

4:30 pm: **Spatial and temporal variability of hyperspectral signatures of terrain**, Donald K. Perovich, Kathleen F. Jones, George G. Koenig, U.S. Army Corps of Engineers ..... [6966-20]

4:50 pm: **Integration of multitechniques on reducing sea surface temperature bias**, Hou Guan Ng, Chow Jeng Wong, Mohd Zubir Mat Jafri, Khiruddin Abdullah, Hwee San Lim, Univ. Sains Malaysia (Malaysia) ..... [6966-21]

5:10 pm: **Temporal and spatial air quality monitoring using internet surveillance camera and ALOS satellite image**, Chow Jeng Wong, Mohd Zubir Mat Jafri, Khiruddin Abdullah, Hwee San Lim, Choay-Ee J. Tan, Univ. Sains Malaysia (Malaysia) ..... [6966-22]

5:30 pm: **Spatio-spectral bilateral filters for hyperspectral imaging**, Honghong Peng, Raghuvveer M. Rao, David W. Messinger, Rochester Institute of Technology ..... [6966-23]

Tuesday 18 March

SESSION 5

Room: Grand 5 . . . . .Tues. 8:00 to 9:00 am

Spectral Data Analysis Methodologies I

Session Chair: Fred A. Kruse, Horizon Geolmaging, LLC

8:00 am: Denoising of hyperspectral imagery using nonlinear filters and its application to image classification, Enid M. Alvira-Concepcion, Miguel Vélez-Reyes, Univ. de Puerto Rico Mayagüez . . . . . [6966-24]

8:20 am: Expert system analysis of hyperspectral data, Fred A. Kruse, Horizon Geolmaging, LLC . . . . . [6966-25]

8:40 am: Transforming hyperspectral data via the median-spectral-spatial transformation, Amber D. Fischer, 21st Century Systems, Inc. . . . . [6966-26]

Symposium-Wide Plenary Presentation
Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am
The Honorable Jay Cohen,
Under Secretary for Science and Technology,
U.S. Dept. of Homeland Security
See p. 6 for details.

Coffee Break . . . . . 10:00 to 10:20 am

SESSION 6

Room: Grand 5 . . . . .Tues. 10:20 to 11:00 am

Spectral Data Analysis Methodologies II

Session Chair: Fred A. Kruse, Horizon Geolmaging, LLC

10:20 am: Bayesian spatial-temporal algorithms for analysis of hyperspectral signatures, Lawrence K. Chilton, Pacific Northwest National Lab. . . . . [6966-27]

10:40 am: Parametric mapping singularity based infrared image fusion algorithm, Igor V. Ternovskiy, Intelligent Optical Systems, Inc. . . . . [6966-28]

SESSION 7

Room: Grand 5 . . . . . Tues. 11:00 am to 12:40 pm

Image Registration and Change Detection I

Session Chair: Paul E. Lewis, National Geospatial-Intelligence Agency

11:00 am: Registration of multisensor remote sensing imagery by gradient-based optimization of cross-cumulative residual entropy, Mark R. Pickering, Xiuping Jia, Australian Defence Force Academy (Australia) . . . . . [6966-29]

11:20 am: Vision inspired spatial engine (VISE): a new approach to automated registration, Derek R. Lewis, Science Applications International Corp. . [6966-30]

11:40 am: Automated vector-to-raster image registration, Boris Kovalerchuk, Central Washington Univ.; Peter J. Doucette, ITT Corp.; Robert Brigantic, Pacific Northwest National Lab.; Gamal Seedahmed, Univ. of Florida . . . . . [6966-31]

12:00 pm: Sensitivity of anomalous change detection to small misregistration errors, James Theiler, Los Alamos National Lab. . . . . [6966-32]

12:20 pm: Image misregistration effects upon hyperspectral change detection, Joseph Meola, Michael T. Eismann, Air Force Research Lab. [6966-33]

Lunch/Exhibition Break . . . . . 12:40 to 1:40 pm

SESSION 8

Room: Grand 5 . . . . .Tues. 1:40 to 4:40 pm

Atmospheric Instrumentation, Measurements, and Forecasting

Session Chair: Joel Susskind, NASA Goddard Space Flight Ctr.

1:40 pm: Sounding improvements expected from the advanced remote-sensing imaging emission spectrometer (ARIES), Thomas S. Pagano, Edward T. Olsen, Hartmut H. Aumann, Moustafa T. Chahine, Eric J. Fetzer, Denis A. Elliott, Steven E. Broberg, Fredrick W. Irion, Jet Propulsion Lab. . . . . [6966-34]

2:00 pm: Improved AIRS retrievals over land, Joel Susskind, John M. Blaisdell, NASA Goddard Space Flight Ctr. . . . . [6966-35]

2:20 pm: Improving forecast skill by assimilation of quality controlled AIRS temperatures retrieved under partial cloud cover, Joel Susskind, Oreste Reale, NASA Goddard Space Flight Ctr. . . . . [6966-36]

2:40 pm: Atmospheric parameter climatologies from AIRS: monitoring short- and longer-term climate variabilities and "trends", Gyula I. Molnar, Joel Susskind, NASA Goddard Space Flight Ctr. . . . . [6966-37]

Coffee Break . . . . . 3:00 to 3:20 pm

3:20 pm: Retrieval of mid-tropospheric CO2 directly from AIRS measurements, Edward T. Olsen, Moustafa T. Chahine, Luke L. Chen, Thomas S. Pagano, Jet Propulsion Lab. . . . . [6966-38]

3:40 pm: Recent progress in neural network estimation of atmospheric profiles using microwave and hyperspectral infrared sounding data in the presence of clouds, William J. Blackwell, MIT Lincoln Lab. . . . . [6966-39]

4:00 pm: Local, regional, and global views of tropospheric carbon monoxide from the InfraRed Sounder (AIRS) onboard NASA's Aqua satellite, W. Wallace McMillan, Leonid Yurganov, Univ. of Maryland/Baltimore County . . . . . [6966-40]

4:20 pm: Application of spaceborne infrared atmospheric sounder for geosynchronous Earth orbit (SIRAS-G) technology to future Earth science missions, Thomas U. Kampe, Ball Aerospace & Technologies Corp. . . . [6966-41]

SESSION 9

Room: Grand 5 . . . . .Tues. 4:40 to 6:00 pm

Atmospheric Characterization and Correction

Session Chair: Gail P. Anderson, Air Force Research Lab.

4:40 pm: Radiative impact of aerosol smoke using MODTRAN™5, Robert S. Stone, National Oceanic and Atmospheric Administration; Gail P. Anderson, Air Force Research Lab.; Eric P. Shettle, Naval Research Lab.; Konstantin Loukachine, NASA Langley Research Ctr.; Elizabeth Andrews, Ellsworth G. Dutton, National Oceanic and Atmospheric Administration . . . . . [6966-42]

5:00 pm: Apparent temperature dependence on localized atmospheric water vapor, Matthew Montanaro, Carl Salvaggio, David W. Messinger, Scott D. Brown, Rochester Institute of Technology; Alfred J. Garrett, Savannah River National Lab. . . . . [6966-43]

5:20 pm: A worldwide physics-based high-spectral resolution atmospheric characterization, Steven T. Fiorino, Richard J. Bartell, Matthew J. Krizo, Michael A. Marciniak, Salvatore J. Cusumano, Air Force Institute of Technology. [6966-44]

5:40 pm: Atmospheric invariants for hyperspectral image correction, Mark Bernhardt, William J. Oxford, Christopher A. Steer, Karen M. Brosseau, Waterfall Solutions Ltd. (United Kingdom) . . . . . [6966-45]

POSTERS-Tuesday

Room: Palms Ballroom-Royal . . . . .Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

Informational properties of the masking atmospheric-optical channel over remotely sensed onground objects, Galib A. Huseynov, Azerbaijan National Aerospace Agency (Azerbaijan). . . . . [6966-68]

The multispectral device for a filtration of optical images, Anatoly N. Sviridov, Anatoly M. Filachev, Vladimir P. Ponomarenko, Andrey S. Kononov, Orion Research and Production Association (Russia) . . . . . [6966-69]

Weighted color composite image algorithm for hyperspectral data, Christopher Neylan, The College of New Jersey; Lawrence T. Rush, Susquehanna Univ.; Angel Gutierrez, Stefan A. Robila, Montclair State Univ. . . . . [6966-70]



**Wednesday 19 March**

**SESSION 10**

**Room: Grand 5** ..... **Wed. 8:30 to 10:10 am**

**Spectral Unmixing**

*Session Chair: Miguel Vélez-Reyes, Univ. de Puerto Rico Mayagüez*

8:30 am: **A generalized linear mixing model for hyperspectral imagery**, David B. Gillis, Jeffrey H. Bowles, Naval Research Lab.; Emmett J. Lentilucci, David W. Messinger, Rochester Institute of Technology ..... [6966-46]

8:50 am: **A revised algorithm to compute the constrained positive matrix factorization and its application in unsupervised unmixing of hyperspectral imagery**, Yahya M. Masalmah, Miguel Vélez-Reyes, Univ. de Puerto Rico Mayagüez ..... [6966-47]

9:10 am: **Ground truth data collection for unmixing algorithm evaluation**, Shawn D. Hunt, Univ. de Puerto Rico Mayagüez ..... [6966-48]

9:30 am: **Abundance estimation algorithms on the NVIDIA CUDA technology**, David Gonzalez, Christian Sanchez, Ricardo Veguilla, Nayda G. Santiago, Univ. de Puerto Rico Mayagüez ..... [6966-49]

9:50 am: **High-order statistics-based approaches to endmember extraction for hyperspectral imagery**, Chushih Yu, Univ. of Maryland/Baltimore County; Hsuan Ren, National Central Univ. (Taiwan); Chein-I Chang, Univ. of Maryland/Baltimore County ..... [6966-50]

Coffee Break ..... 10:10 to 10:30 am

**SESSION 11**

**Room: Grand 5** ..... **Wed. 10:30 am to 12:30 pm**

**Spectral Data Analysis Methodologies III**

*Session Chair: Fred A. Kruse, Horizon Geolmaging, LLC*

10:30 am: **Geometric estimation of the inherent dimensionality of a single material cluster in multi- and hyperspectral imagery**, Ariel A. Schlamm, David W. Messinger, William F. Basener, Rochester Institute of Technology. . . [6966-51]

10:50 am: **Projection pursuit-based dimensionality reduction**, Haleh Safavi, Chein-I Chang, Univ. of Maryland/Baltimore County ..... [6966-52]

11:10 am: **Improving the performance of PCA and JPEG2000 for hyperspectral image compression**, Qian Du, Mississippi State Univ. .... [6966-53]

11:30 am: **An FPGA-based demonstration hyperspectral image compression system**, Tom L. Woolston, Gail E. Bingham, Niel S. Holt, Glen Wada, Utah State Univ. .... [6966-54]

11:50 am: **Exploration of component analysis in multi/hyperspectral image processing**, Keng-Hao Liu, Chein-I Chang, Univ. of Maryland/Baltimore County ..... [6966-55]

12:10 pm: **A 2DPCA-based method for automatic selection of hyperspectral image bands for color visualization**, Jason Kaufman, Jacobs Engineering and Ohio Univ.; Mehmet Celenk, Ohio Univ.; Karmon Vongsy, Jacobs Engineering ..... [6966-56]

Lunch/Exhibition Break ..... 12:30 to 1:30 pm

**SESSION 12**

**Room: Grand 5** ..... **Wed. 1:30 to 3:10 pm**

**Modeling and Simulation**

*Session Chair: Glenn E. Healey, Univ. of California/Irvine*

1:30 pm: **Maximum Gaussianity models for hyperspectral images**, Peter Bajorski, Rochester Institute of Technology ..... [6966-57]

1:50 pm: **A simulation tool for hyperspectral thermal IR imaging sensors**, Yit-Tsi Kwan, Technology Service Corp.; Steven C. Sawtelle, Air Force Research Lab.; Uri Bernstein, Technology Service Corp.; Wellesley E. Pereira, David M. Less, ThermoAnalytics, Inc. .... [6966-58]

2:10 pm: **Atmospheric sampling for hyperspectral signature modeling**, Glenn E. Healey, Univ. of California/Irvine; Anthony J. Ratkowski, Air Force Research Lab. .... [6966-59]

2:30 pm: **How to design synthetic images to validate and evaluate hyperspectral imaging algorithms**, Yu-Chenrg C. Chang, Univ. of Maryland/Baltimore County; Hsuan Ren, National Central Univ. (Taiwan); Chein-I Chang, Univ. of Maryland/Baltimore County; Robert S. Rand, National Geospatial-Intelligence Agency ..... [6966-60]

2:50 pm: **Analysis of an autonomous clutter background characterization method for hyperspectral imagery**, Joao M. Romano, U.S. Army Armament Research, Development and Engineering Ctr.; Dalton S. Rosario, Army Research Lab. .... [6966-61]

Coffee Break ..... 3:10 to 3:30 pm

**SESSION 13**

**Room: Grand 5** ..... **Wed. 3:30 to 5:10 pm**

**Detection and Identification II**

*Session Chair: Sylvia S. Shen, The Aerospace Corp.*

3:30 pm: **Statistical methods for analysis of hyperspectral anomaly detection**, Dalton S. Rosario, Army Research Lab. .... [6966-62]

3:50 pm: **Kernel-based constrained energy minimization (KCEM)**, Xiaoli Jiao, Chein-I Chang, Univ. of Maryland/Baltimore County ..... [6966-63]

4:10 pm: **Hyperspectral trace gas detection using the wavelet packet transform**, Mark Z. Salvador, Ronald G. Resmini, Richard B. Gomez, George Mason Univ. .... [6966-64]

4:30 pm: **Hyperspectral remote sensing of chemical warfare agents for homeland security applications**, Dimitris G. Manolakis, David M. Weitz, MIT Lincoln Lab. .... [6966-65]

4:50 pm: **Support vector machines in hyperspectral imaging spectroscopy with application to material identification**, Pilar Beatriz Garcia-Allende, Francisco Anabitarte, Olga M. Conde, Jesus M. Mirapeix, Francisco J. Madruga, Jose M. Lopez-Higuera, Univ. de Cantabria (Spain) ..... [6966-67]

**Related Courses**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC174 **Multispectral Image Processing (Schowengerdt)** Sunday, 8:30 am to 5:30 pm

SC180 **Imaging Polarimetry (Dereniak, Miles, Sabatke)** Monday, 1:30 to 5:30 pm

SC194 **Multispectral and Hyperspectral Image Sensors (Lomheim)** Sunday, 1:30 to 5:30 pm

# Automatic Target Recognition XVIII

Conference Chairs: **Firooz A. Sadjadi**, Lockheed Martin Corp.; **Abhijit Mahalanobis**, Lockheed Martin Missiles and Fire Control

Program Committee: **Mohammad S. Alam**, Univ. of South Alabama; **Farid Amoozegar**, Jet Propulsion Lab.; **Mahmood R. Azimi-Sadjadi**, Colorado State Univ.; **David P. Casasent**, Carnegie Mellon Univ.; **Leon Cohen**, Hunter College/CUNY; **Belur V. Dasarathy**, Consultant; **Frederick D. Garber**, Wright State Univ.; **Guillermo C. Gaunard**, Army Research Lab.; **Izidor Gertner**, City College/CUNY; **Patti S. Gillespie**, Army Research Lab.; **Riad I. Hammoud**, Delphi Corp.; **Bahram Javidi**, Univ. of Connecticut; **Ismail I. Jouny**, Lafayette College; **Behrooz Kamgar-Parsi**, Naval Research Lab.; **Timothy J. Klausutis**, Air Force Research Lab.; **Wolfgang Kober**, Data Fusion Corp.; **Aaron D. Lanterman**, Georgia Institute of Technology; **Randolph L. Moses**, The Ohio State Univ.; **Robert R. Muise**, Lockheed Martin Missiles and Fire Control; **Nasser M. Nasrabadi**, Army Research Lab.; **Leslie M. Novak**, BAE Systems Advanced Information Technologies; **Joseph A. O'Sullivan**, Washington Univ. in St. Louis; **Mubarak Shah**, Univ. of Central Florida; **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Alan J. Van Nevel**, Naval Air Warfare Ctr.; **Bradley C. Wallet**, Automated Decisions LLC; **Edmund G. Zelnic**, Air Force Research Lab.

## Wednesday 19 March

### SESSION 1

Room: San Francisco ..... Wed. 8:00 to 9:30 am

#### Performance Evaluation Methods in ATR I

Session Chair: **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

8:00 am: **The life and death of ATR/sensor fusion and the hope for resurrection** (*Invited Paper*), Steven K. Rogers, Air Force Research Lab. [6967-01]

8:30 am: **Automated registration evaluation system**, Derek R. Lewis, Nelson Fredes, Jeremy A. Weiss, Science Applications International Corp. .... [6967-02]

8:50 am: **Advancement in ATD performance prediction**, Ross S. Eaton, Scott K. Ralph, Magnús S. Snorrason, Charles River Analytics, Inc.; John M. Irvine, Science Applications International Corp.; Steven D. Vanstone, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. .... [6967-03]

9:10 am: **Clutter performance and confuser rejection using distortion-invariant filters for ATR**, Rohit Patnaik, David P. Casasent, Carnegie Mellon Univ. .... [6967-04]

### SESSION 2

Room: San Francisco ..... Wed. 9:30 to 11:10 am

#### Performance Evaluation Methods in ATR II

Session Chair: **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

9:30 am: **Dynamic range compression deconvolution for enhancement of automatic target recognition system performance**, Bahareh Haji-Saeed, Solid State Scientific Corp.; Jed Khoury, Air Force Research Lab.; William D. Goodhue, Univ. of Massachusetts/Lowell; Charles L. Woods, Air Force Research Lab.; John Kierstead, Solid State Scientific Corp. .... [6967-05]

9:50 am: **ROBIN: a platform for evaluating automatic target recognition algorithms, Part 1: overview of the project and presentation of the SAGEM DS competition**, Daniel Duclos, Quentin Guillermin, Sagem SA (France); Jacques Lonnoy, Sagem Defense Securite (France); Frederic Jurie, Ctr. National de la Recherche Scientifique (France); Stephane Herbin, ONERA (France) ... [6967-06]

Coffee Break ..... 10:10 to 10:30 am

10:30 am: **ROBIN: a platform for evaluating automatic target recognition algorithms, Part 2: protocols used for evaluating algorithms and results obtained on the SAGEM DS database**, Daniel Duclos, Quentin Guillermin, Sagem SA (France); Jacques Lonnoy, Sagem Defense Securite (France); Frederic Jurie, Ctr. National de la Recherche Scientifique (France); Stephane Herbin, ONERA (France) .... [6967-07]

10:50 am: **Statistical methods to aid in performance understanding of SAR ATR systems**, Brian A. Geier, Michael B. Hensel, John Gardner, Andrew Morrison, Jacobs Sverdrup Technology, Inc.; Thomas J. Wild, Air Force Research Lab. .... [6967-08]

### SESSION 3

Room: San Francisco ..... Wed. 11:10 am to 12:40 pm

#### Hyper- and Multispectral Methods in ATR

Session Chair: **Patti S. Gillespie**, Army Research Lab.

11:10 am: **Rapid high-performance hyperspectral anomaly detection via global SVDD** (*Invited Paper*), Reuven Meth, SET Corp.; Amit Banerjee, Philippe Burlina, The Johns Hopkins Univ. Applied Physics Lab.; Thomas M. Strat, SET Corp. .... [6967-09]

11:40 am: **Deterministic hyperspectral target detection using the DWT and spectral fringe-adjusted joint transform correlation**, Wesam A. Sakla, Texas A&M Univ.; Adel Sakla, Mohammad S. Alam, Univ. of South Alabama .. [6967-10]

12:00 pm: **A variational level-set method for automatic target detection in hyperspectral images**, Andres Alarcon, Vidya B. Manian, Univ. de Puerto Rico Mayagüez ..... [6967-11]

12:20 pm: **Mine detection in multispectral imagery using PCA and matched filtering**, Mohammad M. Islam, Mohammad S. Alam, Univ. of South Alabama ..... [6967-12]

Lunch/Exhibition Break ..... 12:40 to 1:40 pm

### SESSION 4

Room: San Francisco ..... Wed. 1:40 to 3:10 pm

#### Target Detection and Classification using Active Sensors I

Session Chair: **Alan J. Van Nevel**, Naval Air Warfare Ctr.

1:40 pm: **Active and passive 3D image sensing and visualization** (*Keynote Presentation*), Bahram Javidi, Univ. of Connecticut; Edward A. Watson, Paul F. McManamon, Air Force Research Lab.; Mehdi M. Daneshpanah, Univ. of Connecticut. .... [6967-13]

2:10 pm: **Target recognition using HRR profile-based incoherent SAR (IN-SAR) image formation**, Nicholas A. O'Donoghue, Walter Kuklinski, Constantine Arabadjis, The MITRE Corp. .... [6967-14]

2:30 pm: **Shape-based recognition of targets in synthetic aperture radar images using elliptical Fourier descriptors**, Louis P. Nicoli, Georgios C. Anagnostopoulos, Florida Institute of Technology ..... [6967-15]

2:50 pm: **Analysis of spatially mismatched imagery for synthetic aperture radar ATR classification**, Chad T. Rupp, Shawn D. Halversen, Lee J. Montagnino, Christina L. Hebert, Matthew T. Young, Mary L. Cassabamu, Raytheon Missile Systems ..... [6967-16]

Coffee Break ..... 3:10 to 3:30 pm

## SESSION 5

**Room: San Francisco . . . . . Wed. 3:30 to 4:50 pm**

### Target Detection and Classification using Active Sensors II

*Session Chair: Guillermo C. Gaunaurd, Army Research Lab.*

3:30 pm: **Dimensionality reduction and information-theoretic divergence between sets of lidar images**, David Gray, Air Force Research Lab. . . [6967-17]

3:50 pm: **Detection of buried objects using GPR change detection in polarimetric Huynen spaces**, Firooz A. Sadjadi, Lockheed Martin Corp.; Guillermo C. Gaunaurd, Anders Sullivan, Army Research Lab. . . . . [6967-18]

4:10 pm: **Particle swarm optimization for radar target recognition and modeling**, Ismail I. Jouny, Lafayette College . . . . . [6967-19]

4:30 pm: **Utilization of volume correlation filters for underwater mine identification in LIDAR imagery**, Bradley Walls, Arete Associates . . . . [6967-20]

## SESSION 6

**Room: San Francisco . . . . . Wed. 4:50 to 6:10 pm**

### Correlation-based Methods in ATR

*Session Chair: Robert R. Muise, Lockheed Martin Missiles and Fire Control*

4:50 pm: **Single distortion-invariant log-polar wavelet-modified maximum average correlation height filter for recognition of infrared and visible targets**, Amit Aran, Soumika Munshi, Vinod K. Beri, Arun K. Gupta, Instruments Research and Development Establishment (India) . . . . . [6967-21]

5:10 pm: **Using radial basis functions to set thresholds for segmentation of targets from backgrounds on matched filter correlation surfaces**, Richard P. Edmondson, Michael H. Rodgers, Polaris Sensor Technologies, Inc. . . . [6967-22]

5:30 pm: **Multi-frame adaptive object recognition**, Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control. . . . . [6967-23]

5:50 pm: **A performance comparison of the transform domain Rayleigh quotient quadratic correlation filter (TDRQQCF) approach to the regularized RQCF**, Pradeep Ragothaman, Univ. of Central Florida; Abhijit Mahalanobis, Robert R. Muise, Lockheed Martin Missiles and Fire Control; Wasfy B. Mikhael, Univ. of Central Florida . . . . . [6967-24]

## Thursday 20 March

## SESSION 7

**Room: San Francisco . . . . . Thurs. 8:00 to 9:30 am**

### Advanced Methods in ATR I

*Session Chair: Timothy J. Klausutis, Air Force Research Lab.*

8:00 am: **Fingerprinting vehicles for tracking and verification across non-overlapping views** (*Invited Paper*), Aswin C. Sankaranarayanan, Rama Chellappa, Univ. of Maryland/College Park. . . . . [6967-25]

8:30 am: **Tactical imagery and geospatial data support options for automatic target acquisition**, Nicola K. Broderick, Michael Podlesak, Defence Science and Technology Organisation (Australia); Paul M. Dare, Spatial Scientific Technologies Pty. Ltd. (Australia); Simon D. Jones, Royal Melbourne Institute of Technology (Australia). . . . . [6967-26]

8:50 am: **Bayesian multi-target tracking and sequential object recognition**, Walter Armbruster, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany). . . . . [6967-27]

9:10 am: **A fast 2D/3D algorithm for georegistration and targetting**, Scott A. Merritt, Alan J. Van Nevel, Naval Air Warfare Ctr. . . . . [6967-28]

## SESSION 8

**Room: San Francisco . . . . . Thurs. 9:30 to 11:20 am**

### Advanced Methods in ATR II

*Session Chair: Timothy J. Klausutis, Air Force Research Lab.*

9:30 am: **Automatic target recognition for generalized sensor networks** (*Invited Paper*), Lawrence Carin, Duke Univ. . . . . [6967-29]

Coffee Break . . . . . 10:00 to 10:20 am

10:20 am: **Automatic detection in a maritime environment: gradient filter versus intensity background estimation**, Tanja Y. C. van Valkenburg-Haarst, Koninklijke Marine (Netherlands) and Univ. van Amsterdam (Netherlands); Fok Bolderheij, Koninklijke Marine (Netherlands); Frans C. Groen, Univ. van Amsterdam (Netherlands). . . . . [6967-30]

10:40 am: **Edge feature extraction for ATR using the Helmholtz principle and level set methods**, Arjuna Flenner, NAVAIR . . . . . [6967-31]

11:00 am: **Automatic target recognition from surveillance images using phase mutual information**, Mark R. Pickering, Scott Elmes, Xiuping Jia, Australian Defence Force Academy (Australia). . . . . [6967-32]

## SESSION 9

**Room: San Francisco . . . . . Thurs. 11:20 to 11:50 am**

### Advanced Methods in ATR III

*Session Chair: Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control*

11:20 am: **Biological models for automatic target detection** (*Invited Paper*), Bruce J. Schachter, Northrop Grumman Corp. . . . . [6967-33]

Lunch/Exhibition Break . . . . . 11:50 am to 1:00 pm

## SESSION 10

**Room: San Francisco . . . . . Thurs. 1:00 to 2:20 pm**

### Advanced Methods in ATR IV

*Session Chair: Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control*

1:00 pm: **A semantic approach to the efficient integration of interactive and automatic target recognition systems for the analysis of complex infrastructure from aerial imagery**, Alexander Bauer, Elisabeth Peinsipp-Byma, Fraunhofer-Institut für Informations-und Datenverarbeitung (Germany). . [6967-34]

1:20 pm: **Using non-negative matrix factorization to find informative basis in spin image data**, Andrew J. Patterson, Donald E. Waagen, Nitesh N. Shah, Raytheon Missile Systems . . . . . [6967-35]

1:40 pm: **Object tracking and classification in aerial videos**, Jiangjian Xiao, Hui Cheng, Feng Han, Changjiang Yang, Sarnoff Corp. . . . . [6967-36]

2:00 pm: **Automatic target detection using vector quantization error**, Brian Wemett, VirtualScopics, Inc. . . . . [6967-37]

## SESSION 11

**Room: San Francisco . . . . . Thurs. 2:20 to 4:10 pm**

### Advanced Methods in ATR V

*Session Chair: Izidor Gertner, City College/CUNY*

2:20 pm: **Target detection and tracking using FKT, DCCF and PDCCF and comparing these methods** (*Invited Paper*), Mohammad S. Alam, Melih S. Aslan, Univ. of South Alabama. . . . . [6967-38]

2:50 pm: **Radar echo characteristics of convective and stratiform mixed clouds during formation period in mountainous region**, Yanwei Li, Shengjie Niu, Ning Luo, Jifen Wen, Haojuan Huang, Nanjing Univ. of Science & Technology (China). . . . . [6967-39]

Coffee Break . . . . . 3:10 to 3:30 pm

3:30 pm: **Multi-source feature extraction and target recognition in wireless sensor networks based on adaptive, distributed wavelet compression algorithms**, William S. Hortos, Associates in Communication Engineering Research and Technology. . . . . [6967-40]

3:50 pm: **Combined classification systems for automatic target recognition**, Michael Turnbaugh, Kenneth W. Bauer, Jr., Air Force Institute of Technology . . . . . [6967-41]

**SESSION 12**

**Room: San Francisco . . . . . Thurs. 4:10 to 5:30 pm**

**Advanced Methods in ATR VI**

4:10 pm: **Small unmanned aerial vehicle (UAV) real-time intelligence, surveillance and reconnaissance (ISR) using onboard preprocessing**, Firooz A. Sadjadi, Rick Stevens, Jacob Braegelmann, Alexander Stephens, Ryan Nelson, Aaron Cordes, Lockheed Martin Corp. . . . . [6967-42]

4:30 pm: **Generalized characteristic functions and moments**, Leon Cohen, Hunter College/CUNY . . . . . [6967-44]

4:50 pm: **Assessment of model-based automatic target recognition on real and simulated infrared imagery**, Heiko Seidel, Christoph Stahl, Wolfgang Ensinger, EADS Deutschland GmbH (Germany); Per-Inge Jensen, Paal Skaaren-Fystro, Kirsten Rosseland, Kongsberg Defence & Aerospace AS (Norway); Frode Bjerkeli, Kongsberg Defence & Aerospace AS (Norway). . . . . [6967-43]

5:10 pm: **Prediction and flexible modeling for automatic target recognition**, Andre U. Sokolnikov, Visual Solutions and Applications . . . . . [6967-45]

**Related Courses**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC892 **Infrared Search and Track Systems** (*Schwering*)  
**NEW** Monday, 1:30 to 5:30 pm

SC158 **Fundamentals of Automatic Target Recognition** (*Nasr*) Wednesday,  
8:30 am to 5:30 pm

SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers**  
(*Vollmerhausen*) Monday, 8:30 am to 5:30 pm

SC545 **Infrared Characterization of Sources and Backgrounds** (*Jacobs*)  
Wednesday, 8:30 am to 5:30 pm

SC728 **Network Centric Target Tracking and Classification** (*Drummond*)  
Monday, 8:30 am to 5:30 pm

**Announcement of the  
ATR Best Paper Awards-New in 2008!**

Lockheed Martin Corporation had generously offered to sponsor the Best Paper Awards for the Automatic Target Recognition (ATR) conference, part of the SPIE Defense and Security Symposium, which will be held in Orlando 16-20 March 2008. Two awards are planned: the first is the overall Best Paper Award in the amount of \$4000, and the second is a Best Student Paper Award in the amount of \$1000.

In order to be considered for these awards:

- Presenter must make their oral presentation as scheduled
- Manuscript must be submitted to SPIE no later than 3 March.

In addition to the above requirements, to be considered for the Best Student Paper Award:

- Student must be the presenting author at the conference
- Student must be the leading author of the manuscript
- Student must send a message to the conference chairs identifying themselves as a student, and include your paper number and title. Please send to:

**Firooz Sadajdi- firooz.a.sadjadi@lmco.com**

and

**Abhijit Mahalanobis- abhijit.mahalanobis@lmco.com**

A panel of experts headed by the ATR conference chairs will evaluate all the papers, both for quality and content. Attention will be given to i) the innovation, clarity, and style of both the oral presentation at the conference and the manuscript submitted for publication, and ii) the importance of the work to the field of ATR. The winners will be notified by mail along with the monetary award shortly after all manuscripts have been received and evaluated. They will be recognized in person at the 2009 ATR conference, and will receive a certificate along with a photo-opportunity with Lockheed Martin and SPIE officials.

Sponsored by



**Make time for the  
Defense+Security Exhibition**

*Orlando World Center Marriott Resort & Convention Center  
Cypress/Sago/Sabel Ballrooms*

Tuesday 18 March . . . . . 10:00 am to 5:00 pm

Wednesday 19 March . . . . . 10:00 am to 5:00 pm

Thursday 20 March . . . . . 10:00 am to 2:00 pm

**Don't miss the NEW**

**Robotics+Unmanned Systems Pavilion.**

*See pp. 18-21 for exhibition details.*

# Signal Processing, Sensor Fusion, and Target Recognition XVII

Conference Chair: **Ivan Kadar**, Interlink Systems Sciences, Inc.

Program Committee: **Mark G. Alford**, Air Force Research Lab.; **William Dale Blair**, Georgia Tech Research Institute; **Erik Blasch**, Air Force Research Lab.; **Mark J. Carlotto**, General Dynamics Corp.; **Kuo-Chu Chang**, George Mason Univ.; **Chee-Yee Chong**, BAE Systems Advanced Information Technologies; **Marvin N. Cohen**, Georgia Tech Research Institute; **Mohammad Farooq**, Royal Military College of Canada (Canada); **Charles W. Glover**, Oak Ridge National Lab.; **I. R. Goodman**, Space and Naval Warfare Systems Ctr., San Diego; **Lynne L. Grewe**, California State Univ./East Bay; **Michael L. Hinman**, Air Force Research Lab.; **Kenneth J. Hintz**, George Mason Univ.; **Jon S. Jones**, Air Force Research Lab.; **Thiagalingam Kirubarajan**, McMaster Univ. (Canada); **Martin E. Liggins II**, MITRE Corp.; **Perry C. Lindberg**, Teledyne Brown Engineering; **James Linas**, Univ. at Buffalo; **Ronald P. Mahler**, Lockheed Martin Co./Tactical Systems; **Raj P. Malhotra**, Air Force Research Lab.; **Alastair D. McAulay**, Lehigh Univ.; **Raman K. Mehra**, Scientific Systems Co., Inc.; **Harley R. Myler**, Lamar Univ.; **David Nicholson**, BAE Systems plc (United Kingdom); **Leslie M. Novak**, BAE Systems Advanced Information Technologies; **Andrew G. Tescher**, AGT Associates; **Stelios C. A. Thomopoulos**, National Ctr. for Scientific Research (Greece); **Wiley E. Thompson**, New Mexico State Univ.

## Monday 17 March

### SESSION 1

Room: Grand 4 ..... Mon. 8:00 to 10:20 am

#### Multisensor Fusion, Multitarget Tracking, and Resource Management I

Session Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Thiagalingam Kirubarajan**, McMaster Univ. (Canada); **Mohammad Farooq**, Royal Military College of Canada (Canada)

8:00 am: **Unscented Kalman filter versus extended Kalman filter**, Arjang A. Noushin, Frederick E. Daum, Raytheon Co. .... [6968-01]

8:20 am: **Stochastic differential equations in micro-Doppler for classifying ground targets and dismounted combatants**, Kumaradevan Punithakumar, Nadarajah Nandakumaran, McMaster Univ. (Canada); Mike McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) .... [6968-02]

8:40 am: **A particle filtering approach for convoy tracking in the midst of civilian traffic**, Evangeline Pollard, Benjamin Pannetier, ONERA (France)[6968-03]

9:00 am: **Long-term ground movement prediction by Monte Carlo simulation**, Mark J. Carlotto, General Dynamics Corp. .... [6968-04]

9:20 am: **Monostatic and multistatic sonar fusion for reverberation rejection**, Nadarajah Nandakumaran, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Tom Lang, General Dynamics Canada Ltd. (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) .... [6968-05]

9:40 am: **Estimating target range-Doppler image slope for maneuver indication**, Chun Yang, Sigtem Technology, Inc.; Erik Blasch, Air Force Research Lab. .... [6968-06]

10:00 am: **Effect of sensor bias on space-based bearing-only tracker using unscented Kalman filter**, Thomas M. Clemons III, Kuo-Chu Chang, George Mason Univ. .... [6968-07]

Coffee Break ..... 10:20 to 10:50 am

### SESSION 2

Room: Grand 4 ..... Mon. 10:50 am to 12:30 pm

#### Multisensor Fusion, Multitarget Tracking, and Resource Management II

Session Chairs: **Kenneth J. Hintz**, George Mason Univ.; **Ivan Kadar**, Interlink Systems Sciences, Inc.

10:50 am: **Co-evolutionary data mining fuzzy decision trees for automatic cooperation between UAVs**, James F. Smith III, Naval Research Lab. . [6968-08]

11:10 am: **Sensor management fusion using operating conditions**, Erik Blasch, Air Force Research Lab.; Bart Kahler, General Dynamics Advanced Information Systems. .... [6968-09]

11:30 am: **Task benefit calculation using information gain in sensor management**, Peter J. Shea, Joe Kirk, Dave Welchons, Black River Systems Company, Inc. .... [6968-10]

11:50 am: **Evaluation of an information-based sensor management system**, Jonathan P. Malachowski, Kenneth J. Hintz, George Mason Univ. .... [6968-11]

12:10 pm: **Collaborative distributed sensor management and information exchange flow control for multitarget tracking using Markov decision processes**, Dmitry Akselrod, Abhijit Sinha, Thiagalingam Kirubarajan, McMaster Univ. (Canada). .... [6968-12]

Lunch Break ..... 12:30 to 1:30 pm

### SESSION 3

Room: Grand 4 ..... Mon. 1:30 to 2:50 pm

#### Assisted Target Recognition (ATR) I

Session Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Kenneth J. Hintz**, George Mason Univ.

1:30 pm: **Experimental ATR performance evaluation under different operational conditions**, Yin Chen, Intelligent Automation, Inc.; Erik Blasch, Air Force Research Lab.; Huimin Chen, Univ. of New Orleans; Tao Qian, Genshe Chen, Intelligent Automation, Inc. .... [6968-13]

1:50 pm: **Moving target detection and recognition from EO images**, Xiaokun Li, Genshe Chen, Intelligent Automation, Inc.; Khanh D. Pham, Erik Blasch, Air Force Research Lab. .... [6968-14]

2:10 pm: **Generation of realistic 3D object models from multisensor data for target recognition**, Carmen Witte, Walter Armbruster, Klaus M. Jäger, Marcus Hebel, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany) .... [6968-15]

2:30 pm: **Evaluating automated image analysis technology**, Peter J. Doucette, National Geospatial-Intelligence Agency and ITT Corp.; John M. Irvine, National Geospatial-Intelligence Agency; James D. Leonard, Jr., Air Force Research Lab.; Ann Martin, National Geospatial-Intelligence Agency. .... [6968-16]

Coffee Break ..... 2:50 to 3:20 pm

### SESSION 4

Room: Grand 4 ..... Mon. 3:20 to 4:40 pm

#### Assisted Target Recognition (ATR) II

Session Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Kenneth J. Hintz**, George Mason Univ.

3:20 pm: **On the limits of target recognition in the presence of atmospheric effects**, Xiaohan Chen, Natalia A. Schmid, West Virginia Univ. .... [6968-17]

3:40 pm: **A distributed automatic target recognition system using multiple low resolution sensors**, Zhanfeng Yue, Pankaj Topiwala, FastVDO LLC[6968-18]

4:00 pm: **Multi-viewpoint image fusion for urban sensing applications**, Fauzia Ahmad, Moeness G. Amin, Villanova Univ. .... [6968-19]

4:20 pm: **Virtual simulation tools for artillery**, Patrick Gozard, Emmanuel Bret, DGA/DSP/Tour DGA (France) .... [6968-20]

**Invited Panel Discussion**

**Room: Grand 4** ..... Mon. 7:00 to 9:45 pm

**Issues and Challenges in Performance Assessment of Multitarget Tracking Algorithms with Applications to Real-World Problems**

*Organizer:* **Ivan Kadar**, Interlink Systems Sciences, Inc.

*Panel Moderators:* **Ivan Kadar**, Interlink Systems Sciences, Inc.,  
**William Dale Blair**, Georgia Tech Research Institute

*Panelists:* **William Dale Blair**, Georgia Tech Research Institute;  
**Erik P. Blasch**, Air Force Research Lab.;

**Chee-Yee Chong**, BAE Systems Advanced Information Technologies;  
**Oliver Drummond**, CyberRnD, Inc.;

**Ivan Kadar**, Interlink Systems Sciences, Inc.;

**Thiagalingam Kirubarajan**, McMaster Univ. (Canada);  
**Xio-Rong Li**, Univ. of New Orleans;  
**Ronald P. Mahler**, Lockheed Martin Corp.

**Tuesday 18 March**

**SESSION 6**

**Room: Grand 4** ..... Tues. 8:00 to 9:00 am

**Multisensor Fusion Methodologies and Applications I**

*Session Chair:* **Ronald P. Mahler**, Lockheed Martin Corp.

8:00 am: **Multitarget-moment filters for nonstandard measurement models**, Ronald P. Mahler, Lockheed Martin Corp. .... [6968-21]

8:20 am: **Joint search and sensor management for geosynchronous satellites**, Aleksandar Zatezalo, Adel I. El-Fallah, Scientific Systems Co., Inc.; Ronald P. Mahler, Lockheed Martin Corp.; Raman K. Mehra, Scientific Systems Co., Inc.; Khanh D. Pham, Air Force Research Lab. .... [6968-22]

8:40 am: **Dynamic sensor management of dispersed and disparate sensors for tracking resident space objects**, Adel I. El-Fallah, Aleksandar Zatezalo, Scientific Systems Co., Inc.; Ronald P. Mahler, Lockheed Martin Corp.; Raman K. Mehra, Scientific Systems Co., Inc.; Delia Donatelli, Air Force Research Lab. .... [6968-23]

**Symposium-Wide Plenary Presentation**

**Room: Palms Ballroom, Canary** ..... Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

*See p. 6 for details.*

Coffee Break ..... 10:00 to 10:30 am

**SESSION 7**

**Room: Grand 4** ..... Tues. 10:30 to 11:30 am

**Multisensor Fusion Methodologies and Applications II**

*Session Chair:* **Ronald P. Mahler**, Lockheed Martin Corp.

10:30 am: **An initial investigation into incorporating human reports into a road-constrained random set tracker**, David W. Winters, James Witkoskie, Walter Kuklinski, The MITRE Corp. .... [6968-31]

10:50 am: **Service-based extensions to the JDL fusion model**, Richard T. Antony, Science Applications International Corp.; Joseph A. Karakowski, U.S. Army ..... [6968-25]

11:10 am: **Handling target obscuration through Markov chain observations**, Michael A. Kouritzin, Dandan Luo, Biao Wu, Univ. of Alberta (Canada) . . [6968-26]

Lunch/Exhibition Break ..... 11:30 am to 1:00 pm

**SESSION 8**

**Room: Grand 4** ..... Tues. 1:00 to 2:20 pm

**Multisensor Fusion Methodologies and Applications III**

*Session Chairs:* **Martin E. Liggins II**, MITRE Corp.;

**Chee-Yee Chong**, BAE Systems Advanced Information Technologies;  
**Michael L. Hinman**, Air Force Research Lab.

1:00 pm: **Statistical, biological and categorical sensor fusion: an integrated methodology**, James R. Bonick, Christopher Marshall, U.S. Army Night Vision & Electronic Sensors Directorate ..... [6968-27]

1:20 pm: **A framework for confidence in classification**, Nathan J. Leap, Kenneth W. Bauer, Jr., Air Force Institute of Technology ..... [6968-28]

1:40 pm: **The confidence manifold of an ROC manifold**, Mark E. Oxley, Steven N. Thorsen, Air Force Institute of Technology; Christine M. Schubert, Virginia Commonwealth Univ. .... [6968-29]

2:00 pm: **ROC manifolds of multiple fused independent classification systems**, Mark E. Oxley, Air Force Institute of Technology ..... [6968-30]

**SESSION 9**

**Room: Grand 4** ..... Tues. 2:20 to 4:10 pm

**Multisensor Fusion Methodologies and Applications IV**

*Session Chairs:* **Martin E. Liggins II**, MITRE Corp.;

**Chee-Yee Chong**, BAE Systems Advanced Information Technologies;  
**Michael L. Hinman**, Air Force Research Lab.

2:20 pm: **Structured pedigree information for distributed fusion systems**, Pablo O. Arambel, BAE Systems Advanced Information Technologies . . [6968-24]

2:40 pm: **Analytical performance evaluation for autonomous sensor fusion**, Kuo-Chu Chang, George Mason Univ.; Martin E. Liggins II, MITRE Corp. [6968-32]

3:00 pm: **Convergence study of message passing in arbitrary continuous Bayesian networks**, Wei Sun, Kuo-Chu Chang, George Mason Univ. . . [6968-33]

Coffee Break ..... 3:20 to 3:50 pm

3:50 pm: **Algebra of Dempster-Shafer evidence accumulation**, Andrzej K. Brodzik, Robert H. Enders, The MITRE Corp. .... [6968-34]

**SESSION 10**

**Room: Grand 4** ..... Tues. 4:10 to 5:10 pm

**Multisensor Fusion Methodologies and Applications V**

*Session Chairs:* **Michael L. Hinman**, Air Force Research Lab.;

**Ivan Kadar**, Interlink Systems Sciences, Inc.

4:10 pm: **Incorporation of indirect evidence into an evidence accrual technique for higher level data fusion**, Stephen C. Stubberud, Rockwell Collins, Inc.; Kathleen A. Kramer, Univ. of San Diego ..... [6968-36]

4:30 pm: **Results from levels 2/3 fusion implementations: issues, challenges, retrospectives and perspectives for the future**, Ivan Kadar, Interlink Systems Sciences, Inc.; Eloi Bossé, Defence R&D Canada/Valcartier (Canada); John J. Salerno, Jr., Air Force Research Lab.; Dale Lambert, Defence Science and Technology Organisation (Australia); Subrata Das, Charles River Analytics, Inc.; Enrique H. Ruspini, SRI International; Bradley J. Rhodes, BAE Systems Advanced Information Technologies; Joachim Biermann, Research Establishment for Applied Science (Germany) ..... [6968-37]

4:50 pm: **A collaborative eye to the future**, Kshanti Greene, Stottler Henke Associates, Inc. .... [6968-38]

**POSTERS-Tuesday**

**Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm**

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**A real-time geographical information exchange system with PDA**, Jun He, Bo Sun, Beijing Normal Univ. (China) . . . . . [6968-60]

**Object recognition in infrared image sequences using scale invariant feature transform**, Changhan Park, Samsung Thales Co., Ltd. (South Korea) . . [6968-61]

**Image fusion in infrared image and visual image using normalized mutual information**, Changhan Park, Jae-Ik Lee, Samsung Thales Co., Ltd. (South Korea); Jik-Han Jung, Dong-Jo Park, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6968-62]

**Dynamic fusion with Gabor-filtered images**, Alan R. Pinkus, Air Force Research Lab. . . . . [6968-63]

**Correlating military operators' visual demands with multispectral image fusion**, Gary L. Martinsen, Jonathon S. Hosket, Mathew W. Swinney, Alan R. Pinkus, Air Force Research Lab. . . . . [6968-64]

**Color transfer algorithm based on gray and edge value for popping out hot targets in dual-band color night vision**, LingXue Wang, Yuan-Meng Zhao, Wei-Qi Jin, Shi-Ming Shi, Beijing Institute of Technology (China); Zhenyu Chu, Dayang Technology Development Inc. (China) . . . . . [6968-65]

**Multi-sensory data exploitation using advanced image fusion and adaptive colorization**, Yufeng Zheng, Alcorn State University; Kwabena Agyepong, Alcorn State Univ.; Ognjen Kuljaca, Alcorn State University . . . . . [6968-66]

**Multimode sensor processing on a dynamically reconfigurable massively parallel processor array**, Paul Y. Chen, Michael Butts, Brad Budlong, Ambric, Inc. . . . . [6968-67]

**Wednesday 19 March**

**SESSION 11**

**Room: Grand 4 . . . . . Wed. 8:00 to 11:50 am**

**Signal and Image Processing I**

*Session Chairs:* **Lynne L. Grewe**, California State Univ./East Bay;  
**Alastair D. McAulay**, Lehigh Univ. ;  
**Mark G. Alford**, Air Force Research Lab.

8:00 am: **Efficient superresolution image reconstruction applied to surveillance video captured by small unmanned aircraft systems**, Qiang He, Richard R. Schultz, Univ. of North Dakota; Henry C. Chu, Univ. of Louisiana at Lafayette . . . . . [6968-39]

8:20 am: **Superresolution image reconstruction from UAS surveillance video through affine invariant interest point-based motion estimation**, Qiang He, Richard R. Schultz, Yi Wang, Aldo Camargo, Florent Martel, Univ. of North Dakota . . . . . [6968-40]

8:40 am: **A smart iterative algorithm for multisensor image registration**, Stephen P. DelMarco, Victor Tom, Helen F. Webb, BAE Systems Advanced Information Technologies; Todd Jenkins, Air Force Research Lab. . . . . [6968-41]

9:00 am: **Three-dimensional organization of 2D urban imagery**, Peter L. Cho, MIT Lincoln Lab. . . . . [6968-42]

9:20 am: **Fusing images and maps**, Mark J. Carlotto, General Dynamics Corp. . . . . [6968-43]

9:40 am: **An investigation of image fusion algorithms using a visual performance-based image evaluation methodology**, Kelly E. Neriani, Alan R. Pinkus, Air Force Research Lab.; David W. Dommert, General Dynamics Advanced Information Systems . . . . . [6968-44]

Coffee Break . . . . . 10:00 to 10:30 am

10:30 am: **Compressive sensing technique for high-resolution radar imaging**, Yeo-Sun Yoon, Moeness G. Amin, Villanova Univ. . . . . [6968-45]

10:50 am: **Target detection from MPEG video based on low-rank filtering in the compressed domain**, Teeradache Viangteeravat, Amir H. Shirkhodaie, Tennessee State Univ. . . . . [6968-46]

11:10 am: **Fast algorithms for video target detection and tracking**, Changchun Li, Jennie Si, Arizona State Univ.; Glen P. Abousleman, General Dynamics C4 Systems. . . . . [6968-47]

11:30 am: **Interval least-squares filtering with applications to video target tracking**, Baohua Li, Changchun Li, Jennie Si, Arizona State Univ.; Glen P. Abousleman, General Dynamics C4 Systems. . . . . [6968-48]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

**SESSION 12**

**Room: Grand 4 . . . . . Wed. 1:30 to 3:10 pm**

**Signal and Image Processing II**

*Session Chairs:* **Alastair D. McAulay**, Lehigh Univ. ;  
**Lynne L. Grewe**, California State Univ./East Bay;  
**Mark G. Alford**, Air Force Research Lab.

1:30 pm: **Frustrated polarization fiber Sagnac interferometer displacement sensor**, Alastair D. McAulay, Lehigh Univ. . . . . [6968-50]

1:50 pm: **On modeling sea clutter by diffusive models**, Jing Hu, Univ. of Florida; Wen-wen Tung, Purdue Univ.; Jianbo Gao, Univ. of Florida; Robert S. Lynch, Jr., Naval Undersea Warfare Ctr.; Genshe Chen, Intelligent Automation, Inc. [6968-51]

2:10 pm: **On modeling sea clutter by noisy chaotic dynamics**, Wen-wen Tung, Purdue Univ.; Jing Hu, Jianbo Gao, Univ. of Florida; Robert S. Lynch, Jr., Naval Undersea Warfare Ctr.; Genshe Chen, Intelligent Automation, Inc. . . . . [6968-52]

2:30 pm: **Identification and localization of potential mortar events**, Sachi V. Desai, Myron E. Hohil, U.S. Army Research, Development and Engineering Command . . . . . [6968-53]

2:50 pm: **Localizing to potential chemical/biological events while on the move using acoustics**, Sachi V. Desai, U.S. Army Research, Development and Engineering Command . . . . . [6968-54]

Coffee Break . . . . . 3:10 to 3:30 pm

**SESSION 13**

**Room: Grand 4 . . . . . Wed. 3:30 to 4:50 pm**

**Signal and Image Processing III**

*Session Chairs:* **Mark G. Alford**, Air Force Research Lab. ;  
**Lynne L. Grewe**, California State Univ./East Bay;  
**Alastair D. McAulay**, Lehigh Univ.

3:30 pm: **The use of interferoceiver for the prevention of fratricide in missile defense**, Ming-Chiang Li, Liceimer. . . . . [6968-55]

3:50 pm: **High-resolution reconstruction of radar/SAR imagery: aggregation of robust regularization with neural computing**, Yuriy V. Shkvarok, Ctr. de Investigación y de Estudios Avanzados (Mexico) . . . . . [6968-56]

4:10 pm: **Empirical performance of spectral independent morphological adaptive classifier using tactical missile signatures**, Joel B. Montgomery, Christine Montgomery, M & M Aviation; Richard B. Sanderson, Air Force Research Lab. . . . . [6968-57]

4:30 pm: **Comparison of theoretical and empirical statistics of wind measurements with validation lidar (VALIDAR)**, Jeffrey Y. Beyon, California State Univ./Los Angeles; Grady J. Koch, NASA Langley Research Ctr. . . [6968-59]

**Related Courses**

**Registration is required.**  
See SPIE Cashier for full course description or to Register.

SC158 **Fundamentals of Automatic Target Recognition (Nasr)** Wednesday, 8:30 am to 5:30 pm

SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers (Vollmerhausen)** Monday, 8:30 am to 5:30 pm

SC728 **Network Centric Target Tracking and Classification (Drummond)** Monday, 8:30 am to 5:30 pm

# Conference 6969 · Room: Grand 6

Tuesday-Thursday 18-20 March 2008 • Proceedings of SPIE Vol. 6969

## Signal and Data Processing of Small Targets 2008

Conference Chair: **Oliver E. Drummond**, Consulting Engineer

Conference Co-Chair: **Richard D. Teichgraber**, Lockheed Martin Corp.

Program Committee: **Liyi Dai**, U.S. Army Research Office; **Darren K. Emge**, U.S. Army Edgewood Chemical Biological Ctr.; **Charles W. Glover**, Oak Ridge National Lab.; **Lawrence E. Hoff**, Hoff Engineering; **Denise L. Jones**, U.S. Army Space and Missile Defense Command; **Cornelius T. Leondes**, Univ. of California/Los Angeles; **Rabinder N. Madan**, Office of Naval Research; **Steven W. Waugh**, Defense Threat Reduction Agency

### Luncheon Dialogues

Lunch breaks on Tuesday, Wednesday, and Thursday will provide an opportunity to meet in a small group with one or two distinguished individuals who will lead discussions on a topic of signal and data processing algorithms. Tables will be reserved for a no-host lunch. Make reservations at the entrance to the main conference room beginning Tuesday morning, 18 March.

### Conference Location Will Alternate Each Year

In the year 2008, this conference is located in Orlando. Thereafter, it will alternate between San Diego in the Summer in odd years and Orlando in the Spring in even years.

### Internet Web Posting

Program changes, workshop announcements, and the latest information about this conference will be posted on the Internet World Wide Web at: <http://home.att.net/~drummond/>

## Tuesday 18 March

### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen,**

Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break . . . . . 10:00 to 10:30 am

### SESSION 1

Room: Grand 6 . . . . . Tues. 10:30 am to 12:10 pm

#### Signal Processing

Session Chairs: **Steven W. Waugh**, Defense Threat Reduction Agency;  
**Darren K. Emge**, U.S. Army Edgewood Chemical Biological Ctr.

10:30 am: **An advanced missile warning processing suite**, Joel B. Montgomery, M & M Aviation; Richard B. Sanderson, John F. McCalmont, Air Force Research Lab. . . . . [6969-01]

10:55 am: **A benchmark data suite for chemical and biological (Chem/Bio) defense applications**, Darren K. Emge, U.S. Army Edgewood Chemical Biological Ctr.; Steven W. Waugh, Defense Threat Reduction Agency; Mohamed-Adel M. Slamani, Brian Fisk, Tom Chyba, ITT Industries, Inc. . . . . [6969-02]

11:20 am: **Chemical detection and classification in Raman spectra**, Steven Kay, Cuichun Xu, Univ. of Rhode Island; Darren K. Emge, U.S. Army Edgewood Chemical Biological Ctr. . . . . [6969-03]

11:45 am: **Detection of small objects in multilayered infrared images**, Jing Wang, Shangqi Bao, Jason F. Ralph, John Y. Goulermas, The Univ. of Liverpool (United Kingdom). . . . . [6969-04]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

### SESSION 2

Room: Grand 6 . . . . . Tues. 1:30 to 5:25 pm

#### Signal/Track Processing

Session Chairs: **Steven W. Waugh**, Defense Threat Reduction Agency;  
**Darren K. Emge**, U.S. Army Edgewood Chemical Biological Ctr.

1:30 pm: **Target detection by distributed sensors-distributed sensor concept for small target detection**, Michael K. Rafailov, PSI RICHER, Inc. . . . . [6969-05]

1:55 pm: **Hyperspectral-aided small target tracking**, Michael J. Mendenhall, Neil A. Soliman, Air Force Institute of Technology . . . . . [6969-06]

2:20 pm: **Multiframe superresolution and nonlinear estimation for closely spaced object resolution**, Linda A. Floyd, Randy C. Paffenroth, Numerica Corp. . . . . [6969-07]

2:45 pm: **Pixel decomposition for tracking in low-resolution videos**, Vivekanand Govinda, Jason F. Ralph, Joe W. Spencer, John Y. Goulermas, The Univ. of Liverpool (United Kingdom); Alaa M. Abbas, Menoufia Univ. (Egypt) . . . . . [6969-08]

Coffee Break . . . . . 3:10 to 3:45 pm



3:45 pm: **Discriminating small extended targets at sea from clutter and other classes of boats in infrared and visual light imagery**, Sebastiaan P. van den Broek, Henri Bouma, Marianne A. C. Degache, TNO Defence, Security and Safety (Netherlands) . . . . . [6969-09]

4:10 pm: **A recurrent velocity filter for detecting large numbers of moving objects**, Reid B. Porter, Edward Rosten, Rohan C. Loveland, Los Alamos National Lab. . . . . [6969-10]

4:35 pm: **Feature-aided target tracking in an urban environment**, Thomas Lenz, Juan R. Vasquez, Air Force Institute of Technology . . . . . [6969-11]

5:00 pm: **Robust method for detecting an infrared small moving target based on the facet-based model**, Hwal-Suk Lee, Seok-Kon Kim, Dong-Jo Park, Korea Advanced Institute of Science and Technology (South Korea); Changhan Park, Samsung Thales Co., Ltd. (South Korea) . . . . . [6969-12]

## POSTERS-Tuesday

**Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm**

*All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.*

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## Oral Standby/Poster Presentations

**Optical recognition of biological agents**, Chris W. Baumgart, Kim D. Linder, Honeywell, Inc. . . . . [6969-42]

**Small-object hyperspectral detection from low-flying UAV**, Jeremy J. Murray-Krezan, SFA, Inc.; Jonathan G. Neumann, Robert A. Leathers, Melvin R. Krueger, Naval Research Lab. . . . . [6969-43]

**Suppression of subpixel jitter fluctuations using temporal whitening**, Steven M. Adler-Golden, Steven C. Richtsmeier, Robert M. Shroll, Spectral Sciences, Inc. . . . . [6969-44]

**Tracking with poorly localized sensors in multistatic sensor networks**, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Tom Lang, General Dynamics Canada Ltd. (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) . . . . . [6969-46]

**Surveillance by multiple cooperative UAVs in adversarial environments**, Xin Tian, Yaakov Bar-Shalom, Univ. of Connecticut; Abhijit Sinha, McMaster Univ. (Canada); Krishna R. Pattipati, Univ. of Connecticut . . . . . [6969-47]

**Passive tracking with sensors of opportunity using PCL**, Maheswaran Subramaniam, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Mike McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) . . . . . [6969-48]

**Differential geometry measures of nonlinearity for the video filtering problem**, Mahendra K. Mallick, Science Applications International Corp.; Barbara F. La Scala, The Univ. of Melbourne (Australia) . . . . . [6969-49]

**Concurrent MAP data association and absolute bias estimation with an arbitrary number of sensors**, Bret D. Kragel, Aubrey B. Poore, Shawn M. Herman, Scott Danford, Numerica Corp. . . . . [6969-50]

**Out-of-sequence measurement updates for multi-hypothesis tracking algorithms**, Stephanie Chan, Randy C. Paffenroth, Numerica Corp. . . . . [6969-51]

## Poster Presentations

**Robust scale invariant small target detection using the Laplacian scale-space theory**, Sungho Kim, Yukyung Yang, Joo-Hyoung Lee, Yong-Chan Park, Agency for Defense Development (South Korea) . . . . . [6969-52]

**A real-time small target detection algorithm in large field and deep sky**, Jin Zhou, Qin-zhang Wu, Mei Yang, Pin Jiang, Institute of Optics and Electronics (China) . . . . . [6969-54]

**Demonstrations and Open Discussion**  
**Room: Grand 6 . . . . . Tues. 8:00 to 10:00 pm**  
**Signal and Data Processing**  
*Moderator: Oliver E. Drummond, Consulting Engineer*

## Wednesday 19 March

### SESSION 3

**Room: Grand 6 . . . . . Wed. 8:30 am to 12:00 pm**

### Target Tracking

*Session Chair: Richard D. Teichgraeber, Lockheed Martin Corp.*

8:30 am: **Conference Overview (Presentation Only)**, O. E. Drummond, Consulting Engineer . . . . . [6969-100]

8:55 am: **Removal of bias due to propagation of estimates through nonlinear mappings**, Trond Jorgensen, Ronald L. Rothrock, SPARTA, Inc. . . . . [6969-13]

9:20 am: **Improving multiple target tracking in structured environments using velocity priors**, Rohan C. Loveland, Edward Rosten, Reid B. Porter, Los Alamos National Lab. . . . . [6969-14]

9:45 am: **Multisensor range-only tracking for a distributed architecture of imaging sensors**, Thomas L. Homsley, Radiance Technologies, Inc. . . . . [6969-45]

Coffee Break . . . . . 10:10 to 10:45 am

10:45 am: **Assurance regions in tracking**, David D. Sworder, Univ. of California/San Diego; John E. Boyd, Cubic Corp.; Robert G. Hutchins, Naval Postgraduate School . . . . . [6969-16]

11:10 am: **Spline filter for multidimensional nonlinear/non-Gaussian Bayesian tracking**, Kumaradevan Punithakumar, McMaster Univ. (Canada); Mike McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) . . . . . [6969-17]

11:35 am: **Tracking extended targets with and without clustering**, Edmund F. Brekke, Oddvar Hallingstad, Norwegian Univ. of Science and Technology (Norway); John H. Glatte, Kongsberg Simrad Maritime AS (Norway) . . . . . [6969-18]

Lunch/Exhibition Break . . . . . 12:00 to 1:30 pm

### SESSION 4

**Room: Grand 6 . . . . . Wed. 1:30 to 5:25 pm**

### Multiple Sensor Processing

*Session Chairs: Liyi Dai, U.S. Army Research Office; Charles W. Glover, Oak Ridge National Lab.*

1:30 pm: **Game theoretic target assignment approach in ballistic missile defense**, Genshe Chen, Mo Wei, Intelligent Automation, Inc.; Khanh D. Pham, Erik Blasch, Air Force Research Lab. . . . . [6969-19]

1:55 pm: **Multihypothesis multiresolutional registration for ballistic missile defense**, Shan Cong, Lang Hong, Wright State Univ. . . . . [6969-20]

2:20 pm: **Integrated bias removal and sensor calibration in passive radar systems**, Maheswaran Subramaniam, Kumaradevan Punithakumar, McMaster Univ. (Canada); Mike McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) . . . . . [6969-21]

2:45 pm: **Determining the optimal time frame for multisensor track correlation**, Lisa M. Ehrman, William D. Blair, Georgia Tech Research Institute . . . . . [6969-22]

Coffee Break . . . . . 3:10 to 3:45 pm

3:45 pm: **Accurate 3D extended target motion and structure estimation by using GMTI/HRR with template information**, Shunguang Wu, Sarnoff Corp.; Lang Hong, Wright State Univ. . . . . [6969-23]

4:10 pm: **Joint path planning and sensor subset selection for multistatic sensor networks**, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Tom Lang, General Dynamics Canada Ltd. (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) . . . . . [6969-24]

4:35 pm: **Aspect aware UAV detection and tracking**, Christian R. Berger, Shengli Zhou, Peter K. Willett, Univ. of Connecticut. . . . . [6969-25]

5:00 pm: **Efficiency and sensitivity of methods for assessing ambiguity in data association decisions**, Bret D. Kragel, Shawn M. Herman, Numerica Corp. . . . . [6969-26]

Thursday 20 March

SESSION 5

Room: Grand 6 ..... Thurs. 8:30 am to 12:00 pm

Sensor Data Fusion

Session Chair: Rabinder N. Madan, Office of Naval Research

8:30 am: Multitarget multisensor tracking in an urban environment: a closed-loop approach, Patricia R. Barbosa, Edwin K. P.Chong, Colorado State Univ.; Sofia Suvorova, Bill Moran, The Univ. of Melbourne (Australia) ..... [6969-27]

8:55 am: Comparison of track-to-track fusion algorithms using video sensors on multiple unmanned aerial vehicles, Mahendra K. Mallick, Science Applications International Corp.; Kuo-Chu Chang, George Mason Univ.. [6969-28]

9:20 am: Track fusion with feedback for local trackers using MHT, Daniel G. Danu, Abhijit Sinha, Thiagalingam Kirubarajan, McMaster Univ. (Canada)[6969-29]

9:45 am: Analysis of scan and batch processing approaches to static fusion in sensor networks, Marco Guerriero, Univ. of Connecticut; Stefano P. Coraluppi, NATO Undersea Research Ctr. (Italy); Peter K. Willett, Univ. of Connecticut. .... [6969-30]

Coffee Break ..... 10:10 to 10:45 am

10:45 am: Sequential track-to-track fusion algorithm: exact solution and approximate implementation, Xin Tian, Yaakov Bar-Shalom, Univ. of Connecticut ..... [6969-31]

11:10 am: Covariance compensation for measurement misassociations: alternative data association algorithms, Oliver E. Drummond, CyberRnD, Inc..... [6969-32]

11:35 am: Distributed multiple-hypothesis correlation and feedback with applications to video data, Kyle M. Tarplee, David J. Trawick, Shawn M. Herman, Numerica Corp. .... [6969-33]

Lunch Break ..... 12:00 to 1:30 pm

SESSION 6

Room: Grand 6 ..... Thurs. 1:30 to 5:25 pm

Signal and Data Processing

Session Chairs: Oliver E. Drummond, Consulting Engineer; Denise L. Jones, U.S. Army Space and Missile Defense Command

1:30 pm: Tracking and classification using aspect-dependent RCS and kinematic data, Sivagnanam Sutharsan, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Tom Lang, General Dynamics Canada Ltd. (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada)..... [6969-34]

1:55 pm: Scene context-aided tracking in an urban environment with persistent video, Juan R. Vasquez, Air Force Institute of Technology . . [6969-35]

2:20 pm: A distributed database view of network tracking systems, Jason Yosinski, Randy C. Paffenroth, Numerica Corp..... [6969-36]

2:45 pm: Trade-off of covariance compensation methods for misassociation versus complexity, Oliver E. Drummond, CyberRnD, Inc. .... [6969-37]

Coffee Break ..... 3:10 to 3:45 pm

3:45 pm: Efficient data association for move-stop-move target tracking, Thuraiappah Sathyan, McMaster Univ. (Canada); Mike McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) ..... [6969-38]

4:10 pm: Particle flow for nonlinear filters with log-homotopy, Frederick E. Daum, Jim Huang, Raytheon Co. .... [6969-39]

4:35 pm: Performance metrics for separation point estimates and track parent-child relationships in multiple target tracking, Susan A. Frost, Darin T. Dunham, Vectraxx; William D. Blair, Georgia Tech Research Institute... [6969-40]

5:00 pm: The probability of misassociation between neighboring targets, Javier A. Areta, Yaakov Bar-Shalom, Univ. of Connecticut; Ronald L. Rothrock, SPARTA, Inc..... [6969-41]

Related Courses

Registration is required.

See SPIE Cashier for full course description or to Register.

SC158 Fundamentals of Automatic Target Recognition (Nasr) Wednesday, 8:30 am to 5:30 pm

SC181 Predicting Target Acquisition Performance of Electro-Optical Imagers (Vollmerhausen) Monday, 8:30 am to 5:30 pm

SC728 Network Centric Target Tracking and Classification (Drummond) Monday, 8:30 am to 5:30 pm



# Algorithms for Synthetic Aperture Radar Imagery XV

Conference Chair: **Edmund G. Zelnio**, Air Force Research Lab.; **Frederick D. Garber**, Wright State Univ.

Program Committee: **Bir Bhanu**, Univ. of California/Riverside; **Mujdat Çetin**, Sabanci Univ. (Turkey); **Dan E. Dudgeon**, BAE Systems plc; **Gil J. Ettinger**, BAE Systems Advanced Information Technologies; **Robert A. Hummel**, Booz Allen Hamilton; **Charles V. Jakowatz, Jr.**, Sandia National Labs.; **Eric R. Keydel**, Science Applications International Corp.; **John M. Miller**, Army Research Lab.; **Randolph L. Moses**, The Ohio State Univ.; **Brian D. Rigling**, Wright State Univ.; **Timothy D. Ross**, Air Force Research Lab.; **Gerard W. Titi**, BAE Systems Advanced Information Technologies; **Stephen P. Welby**, DARPA; **Robert L. Williams**, Air Force Research Lab.

## Innovative Format

Once again, this conference will follow a “Briefing, Poster Workshop, Panel Discussion” format. During the first sessions of each day, authors will highlight the results for their work in 10 minute briefings. After the presentations, these same authors will be available for in-depth discussions in an extended poster session setting. After the Poster Workshop, there will be a Panel Discussion where experts and audience will address pressing issues from the sessions that day.

## Monday 17 March

### Prolog

**Room: Chicago/Denver. . . . . Mon. 8:25 to 8:30 am**

Session Chair: **Edmund G. Zelnio**, Air Force Research Lab.

### Session Introduction

**Room: Chicago/Denver. . . . . Mon. 8:30 to 8:35 am**

Session Chair: **Randolph L. Moses**, The Ohio State Univ.

### SESSION 1

**Room: Chicago/Denver. . . . . Mon. 8:35 to 10:35 am**

#### Invited Session: Sparse Recognition for Imaging

Session Chair: **Randolph L. Moses**, The Ohio State Univ.

- 8:35 am: **Compressive sensing and RADAR** (*Invited Paper*), Richard G. Baraniuk, Rice Univ. . . . . [6970-01]
- 9:05 am: **Sparse reconstruction for RADAR** (*Invited Paper*), Lee C. Potter, The Ohio State Univ. . . . . [6970-02]
- 9:35 am: **Mono- and multistatic polarimetric sparse aperture SAR imaging**, Stuart DeGraph, Charles Twigg, Louis C. Phillips, Essex Corp. . . . . [6970-03]
- 9:45 am: **Joint space aspect reconstruction of wide-angle SAR exploiting sparsity**, Ivana Stojanovic, W. Clem Karl, Boston Univ.; Mujdat Çetin, Sabanci Univ. (Turkey). . . . . [6970-04]
- 9:55 am: **Basis pursuit versus a clean algorithm for 3D moving target imaging**, Matthew A. Ferrara, Air Force Research Lab.; Emre Ertin, Randolph L. Moses, Lee C. Potter, The Ohio State Univ.; Mark A. Stuf, Michigan Tech Research Institute . . . . . [6970-05]
- 10:05 am: **3D ISAR imaging of satellites** (*Invited Paper*), Greg Ushomirsky, MIT Lincoln Lab. . . . . [6970-06]
- 10:15 am: **Multibaseline IFSAR for 3D target reconstruction**, Emre Ertin, Randolph L. Moses, Lee C. Potter, The Ohio State Univ. . . . . [6970-07]

- 10:25 am: **Hyper-parameter selection in non-quadratic regularization-based radar image formation**, Özge Batu, Mujdat Çetin, Sabanci Univ. (Turkey) . . . . . [6970-08]
- Coffee Break . . . . . 10:35 to 11:00 am

### Session Introduction

**Room: Chicago/Denver. . . . . Mon. 11:00 to 11:05 am**

Session Chair: **Gerard W. Titi**, BAE Systems Advanced Information Technologies

### SESSION 2

**Room: Chicago/Denver. . . . . Mon. 11:05 am to 12:35 pm**

#### Circular SAR

Session Chair: **Gerard W. Titi**, BAE Systems Advanced Information Technologies

- 11:05 am: **GOTCHA technology challenges** (*Invited Paper*), Michael J. Minardi, Air Force Research Lab. . . . . [6970-09]
- 11:35 am: **3D imaging results using circular flight track SAR**, Steve Jaroszewski, Wayne Haack, Charles Morgan, Technology Service Corp.; Curtis H. Casteel, Jr., Air Force Research Lab. . . . . [6970-10]
- 11:45 am: **Fast CSAR algorithm**, Jehanzeb Burki, Christopher F. Barnes, Georgia Institute of Technology . . . . . [6970-11]
- 11:55 am: **Gotcha GUI: a software tool to process SAR data on a supercomputer system**, Curtis H. Casteel, Jr., Uttam K. Majumder, Michael J. Minardi, LeRoy A. Gorham, Steven Scarborough, Air Force Research Lab.; John W. Nehrbass, Ohio Supercomputer Ctr. . . . . [6970-12]
- 12:05 pm: **SAR backprojection on a Sony Playstation 3**, Mark J. Backues, SET Corp.; Uttam K. Majumder, Curtis H. Casteel, Jr., LeRoy A. Gorham, Steven Scarborough, Michael J. Minardi, Daniel York, Air Force Research Lab. . [6970-13]
- 12:15 pm: **An analytical expression for the three-dimensional response of a point scatterer for circular synthetic aperture radar**, Linda J. Moore, Univ. of Dayton; Uttam K. Majumder, Air Force Research Lab. . . . . [6970-14]
- 12:25 pm: **Lossless SAR data compression for staring RADAR application**, Daniel Bishop, Russell M. Mersereau, Georgia Institute of Technology; Uttam K. Majumder, Michael J. Minardi, Air Force Research Lab. . . . . [6970-15]
- Lunch Break . . . . . 12:35 to 1:40 pm

**POSTERS-Monday. . . . . Mon. 1:40 to 3:30 pm**

Coffee Break . . . . . 3:30 to 4:00 pm

**Panel Discussion/Workshop. . . . . Mon. 4:00 to 5:00 pm**

# Conference 6970 · Room: Chicago

## Tuesday 18 March

### Session Introduction

Room: Chicago/Denver. . . . . Tues. 8:00 to 8:05 am

Session Chair: Charles V. Jakowatz, Jr., Sandia National Labs

### SESSION 3

Room: Chicago/Denver. . . . . Tues. 8:05 to 9:05 am

#### Advanced Imaging I

Session Chair: Charles V. Jakowatz, Jr., Sandia National Labs.

8:05 am: **An implementation of a fast back-projection image formation algorithm for spotlight-mode SAR**, Daniel E. Wahl, David A. Yocky, Charles V. Jakowatz, Jr., Sandia National Labs. . . . . [6970-16]

8:15 am: **Imaging moving targets from scattered waves**, Margaret Cheney, Rensselaer Polytechnic Institute; Brett H. Borden, Naval Postgraduate School . . . . . [6970-17]

8:25 am: **Distributed aperture imaging with multiple transmitters in complex environments**, Trond K. Varslot, The Australian National Univ. (Australia); Birsan Yazici, Margaret Cheney, Rensselaer Polytechnic Institute . . . . . [6970-18]

8:35 am: **Wavelet denoising for IFSAR processing**, Kenneth Sartor, Harris Corp.; Samuel P. Kozaitis, Gnana Bhaskar Tenali, Florida Institute of Technology . . . . . [6970-19]

8:45 am: **Subsidence measurement and DSM extraction of IFSAR data using anisotropic diffusion**, Kenneth Sartor, Josef D. Allen, Emile Ganther, Harris Corp.; Gnana Bhaskar Tenali, Florida Institute of Technology . . . . . [6970-20]

8:55 am: **Multipath simulation and removal from SAR imagery**, Daniel B. Andre, Robert D. Hill, Christopher P. Moate, QinetiQ Ltd. (United Kingdom). . . . . [6970-21]

#### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am

The Honorable Jay Cohen,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break . . . . . 10:00 to 10:30 am

### SESSION 4

Room: Chicago . . . . . Tues. 10:30 to 11:30 am

#### Advanced Imaging II

Session Chair: Charles V. Jakowatz, Jr., Sandia National Labs.

10:30 am: **Through-the-wall polarimetric imaging**, Fauzia Ahmad, Yeo-Sun Yoon, Moeness G. Amin, Villanova Univ. . . . . [6970-22]

10:40 am: **Autofocus for 3D imaging**, Forest A. Lee-Elkin, SET Corp. . . . . [6970-34]

10:50 am: **Recursive image updating for persistent synthetic aperture radar surveillance**, Randolph L. Moses, The Ohio State Univ. . . . . [6970-23]

11:00 am: **Beamforming as a foundation for spotlight-mode SAR image formation by backprojection** (*Invited Paper*), Charles V. Jakowatz, Jr., Daniel E. Wahl, David A. Yocky, Sandia National Labs. . . . . [6970-24]

### Session Introduction

Room: Chicago . . . . . Tues. 11:30 to 11:35 am

Session Chair: Stephen P. Welby,  
Defense Advanced Research Projects Agency

### SESSION 5

Room: Chicago/Denver. . . . . Tues. 11:35 am to 12:15 pm

#### Detection, Tracking, and Identification Techniques I

Session Chair: Stephen P. Welby,  
Defense Advanced Research Projects Agency

11:35 am: **Analyzing the effects of square versus non-square resolutions on automatic target recognition performance**, Lee J. Montagnino, Mary L. Cassabaum, Shawn D. Halversen, Christina L. Hebert, Chad T. Rupp, Matthew T. Young, Raytheon Missile Systems. . . . . [6970-26]

11:45 am: **An ATR challenge problem using HRR data**, Bart Kahler, General Dynamics Advanced Information Systems; John Querns, General Dynamics Information Technology. . . . . [6970-27]

11:55 am: **Performance model for joint tracking and ATR with HRR radar**, Shan Cong, Lang Hong, Wright State Univ.; Erik Blasch, Air Force Research Lab. . . . . [6970-28]

12:05 pm: **Vehicle tracking for urban surveillance**, William L. Roberts, Univ. of Florida; Leslie G. Watkins, North Carolina State Univ.; Dapeng O. Wu, Jian Li, Univ. of Florida . . . . . [6970-29]

Lunch/Exhibition Break . . . . . 12:15 to 1:30 pm

### SESSION 6

Room: Chicago/Denver. . . . . Tues. 1:30 to 2:20 pm

#### Detection, Tracking, and Identification Techniques II

1:30 pm: **Dismount data collection and exploitation utilizing a low-cost multisensor data collection system**, John D. Gorman, King-Sang Chan, Brandon Jasionowski, SET Corp.; Uttam K. Majumder, LeRoy A. Gorham, Michael J. Minardi, Steven Scarborough, Air Force Research Lab. . . . . [6970-30]

1:40 pm: **A rotation/translation-invariant transform for target detection in SAR images**, Wenxing Ye, Christopher R. Paulson, Dapeng O. Wu, Jian Li, Univ. of Florida . . . . . [6970-31]

1:50 pm: **Ripplet transform for feature extraction**, Jun Xu, Dapeng O. Wu, Univ. of Florida . . . . . [6970-32]

2:00 pm: **A target detection scheme for VHF SAR ground surveillance**, Wenxing Ye, Christopher R. Paulson, Dapeng O. Wu, Jian Li, Univ. of Florida . . . . . [6970-33]

2:10 pm: **Discrimination of civilian vehicles using wide-angle SAR**, Kerry E. Dungan, Lee C. Potter, The Ohio State Univ.; John W. Nehrbass, Ohio Supercomputer Ctr. . . . . [6970-35]

Coffee Break . . . . . 2:20 to 3:20 pm

Posters-Tuesday . . . . . Tues. 3:30 to 5:30 pm

### Related Courses

#### Registration is required.

See SPIE Cashier for full course description or to Register.

SC893 **SAR Signal Processing Laboratory** (*Soumekh*)

**NEW** Tuesday, 8:30 am to 5:30 pm

SC162 **SAR Signal Processing** (*Soumekh*) Sunday, 8:30 am to 5:30 pm

# Acquisition, Tracking, Pointing, and Laser Systems Technologies XXII

Conference Chairs: **Steven L. Chodos**, Boeing-SVS, Inc.; **William E. Thompson**, Air Force Research Lab.

Conference Co-Chair: **Ali T. Alouani**, Tennessee Technological Univ.

Program Committee: **James E. Kimbrell**, L-3 Brashear; **Jim F. Riker**, Air Force Research Lab.; **William Dale Blair**, Georgia Tech Research Institute; **John E. Gray**, Naval Surface Warfare Ctr.; **Gillian K. Groves**, Raytheon Co.; **Christopher J. Musial**, Boeing-SVS, Inc.; **James M. Hilkert**, Alpha-Theta Technologies; **Glenn A. Tyler**, The Optical Sciences Co.; **Juan R. Vasquez**, Air Force Institute of Technology

## Tuesday 18 March

### POSTERS-Tuesday

Room: Palms Ballroom-Royal ..... Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**Energy efficient collaborative target tracking by Gaussian Rao-Blackwellised particle filter in wireless sensor networks**, Zhi-Jun Yu, Jian-Ming Wei, Hai-Tao Liu, Shanghai Institute of Microsystem and Information Technology (China) ..... [6971-08]

## Thursday 20 March

### SESSION 1

Room: Grand 4 ..... Thurs. 8:00 to 11:30 am

#### Signal/Image Processing for Tracking

Session Chair: **Steven L. Chodos**, Boeing-SVS, Inc.

8:00 am: **Real-time object tracking with feature fusion particle filter**, Meng Bo, Guangliang Han, Changchun Institute of Optics, Fine Mechanics and Physics (China) ..... [6971-01]

8:20 am: **A hardware neural network for target tracking**, Wendall C. Deck, Gilles Labonté, Royal Military College of Canada (Canada) ..... [6971-02]

8:40 am: **Online contour structure from motion with known camera pose**, Vitaliy Kaganovich, Raytheon Space and Airborne Systems ..... [6971-03]

9:00 am: **A unified framework for capturing facial images in video surveillance systems using cooperative camera system**, Fai Chan, Yiu-Sang Moon, The Chinese Univ. of Hong Kong (Hong Kong China) ..... [6971-04]

9:20 am: **A real-time multimode electro-optical tracking system**, Jin Zhou, Qin-zhang Wu, Mei Yang, Pin Jiang, Institute of Optics and Electronics (China) ..... [6971-05]

9:40 am: **Multisensor 3D tracking for counter small unmanned air vehicles**, Juan R. Vasquez, Air Force Institute of Technology; Kyle M. Tarplee, Numerica Corp.; Brian D. Rigling, Wright State Univ. .... [6971-06]

Coffee Break ..... 10:00 to 10:30 am

10:30 am: **A robust real-time object detection and tracking system**, Zhanfeng Yue, Bhavani Gopalakrishnan, Pankaj Topiwala, FastVDO LLC. .... [6971-07]

10:50 am: **Non-photorealistic synthesis of video sequences for an accurate evaluation of tracking algorithms on complex scenes**, Christine Dubreu, Cedip Infrared Systems (France); Antoine Manzanera, Ecole Nationale Supérieure de Techniques Avancées (France); Eric Bohain, Cedip Infrared Systems (France) ..... [6971-09]

11:10 am: **Vehicle detection in forward-looking infrared image sequences**, Yanhua Ruan, Wright State Univ.; Adrian P. Palomino, General Dynamics Corp.; Devert Wicker, Air Force Research Lab.; Juan R. Vasquez, Numerica Corp.; Lang Hong, Wright State Univ. .... [6971-19]

Lunch/Exhibition Break ..... 11:30 am to 1:00 pm

### SESSION 2

Room: Grand 4 ..... Thurs. 1:00 to 3:00 pm

#### Hardware Implementation

Session Chair: **William E. Thompson**, Air Force Research Lab.

1:00 pm: **Application of network control systems for adaptive optics**, Robert J. Eager, The Boeing Co. and Air Force Research Lab. .... [6971-10]

1:20 pm: **Control of a deformable mirror subject to structural disturbance**, Matthew R. Allen, Jae Jun Kim, Brij N. Agrawal, Naval Postgraduate School ..... [6971-11]

1:40 pm: **Practical application of periodic error correction techniques in the design of a low-cost high-accuracy pan-tilt unit utilizing high-resolution modular encoders**, James L. Sellkoff, Automated Solutions Enterprises, Inc. .... [6971-12]

2:00 pm: **A unique three-axis gimbal mechanism**, James M. Hilkert, Alpha-Theta Technologies; Matt Jonas, Raytheon Co. .... [6971-13]

2:20 pm: **Sin/Cos encoder interpolation methods and system level configuration of encoder to digital tracking converters for rate and position loop controllers**, Steven T. Jenkins, Texas Instruments Inc. and Alpha-Theta Technologies; James M. Hilkert, Alpha-Theta Technologies ..... [6971-14]

2:40 pm: **An analog, non-mechanical beam-steerer with an 80-degree field of regard for lidar applications**, Scott R. Davis, George Farca, Scott D. Rommel, Michael H. Anderson, Vescent Photonics Inc. .... [6971-15]

Coffee Break ..... 3:00 to 3:30 pm

### SESSION 3

Room: Grand 4 ..... Thurs. 3:30 to 4:30 pm

#### System Applications

Session Chair: **Ali T. Alouani**, Tennessee Technological Univ.

3:30 pm: **Deriving predictive turbulence models from local measurements**, Michael J. Curley, Holger M. Jaenisch, Alabama A&M Univ.; James W. Handley, AXIOM Corp.; Matthew E. Edwards, Alabama A&M Univ. .... [6971-16]

3:50 pm: **Automatic object recognition implications of attentive ladar scanning**, Mike Mamanakis, Rollin R. Fullmer, Scott E. Budge, Robert T. Pack, Utah State Univ. .... [6971-17]

4:10 pm: **Robust control of photovoltaic generators under uncertain load conditions**, Ali T. Alouani, Mohammed S. Alam, Tennessee Technological Univ. .... [6971-18]

### Related Courses

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC158 **Fundamentals of Automatic Target Recognition (Nasr)** Wednesday, 8:30 am to 5:30 pm

SC160 **Precision Stabilization and Laser Pointing Systems (Hilkert)** Wednesday, 8:30 am to 5:30 pm

SC167 **Introduction to Laser Radar (Kammerman)** Tuesday, 1:30 to 5:30 pm

SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers (Vollmerhausen)** Monday, 8:30 am to 5:30 pm

SC728 **Network Centric Target Tracking and Classification (Drummond)** Monday, 8:30 am to 5:30 pm

# Conference 6972 · Room: San Antonio

Tuesday-Wednesday 18-19 March 2008 • Proceedings of SPIE Vol. 6972

## Polarization: Measurement, Analysis, and Remote Sensing VIII

Conference Chair: **David B. Chenault**, Polaris Sensor Technologies, Inc.; **Dennis H. Goldstein**, Polaris Sensor Technologies, Inc.

Program Committee: **Thomas R. Caudill**, Air Force Research Lab.; **Russell A. Chipman**, College of Optical Sciences/The Univ. of Arizona; **Joseph Lee Cox**, Air Force Space and Missile Systems Ctr.; **Aed M. El-Saba**, Univ. of South Alabama; **Matthew P. Fetrow**, Air Force Research Lab.; **Joseph A. Shaw**, Montana State Univ./Bozeman; **J. Scott Tyo**, College of Optical Sciences/The Univ. of Arizona; **Kyle J. Zeringue**, Photon Research Associates, Inc.

### Tuesday 18 March

#### Welcome and Nomenclature Overview

Room: San Antonio ..... Tues. 8:10 to 8:30 am

David B. Chenault, Dennis H. Goldstein,  
Polaris Sensor Technologies, Inc.

8:10 am: **Polarization: nomenclature and background**, David B. Chenault,  
Polaris Sensor Technologies, Inc. .... [6972-01]

#### SESSION 1

Room: San Antonio ..... Tues. 8:30 to 9:00 am

#### Invited Presentation

Session Chair: **David B. Chenault**, Polaris Sensor Technologies, Inc.

8:30 am: **Fine structure and optical properties of biological polarizers in crustaceans and cephalopods** (*Invited Paper*), Tsyr-Huei Chiou, Thomas W. Cronin, Univ. of Maryland/Baltimore County ..... [6972-02]

#### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

The Honorable Jay Cohen,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break ..... 10:00 to 10:30 am

#### SESSION 2

Room: San Antonio ..... Tues. 10:30 am to 12:10 pm

#### Polarization-based Devices I

Session Chair: **Dennis H. Goldstein**, Polaris Sensor Technologies, Inc.

10:30 am: **Fiber faceplates and tapers to mitigate diffraction effects in an imaging snapshot polarimeter**, Alvaro A. Cruz-Cabrera, Shanalyn A. Kemme, Sandia National Labs. .... [6972-03]

10:50 am: **High-speed polarization imaging camera based on electrically driven waveplates and split focal plane**, Nicolas A. Lefaudeaux, Sebastien Breugnot, Philippe Clemenceau, Bossa Nova Technologies ..... [6972-04]

11:10 am: **Hybrid optical retarders fabricated from liquid crystal polymer and form birefringent thin films**, Karen D. Hendrix, Paul McKenzie, David M. Shemo, Kim Tan, Nada A. O'Brien, JDSU ..... [6972-05]

11:30 am: **Automated detection of EOS-ESD in electronic circuits using a polarization modulation sensing system**, Niels F. Jacksen, ITT Industries Night Vision; Thomas Odom, Vcd Technologies L.L.C.; James P. Karins, Pukoa Scientific, LLC; John Slewinski, Steven Hampton, Vcd Technologies L.L.C. .... [6972-06]

11:50 am: **Fast switchable FLC modulators for application in polarization optics**, Anastasia M. Suvorova, South Ural State Univ. (Russia); Fedor V. Podgornov, South Ural State Univ. (Russia) and Technische Univ. Darmstadt (Germany); Yakov Korepanov, South Ural State Univ. (Russia); Wolfgang Haase, Technische Univ. Darmstadt (Germany) ..... [6972-07]

Lunch/Exhibition Break ..... 12:10 to 2:00 pm

#### SESSION 3

Room: San Antonio ..... Tues. 2:00 to 3:40 pm

#### Developments in Polarization Instrumentation I

Session Chair: **Joseph A. Shaw**, Montana State Univ./Bozeman

2:00 pm: **Liquid-crystal tunable polarization filter for target detection applications**, Karen N. Zachery, Bruce K. Winker, Dong-Feng Gu, Bing Wen, John Mansell, Keith A. Sage, Donald B. Taber, Teledyne Scientific Co. .... [6972-08]

2:20 pm: **Polarimetric systems based on ferroelectric liquid crystals**, Fedor V. Podgornov, South Ural State Univ. (Russia) and Technische Univ. Darmstadt (Germany); Anastasia M. Suvorova, South Ural State Univ. (Russia); Ivan V. Chernyaev, Wolfgang Haase, Technische Univ. Darmstadt (Germany) .... [6972-09]

2:40 pm: **Compact and robust linear Stokes polarization imaging camera**, Nicolas A. Lefaudeaux, Nicolas Lechocinski, Sebastien Breugnot, Philippe Clemenceau, Bossa Nova Technologies. .... [6972-10]

3:00 pm: **Acousto-optic tunable filter-based spectropolarimetric imagers**, Neelam Gupta, Army Research Lab. .... [6972-11]

3:20 pm: **Snapshot imaging spectropolarimetry in the visible and infrared**, Riley W. Aumiller, Corrie Vanderlugt, Eustace L. Dereniak, College of Optical Sciences/The Univ. of Arizona; Bob Sampson, I Technology Applications; Robert W. McMilian, U.S. Army Space and Missile Defense Command ..... [6972-12]

Coffee Break ..... 3:40 to 4:10 pm

#### SESSION 4

Room: San Antonio ..... Tues. 4:10 to 5:30 pm

#### Polarization in Remote Sensing

Session Chair: **Joseph Lee Cox**,  
Air Force Space and Missile Systems Ctr.

4:10 pm: **Polarimetric lidar signatures for remote detection of biological warfare agents**, Jonathan M. Richardson, John C. Aldridge, Adam B. Milstein, MIT Lincoln Lab. .... [6972-13]

4:30 pm: **Utility of polarimetric imagery as ancillary data for thematic classification as predicted by the use of spectral separability**, Clyde H. Spencer, Ball Aerospace & Technologies Corp. .... [6972-14]

4:50 pm: **Visible-NIR imaging polarimetry of metal surfaces viewed under a variable atmosphere**, Nathan J. Pust, Joseph A. Shaw, Andrew R. Dahlberg, Montana State Univ./Bozeman ..... [6972-15]

5:10 pm: **Mapping wetlands cover types with directional polarization signatures**, Vern C. Vanderbilt, NASA Ames Research Ctr.; Jonathan Greenberg, Shruti Khanna, Susan L. Ustin, Univ. of California/Davis; Gerald P. Livingston, Univ. of Vermont ..... [6972-16]

#### POSTERS-Tuesday

Room: Palms Ballroom-Royal ..... Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**Ferroelectric liquid-crystal modulators for application in polarization optics**, Ivan V. Chernyaev, Technische Univ. Darmstadt (Germany); Anastasia M. Suvorova, Ivan Popkov, Evelina Bibikova, South Ural State Univ. (Russia); Fedor V. Podgornov, South Ural State Univ. (Russia) and Technische Univ. Darmstadt (Germany); Wolfgang Haase, Technische Univ. Darmstadt (Germany). . . [6972-36]

**Spectropolarimetric reflectance of minerals in the infrared**, Dennis H. Goldstein, Polaris Sensor Technologies, Inc. . . . . [6972-37]

**Design and performance of a polarized IR scene generator**, Peter S. Erbach, David B. Chenault, Polaris Sensor Technologies, Inc. . . . . [6972-38]

**Generalized conditions for eigenpolarizations orthogonality: Jones matrix calculus**, Sergey N. Savenkov, National Taras Shevchenko Univ. of Kyiv (Ukraine) . . . . . [6972-39]

**A comparison of MWIR and LWIR polarimetric imaging for surface swimmer detection**, John S. Harchanko, Polaris Sensor Technologies, Inc. . . . . [6972-40]

**Introducing depolarization into a low-cost simple cloud sensor for standoff aerosol detection**, Rebecca J. Hopkins, Joseph W. Jones, Stephen J. Barrington, Virginia E. Foot, Karen L. Baxter, Defence Science and Technology Lab. (United Kingdom). . . . . [6972-41]

## Wednesday 19 March

### Welcome and Nomenclature Overview

**Room: San Antonio . . . . . Wed. 8:00 to 8:10 am**

**David B. Chenault, Dennis H. Goldstein,**  
Polaris Sensor Technologies, Inc.

### SESSION 5

**Room: San Antonio . . . . . Wed. 8:10 to 9:50 am**

#### Developments in Polarization Instrumentation II

*Session Chair: J. Scott Tyo,*  
College of Optical Sciences/The Univ. of Arizona

8:10 am: **Astrophysical polarimetry: science, techniques, and methodology** (*Invited Paper*), Christopher C. Packham, Univ. of Florida . . . . . [6972-18]

8:40 am: **Four camera complete Stokes imaging polarimeter** (*Invited Paper*), J. L. Pezzaniti, Polaris Sensor Technologies, Inc.; Howard J. Schultz, Univ. of Massachusetts/Amherst; Michael E. Roche, John E. Reinhardt, Polaris Sensor Technologies, Inc. . . . . [6972-19]

9:10 am: **2-Cam LWIR imaging Stokes polarimeter**, Michael W. Kudenov, College of Optical Sciences/The Univ. of Arizona; J. L. Pezzaniti, Polaris Sensor Technologies, Inc.; Eustace L. Dereniak, College of Optical Sciences/The Univ. of Arizona; Grant R. Gerhart, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. . . . . [6972-20]

9:30 am: **Optimized multispectral Mueller imaging polarimeter with nematic liquid crystals**, Antonello De Martino, Makrina Anastasiadou, Sami Ben Hatit, Ecole Polytechnique (France) . . . . . [6972-21]

Coffee Break . . . . . 9:50 to 10:20 am

### SESSION 6

**Room: San Antonio . . . . . Wed. 10:20 to 11:40 am**

#### Analysis: Polarization Mathematics, Algorithms, and Processing I

*Session Chair: Aed M. El-Saba, Univ. of South Alabama*

10:20 am: **Product decompositions of Mueller matrices in polarimetry**, Antonello De Martino, Razvigor Ossikovski, Makrina Anastasiadou, Ecole Polytechnique (France); Sami Ben Hatit, Ecole Polytechnique (France) and Horiba Jobin Yvon (France); Steve Guyot, Univ. Paris 12 Val-de-Marne (France) [6972-22]

10:40 am: **Polarization visual enhancement technique for LWIR microgrid polarimeter imagery**, Bradley M. Ratliff, J. Scott Tyo, College of Optical Sciences/The Univ. of Arizona; Wiley T. Black, James K. Boger, David L. Bowers, Applied Technology Associates . . . . . [6972-23]

11:00 am: **Emission polarization from rough surfaces**, Chang-Hyuk An, Kyle J. Zeringue, Photon Research Associates, Inc. . . . . [6972-24]

11:20 am: **Detection comparisons between LWIR and MWIR polarimetric sensors**, Neil R. Malone, Raytheon Vision Systems. . . . . [6972-25]

### Polarization Technical Event/Lunch Break

**Room: San Antonio . . . . . Wed. 11:40 am to 1:30 pm**

*Workshop Chairs: David B. Chenault, Polaris Sensor Technologies, Inc.; Dennis H. Goldstein, Polaris Sensor Technologies, Inc.*

This meeting is focused on research, development, engineering, and applications in fields of optics where polarization and its measurement are key issues.

*Boxed lunches will be available for purchase.*

### SESSION 7

**Room: San Antonio . . . . . Wed. 1:30 to 2:50 pm**

#### Analysis: Polarization Mathematics, Algorithms, and Processing II

*Session Chair: Dennis H. Goldstein, Polaris Sensor Technologies, Inc.*

1:30 pm: **Fusion of Stokes vector imagery using simple logical operators: application to the problem of surface land mine detection**, Aed M. El-Saba, Tadele Bezuayehu, Univ. of South Alabama . . . . . [6972-28]

1:50 pm: **Correction of erroneous degree of polarization of moving objects in a video sequence**, Luc Gendre, Alban Foulonneau, Laurent Bigue, Univ. de Haute Alsace (France) . . . . . [6972-29]

2:10 pm: **Estimation of the index of refraction and reflection angle from Mueller matrix imagery**, Vimal Thilak, David G. Voelz, Charles D. Creusere, New Mexico State Univ. . . . . [6972-30]

2:30 pm: **Single-frame polarization measurement techniques**, Robert W. McMillan, U.S. Army Space and Missile Defense Command . . . . . [6972-31]

Coffee Break . . . . . 2:50 to 3:30 pm

### SESSION 8

**Room: San Antonio . . . . . Wed. 3:30 to 4:50 pm**

#### Polarization Measurements

*Session Chair: David B. Chenault, Polaris Sensor Technologies, Inc.*

3:30 pm: **Higher probability of detection of subsurface land mines with a single sensor using multiple polarized and unpolarized image fusion**, Aed M. El-Saba, Tadele Bezuayehu, Univ. of South Alabama . . . . . [6972-32]

3:50 pm: **Spectropolarimetric characteristics of automobile paints**, Dennis H. Goldstein, Polaris Sensor Technologies, Inc. . . . . [6972-33]

4:10 pm: **Variation in MidIR and LWIR polarimetric imagery due to diurnal and meteorological impacts**, Kristan Gurton, Melvin A. Felton, Army Research Lab. . . . . [6972-34]

4:30 pm: **Evaluation of passive polarimetric electro-optic imagery for civilian and military targets discrimination**, Daniel A. Lavigne, Defence Research and Development Canada (Canada); Mélanie Breton, AEREX Avionics Inc. (Canada); Mario Pichette, Vincent Larochelle, Jean-Robert Simard, Defence Research and Development Canada (Canada) . . . . . [6972-35]

### Related Courses

#### Registration is required.

See SPIE Cashier for full course description or to Register.

SC180 **Imaging Polarimetry** (*Dereniak, Miles, Sabatke*) Monday, 1:30 to 5:30 pm

SC789 **Introduction to Optical and Infrared Sensor Systems** (*Shaw*) Thursday, 8:30 am to 5:30 pm

# Data Mining, Intrusion Detection, Information Assurance, and Data Networks Security 2008

Conference Chair: **Belur V. Dasarathy**, Consultant, Information Fusion Technologies

Program Committee: **Thomas G. L. Allen**, Air Force Research Lab.; **Jonathan A. Gloster**, The Van Dyke Technology Group, Inc.; **Bahareh Haji-Saeed**, Solid State Scientific Corp.; **Sajid Hussain**, Acadia Univ. (Canada); **Robert S. Lynch, Jr.**, Naval Undersea Warfare Ctr.; **Vahid R. Riasati**, Boeing Satellite Systems; **John J. Salerno, Jr.**, Air Force Research Lab.; **Martin R. Stytz**, Institute for Defense Analyses; **Shusaku Tsumoto**, Shimane Univ. (Japan)

## Monday 17 March

### SESSION 1

Room: Crystal E. . . . . Mon. 1:20 to 3:00 pm

#### Information Assurance and Security

Session Chairs: **Jonathan A. Gloster**, The Van Dyke Technology Group, Inc.; **Thomas G. L. Allen**, Air Force Research Lab.

1:20 pm: **Integrated mandatory access control for digital data**, George Hsieh, Gregory Patrick, Keith Foster, Gerald Emamali, Norfolk State Univ.; Lisa M. Marvel, Army Research Lab. . . . . [6973-01]

1:40 pm: **Addressing security issues related to virtual institute distributed activities**, Martin R. Stytz, Institute for Defense Analyses; Sheila B. Banks, Calculated Insight . . . . . [6973-02]

2:00 pm: **An innovative middle tier design for protecting federal privacy act data**, Thomas G. L. Allen, Air Force Research Lab. . . . . [6973-03]

2:20 pm: **Mathematical model for security effectiveness measurement and optimization**, Sheela V. Belur, Jonathan A. Gloster, The Van Dyke Technology Group, Inc. . . . . [6973-04]

2:40 pm: **A grid security model based on PKI**, Yahui Liu, Beijing Univ. of Information and Technology (China); Jie Su, Harbin Univ. of Science and Technology (China) . . . . . [6973-05]

Coffee Break . . . . . 3:00 to 3:30 pm

### SESSION 2

Room: Crystal E. . . . . Mon. 3:30 to 5:10 pm

#### Data Mining

Session Chairs: **Martin R. Stytz**, Institute for Defense Analyses; **Shusaku Tsumoto**, Shimane Univ. (Japan)

3:30 pm: **Is mining of knowledge possible?**, Jim E. Brander, Interactive Engineering Pty Ltd. (Australia) . . . . . [6973-06]

3:50 pm: **Application of data mining to medical risk management**, Shusaku Tsumoto, Shimane Univ. (Japan) . . . . . [6973-07]

4:10 pm: **A data mining approach to intelligence operations**, Nasrullah Memon, Aalborg Univ. (Denmark) and Hellenic American Univ. (Greece); David L. Hicks, Aalborg Univ. (Denmark); Nicholas Harkiolakis, Hellenic American Univ. (Greece) . . . . . [6973-08]

4:30 pm: **Effect of vaccination in a heterogeneous population and global public health security**, Doracelly Hincapie, Univ. de Antioquia (Colombia) . . . . . [6973-09]

4:50 pm: **Observational study of content of Hg in fog water relative to air pollution in suburbs of Nanjing**, Lili Tang, Shengjie Niu, Shuxian Fan, Xiaofeng Xu, Saihua Jin, Jie Xu, Nanjing Univ. of Information Science & Technology (China) . . . . . [6973-10]

## Tuesday 18 March

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am**  
**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security  
*See p. 6 for details.*

### SESSION 3

Room: Crystal E. . . . . Tues. 10:30 am to 12:10 pm

#### Intrusion Detection

Session Chairs: **John J. Salerno, Jr.**, Air Force Research Lab.; **Sajid Hussain**, Acadia Univ. (Canada)

10:30 am: **Applicability of clustering to cyber intrusion detection**, Gilbert R. Hendry, Shanchieh J. Yang, Rochester Institute of Technology. . . . . [6973-11]

10:50 am: **Securing MANETs with BITS: danger theory and mission continuity**, Marco M. Carvalho, Institute for Human and Machine Cognition; Richard Ford, William H. Allen, Gerald Marin, Florida Institute of Technology . . . . . [6973-12]

11:10 am: **Virtual terrain: a common representation of a computer network**, Jared Holsopple, CUBRC; Shanchieh J. Yang, Brian J. Argauer, Jr., Rochester Institute of Technology . . . . . [6973-14]

11:30 am: **VTAC: virtual terrain assisted impact assessment for cyber attacks**, Brian J. Argauer, Jr., Shanchieh J. Yang, Rochester Institute of Technology . . . . . [6973-13]

11:50 am: **Usefulness of DARPA dataset for intrusion detection system evaluation**, Ciza Thomas, Narayanaswamy Balakrishnan, Indian Institute of Science (India) . . . . . [6973-15]

Lunch/Exhibition Break . . . . . 12:10 to 2:00 pm

### SESSION 4

Room: Crystal E. . . . . Tues. 2:00 to 3:00 pm

#### Miscellaneous Topics

Session Chairs: **Robert S. Lynch, Jr.**, Naval Undersea Warfare Ctr.; **Vahid R. Riasati**, Boeing Satellite Systems

2:00 pm: **Performance comparison of the automatic data reduction system (ADRS)**, Robert S. Lynch, Jr., Naval Undersea Warfare Ctr.; Dan Patterson, Fei Liu, David Turner, Arturo Concepcion, California State Univ./San Bernardino. . . . . [6973-16]

2:20 pm: **Two-beam coupling correlation synthetic aperture radar image recognition with power-law scattering centers pre-enhancement**, Bahareh Haji-Saeed, Solid State Scientific Corp. and Air Force Research Lab.; Jed Khoury, Charles L. Woods, Air Force Research Lab.; John Kierstead, Solid State Scientific Corp. . . . . [6973-17]

2:40 pm: **Adaptive Markov feature estimation and categorization using the projection-slice theorem**, Vahid R. Riasati, Boeing Satellite Systems. . [6973-18]

Coffee Break . . . . . 3:00 to 3:20 pm



## SESSION 5

Room: Crystal E. . . . . Tues. 3:20 to 4:40 pm

### Miscellaneous Applications

Session Chair: **Sajid Hussain**, Acadia Univ. (Canada); **Bahareh Haji-Saeed**, Solid State Scientific Corp.

3:20 pm: **A new approach to chemical agent detection, classification, and estimation**, Tao Qian, Genshe Chen, Yin Chen, Intelligent Automation, Inc.; Erik Blasch, Air Force Research Lab.; Robert S. Lynch, Jr., Naval Undersea Warfare Ctr. . . . . [6973-20]

3:40 pm: **Using received signal strength variation for surveillance in residential areas**, Sajid Hussain, Daniel L. Silver, Andrei Gagarin, Richard Peters, Acadia Univ. (Canada). . . . . [6973-21]

4:00 pm: **Power-law radon-transformed superimposed inverse filter synthetic discriminant correlator for facial recognition**, Bahareh Haji-Saeed, Solid State Scientific Corp. and Air Force Research Lab.; Jed Khoury, Charles L. Woods, Air Force Research Lab.; John Kierstead, Solid State Scientific Corp. . . . . [6973-22]

4:20 pm: **Improvement in minority attack detection with skewness in network traffic**, Ciza Thomas, Narayanaswamy Balakrishnan, Indian Institute of Science (India). . . . . [6973-23]

### POSTERS-Tuesday

Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**An improved clone selection immune algorithm**, Peili Qiao, Tong Wang, Jie Su, Harbin Univ. of Science and Technology (China) . . . . . [6973-24]

**An immunity-based model for dynamic distributed intrusion detection**, Peili Qiao, Tong Wang, Jie Su, Harbin Univ. of Science and Technology (China) . . . . . [6973-25]

**Research on parallel algorithm for sequential pattern mining**, Lijuan Zhou, Capital Normal Univ. (China); Bai Qin, Yu Wang, Zhongxiao Hao, Harbin Univ. of Science and Technology (China). . . . . [6973-26]

### Related Courses

#### Registration is required.

See SPIE Cashier for full course description or to Register.

SC891 **Security of Information and Communication**

**NEW Networks (Kartalopoulos)** Sunday, 1:30 to 5:30 pm

SC728 **Network Centric Target Tracking and Classification (Drummond)**

Monday, 8:30 am to 5:30 pm

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## Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2008

Conference Chair: **Belur V. Dasarathy**, Consultant, Information Fusion Technologies

Program Committee: **Sheela V. Belur**, The Van Dyke Technology Group, Inc.; **Jerome J. Braun**, MIT Lincoln Lab.; **Nour-Eddin El Faouzi**, Institut National de Recherche sur les Transports (France); **Michael Heizmann**, Fraunhofer Institute for Information and Data Processing IITB (Germany); **Mieczyslaw M. Kokar**, Northeastern Univ.; **Christopher J. Matheus**, VISTology, Inc.; **Damian M. Lyons**, Fordham Univ.; **Firooz A. Sadjadi**, Lockheed Martin Corp.; **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Pierre Valin**, Defence R&D Canada/Valcartier (Canada); **Shanchieh Jay Yang**, Rochester Institute of Technology

### Tuesday 18 March

#### POSTERS-Tuesday

Room: Palms Ballroom-Royal ..... Tues. 6:00 to 7:30 pm

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**Intermediate view reconstruction using adaptive disparity search algorithm for real-time 3D processing**, Kyung-Hoon Bae, Samsung Thales Co., Ltd. (South Korea); Dong-Choon Hwang, Kwangwoon Univ. (South Korea) ..... [6974-31]

**Automatic extraction of corresponding points for image registration**, Jik-Han Jung, Won-Chul Choi, Dong-Jo Park, Korea Advanced Institute of Science and Technology (South Korea); Chang-Han Park, Jae-Ik Lee, Samsung Thales Co., Ltd. (South Korea) ..... [6974-32]

**Design of time-pulse coded optoelectronic neuronal elements for nonlinear transformation and integration**, Vladimir G. Krasilenko, Alexander A. Lazarev, Alexander I. Nikolsky, Vinnitsa State Technical Univ. (Ukraine); Maria V. Lazareva, Vinnitsa Social Economy Institute (Ukraine) ..... [6974-33]

### Wednesday 19 March

#### SESSION 1

Room: Crystal E. .... Wed. 8:30 to 10:10 am

#### Image Level Issues and Applications

Session Chairs: **Belur V. Dasarathy**, Consultant, Information Fusion Technologies; **Michael Heizmann**, Fraunhofer-Institut für Informations- und Datenverarbeitung (Germany)

8:30 am: **Advances in image registration and fusion**, Christopher A. Steer, Moira I. Smith, Jamie P. Heather, Mark Bernhardt, Waterfall Solutions Ltd. (United Kingdom); Paul K. Kimber, SELEX Sensors and Airborne Systems Ltd. (United Kingdom); Karen M. Brosseau, Waterfall Solutions Ltd. (United Kingdom) ..... [6974-03]

8:50 am: **Method for applying daytime colors to night-time imagery in realtime**, Maarten A. Hogervorst, Alexander Toet, TNO Human Factors (Netherlands) ..... [6974-02]

9:10 am: **Portable real-time color night vision**, Alexander Toet, Maarten A. Hogervorst, TNO Human Factors (Netherlands) ..... [6974-01]

9:30 am: **Image registration via invariant object/image equations and O/I-metrics**, Olga L. Mendoza, D. Gregory Arnold, Air Force Research Lab.; Peter F. Stiller, Texas A&M Univ. .... [6974-04]

9:50 am: **Fusion of combined stereo and spectral series for obtaining 3D information**, Ioana Gheta, Markus Mathias, Univ. Karlsruhe (Germany); Michael Heizmann, Jürgen Beyerer, Fraunhofer-Institut für Informations- und Datenverarbeitung (Germany) ..... [6974-05]

Coffee Break ..... 10:10 to 10:40 am

#### SESSION 2

Room: Crystal E. .... Wed. 10:40 am to 12:00 pm

#### Detection and Classification

Session Chairs: **Sheela V. Belur**, The Van Dyke Technology Group, Inc.; **Damian M. Lyons**, Fordham Univ.

10:40 am: **Multi-class classification fusion using boosting for identifying steganography methods**, Benjamin M. Rodriguez II, Gilbert L. Peterson, Air Force Institute of Technology ..... [6974-06]

11:00 am: **Comparing discrimination and CFA for selecting tracking features**, Damian M. Lyons, D. F. Hsu, Fordham Univ. .... [6974-07]

11:20 am: **Real-time object-based image registration using multilayer perceptron**, Pramod L. Narasimha, Zhanfeng Yue, Pankaj Topiwala, FastVDO LLC ..... [6974-09]

11:40 am: **A large heterogeneous sensor network simulation system with integrated terrain data for real-time target detection**, Hong Lin, Steve Tanner, John A. Rushing, Sara J. Graves, Evans A. Criswell, The Univ. of Alabama in Huntsville ..... [6974-10]

Lunch/Exhibition Break ..... 12:00 to 1:20 pm

#### SESSION 3

Room: Crystal E. .... Wed. 1:20 to 3:00 pm

#### Surveillance and Tracking

Session Chairs: **Jerome J. Braun**, MIT Lincoln Lab.; **Shanchieh Jay Yang**, Rochester Institute of Technology

1:20 pm: **Vehicle tracking in UAV video using multi-spectral spatiogram models**, Noel E. O'Connor, Peter Kehoe, Ciarán E. Ó Conaire, Alan F. Smeaton, Dublin City Univ. (Ireland) ..... [6974-11]

1:40 pm: **Dynamic resource management for adaptive distributed information fusion in large volume surveillance**, Uwe P. Glässer, Roozbeh Farahbod, Simon Fraser Univ. (Canada); Hans W. Wehn, MacDonald, Dettwiler and Associates Ltd. (Canada) ..... [6974-12]

2:00 pm: **Situation-aware BDI agents in support of autonomous intelligence, surveillance, and reconnaissance (ISR) analysis**, Lundy M. Lewis, Gabe Jakobson, John F. Buford, Altusys Corp. .... [6974-13]

2:20 pm: **A system for testing distributed information fusion applications for maritime surveillance**, Hans W. Wehn, Jens Happe, MacDonald, Dettwiler and Associates Ltd. (Canada); Adel Guitouni, Pierre Valin, Elloi Bossé, Defence R&D Canada/Valcartier (Canada) ..... [6974-14]

2:40 pm: **A standards-based multi-sensor system for surveillance**, Arthur J. Na, Argon ST, Inc. .... [6974-15]

Coffee Break ..... 3:00 to 3:30 pm

**PANEL SESSION**

**Room: Crystal E. . . . . Wed. 3:30 to 5:10 pm**

*Panel Moderators:* **Shanchieh Jay Yang**, Rochester Institute of Technology; **John J. Salerno, Jr.**, Air Force Research Lab.; **James Llinas**, Univ. at Buffalo; **Robert S. Lynch, Jr.**, Naval Undersea Warfare Ctr.; **Jerome J. Braun**, MIT Lincoln Lab.; **Erik Blasch**, Air Force Research Lab. Performance Evaluation for Impact Assessment Systems

Traditionally, fusion systems are evaluated via Monte-Carlo simulations against the ground truth. ROC charts and associated metrics are typically used to assess performance of object detection and tracking. In the case of Impact Assessment, a fusion system presumably aims at projecting future actions of the RED and BLUE teams and assessing the consequences of such actions. Because it involves “future actions” and “potential consequences,” evaluating performance of an impact assessment system becomes a nontrivial problem. Techniques, metrics and data sets suitable for evaluating lower level fusion systems may no longer applicable. This panel will identify challenges and discuss methodologies in evaluating impact assessment systems for general and specific application domains.

**Thursday 20 March**

**SESSION 5**

**Room: Crystal E. . . . . Thurs. 8:30 to 9:50 am**

**Applications**

*Session Chairs:* **Pierre Valin**, Defence R&D Canada/Valcartier (Canada); **Nour-Eddin El Faouzi**, Institut National de Recherche sur les Transports (France)

8:30 am: **Data and sensor fusion for bistatic radar applications**, Anne L. Lee, Antonia T. Cheung, Vahid R. Riasati, Boeing Satellite Systems . . . . . [6974-21]

8:50 am: **Smart optical receiver for beamforming and enhancement of field-of-view in LADAR systems**, Jed Khoury, Air Force Research Lab.; Bahareh Haji-Saeed, Solid State Scientific Corp.; Charles L. Woods, Air Force Research Lab.; John Kierstead, Solid State Scientific Corp. . . . . [6974-22]

9:10 am: **The use of a multidimensional space for fusion candidate representation in a maritime domain awareness application**, Eric Lefebvre, Lockheed Martin Canada (Canada); Christopher Helleur, Defence Research and Development Canada (Canada) . . . . . [6974-18]

9:30 am: **A Markov game model for space threat prediction**, Dan Shen, Genshe Chen, Intelligent Automation, Inc.; Erik Blasch, Khanh D. Pham, Air Force Research Lab. . . . . [6974-16]

Coffee Break . . . . . 9:50 to 10:40 am

**SESSION 6**

**Room: Crystal E. . . . . Thurs. 10:40 am to 12:20 pm**

**Miscellaneous Topics**

*Session Chairs:* **Jerome J. Braun**, MIT Lincoln Lab.; **Michael Heizmann**, Fraunhofer-Institut für Informations-und Datenverarbeitung (Germany)

10:40 am: **Non-algorithmic information fusion**, Jim E. Brander, Interactive Engineering Pty Ltd. (Australia) . . . . . [6974-26]

11:00 am: **About the fusion of default knowledge**, Eric Gregoire, Univ. d'Artois (France) . . . . . [6974-27]

11:20 am: **Advanced algorithms for distributed fusion (A2DF)**, Andrew E. Gelfand, Mike Colony, Chris Smith, Decisive Analytics Corp.; Christopher L. Bowman, Data Fusion and Neural Networks; Richard S. Pei, Clinton Brown, Thien Huynh, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6974-28]

11:40 am: **Dynamic adaptive learning for decision-making supporting systems**, Haibo He, Stevens Institute of Technology; Sachi V. Desai, Myron E. Hohil, U.S. Army Research, Development and Engineering Command . . . . . [6974-29]

12:00 pm: **Distributed multi-sensor fusion**, Robert Fish, McQ, Inc. . . . . [6974-30]

**Related Course**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

**SC728 Network Centric Target Tracking and Classification (Drummond)**  
Monday, 8:30 am to 5:30 pm

**Don't Miss These Presentations!**

*Free to all registered attendees.*

**Plenary Presentation, p. 6**



**The Honorable Jay Cohen**  
Under Secretary for Science and Technology,  
U.S. Department of Homeland Security

**Innovation and the Wealth of Nations, p. 6**



**Sir John Chisholm**  
Chairman of QinetiQ

# Enabling Photonic Technologies for Defense, Security, and Aerospace Applications IV

Conference Chairs: **Michael J. Hayduk**, Air Force Research Lab.; **Peter J. Delfyett, Jr.**, College of Optics & Photonics/Univ. of Central Florida

Conference Co-Chairs: **Andrew R. Pirich**, ACP Consulting; **Eric J. Donkor**, Univ. of Connecticut

Program Committee: **John P. Barrios**, Air Force Research Lab.; **H. John Caulfield**, Diversified Research Corp.; **Reinhard K. Erdmann**, Air Force Research Lab.; **Michael L. Fanto**, Air Force Research Lab.; **Bahram Javidi**, Univ. of Connecticut; **Robert L. Kaminski**, Air Force Research Lab.; **Guifang Li**, College of Optics & Photonics/Univ. of Central Florida; **Joseph M. Osman**, Air Force Research Lab.; **Edward W. Taylor**, International Photonics Consultants, Inc.; **Henry Zmuda**, Univ. of Florida; **Monte Ross**, FastMetrix, Inc.

## Monday 17 March

### SESSION 1

Room: Crystal P ..... Mon. 1:00 to 3:10 pm

#### Photonic Systems and Subsystems

Session Chairs: **Andrew R. Pirich**, ACP Consulting;

**Guifang Li**, College of Optics & Photonics/Univ. of Central Florida

1:00 pm: **Managing thermal emission: plasmon/photon coupling using subwavelength diffractive optics technology** (*Invited Paper*), Shanalyn A. Kemme, Alvaro A. Cruz-Cabrera, David W. Peters, A. R. Ellis, Tony R. Carter, Sally Samora, Sandia National Labs. .... [6975-01]

1:30 pm: **A new electro-optic waveguide architecture and the unprecedented devices it enables**, Scott R. Davis, George Farca, Scott D. Rommel, Michael H. Anderson, Vescent Photonics Inc. .... [6975-02]

1:50 pm: **Experimental results for a photonic time reversal processor for the adaptive control of an ultra-wideband phased array antenna**, Henry Zmuda, Univ. of Florida; Michael L. Fanto, Thomas McEwen, Air Force Research Lab. .... [6975-03]

2:10 pm: **Demonstration of an all-optical flip-flop using a Lyot filter and a semiconductor optical amplifier arrangement**, Catherine M. Emmons, Patrick D. Kumavor, Eric J. Donkor, Univ. of Connecticut .... [6975-04]

2:30 pm: **Photonically-enabled RF spectrum analyzer demonstration**, Elizabeth T. Kunkke, Ken Tsai, Andrew D. Smith, T. Jung, Lawrence Lembo, Richard Davis, Northrop Grumman Space Technology; W. R. Babbitt, R. Krishna-Mohan, Montana State Univ./Bozeman; Z. Cole, Scientific Materials Corp.; K. Merkel, S2 Corp.; Kelvin Wagner, Univ. of Colorado at Boulder .... [6975-05]

2:50 pm: **Improved technique for high-precision FSR measurement**, Ibrahim Ozdur, Sarp Ozharar, Franklyn J. Quinlan, Peter J. Delfyett, Jr., College of Optics & Photonics/Univ. of Central Florida .... [6975-06]

Coffee Break ..... 3:10 to 3:40 pm

### SESSION 2

Room: Crystal P ..... Mon. 3:40 to 5:30 pm

#### Optical Communications

Session Chairs: **Eric J. Donkor**, Univ. of Connecticut;

**Joseph M. Osman**, Air Force Research Lab.

3:40 pm: **Free-space, laser-based data transmission: satellite communication as a technology driver for the development of fast, reliable terrestrial data networks**, Martin Gerken, Martin Theis, Georg Luichtel, Carl Zeiss Optronics GmbH (Germany). .... [6975-07]

4:00 pm: **Nonlinearity compensation in coherent optical transmission**, Gilad Goldfarb, Xiaoxu Li, Guifang Li, College of Optics & Photonics/Univ. of Central Florida .... [6975-08]

4:20 pm: **Security of reconfigurable FSO mesh networks and application to disaster areas**, Stamatios V. Kartalopoulos, Sr., Univ. of Oklahoma ... [6975-09]

4:40 pm: **Needle-in-the-haystack secure optical communication** (*Invited Paper*), Guifang Li, College of Optics & Photonics/Univ. of Central Florida; Michael Taylor, Atlantic Sciences .... [6975-10]

5:10 pm: **Performance analysis of an optical identification and interrogation system**, Anandkumar Venugopalan, Anjan K. Ghosh, Pramode Verma, Sam Cheng, Univ. of Oklahoma .... [6975-11]

## Tuesday 18 March

### Symposium-Wide Plenary Presentation

Room: Palms Ballroom, Canary ..... Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,

Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break ..... 10:00 to 10:30 am

### SESSION 3

Room: Crystal P ..... Tues. 10:30 to 11:10 am

#### Keynote Presentation

Session Chairs: **Michael J. Hayduk**, Air Force Research Lab.;

**Peter J. Delfyett, Jr.**, College of Optics & Photonics/  
Univ. of Central Florida

10:30 am: **Optically compressed image sensing using random aperture coding** (*Keynote Presentation*) (*Invited Paper*), Adrian Stern, Ben-Gurion Univ. of the Negev (Israel); Bahram Javidi, Univ. of Connecticut. .... [6975-13]

### SESSION 4

Room: Crystal P ..... Tues. 11:10 am to 12:10 pm

#### Photonic Analog to Digital Converters

Session Chairs: **Michael J. Hayduk**, Air Force Research Lab.;

**Peter J. Delfyett, Jr.**, College of Optics & Photonics/  
Univ. of Central Florida

11:10 am: **Optically synchronized decoder and multiplexer scheme for interleaved photonics analog to digital conversion**, Carlos Villa-Angulo, Patrick Kumavor, Eric Donkor, Univ. of Connecticut .... [6975-14]

11:30 am: **Recirculating optical delay line for high-speed, high-resolution analog-to-digital conversion and other radar applications**, Henry Zmuda, Univ. of Florida; Michael L. Fanto, Thomas McEwen, Air Force Research Lab.; Jared Pawloski, Binghamton Univ.; Kristina Norelli, Syracuse Univ. .... [6975-15]

11:50 am: **High-speed optoelectronics polyphase scheme for sampling/demultiplexing RF analog signals**, Carlos Villa-Angulo, Patrick Kumavor, Aaron Feldstein, Jennifer Hernandez, Eric Donkor, Univ. of Connecticut. .... [6975-16]

Lunch/Exhibition Break ..... 12:10 to 1:10 pm

**SESSION 5**

**Room: Crystal P . . . . .Tues. 1:10 to 3:20 pm**

**Lasers and Emitters**

*Session Chairs: Michael L. Fanto, Air Force Research Lab.;  
Eric J. Donkor, Univ. of Connecticut*

- 1:10 pm: **Interband injection locking of a quantum dot mode-locked two-section diode laser**, Jimyung Kim, Peter J. Delfyett, Jr., College of Optics & Photonics/Univ. of Central Florida . . . . . [6975-17]
- 1:30 pm: **Stabilized optical frequency combs from diode lasers: applications in optical communications, signal processing, and instrumentation** (*Invited Paper*), Peter J. Delfyett, Jr., College of Optics & Photonics/Univ. of Central Florida . . . . . [6975-18]
- 2:00 pm: **Optical frequency comb generation by direct modulation of CW light**, Sarper Ozharar, Ibrahim Ozdur, Franklyn J. Quinlan, Peter J. Delfyett, Jr., College of Optics & Photonics/Univ. of Central Florida . . . . . [6975-19]
- 2:20 pm: **Low-noise high-power ultra-stable diode-pumped Er-Yb phosphate glass laser**, Robert van Leeuwen, Bing Xu, Laurence S. Watkins, Qing Wang, Chuni Ghosh, Princeton Optronics, Inc. . . . . [6975-20]
- 2:40 pm: **Linearly chirped nanosecond stretched pulses from an eXtreme chirped pulse semiconductor mode-locked oscillator (XCPO)**, Shinwook Lee, College of Optics & Photonics/Univ. of Central Florida; Dimitrios Mandridis, Univ. of Central Florida; Peter J. Delfyett, Jr., College of Optics & Photonics/Univ. of Central Florida . . . . . [6975-21]
- 3:00 pm: **Modeling of generalized Lambertian sources for military and homeland security applications**, Mark Bennahmias, Vladimir Esterkin, Thomas C. Forrester, Min-Yi Shih, Ranjit Pradhan, Andrew A. Kostrzewski, Naresh Menon, Paul Shnitser, Michael Reznikov, Tomasz P. Jansson, Physical Optics Corp.; Kevin Yu, Engin Arik, Luminitt LLC. . . . . [6975-22]
- Coffee Break . . . . . 3:20 to 3:50 pm

**SESSION 6**

**Room: Crystal P . . . . .Tues. 3:50 to 5:40 pm**

**RF Links and Components**

*Session Chairs: Peter J. Delfyett, Jr., College of Optics & Photonics/  
Univ. of Central Florida; Andrew R. Pirich, ACP Consulting*

- 3:50 pm: **Characterization of an electroabsorption modulator design with high-dynamic range for broadband analog applications**, Rebecca J. Bussjaeger, Richard J. Michalak, Brian McKeon, Paul Cook, Air Force Research Lab.; Henry Zmuda, Univ. of Florida; Reinhard K. Erdmann, Air Force Research Lab.; Songsheng Tan, Nancy Stoffel, Charles Schick, Terrance G. McDonald, Infotonics Technology Ctr. . . . . [6975-23]
- 4:10 pm: **Design and development of a package for a peripheral-coupled waveguide electro-absorption modulator** (*Invited Paper*), Songsheng Tan, Nancy Stoffel, Charles Schick, Terrance G. McDonald, Al Whitbeck, Infotonics Technology Ctr.; Reinhard K. Erdmann, Richard J. Michalak, Rebecca J. Bussjaeger, Air Force Research Lab.; Ivan N. Shubin, Paul K. L.Yu, Univ. of California/San Diego . . . . . [6975-24]
- 4:40 pm: **Compact WDM bidirectional fiber optic RF link**, Alex Rosiewicz, Markus Renlind, EM4, Inc. . . . . [6975-25]
- 5:00 pm: **Measurement of SFDR and noise in EDF amplified analog RF links using all-optical downconversion and balanced receivers**, Charles Middleton III, Michael R. Borbath, Richard DeSalvo, Harris Corp. . . . . [6975-26]
- 5:20 pm: **High-power handling, ultra-fast GRIN lens-coupled photodetectors**, Abhay M. Joshi, Donald A. Becker, Shubhashish Datta, Discovery Semiconductors, Inc. . . . . [6975-27]

**POSTERS-Tuesday**

**Room: Palms Ballroom-Royal . . . . .Tues. 6:00 to 7:30 pm**

*All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.*

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**Multimode interference mode generator**, J. E. Antonio-Lopez, D. A. May-Arrijoja, J. J. Sánchez-Mondragón, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [6975-28]

**Picosecond standoff multiphoton detection of gas phase species: initial results**, J. B. Johnson, Kevin Lyon, William D. Murry, Daniel R. Britton, Arkansas State Univ.; Michael J. Johnson, Brigham Young Univ. . . . . [6975-12]

**Related Course**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

**SC728 Network Centric Target Tracking and Classification** (*Drummond*) Monday, 8:30 am to 5:30 pm



# Conference 6976 · Room: Crystal A

Wednesday-Thursday 19-20 March 2008 • Proceedings of SPIE Vol. 6976

## Quantum Information and Computation VI

Conference Chairs: **Eric J. Donkor**, Univ. of Connecticut; **Andrew R. Pirich**, ACP Consulting; **Howard E. Brandt**, Army Research Lab.

Program Committee: **Chip Brig Elliott**, BBN Technologies; **Michael J. Hayduk**, Air Force Research Lab.; **Louis H. Kauffman**, Univ. of Illinois/Chicago; **Vladimir E. Korepin**, Stony Brook Univ.; **Samuel J. Lomonaco, Jr.**, Univ. of Maryland/Baltimore County; **John M. Myers**, Harvard Univ.; **Vladimir Privman**, Clarkson Univ.; **Alexander V. Sergienko**, Boston Univ.; **Tai Tsun Wu**, Harvard Univ.

### Wednesday 19 March

#### SESSION 1

Room: Crystal A ..... Wed. 8:50 to 10:20 am

#### Quantum Gates and Processors

Session Chair: **Howard E. Brandt**, Army Research Lab.

8:50 am: **Room temperature solid state quantum processors in diamond** (*Invited Paper*), Philip R. Hemmer, Texas A&M Univ.; Mikhail D. Lukin, Harvard Univ. .... [6976-01]

9:20 am: **Entanglement and coherence in double well optical lattices**, Philip R. Johnson, American Univ. .... [6976-02]

9:40 am: **A quantum-mathematical model to state single photon (electron) double slit experiment, Fraunhofer and Fresnel diffractions**, Akbar Rahmani Nejad, Civil Aviation Organization (Iran) .... [6976-03]

10:00 am: **Universal entanglement decoherence of warm qubits**, Ting Yu, Joseph H. Eberly, Univ. of Rochester ..... [6976-04]

Coffee Break ..... 10:20 to 10:50 am

#### SESSION 2

Room: Crystal A ..... Wed. 10:50 am to 12:20 pm

#### Quantum Networks, Detectors and Sensors

Session Chairs: **Michael J. Hayduk**, Air Force Research Lab.; **Eric J. Donkor**, Univ. of Connecticut

10:50 am: **High-speed infrared photon counting with Superconducting Single-Photon Detectors (SSPD) for quantum communication** (*Invited Paper*), Olga Minaeva, Alexander V. Sergienko, Boston Univ.; Gregory N. Goltsman, Moscow State Pedagogical Univ. (Russia) .... [6976-05]

11:20 am: **High-count rate germanium single photon detectors at 1310nm**, Malcolm Carroll, John Seamons, Sandia National Labs. .... [6976-06]

11:40 am: **Quantum sensor miniaturization**, Gerald N. Gilbert, Michael D. Hamrick, Yaakov S. Weinstein, Stephen P. Pappas, Anthony Donadio, The MITRE Corp. .... [6976-07]

12:00 pm: **Quantum sensors in a lossy medium**, Hwang Lee, Louisiana State Univ. .... [6976-08]

Lunch/Exhibition Break ..... 12:20 to 1:20 pm

#### SESSION 3

Room: Crystal A ..... Wed. 1:20 to 3:00 pm

#### Quantum Measurement

Session Chairs: **Alexander V. Sergienko**, Boston Univ.; **Andrew R. Pirich**, ACP Consulting

1:20 pm: **On the quantum-mechanical form of experimental reports**, John M. Myers, Harvard Univ. .... [6976-09]

1:40 pm: **Non-destructive quantum measurement scheme for quantum states in superposition**, Patrick D. Kumavor, Eric J. Donkor, Univ. of Connecticut ..... [6976-10]

2:00 pm: **Accelerated control of quantum systems using two qubit feedback and guidance**, Charles Hill, Jason F. Ralph, The Univ. of Liverpool (United Kingdom) ..... [6976-11]

2:20 pm: **Hilbert-Schmidt disturbance due to measurement**, Michael R. Frey, Bucknell Univ. and Naval Research Lab. .... [6976-12]

2:40 pm: **Weak measurements, quantum random walk and majorization**, Debabrata Ghoshal, George Mason Univ. .... [6976-13]

Coffee Break ..... 3:00 to 3:30 pm

#### SESSION 4

Room: Crystal A ..... Wed. 3:30 to 5:10 pm

#### Quantum Key Distribution, Secure Communication

Session Chair: **Samuel J. Lomonaco, Jr.**, Univ. of Maryland/Baltimore County

3:30 pm: **Free space QKD in daylight**, Matthew P. Peloso, Alexander Ling, Antia Lamas-Linares, Christian Kurtsiefer, National Univ. of Singapore (Singapore) ..... [6976-14]

3:50 pm: **Spying on an entanglement-based QKD system through a timing side-channel**, Antia Lamas-Linares, Christian Kurtsiefer, National Univ. of Singapore (Singapore) ..... [6976-15]

4:10 pm: **Nonextensive statistics framework for secret shared key construction using continuous variables**, Ravi C. Venkatesan, Systems Research Corp. (India) ..... [6976-16]

4:30 pm: **Hastening, delaying, or averting sudden death of quantum entanglement**, Ravi P. Rau, Louisiana State Univ. .... [6976-17]

4:50 pm: **Generalized statistics framework for privacy amplification in quantum cryptography**, Ravi C. Venkatesan, Systems Research Corp. (India) ..... [6976-18]

### Thursday 20 March

#### SESSION 5

Room: Crystal A ..... Thurs. 8:50 to 10:20 am

#### Quantum Information Theory I

Session Chair: **Andrew R. Pirich**, ACP Consulting

8:50 am: **Quantum braids and knots** (*Invited Paper*), Samuel J. Lomonaco, Jr., Univ. of Maryland/Baltimore County; Louis H. Kauffman, Univ. of Illinois at Chicago ..... [6976-19]

9:20 am: **Estimation of classical and quantum entropy and other information-theoretic quantities**, Alexei Kaltchenko, Wilfrid Laurier Univ. (Canada) . [6976-20]

9:40 am: **Topological quantum computing**, Louis H. Kauffman, Univ. of Illinois at Chicago; Samuel J. Lomonaco, Jr., Univ. of Maryland/Baltimore County [6976-21]

10:00 am: **Model link and knot mapping in quantum electrodynamics**, Howard E. Brandt, Army Research Lab. .... [6976-22]

Coffee Break ..... 10:20 to 10:50 am

#### SESSION 6

Room: Crystal A ..... Thurs. 10:50 am to 12:30 pm

#### Quantum Information Theory II

Session Chair: **Howard E. Brandt**, Army Research Lab.

10:50 am: **Quantum algorithms for the Bollobas-Riordan-Tutte polynomial**, Juan F. Ospina, Univ. EAFIT (Colombia) ..... [6976-23]

11:10 am: **The Grover iteration from Noether's theorem**, Ravi C. Venkatesan, Systems Research Corp. (India) ..... [6976-24]

11:30 am: **Generalized statistics analysis of bound information and bound quantum entanglement in quantum cryptography**, Ravi C. Venkatesan, Systems Research Corp. (India) ..... [6976-25]

11:50 am: **Memory, contextuality and quantum mechanics**, John E. Gray, Naval Surface Warfare Ctr.; Jeff Tollaksen, George Mason Univ. .... [6976-26]

12:10 pm: **The A-V formula, its justification and implications for "Signal Enhancement"**, John E. Gray, Naval Surface Warfare Ctr.; Jeff Tollaksen, George Mason Univ. .... [6976-27]

Lunch Break ..... 12:30 to 1:30 pm

**SESSION 7**

**Room: Crystal A** ..... **Thurs. 1:30 to 4:00 pm**

**Quantum Algorithms**

*Session Chairs:* **Louis H. Kauffman**, Univ. of Illinois at Chicago;  
**Eric J. Donkor**, Univ. of Connecticut

- 1:30 pm: **Operator quantum fault tolerance** (*Invited Paper*), Gerald N. Gilbert, Michael D. Hamrick, Yaakov S. Weinstein, The MITRE Corp.; Vaneet Aggarwal, A. Robert Calderbank, Princeton Univ. .... [6976-28]
- 2:00 pm: **Quantum lattice algorithms for quantum turbulence in BEC**, Jeffrey Yepez, Air Force Research Lab.; George Vahala, The College of William & Mary; Linda L. Vahala, Old Dominion Univ. .... [6976-31]
- 2:20 pm: **Finite temperature quantum algorithm and majorization**, Debabrata Ghoshal, Richard B. Gomez, Marco O. Lanzagorta, George Mason Univ.; Jeffrey K. Uhlmann, Univ. of Missouri/Columbia ..... [6976-32]

- 2:40 pm: **Is quantum parallelism real?**, Marco O. Lanzagorta, George Mason Univ.; Jeffrey K. Uhlmann, Univ. of Missouri/Columbia ..... [6976-33]
- 3:00 pm: **Differential geometry of quantum computation**, Howard E. Brandt, Army Research Lab. .... [6976-34]
- 3:20 pm: **Quantum error correction code in the Hamiltonian formulation**, Yong Zhang, the Univ. of Utah ..... [6976-35]
- 3:40 pm: **Quantum lithography with classical light: generation of arbitrary patterns**, Qingqing Sun, Texas A&M Univ. .... [6976-36]

**Related Course**

**Registration is required.**  
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SC728 **Network Centric Target Tracking and Classification** (*Drummond*) Monday, 8:30 am to 5:30 pm

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# Conference 6977 · Room: Crystal B

Monday-Tuesday 17-18 March 2008 • Proceedings of SPIE Vol. 6977

## Optical Pattern Recognition XIX

Conference Chairs: **David P. Casasent**, Carnegie Mellon Univ.; **Tien-Hsin Chao**, Jet Propulsion Lab.

Program Committee: **Mohammad S. Alam**, Univ. of South Alabama; **Don A. Gregory**, The Univ. of Alabama in Huntsville; **Bahram Javidi**, Univ. of Connecticut; **Richard D. Juday**, NASA Johnson Space Ctr.; **Dennis R. Pape**, AlphaLaunch; **Yunlong Sheng**, Univ. Laval (Canada); **Joseph L. Stufflebeam**, NewTec; **Ashit Talukder**, Univ. of Southern California; **B. V. K. Vijaya Kumar**, Carnegie Mellon Univ.; **Rupert C. D. Young**, Univ. of Sussex at Brighton (United Kingdom)

### Monday 17 March

#### SESSION 1

Room: Crystal B ..... Mon. 8:30 to 10:00 am

##### Invited Papers I

Session Chair: **David P. Casasent**, Carnegie Mellon Univ.

- 8:30 am: **Optical ID tags for automatic vehicle identification and authentication** (Keynote Presentation) (Invited Paper), Bahram Javidi, Univ. of Connecticut; Elisabet Pérez-Cabré, Maria S. Millan, Univ. Politècnica de Catalunya (Spain) ..... [6977-01]
- 9:00 am: **Distortion-invariant kernel filters for ATR** (Invited Paper), Rohit Patnaik, David P. Casasent, Carnegie Mellon Univ. .... [6977-02]
- 9:30 am: **Grayscale optical correlator for CAD/CAC applications** (Invited Paper), Tien-Hsin Chao, Thomas T. Lu, Jet Propulsion Lab. .... [6977-03]
- Coffee Break ..... 10:00 to 10:30 am

#### SESSION 2

Room: Crystal B ..... Mon. 10:30 am to 12:00 pm

##### Invited Papers II

Session Chair: **David P. Casasent**, Carnegie Mellon Univ.

- 10:30 am: **Multiple target detection in video using quadratic multi-frame correlation filtering** (Invited Paper), Ryan A. Kerekes, Oak Ridge National Lab.; B. V. K. Vijaya Kumar, Carnegie Mellon Univ. .... [6977-04]
- 11:00 am: **Dynamic range compression deconvolution for enhancement of automatic target recognition system performance** (Invited Paper), Bahareh Haji-Saeed, Solid State Scientific Corp.; William D. Goodhue, Univ. of Massachusetts/Lowell; Jed Khoury, Charles L. Woods, Air Force Research Lab.; John Kierstead, Solid State Scientific Corp. .... [6977-05]
- 11:30 am: **Mine detection in multispectral imagery data using constant energy minimization** (Invited Paper), Mohamed I. Elbakary, Mohammad S. Alam, Univ. of South Alabama. .... [6977-06]
- Lunch/Exhibition Break ..... 12:00 to 1:20 pm

#### SESSION 3

Room: Crystal B ..... Mon. 1:20 to 3:00 pm

##### Pattern Recognition Correlators

Session Chairs: **Tien-Hsin Chao**, Jet Propulsion Lab.;

**Rupert C. D. Young**, Univ. of Sussex at Brighton (United Kingdom)

- 1:20 pm: **Pseudorandom phase function for phase encoded JTC**, Abdul Rahman Alsamman, Univ. of New Orleans ..... [6977-07]
- 1:40 pm: **Probability density function-based Fisher ratio applied to polarization-enhanced patterns**, Aed M. El-Saba, Mohammad S. Alam, Hari Nalluri, Univ. of South Alabama ..... [6977-08]
- 2:00 pm: **Pattern recognition using Gaussian-filtered, shifted phase-encoded fringe-adjusted joint transform correlation**, Mohammed N. Islam, Old Dominion Univ.; Mohammad S. Alam, Univ. of South Alabama; Vijayan K. Asari, Mohammad A. Karim, Old Dominion Univ. .... [6977-09]
- 2:20 pm: **Two-stage automatic target recognition system for false alarm reduction** (Presentation Only) Thomas T. Lu, Tien-Hsin Chao, Jet Propulsion Lab. .... [6977-10]
- 2:40 pm: **LPCC invariant correlation filters: realization in 4-f holographic correlator**, Nikolay Evtikhiev, Eugene Zlokazov, Sergey N. Starikov, Rostislav Starikov, Sergey Sirotkin, Moscow Engineering Physics Institute (Russia)[6977-11]
- Coffee Break ..... 3:00 to 3:30 pm

#### SESSION 4

Room: Crystal B ..... Mon. 3:30 to 5:10 pm

##### Pattern Recognition Filters and Applications

Session Chair: **Mohammad S. Alam**, Univ. of South Alabama

- 3:30 pm: **A method for synthesizing training images using feature prediction** (Presentation Only), Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control. .... [6977-12]
- 3:50 pm: **Space vehicle pose estimation via optical correlation and nonlinear estimation**, John M. Rakoczy, NASA Marshall Space Flight Ctr. .... [6977-13]
- 4:10 pm: **Improved training for target detection using Fukunaga-Koontz transform and distance classifier correlation filter**, Mohamed I. Elbakary, Mohammad S. Alam, Melih S. Aslan, Univ. of South Alabama. .... [6977-14]
- 4:30 pm: **Multiscale beamlet transform application to airfield runway detection**, Samir Sahli, Yunlong Sheng, Univ. Laval (Canada). .... [6977-15]
- 4:50 pm: **Land cover mapping after the TSUNAMI event over Nanggroe Aceh Darussalam (NAD) Province, Indonesia**, Hwee-San Lim, Chow Jeng Wong, Mohd Zubir Mat Jafri, Khiruddin Abdullah, Azrul Nizam Alias, Nasirun Mohd. Saleh, Univ. Sains Malaysia (Malaysia); Muhammad Syukri Surbakti, Syiah Kuala Univ. (Indonesia) ..... [6977-16]

### Tuesday 18 March

#### SESSION 5

Room: Crystal B ..... Tues. 8:30 to 10:10 am

##### Image Processing

Session Chair: **Rupert C. D. Young**, Univ. of Sussex at Brighton (United Kingdom)

- 8:30 am: **Optoelectronic multifractal and directional wavelet analysis for accurate detection of precipitation events in weather radar images**, Abdul Rahman Alsamman, Univ. of New Orleans ..... [6977-17]
- 8:50 am: **Noise elimination methods in topological pattern recognition**, Chia-Lun J. Hu, Univ. of Colorado at Boulder ..... [6977-18]
- 9:10 am: **The suppression of non-aligned gradients in the correlation between two grayscale images** (Presentation Only), Antonio F. Ramirez, Raytheon Missile Systems ..... [6977-19]
- 9:30 am: **Image watermarking extraction using Fourier domain wiener filter**, Philip M. Birch, Ioannis Kypraos, Bhargav Mitra, Rupert C. D. Young, Chris Chatwin, Univ. of Sussex at Brighton (United Kingdom). .... [6977-20]
- 9:50 am: **Computational sensing algorithms for image reconstruction and the detection of moving objects in multiplexed imaging systems**, Robert R. Muise, Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control. .... [6977-21]
- Coffee Break ..... 10:10 to 10:40 am



**SESSION 6**

**Room: Crystal B . . . . .Tues. 10:40 to 11:40 am**

**Tracking and Applications**

*Session Chair: Tien-Hsin Chao, Jet Propulsion Lab.*

10:40 am: **Near real-time extraction of planar features from 3D flash-lidar video frames**, Don T. Venable, Maarten Uijt de Haag, Ohio Univ. . . . . [6977-22]

11:00 am: **Compact liquid crystal waveguide based Fourier transform spectrometer for in-situ and remote gas and chemical sensing**, Tien-Hsin Chao, Thomas T. Lu, Jet Propulsion Lab.; Scott R. Davis, Michael H. Anderson, Vescent Photonics Inc. . . . . [6977-24]

11:20 am: **Predictive control and resource management of a distributed coastal monitoring sensor network**, Ashit Talukder, Jet Propulsion Lab.; Anand Panangadan, Alan Blumberg, Nickitas Georgias, Thomas Herrington, Univ. of Southern California . . . . . [6977-25]

**POSTERS-Tuesday**

**Room: Palms Ballroom-Royal . . . . .Tues. 6:00 to 7:30 pm**

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**Pattern Recognition Filters and Applications**

Using commercial photo camera's RAW-based images in optical-digital correlator for pattern recognition, Sergey N. Starikov, Mikhail V. Konnik, Moscow Engineering Physics Institute (Russia). . . . . [6977-26]

**Image Processing**

**High-spatial resolution land cover mapping using remotely sensed image**, Hwee-San Lim, Univ. Sains Malaysia (Malaysia); Sultan AlSultan, Qassim Univ. (Saudi Arabia); Chow Jeng Wong, Mohd Zubir Mat Jafri, Khiruddin Abdullah, Azrul Nizam Alias, Nasirun Mohd. Saleh, Univ. Sains Malaysia (Malaysia) . . . . [6977-28]

**The cognitive structural approach for image restoration**, Igor Mardare, Veacheslav L. Perju, Technical Univ. of Moldova (Moldova); David Casasent, Carnegie Mellon Univ. . . . . [6977-29]

**Face recognition on the basis of moment invariant, principal component analysis and correlation**, Veacheslav L. Perju, Technical Univ. of Moldova (Moldova); David Casasent, Carnegie Mellon Univ.; Igor Mardare, Andrei Crivat, Technical Univ. of Moldova (Moldova) . . . . . [6977-30]

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SC728 **Network Centric Target Tracking and Classification (Drummond)** Monday, 8:30 am to 5:30 pm

**Make time for the  
Defense+Security Exhibition**  
Orlando World Center Marriott Resort & Convention Center  
Cypress/Sago/Sabel Ballrooms

Tuesday 18 March . . . . . 10:00 am to 5:00 pm  
Wednesday 19 March . . . . . 10:00 am to 5:00 pm  
Thursday 20 March . . . . . 10:00 am to 2:00 pm

**Don't miss the NEW  
Robotics+Unmanned Systems Pavilion.**  
*See pp. 18–21 for exhibition details.*

# Conference 6978 · Room: Crystal N

Tuesday-Wednesday 18-19 March 2008 • Proceedings of SPIE Vol. 6978

## Visual Information Processing XVII

*Conference Chairs:* **Zia-ur Rahman**, Old Dominion Univ.; **Stephen E. Reichenbach**, Univ. of Nebraska/Lincoln; **Mark Allen Neifeld**, The Univ. of Arizona

*Program Committee:* **Gary W. Euliss**, The MITRE Corp.; **Richard D. Juday**, NASA Johnson Space Ctr.; **Ram Mohan Narayanan**, The Pennsylvania State Univ.; **John M. Pellegrino**, Army Research Lab.; **Robert A. Schowengerdt**, The Univ. of Arizona; **Joseph van der Gracht**, HoloSpex, Inc.

### Tuesday 18 March

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am**

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

*See p. 6 for details.*

Coffee Break . . . . . 10:00 to 10:30 am

#### SESSION 1

**Room: Crystal N . . . . . Tues. 10:30 to 11:50 am**

##### Enhancement Methods

*Session Chair:* **Glenn A. Woodell**, NASA Langley Research Ctr.

10:30 am: **Gaussian model-based statistical matching for image enhancement and segmentation**, Yufeng Zheng, Alcorn State Univ. . . [6978-01]

10:50 am: **A nonlinear technique for the enhancement of extremely high contrast images**, Saibabu Arigela, Vijayan K. Asari, Zia-ur Rahman, Old Dominion Univ. . . . . [6978-02]

11:10 am: **A multiresolution approach to image enhancement via histogram shaping and adaptive wiener filtering**, Teresa L. Pace, Drew Manville, Harry Lee, Gene Cloud, Jim Puritz, DRS Technologies, Inc. . . . . [6978-03]

11:30 am: **A fast and robust wavelet-based dynamic range compression and contrast enhancement model**, Numan Unaldi, Vijayan K. Asari, Zia-ur Rahman, Sertan Erkanli, Old Dominion Univ. . . . . [6978-04]

Lunch/Exhibition Break . . . . . 11:50 am to 1:20 pm

#### SESSION 2

**Room: Crystal N . . . . . Tues. 1:20 to 3:00 pm**

##### Applications

*Session Chair:* **Zia-ur Rahman**, Old Dominion Univ.

1:20 pm: **Indoor localization of tactical mobile robots via sensor data fusion**, Emin Kuscu, Amir H. Shirkhodaie, Haroun Rabbabaah, Tennessee State Univ. . . . . [6978-05]

1:40 pm: **A modular approach on adaptive thresholding for the extraction of mammalian cell regions from bioelectric images in complex background environments**, Praveen Sankaran, Inder Purohit, Vijayan K. Asari, Mohammad A. Karim, Old Dominion Univ. . . . . [6978-06]

2:00 pm: **A modular high-precision digital system for hypervelocity projectile performance measurements**, Vivek V. Nagarkar, Bipin Singh, Stuart Miller, Radiation Monitoring Devices, Inc.; Larry Campbell, Ron Bishel, Rick Rushing, U.S. Air Force . . . . . [6978-07]

2:20 pm: **Automated visual inspection of jet engine aerofoils based on soft computing techniques**, Amir H. Shirkhodaie, Naresh Hanchate, Mohammad Habibi, Tennessee State Univ. . . . . [6978-08]

2:40 pm: **Determination of aerosol concentration using a digital SLR camera**, Chow Jeng Wong, Mohd Zubir Mat Jafri, Khiruddin Abdullah, Hwee San Lim, Khee Lam Low, Univ. Sains Malaysia (Malaysia) . . . . . [6978-09]

Coffee Break . . . . . 3:00 to 3:30 pm

#### SESSION 3

**Room: Crystal N . . . . . Tues. 3:30 to 5:10 pm**

##### Compression and Metrics

*Session Chair:* **Gary W. Euliss**, The MITRE Corp.

3:30 pm: **Lossless compression of the geostationary imaging Fourier transform spectrometer (GIFTS) by the codebook-guided point-to-line vector quantization**, Bormin Huang, Jing Ma, Allen H. Huang, Univ. of Wisconsin/Madison. . . . . [6978-10]

3:50 pm: **Region-of-interest-based ultra-low-bit-rate video coding**, Wei-Jung Chien, Nabil G. Sadaka, Arizona State Univ.; Glen P. Abousleman, General Dynamics C4 Systems; Lina J. Karam, Arizona State Univ. . . . . [6978-11]

4:10 pm: **Wavelet-based image registration with JPEG2000 compressed imagery**, Derrick S. Campbell, William D. Reynolds, Jr., ITT Corp. . . . . [6978-12]

4:30 pm: **A structure-based image similarity measure using homogeneity regions**, Eric P. Lam, ThalesRaytheonSystems . . . . . [6978-13]

4:50 pm: **Analysis of the general image quality equation**, Samuel T. Thurman, James R. Fienup, Univ. of Rochester . . . . . [6978-14]

#### POSTERS-Tuesday

**Room: Palms Ballroom-Royal . . . . . Tues. 6:00 to 7:30 pm**

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**A secure workflow-based automated research manager for hyperspectral image processing**, Jonathan K. Riek, Brian Wemett, VirtualScopics, Inc.; Robert A. Leathers, Trijntje V. Downes, Naval Research Lab.; Dale Keefer, Robert Weetman, Anthony Mazzola, VirtualScopics, Inc. . . . . [6978-30]

**Feasibility of a portable morphological scene change detection security system for use in various environments on a field programmable gate array**, Andrew J. Tickle, Jeremy S. Smith, Q. H. Wu, The Univ. of Liverpool (United Kingdom) . . . . . [6978-31]

**Feasibility of a morphological forensic document recovery system for burnt documents using mobile phone camera and field programmable gate array technology**, Andrew J. Tickle, The Univ. of Liverpool (United Kingdom); Jeremy S. Smith, The Univ. of Liverpool; Q. H. Wu, The Univ. of Liverpool (United Kingdom) . . . . . [6978-32]

**Next generation network based intermediate-view reconstruction using variable block matching algorithm**, Kyung-Hoon Bae, Samsung Thales Co., Ltd. (South Korea); Dong-Choon Hwang, Eun Soo Kim, Kwangwoon Univ. (South Korea) . . . . . [6978-33]

**Optimization and application of retinex algorithm in aerial image processing**, Jun He, Beijing Normal Univ. (China) . . . . . [6978-34]

**Linear restoration methods for wavefront coded imaging system based on digital photo camera**, Sergey N. Starikov, Mikhail V. Konnik, Edward A. Manykin, Vladislav G. Rodin, Moscow Engineering Physics Institute (Russia) . . . . [6978-35]

**Linearization of RAW data from commercial photo cameras for optical-digital imaging systems**, Sergey N. Starikov, Mikhail V. Konnik, Moscow Engineering Physics Institute (Russia). . . . . [6978-36]

**Anomalous behavior detection in crowded maritime port facilities**, Mikel D. Rodriguez, Univ. of Central Florida. . . . . [6978-37]

**Transferring color to single band infrared images based on orientation texture feature analysis**, Yuan-Meng Zhao, LingXue Wang, Wei-Qi Jin, Shi-Ming Shi, Beijing Institute of Technology (China). . . . . [6978-39]

**Statistical simulation of deformations using wavelet independent component analysis**, Ahmed S. Elsafi, Rami Zewail, Nelson G. Durdle, Univ. of Alberta (Canada). . . . . [6978-40]

## Wednesday 19 March

### SESSION 4

**Room: Crystal N . . . . . Wed. 8:50 to 10:40 am**

#### Computational Imaging

*Session Chair: Mark Allen Neifeld, The Univ. of Arizona*

8:50 am: **Recent developments in coded aperture multiplexed imaging systems** (*Invited Paper*), Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control. . . . . [6978-15]

9:20 am: **Scaling analysis of computational imaging systems** (*Invited Paper*), Ravindra A. Athale, Gary W. Euliss, The MITRE Corp.; Joseph N. Mait, Army Research Lab. . . . . [6978-16]

9:50 am: **Adaptive spectroscopy: towards adaptive spectral imaging** (*Invited Paper*), Michael E. Gehm, Joseph Kinast, The Univ. of Arizona. . . . . [6978-17]

10:20 am: **The application of a compressed sensing technique to a networked surveillance camera system**, Jing Zheng, Eddie L. Jacobs, The Univ. of Memphis . . . . . [6978-18]

Coffee Break . . . . . 10:40 to 11:10 am

### SESSION 5

**Room: Crystal N . . . . . Wed. 11:10 am to 12:50 pm**

#### Analysis and Algorithms

*Session Chair: Stephen E. Reichenbach, Univ. of Nebraska/Lincoln*

11:10 am: **Direct object brightness estimation from atmospheric turbulence degraded images using a new high-speed, modified phase diversity method**, William W. Arrasmith, Florida Institute of Technology. . . . . [6978-19]

11:30 am: **Scene context dependency of pattern constancy of time series imagery**, Glenn A. Woodell, Daniel J. Jobson, NASA Langley Research Ctr.; Zia-ur Rahman, Old Dominion Univ. . . . . [6978-20]

11:50 am: **Building prediction models of large hierarchical simulation models with artificial neural networks**, June F. D.Rodriguez, John O. Miller, Kenneth W. Bauer, Jr., Air Force Institute of Technology. . . . . [6978-21]

12:10 pm: **Adaptive methods of two-scale edge detection in post-enhancement visual pattern processing**, Zia-ur Rahman, Old Dominion Univ.; Daniel J. Jobson, Glenn A. Woodell, NASA Langley Research Ctr. . . . . [6978-22]

12:30 pm: **Stereo correspondence with robust correlation measures in a hypothetical reasoning model**, Jean Saad, Didier Guériot, Christophe Sintès, Basel Solaiman, Ecole Nationale Supérieure des Télécommunications Bretagne (France) . . . . . [6978-23]

Lunch/Exhibition Break . . . . . 12:50 to 1:50 pm

### SESSION 6

**Room: Crystal N . . . . . Wed. 1:50 to 3:10 pm**

#### Security and Surveillance

*Session Chair: Zia-ur Rahman, Old Dominion Univ.*

1:50 pm: **Detecting building facades in urban imagery**, Philip David, Army Research Lab. . . . . [6978-24]

2:10 pm: **A grayscale skin and facial detection mechanism for use in conjunction with security system technology via graphical block methodologies on field programmable gate arrays**, Andrew J. Tickle, Jeremy S. Smith, Q. H. Wu, The Univ. of Liverpool (United Kingdom) . . . . . [6978-25]

2:30 pm: **Adaptive skin pixel classification technique based on hybrid color spaces and skin textural information**, Ramya Reddy Maaram, Satyanadh Gundimada, Vijayan K. Asari, Old Dominion Univ. . . . . [6978-26]

2:50 pm: **Intelligent preprocessing for fast-moving object detection**, Chris Poppe, Sarah De Bruyne, Peter Lambert, Rik Van de Walle, Univ. Gent (Belgium) . . . . . [6978-28]

Coffee Break . . . . . 3:10 to 4:00 pm

### SESSION 7

**Room: Crystal N . . . . . Wed. 4:00 to 4:30 pm**

#### ATR

4:00 pm: **Overview of the ATR Center** (*Invited Paper*), D. Gregory Arnold, Air Force Research Lab.; Lawrence Carin, Duke Univ.; Randolph L. Moses, The Ohio State Univ.; Lori A. Westerkamp, Air Force Research Lab. . . . . [6978-29]

### Related Courses

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC717 **3D Visualization Techniques for Laser Radar** (*Roth*) Tuesday, 8:30 am to 12:30 pm

SC728 **Network Centric Target Tracking and Classification** (*Drummond*) Monday, 8:30 am to 5:30 pm

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# Independent Component Analyses, Wavelets, Unsupervised Nano-Biomimetic Sensors and Neural Networks VI

Conference Chairs: **Harold H. Szu**, Office of Naval Research; **F. Jack Agee**, Rice Univ.

Conference Co-Chair: **Fredric M. Ham**, Florida Institute of Technology

Program Committee: **Shun-ichi Amari**, The Institute of Physical and Chemical Research (RIKEN) (Japan); **C. Sidney Burrus**, Rice Univ.; **Chang Wen Chen**, Florida Institute of Technology; **Wen-Yan Danny Chung**, Chung Yuan Christian Univ. (Taiwan); **Andrzej S. Cichocki**, The Institute of Physical and Chemical Research (RIKEN) (Japan); **Ronald A. DeVore**, Univ. of South Carolina; **Qian Du**, Mississippi State Univ.; **Norden E. Huang**, NASA Goddard Space Flight Ctr.; **Phillip Q. Hwang**, National Imagery and Mapping Agency; **Joseph Landa**, BriarTek Inc.; **Soo-Young Lee**, Korea Advanced Institute of Science and Technology (South Korea); **Te-Won Lee**, Univ. of California/San Diego; **William Liou**, Western Michigan Univ.; **Kevin W. Lyons**, National Institute of Standards and Technology; **Shoji Makino**, Nippon Telegraph and Telephone Corp. (Japan); **Anke Meyer-Bäse**, Florida State Univ.; **Uwe Meyer-Bäse**, Florida State Univ.; **Francesco Carlo Morabito**, Univ. degli Studi di Reggio Calabria (Italy); **Erkki Oja**, Helsinki Univ. of Technology (Finland); **Dennis W. Prather**, Univ. of Delaware; **Hairong Qi**, The Univ. of Tennessee; **Mark J. T. Smith**, Purdue Univ.; **Wim Sweldens**, Lucent Technologies/Bell Labs.; **Mladen Victor Wickerhauser**, Washington Univ. in St. Louis; **Donald C. Wunsch II**, Univ. of Missouri/Rolla; **Ning Xi**, Michigan State Univ.; **Takeshi Yamakawa**, Kyushu Institute of Technology (Japan); **Fred Yang**, Missioncare Hospital Group (Taiwan)

## Monday 17 March

### SESSION 1

Room: Crystal Q ..... Mon. 8:30 to 9:50 am

#### Sensors, Biometrics, and Security

- 8:30 am: **Fixed analysis-adaptive synthesis filter banks**, Clyde A. Lettsome, Georgia Institute of Technology; Mark J. T. Smith, Purdue Univ.; Russell M. Mersereau, Georgia Institute of Technology ..... [6979-01]
- 8:50 am: **Texture-based iris recognition system**, Phalguni Gupta, Hunny Mehrotra, Indian Institute of Technology Kanpur (India) ..... [6979-02]
- 9:10 am: **Sensor performance evaluation analysis of imitation fingerprint**, Kyoung H. Yu, Hyun-Suk Lee, You-Suk Bae, Korea Polytechnic Univ. (South Korea) ..... [6979-04]
- 9:30 am: **A novel scheme for non-cooperative long-range biometric recognition**, Xiaokun Li, Genshe Chen, Intelligent Automation, Inc.; Erik Blasch, Air Force Research Lab.; Harold H. Szu, Office of Naval Research ..... [6979-05]
- Coffee Break ..... 9:50 to 10:40 am

### SESSION 2

Room: Crystal Q ..... Mon. 10:40 am to 12:20 pm

#### Digital Programmable Logic

- 10:40 am: **FPGA design of MOMS-based sampling rate converters**, Uwe Meyer-Bäse, Florida State Univ. .... [6979-06]
- 11:00 am: **DSP with FPGAs: a Xilinx/Simulink-based course and laboratory**, Uwe Meyer-Bäse, Florida State Univ.; Alonzo Vera, Marios Pattichis, The Univ. of New Mexico; Anke Meyer-Bäse, Reginald Perry, Florida State Univ. .... [6979-07]
- 11:20 am: **Performance evaluation of a FPGA implementation of a digital rotation support vector machine (Invited Paper)**, Horacio Lamela, Matias Jiménez, Jesús Gimeno, Marta Ruiz, Univ. Carlos III de Madrid (Spain) . [6979-08]
- 11:50 am: **An analogue circuit for sequential minimal optimization for support vector machines (Invited Paper)**, Matias Jiménez, Horacio Lamela, Jesús Gimeno, Marta Ruiz, Univ. Carlos III de Madrid (Spain) ..... [6979-09]
- Lunch Break ..... 12:20 to 1:40 pm

### SESSION 3

Room: Crystal Q ..... Mon. 1:40 to 3:00 pm

#### Applications in Medicine

- 1:40 pm: **Robust stability analysis under considerations of uncertainties applied to the heat shock response in e. coli**, Anke Meyer-Bäse, Florida State Univ. .... [6979-10]
- 2:00 pm: **West meets East: psychophysics studies for understanding mysterious Oriental health promoting practices**, Hai-Wen Chen, Science Applications International Corp. .... [6979-11]
- 2:20 pm: **Biological networks reduced by nonlinear balanced truncation**, Anke Meyer-Bäse, Florida State Univ. .... [6979-12]
- 2:40 pm: **Dependent component analysis applied to lesions' characterization in breast MRI**, Anke Meyer-Bäse, Florida State Univ. .... [6979-13]
- Coffee Break ..... 3:00 to 3:30 pm

### SESSION 4

Room: Crystal Q ..... Mon. 3:30 to 4:20 pm

#### Nanoscience and Nanotechnology

- 3:30 pm: **Nanotechnology for aerospace: potential transitions from university research (Invited Paper)**, F. Jack Agee, Rice Univ. .... [6979-14]
- 4:00 pm: **Plasmon-enhanced terahertz near-field microscopy for nanometer-scale sensing**, Daniel Mittleman, Victoria Astley, Hui Zhan, Feng Hao, Peter Nordlander, F. Jack Agee, Rice Univ. .... [6979-15]

### SESSION 5

Room: Crystal Q ..... Mon. 4:20 to 5:00 pm

#### 2008 Wavelets Pioneer Award

- 4:20 pm: **Compressive sensing (Invited Paper, Presentation Only)**, Richard G. Baraniuk, Rice Univ. .... [6979-32]

**Tuesday 18 March**

**Symposium-Wide Plenary Presentation**  
**Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am**  
**The Honorable Jay Cohen,**  
 Under Secretary for Science and Technology,  
 U.S. Dept. of Homeland Security  
*See p. 6 for details.*

Coffee Break . . . . . 10:00 to 10:30 am

**SESSION 6**

**Room: Crystal Q . . . . . Tues. 10:30 to 11:30 am**

**IP Protection of Electronics and Wireless Networks**

10:30 am: **HDL-level automated watermarking of IP cores**, Encarnacion Castillo, Univ. de Granada (Spain); Uwe Meyer-Bäse, Florida State Univ.; Luis Parrilla, Antonio García, Antonio Lloris, Univ. de Granada (Spain) . . . . . [6979-16]

10:50 am: **Dynamic watermark technique based on neural network**, Tao Gu, Li Xu, North China Institute of Science and Technology (China) . . . . . [6979-17]

11:10 am: **Fuzzy neighborhood tracking filters for UWB range radios in multipath environments**, Ka C. Cheok, Oakland Univ. and Jadi, Inc. . . . . [6979-18]

Lunch/Exhibition Break . . . . . 11:30 am to 12:30 pm

**SESSION 7**

**Room: Crystal Q . . . . . Tues. 12:30 to 1:10 pm**

**Neural Networks Applied**

12:30 pm: **Associated neural network independent component analysis structure**, Keehoon Kim, Andrew A. Kostrzewski, Physical Optics Corp. [6979-19]

12:50 pm: **Neural networks utilized to provide mortar classification**, Sachi V. Desai, U.S. Army Research, Development and Engineering Command. . . [6979-20]

**SESSION 8**

**Room: Crystal Q . . . . . Tues. 1:10 to 4:00 pm**

**Imaging Applications**

1:10 pm: **Using a genetic algorithm to find an optimized pulse coupled neural network solution**, Richard P. Edmondson, Michael H. Rodgers, Michele R. Banish, Polaris Sensor Technologies, Inc. . . . . [6979-21]

1:30 pm: **Graph-theoretic segmentation of airborne lidar data**, Lu Wang, Henry C. Chu, Univ. of Louisiana at Lafayette. . . . . [6979-22]

1:50 pm: **Denosing of imagery using higher-order statistics**, Samuel P. Kozaitis, Florida Institute of Technology; Timothy Young, Northrop Grumman Corp. . . . . [6979-23]

2:10 pm: **A canonical minimised Adder graph representation**, Uwe Meyer-Bäse, Florida State Univ.; Oscar Gustafsson, Linköpings Univ. (Sweden); Andrew Dempster, Univ. of New South Wales (Australia) . . . . . [6979-24]

2:30 pm: **Advance image registration techniques and applications**, H. Chen, D. Braunreiter, Science Applications International Corp. . . . . [6979-25]

Coffee Break . . . . . 2:50 to 3:10 pm

3:10 pm: **Autonomous mental development with selective attention, object perception and knowledge representation** (*Invited Paper*), Sang-Woo Ban, Dongguk Univ. (South Korea); Minho Lee, Kyungpook National Univ. (South Korea) . . . . . [6979-27]

3:40 pm: **Spatiotemporal sharpening of sub-pixel super-resolution by means of two infrared spectrum cameras for early cancer detection**, Chia-Yen Lee, Hsin Yu Hsieh, Si-Chen Lee, National Taiwan Univ. (Taiwan); Chiun-Sheng Huang, National Taiwan Univ. Hospital (Taiwan); Yeun-Chung Chang, Chung-Ming Chen, National Taiwan Univ. (Taiwan); Harold H. Szu, National Taiwan Univ. Hospital (Taiwan) . . . . . [6979-33]

**SESSION 9**

**Room: Crystal Q . . . . . Tues. 4:00 to 4:40 pm**

**2008 Unsupervised Learning ICA Award**

4:00 pm: **Independent components of electroencephalographic data**, Tzzy-Ping Jung, Univ. of California, San Diego and National Chiao-Tung Univ.; Scott Makeig, Univ. of California, San Diego. . . . . [6979-34]

**SESSION 10**

**Room: Crystal Q . . . . . Tues. 4:40 to 5:20 pm**

**2008 Biomedical Wellness Award**

4:40 pm: **Unsupervised feature extraction and supervised feature selection for efficient classification** (*Invited Paper*), Soo-Young Lee, Chandra Shekhar Dhir, Paresh Chandra Barman, Sangkyun Lee, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6979-26]

**Wednesday 19 March**

**SESSION 11**

**Room: Crystal Q . . . . . Wed. 9:00 to 9:40 am**

**2008 Nanoengineering Award**

9:00 am: **Micro and nano robotic technologies**, Toshio Fukuda, Nagoya Univ. (Japan) . . . . . [6979-35]

**SESSION 12**

**Room: Crystal Q . . . . . Wed. 9:40 to 11:30 am**

**Fast Parallel Processing using GPU and Applications in STAP (Space Time Adaptive Processing)**

9:40 am: **Overview of DARPA MTO GPU program** (*Invited Paper*), Dennis M. Healy, Jr., Univ. of Maryland/College Park . . . . . [6979-29]

Coffee Break . . . . . 10:10 to 10:30 am

10:30 am: **Overview of implementation of DARPA GPU program in SAIC** (*Invited Paper*), Dennis Braureiter, SAIC . . . . . [6979-30]

11:00 am: **Advance image registration techniques and applications in STAP** (*Invited Paper*), Hai-Wen Chen, Science Applications International Corp. . . . . [6979-31]

**Related Courses**

**Registration is required.**

See SPIE Cashier for full course description or to Register.

SC902 **Compressive Sensing: Theory and Applications** (*DeVore, Baraniuk*) Sunday, 1:30 to 5:30 pm

SC715 **Independent Component Analysis and Beyond: Blind Signal Processing and its Applications** (*Lee, Lee*) Wednesday, 8:30 am to 12:30 pm

# Conference 6980 · Room: Crystal F

Monday-Tuesday 17-18 March 2008 • Proceedings of SPIE Vol. 6980

## Wireless Sensing and Processing III

Conference Chairs: **Sohail A. Dianat**, Rochester Institute of Technology; **Michael David Zoltowski**, Purdue Univ.

Program Committee: **Moeness G. Amin**, Villanova Univ.; **Sirisha R. Medidi**, Washington State Univ.; **John W. Nieto**, Harris Corp.; **Raghuveer M. Rao**, Rochester Institute of Technology; **Pramod Kumar Varshney**, Syracuse Univ.

### Monday 17 March

#### SESSION 1

Room: Crystal F. . . . . Mon. 8:30 to 10:10 am

#### Diversity and Multicarrier Techniques

Session Chair: **Fred C. Kellerman**, Harris Corp.

- 8:30 am: **An investigation of constant-envelope variations of OFDM waveforms for use on HF multipath/fading channels**, John W. Nieto, Harris Corp. . . . . [6980-01]
- 8:50 am: **Reduced dimension equalizer and interference canceller for MIMO-OFDM**, Michael D. Zoltowski, Chad Lau, Purdue Univ. . . . . [6980-02]
- 9:10 am: **Carrier diversity via code-spread OFDM**, Michael D. Zoltowski, Muthanna Al-Mahmoud, Purdue Univ. . . . . [6980-03]
- 9:30 am: **Waveform diversity for wireless sensing**, Michael D. Zoltowski, Purdue Univ. . . . . [6980-04]
- 9:50 am: **OFDM LDPC performance comparison on an HF multipath fading channel**, Fred C. Kellerman, Harris Corp. . . . . [6980-05]
- Coffee Break . . . . . 10:10 to 10:40 am

#### SESSION 2

Room: Crystal F. . . . . Mon. 10:40 to 11:40 am

#### Radio Frequency and Identification (RFID)

Session Chair: **Yimin Zhang**, Villanova Univ.

- 10:40 am: **An RF tag communications system model for noise radar**, Qihe Pan, Ram M. Narayanan, The Pennsylvania State Univ. . . . . [6980-06]
- 11:00 am: **Smart radio: spectrum access for first responders**, Mark D. Silvious, Feng Ge, Alex Young, Allen B. MacKenzie, Charles W. Bostian, Virginia Polytechnic Institute and State Univ. . . . . [6980-07]
- 11:20 am: **Nonuniform pulse quantization for multiplication-free correlation in ultrawideband receivers**, Khalil Naghdali, Serkan Dursun, David Akopian, The Univ. of Texas at San Antonio. . . . . [6980-08]

#### SESSION 3

Room: Crystal F. . . . . Mon. 11:40 am to 12:40 pm

#### Implementation and Application

Session Chair: **Raghuveer M. Rao**, Rochester Institute of Technology

- 11:40 am: **An unattended ground sensor architecture for persistent border surveillance**, Robert A. Johnson, Harris Corp.; Gervasio Prado, SenTech Inc. . . . . [6980-09]
- 12:00 pm: **Wireless bio-telemetry link with implantable LC sensor**, Jayanti Venkataraman, Marie Yvanoff, Rochester Institute of Technology. . . . . [6980-10]
- 12:20 pm: **Application and analysis of reduced state techniques on hybrid CPM demodulation**, James A. Norris, Harris Corp. . . . . [6980-24]
- Lunch Break . . . . . 12:40 to 1:50 pm

#### SESSION 4

Room: Crystal F. . . . . Mon. 1:50 to 3:30 pm

#### Sensor Networks

Session Chair: **John W. Nieto**, Harris Corp.

- 1:50 pm: **Distributed event region detection in wireless sensor networks**, Jun Fang, Hongbin Li, Stevens Institute of Technology; Shafik A. Quoraishee, Myron E. Hohil, U.S. Army Armament Research, Development and Engineering Ctr. . . . . [6980-11]

- 2:10 pm: **A lightweight key distribution for wireless sensor networks**, Sirisha R. Medidi, Lynsey Compton-Drake, Muralidhar Medidi, Washington State Univ. . . . . [6980-12]

- 2:30 pm: **Predicting sybil attack in wireless sensor network using swarm-based reasoning algorithm**, Rajani S. Muraleedharan-Sreekumaridevi, Syracuse Univ. . . . . [6980-13]

- 2:50 pm: **Remote monitoring of soldier safety through body posture identification using wearable sensor networks**, Subir Biswas, Muhammad Quwaider, Michigan State Univ. . . . . [6980-15]

- 3:10 pm: **Application of wireless sensor network for group personnel localization in large scale public site**, Chihhsiong Shih, Tunghai Univ. (Taiwan) . . . . . [6980-14]

- Coffee Break . . . . . 3:30 to 3:40 pm

#### SESSION 5

Room: Crystal F. . . . . Mon. 4:00 to 5:00 pm

#### Wireless Networks

Session Chair: **Sohail A. Dianat**, Rochester Institute of Technology

- 4:00 pm: **Asynchronous ad hoc network discovery for low-power systems**, Todd Joslin, Harris Corp. . . . . [6980-16]

- 4:20 pm: **Multibeam antenna scheduling in ad hoc wireless networks**, Xin Li, Yimin Zhang, Moeness G. Amin, Villanova Univ. . . . . [6980-17]

- 4:40 pm: **Application of mesh network radios to UGS**, Wade Calcutt, Barry Jones, Brent Roeder, McQ, Inc. . . . . [6980-18]

### Tuesday 18 March

#### SESSION 6

Room: Crystal F. . . . . Tues. 8:50 to 10:50 am

#### Localization and Multipath

Session Chair: **Michael David Zoltowski**, Purdue Univ.

- 8:50 am: **Uplink transmit beamforming design for SINR maximization with full multiuser channel state information**, Songnan Xi, Michael D. Zoltowski, Purdue Univ. . . . . [6980-19]

- 9:10 am: **A direction finding algorithm for MIMO radar system with transmitting diversity**, Wei-Jen Chen, Ram M. Narayanan, The Pennsylvania State Univ. . . . . [6980-20]

- 9:30 am: **Realization and capacity analysis of cooperative communications based on multiplexing**, Yao Zhao, Western Michigan Univ. . . . . [6980-21]

- 9:50 am: **Near-field MVDR source localization**, Joseph Handfield, Raghuveer M. Rao, Sohail A. Dianat, Rochester Institute of Technology . . . . . [6980-22]

- 10:10 am: **An iterative maximum-likelihood-based parameter estimation algorithm for nakagami-m distribution**, Sohail A. Dianat, Raghuveer M. Rao, Rochester Institute of Technology . . . . . [6980-23]

- 10:30 am: **Finite mixture models for ultrawideband channels**, Divya Choudhary, Aaron L. Robinson, The Univ. of Memphis . . . . . [6980-26]

#### Related Courses

Registration is required.

See SPIE Cashier for full course description or to Register.

SC197 **Fundamentals of Digital Signal/Image Processing (Dianat)** Sunday, 8:30 am to 5:30 pm

SC901 **Sensor Array Signal Processing (Rao)** 8:30 am to 5:30 pm

# Conference 6981 · Room: Grand 14 and Grand 7B

Tuesday-Thursday 18-20 March 2008 • Proceedings of SPIE Vol. 6981

## Defense Transformation and Net-Centric Systems 2008

Conference Chair: **Raja Suresh**, General Dynamics Advanced Information Systems

Program Committee: **Michael James DeWeert**, BAE Systems; **John S. Eicke**, Army Research Lab.; **Paul S. Gaertner**, Defence Science and Technology Organisation (Australia); **John W. Gowens II**, Army Research Lab.; **Gayle D. Grant**, U.S. Army Communications-Electronics Command; **Robert G. Hillman**, Air Force Research Lab.; **Michael A. Kolodny**, Army Research Lab.; **Chung-Hye Read**, National Geospatial-Intelligence Agency; **Brian M. Sadler**, Army Research Lab.; **Larry B. Stotts**, Defense Advanced Research Projects Agency; **Venkataraman Sundareswaran**, Teledyne Scientific Co.; **George Vachtsevanos**, Georgia Institute of Technology; **Guy Vézina**, Defence R&D Canada/Valcartier (Canada)

### Tuesday 18 March

**Symposium-Wide Plenary Presentation**  
Room: Palms Ballroom, Canary . . . . . Tues. 9:15 to 10:00 am

**The Honorable Jay Cohen**,  
Under Secretary for Science and Technology,  
U.S. Dept. of Homeland Security

See p. 6 for details.

Coffee Break . . . . . 10:00 to 10:30 am

#### SESSION 1

Room: Grand 14 . . . . . Tues. 10:30 to 11:50 am

##### Sensor Networks

Session Chair: **Raja Suresh**,  
General Dynamics Advanced Information Systems

10:30 am: **Exposing and manipulating human networks** (*Invited Paper*), Martin Kruger, Office of Naval Research . . . . . [6981-01]

11:00 am: **Focused long term challenges** (*Invited Paper*), Leo J. Rose, U.S. Air Force . . . . . [6981-02]

11:30 am: **Probabilistic framework for characterizing uncertainty in the performance of networked battlefield sensors**, D. Keith Wilson, U.S. Army Engineer Research and Development Ctr.; Chris L. Pettit, U.S. Naval Academy; Sean Mackay, Atmospheric and Environment Research, Inc.; Peter M. Seman, U.S. Army Engineer Research and Development Ctr. . . . . [6981-03]

Lunch Break . . . . . 11:50 am to 1:20 pm

#### SESSION 2

Room: Grand 14 . . . . . Tues. 1:20 to 3:40 pm

##### ARL International Technology Alliance

Session Chairs: **Tien Pham**, Army Research Lab.;  
**John S. Eicke**, Army Research Lab.

1:20 pm: **The challenge of sensor information processing and delivery within network and information science research**, Gavin Pearson, Defence Science and Technology Lab. (United Kingdom); Tien Pham, Army Research Lab. . . . . [6981-04]

1:40 pm: **A biologically inspired MANET architecture**, Aaron Kershenbaum, Vasileios Pappas, Kang-Won Lee, IBM Thomas J. Watson Research Ctr.; Pietro Lio, Univ. of Cambridge (United Kingdom); Brian M. Sadler, Army Research Lab.; Dinesh C. Verma, IBM Thomas J. Watson Research Ctr. . . . . [6981-05]

2:00 pm: **On the resilience of wireless sensor network with circulatory graphs**, Vasileios Pappas, Dinesh C. Verma, IBM Thomas J. Watson Research Ctr.; Ananthram Swami, Army Research Lab. . . . . [6981-06]

2:20 pm: **Policy enabled interconnection of sensor networks**, Dinesh C. Verma, IBM Thomas J. Watson Research Ctr.; Greg Cirincione, Tien Pham, Army Research Labs. . . . . [6981-07]

2:40 pm: **Matching sensors to missions using a knowledge-based approach**, Alun Preece, Cardiff Univ. (United Kingdom); Mario Gomez, Geeth de Mel, Wamberto W. Vasconcelos, Derek Sleeman, Univ. of Aberdeen (United Kingdom); Stuart R. Colley, Gavin Pearson, Defence Science and Technology Lab. (United Kingdom); Thomas F. La Porta, The Pennsylvania State Univ. . . . . [6981-08]

3:00 pm: **Providing rapid adaptation for dynamic missions in mobile, wireless sensor environments**, Sharanya Eswaran, The Pennsylvania State Univ.; Archan Misra, IBM Thomas J. Watson Research Ctr.; Thomas F. La Porta, The Pennsylvania State Univ.; Kin Leung, Imperial College London (United Kingdom) . . . . . [6981-09]

3:20 pm: **Location dependent heuristics for sensor coverage planning**, Dinesh C. Verma, Chai Wu, IBM Thomas J. Watson Research Ctr.; Mark S. Nixon, Univ. of Southampton (United Kingdom); Theodore Brown, Amotz Bar-Noy, Simon Shamoun, City Univ. of New York . . . . . [6981-10]

### Wednesday 19 March

#### SESSION 3

Room: Grand 7B . . . . . Wed. 8:00 to 10:10 am

##### Self-organizing, Collaborative Unmanned I SR Robotic Teams I

Session Chair: **George Vachtsevanos**, Georgia Institute of Technology;  
**Venkataraman Sundareswaran**, Teledyne Scientific Co.

Joint session with conference 6981

8:00 am: **Sensors as robots** (*Invited Paper*), Michael C. Wicks, Air Force Research Lab. . . . . [6981-11]

8:30 am: **Bringing UAVs to the fight: recent army autonomy research and a vision for the future** (*Invited Paper*), Jayashree Moorthy, Keith Arthur, Raymond Higgins, U.S. Army Aviation Applied Technology Directorate . . . . . [6981-12]

9:00 am: **Tactical service-oriented architecture** (*Invited Paper*), Brent Rickenbach, General Dynamics Advanced Information Systems. . . . . [6981-13]

9:30 am: **Fault tolerant and lifetime control architecture for autonomous vehicles**, Alexander Bogdanov, Yi-Liang Chen, Venkataraman Sundareswaran, Thomas Altshuler, Teledyne Scientific Co. . . . . [6981-14]

9:50 am: **Global image registration using shape space tracking**, Liangyin Yu, Jose Molineros, Venkataraman Sundareswaran, Teledyne Scientific Co. [6981-15]

Coffee Break . . . . . 10:10 to 10:40 am

#### SESSION 6

Room: Grand 7B . . . . . Wed. 10:40 am to 12:10 pm

##### Special Topics Session I

Session Chairs: **Scott Fish**, The Univ. of Texas at Austin;  
**Douglas W. Gage**, XPM Technologies

Joint session with conference 6981

10:40 am: **Perspectives on the DARPA Urban Challenge** (*Invited Paper*), Douglas W. Gage, XPM Technologies . . . . . [6962-31]

11:10 am: **FCS-UGV safe operations**, Scott Fish, The Univ. of Texas at Austin; Joshua Ruedin, Science Applications International Corp.; Michael R. Perschbacher, RovnoTech; John E. Bares, Carnegie Mellon Univ. . . . . [6962-32]

11:30 am: **Near-Nash targeting strategies for heterogeneous teams of unmanned combat air vehicles**, David G. Galati, Carnegie Mellon Univ.; Marwan A. Simaan, Univ. of Pittsburgh . . . . . [6962-33]

11:50 am: **Adaptive collaborative control of highly redundant robots**, David A. Handelman, American Android Corp. . . . . [6962-34]

Lunch/Exhibition Break . . . . . 12:10 to 1:30 pm

# Conference 6981 · Room: Grand 14 and grand 7B

## SESSION 7

Room: Grand 7B ..... Wed. 1:30 to 2:50 pm

### Special Topics Session II

Session Chairs: **Scott Fish**, The Univ. of Texas at Austin;  
**Douglas W. Gage**, XPM Technologies

Joint Session with conferences 6962 and 6981

1:30 pm: **Skid steer fuel cell-powered unmanned ground vehicle (Burro)**, Jay S. Meldrum, Michigan Technological Univ..... [6962-35]

1:50 pm: **Hands-free device control using sound picked up in the ear canal**, Siddharth Chhatpar, Lester Ngia, Chris Vlach, Dong Lin, Craig Birkhimer, Amit Juneja, Tarun Pruthi, Think-A-Move, Ltd.; Orin Hoffman, Tristan Lewis, iRobot Corp..... [6962-36]

2:10 pm: **Argumentation-based negotiation for automated sensor tasking**, Daniel Gutches, Christopher Mow, Magnús S. Snorrason, Stephen Ho, Charles River Analytics, Inc..... [6962-37]

2:30 pm: **Low-cost robotic arm control**, John R. Rogers, United States Military Academy ..... [6962-38]

Coffee Break ..... 2:50 pm

## SESSION 8

Room: Grand 7B ..... Wed. 3:20 to 5:20 pm

### Self-organizing, Collaborative Unmanned ISR Robotic Teams II

Session Chairs: **Nahid N. Sidki**, Science Applications International Corp.; **Venkataraman Sundareswaran**, Teledyne Scientific Co.; **George Vachtsevanos**, Georgia Institute of Technology

Joint session with conference 6981

3:20 pm: **Sagittarius: UAV/UGV cooperation for shared situational awareness in urban environments**, Brian M. Yamauchi, iRobot Corp.; Christopher Geyer, Carnegie Mellon Univ..... [6962-44]

3:40 pm: **Coordination of UAVs with resource constraints using market-based approach**, Bandi B. K.Reddy, Abdollah M. Homaifar, Albert C. Esterlin, Eisa M. Osman, North Carolina A&T State Univ..... [6962-39]

4:00 pm: **Multi-objective optimization to support mission planning for constellations of unmanned aerial systems**, Daniel W. Stouch, Sofya Tenenbaum, Ted Fichtl, Charles River Analytics, Inc..... [6962-40]

4:20 pm: **UAV-UGV collaboration with a PackBot UGV and Raven SUAV for pursuit and tracking of a dynamic target**, Carol Cheung, iRobot Corp.; Ben Grocholsky, Carnegie Mellon Univ..... [6962-41]

4:40 pm: **A novel real-time impact monitoring system for unmanned vehicles**, David C. Zhang, Peter Qing, Shawn J. Beard, Amrita Kumar, Irene Li, Acellent Technologies, Inc.; Fukuo Chang, Stanford Univ..... [6962-42]

5:00 pm: **Modeling and simulation of reliability of unmanned intelligent vehicles**, Harpreet Singh, Arati M. Dixit, Wayne State Univ. .... [6962-45]

## Thursday 20 March

## SESSION 4

Room: Grand 14 ..... Thurs. 8:30 to 10:10 am

### Persistent Surveillance Systems

Session Chair: **Larry B. Stotts**,  
Defense Advanced Research Projects Agency

8:30 am: **Autonomous real-time ground ubiquitous surveillance: imaging system (ARGUS-IS) (Invited Paper)**, Brian S. Leininger, Defense Advanced Research Projects Agency ..... [6981-16]

9:00 am: **Track-based video compression**, Mark J. Carlotto, General Dynamics Corp..... [6981-17]

9:20 am: **Multisensor staring exploitation (Invited Paper)**, Michael L. Bryant, Air Force Research Lab..... [6981-18]

9:50 am: **Analysis of tower locations for the secure border initiative network**, Keith W. Brendley, Artis LLC..... [6981-20]

Coffee Break ..... 10:10 to 11:10 am

## SESSION 5

Room: Grand 14 ..... Thurs. 11:10 am to 12:00 pm

### Networks and Net-centric Systems I

Session Chairs: **Gayle D. Grant**, U.S. Army Communications-Electronics Command; **Paul S. Gaertner**, Defence Science and Technology Organisation

11:10 am: **Routing protocols and management for military networks (Invited Paper)**, Tim Gibson, Defense Advanced Research Projects Agency ..... [6981-21]

11:40 am: **Embedded instrumentation systems architecture: supporting system of systems concept**, Nikita A. Visnevski, Khaled Bahei-Eldin, GE Global Research ..... [6981-23]

Lunch Break ..... 12:00 to 1:50 pm

## SESSION 6

Room: Grand 14 ..... Thurs. 1:50 to 2:50 pm

### Networks and Net-centric Systems II

1:50 pm: **Development of IPv6 based distributed NCW management software architecture**, Michael X. Zhao, Leo H. Li, Etonnet, Inc.; Thomas T. Lu, Jet Propulsion Lab..... [6981-24]

2:10 pm: **Predictive ad hoc routing for tactical information management systems**, Marco M. Carvalho, Institute for Human and Machine Cognition; Robert Winkler, Army Research Lab.; Carlos Perez, Institute for Human and Machine Cognition; Jesse Kovach, Steven Choy, Army Research Lab..... [6981-25]

2:30 pm: **Extended range 10 Gbps free space optical communications experiment**, David W. Young, Joseph E. Sluz, Juan C. Juarez, Marc B. Airola, Raymond M. Sova, Harry Hurt III, The Johns Hopkins Univ. Applied Physics Lab.; Malcolm J. Northcott, John Phillips, Andy McClaren, Don Driver, J. Elon Graves, David D. Abelson, AOptix Technologies, Inc.; James J. Foshee, Air Force Research Lab..... [6981-26]

Coffee Break ..... 2:50 to 3:20 pm

## SESSION 7

Room: Grand 14 ..... Thurs. 3:20 to 4:40 pm

### C2 Systems

Session Chair: **Guy Vézina**, Defence R&D Canada/Valcartier (Canada)

3:20 pm: **Collaborative agents for C2 of tactical urban combat operations**, Gabriel Jakobson, Altusys Corp.; John F. Buford, Avaya Inc.; Lundy M. Lewis, Southern New Hampshire Univ. .... [6981-27]

3:40 pm: **Building net-centric systems for the tactical environment**, Mel R. Crocker, Mark Adcock, General Dynamics Canada Ltd. (Canada)..... [6981-28]

4:00 pm: **Semantic technology for rapid integration and event aggregation across heterogeneous information sources**, Suzette Kruger Stoutenburg, Leo Obrst, The MITRE Corp. .... [6981-29]

4:20 pm: **Distributed technology for global dominance**, Peter S. Sapaty, National Academy of Sciences of Ukraine (Ukraine)..... [6981-30]

## Related Courses

Registration is required.

See SPIE Cashier for full course description or to Register.

SC891 **Security of Information and Communication**  
*NEW Networks (Kartalopoulos)* Sunday, 1:30 to 5:30 pm

SC728 **Network Centric Target Tracking and Classification (Drummond)**  
Monday, 8:30 am to 5:30 pm



# Mobile Multimedia/Image Processing, Security, and Applications 2008

Conference Chairs: **Sos S. Agaian**, The Univ. of Texas at San Antonio; **Sabah A. Jassim**, Univ. of Buckingham (United Kingdom)

Program Committee: **Salim Alsharif**, Univ. of South Alabama; **David Akopian**, The Univ. of Texas at San Antonio; **Patrick D. Baier**, The George Washington Univ.; **Cesar Bandera**, BanDeMar Networks; **Chang Wen Chen**, Florida Institute of Technology; **Reiner Creutzburg**, Fachhochschule Brandenburg (Germany); **Martin Dietze**, 4G Systeme GmbH (Germany); **Yingzi Du**, Indiana Univ.-Purdue Univ. Indianapolis; **Frederic Dufaux**, École Polytechnique Fédérale de Lausanne (Switzerland); **Touradj Ebrahimi**, École Polytechnique Fédérale de Lausanne (Switzerland); **Erlan H. Feria**, College of Staten Island/CUNY; **Phalguni Gupta**, Indian Institute of Technology Kanpur (India); **Jacques Koreman**, Norwegian Univ. of Science and Technology (Germany); **Yo-Ping Huang**, Tatung Univ. (Taiwan); **Maryline Maknavigius**, Institut National des Télécommunications (France); **Alessandro Neri**, Univ. degli Studi di Roma Tre (Italy); **Gilbert L. Peterson**, Air Force Institute of Technology; **Salil Prabhakar**, Digital Persona Inc.; **Sonia Salicetti**, GET/INT (France); **Xiyu Shi**, Univ. of Surrey (United Kingdom); **Yuri Shukuryan**, National Academy of Sciences of Armenia (Armenia); **Gregory B. White**, The Univ. of Texas at San Antonio; **Prem Kumar Kalra**, Indian Institute of Technology Kanpur (India)

## Tuesday 18 March

### POSTERS-Tuesday

Room: Palms Ballroom-Royal .....Tues. 6:00 to 7:30 pm

All symposium attendees are invited to attend the poster sessions provided as an opportunity to enjoy refreshments while reviewing poster papers. This session provides a great opportunity for networking with colleagues in your field. Attendees are encouraged to review the high-quality papers that are presented in this alternate format and to interact with the poster authors. Attendees are requested to wear their conference registration badges to the poster sessions.

Authors may set-up their posters between 10:00 am and 5:00 pm on Tuesday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-shows and their manuscripts will not be published. All posters must be removed no later than 8:00 pm, any papers left on the boards at the close of the poster session will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors should be at their papers from 6:00 pm to 7:30 pm to answer questions from attendees.

**A novel digital watermarking system based on web services**, Zude Zhou, Qingsong Ai, Quan Liu, Wuhan Univ. of Technology (China); Shengquan Xie, The Univ. of Auckland (New Zealand) ..... [6982-30]

**Restoration of images damaged by semi-transparent water blotches using localized image enhancement**, Aaron B. Greenblatt, Karen Panetta, Tufts Univ.; Sos S. Agaian, The Univ. of Texas at San Antonio ..... [6982-31]

**Techniques for detection and classification of edges in color images**, Karen Panetta, Sadaf Qazi, Tufts Univ.; Sos S. Agaian, The Univ. of Texas at San Antonio ..... [6982-32]

**Logical wavelets-based secured multimedia systems**, Ravindrnath C. Cherukuri, Sos S. Agaian, The Univ. of Texas at San Antonio ..... [6982-33]

**Preventive security information systems based on massive user data collection**, David Akopian, Philip Chen, Susheel Miryakar, The Univ. of Texas at San Antonio ..... [6982-34]

**Projection image segmentation for luggage explosive detection systems utilizing computed tomography**, Yesna O. Yildiz, Douglas Q. Abraham, Analogic Corp.; Sos S. Agaian, The Univ. of Texas at San Antonio ..... [6982-35]

**Latency-information theory and applications: part I**, Erlan H. Feria, College of Staten Island/CUNY ..... [6982-36]

**Latency-information theory and applications: part II**, Erlan H. Feria, College of Staten Island/CUNY ..... [6982-37]

**Latency-information theory and applications: part III**, Erlan H. Feria, College of Staten Island/CUNY ..... [6982-38]

## Wednesday 19 March

### SESSION 1

Room: Crystal F. .... Wed. 8:30 to 10:00 am

#### Wireless Networking I

Session Chair: **Sabah A. Jassim**, Univ. of Buckingham (United Kingdom)

8:30 am: **Overview of JPEG 2000 extensions for security and wireless applications (Invited Paper)**, Touradj Ebrahimi, Ecole Polytechnique Fédérale de Lausanne (Switzerland) ..... [6982-01]

9:00 am: **Private synchronization technique for heterogeneous wireless network (WiFi and WiMAX)**, Ali Al-Sherbaz, Chris Adams, Sabah Jassim, Univ. of Buckingham (United Kingdom) ..... [6982-02]

9:20 am: **Credibility-based secure route finding in wireless ad hoc networks**, Fanzhi Li, Ali Al-Sherbaz, Sabah Jassim, Chris Adams, Univ. of Buckingham (United Kingdom) ..... [6982-03]

9:40 am: **Intrusion detection using wireless positioning technologies**, David Akopian, Philip Chen, Maheedhar Gunturu, The Univ. of Texas at San Antonio ..... [6982-04]

Coffee Break ..... 10:00 to 10:30 am

### SESSION 2

Room: Crystal F. .... Wed. 10:30 am to 12:00 pm

#### Wireless Networking II

Session Chairs: **Yo-Ping Huang**, Tatung Univ. (Taiwan); **Chang Wen Chen**, Florida Institute of Technology

10:30 am: **Novel armoured plated networking with intelligent high-speed wireless ad-hoc capability (Invited Paper)**, Garik Markarian, Lancaster Univ. (United Kingdom) ..... [6982-05]

11:00 am: **Integrating RFID technique to design mobile handheld inventory management system**, Yo-Ping Huang, Wei Yen, Shih-Chung Chen, Tatung Univ. (Taiwan) ..... [6982-06]

11:20 am: **IDMA: improving the defense against malicious attack for ad hoc networks based on ARIP**, Chaorong Peng, Chang Wen Chen, Florida Institute of Technology ..... [6982-07]

11:40 am: **Performance study of MPLS and DS techniques to improve QoS routing for critical applications on IP networks**, Salim Alsharif, Univ. of South Alabama ..... [6982-08]

Lunch/Exhibition Break ..... 12:00 to 1:00 pm

## SESSION 3

Room: Crystal F. . . . . Wed. 1:00 to 3:30 pm

### Data Hiding and Watermarking

*Session Chair: Marco Carli, Univ. degli Studi di Roma Tre (Italy);  
Alessandro Neri, Univ. degli Studi di Roma Tre (Italy)*

- 1:00 pm: **Q-filter structures with applications in mobile communication systems** (*Invited Paper*), Magdi A. Mohamed, Motorola, Inc. . . . . [6982-09]
- 1:30 pm: **Reversible data hiding by exploiting DCT structure information in JPEG images**, Hong Cai, Sos S. Agaian, The Univ. of Texas at San Antonio . . . . . [6982-10]
- 1:50 pm: **Fractal steganography using artificially generated images**, Sos S. Agaian, Johanna M. Susmilch, Ravindrath C. Cherukuri, The Univ. of Texas at San Antonio . . . . . [6982-11]
- 2:10 pm: **A spatial data hiding scheme based on generalized Fibonacci sequence**, Elena Mammi, Federica Battisti, Marco Carli, Alessandro Neri, Univ. degli Studi di Roma Tre (Italy); Karen Egiazarian, Tampereen Teknillinen Yliopisto (Finland) . . . . . [6982-12]
- 2:30 pm: **Sum-SINR/sum-capacity optimal multisignature spread-spectrum steganography**, Lili Wei, Dimitris A. Pados, Stella N. Batalama, Univ. at Buffalo; Michael J. Medley, Air Force Research Lab. . . . . [6982-13]
- 2:50 pm: **Secure and robust digital watermarking algorithms in parametric slant transform domain**, Jiong Xie, Tufts Univ.; Sos S. Agaian, The Univ. of Texas at San Antonio; Joseph P. Noonan, Tufts Univ. . . . . [6982-14]
- 3:10 pm: **MPEG 4 AVC domain watermarking transparency**, Sorin A. Duta, Mihai Mitrea, Françoise Prêteux, Maher Belhaj Abdallah, Institut National des Télécommunications (France) . . . . . [6982-15]
- Coffee Break . . . . . 3:30 to 4:00 pm

## SESSION 4

Room: Crystal F. . . . . Wed. 4:00 to 5:20 pm

### Security & Integrity of Multimedia Objects

*Session Chair: Prem Kumar Kalra, Indian Institute of Technology Kanpur (India)*

- 4:00 pm: **Alpha rooting for scalable encryption**, Eric J. Wharton, Karen Panetta, Tufts Univ.; Sos S. Agaian, The Univ. of Texas at San Antonio . . . . . [6982-16]
- 4:20 pm: **P-recursive sequence and multimedia scrambling**, Yicong Zhou, Karen Panetta, Tufts Univ.; Sos S. Agaian, The Univ. of Texas at San Antonio . . . . . [6982-17]
- 4:40 pm: **On finite state machine reasoning for digital forensics**, Long Chen, Guoyin Wang, SouthWest JiaoTong Univ. (China) and Chongqing Univ. of Posts and Telecommunications (China) . . . . . [6982-19]
- 5:00 pm: **Perception measures for digital restoration of semi-transparent blotches**, Vittoria Bruni, Andrew J. Crawford, Istituto per le Applicazioni del Calcolo (Italy); Anil C. Kokaram, The Univ. of Dublin, Trinity College (Ireland); Domenico Vitulano, Istituto per le Applicazioni del Calcolo (Italy) . . . . . [6982-20]

## Thursday 20 March

## SESSION 5

Room: Crystal F. . . . . Thurs. 8:50 to 10:10 am

### Identification and Feature Detection I

*Session Chair: Yingzi Du, Indiana Univ.-Purdue Univ. Indianapolis*

- 8:50 am: **Can we ID from CCTV? Image quality in digital CCTV and face identification performance**, Hina Keval, M. Angela Sasse, Univ. College London (United Kingdom) . . . . . [6982-21]
- 9:10 am: **Fingerprint separation: an application of independent component analysis**, Meenakshi Singh, Deepak K. Singh, Prem K. Kalra, Indian Institute of Technology Kanpur (India) . . . . . [6982-22]
- 9:30 am: **A special purpose knowledge-based face localization method**, Ahmad B. Hassanat, Sabah Jassim, Univ. of Buckingham (United Kingdom) . . . . . [6982-23]
- 9:50 am: **Face recognition using facial expression: a novel approach**, Deepak K. Singh, Indian Institute of Technology Kanpur (India); Priya Gupta, Capgemini India (India); Uma Shanker Tiwari, Indian Institute of Information Technology (India) . . . . . [6982-24]
- Coffee Break . . . . . 10:10 to 10:40 am

## SESSION 6

Room: Crystal F. . . . . Thurs. 10:40 am to 12:20 pm

### Identification and Feature Detection II

*Session Chairs: Alessandro Neri, Univ. degli Studi di Roma Tre (Italy);  
Patrizio Campisi, Univ. degli Studi di Roma Tre (Italy)*

- 10:40 am: **Contrast invariant quality measure for iris recognition**, Craig S. Belcher, Yingzi Du, Indiana Univ.-Purdue Univ. Indianapolis . . . [6982-25]
- 11:00 am: **Video-based iris image processing**, Yingzi Du, Zhi Zhou, Indiana Univ.-Purdue Univ. Indianapolis . . . . . [6982-26]
- 11:20 am: **Multilevel approach for iris recognition**, Yingzi Du, Emrah Arslanturk, Indiana Univ.-Purdue Univ. Indianapolis . . . . . [6982-27]
- 11:40 am: **On-line signature authentication: user adaptive template protection and renewability**, Emanuele Maiorana, Patrizio Campisi, Alessandro Neri, Univ. degli Studi di Roma Tre (Italy) . . . . . [6982-28]
- 12:00 pm: **Classifier dependent feature preprocessing methods**, Benjamin M. Rodriguez II, Gilbert L. Peterson, Air Force Institute of Technology . . . . [6982-29]

## Don't Miss These Presentations!

*Free to all registered attendees.*

### Plenary Presentation, p. 6



**The Honorable Jay Cohen**  
Under Secretary for Science and Technology,  
U.S. Department of Homeland Security

### Innovation and the Wealth of Nations, p. 6



**Sir John Chisholm**  
Chairman of QinetiQ



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**Bold = SPIE Member**



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Orlando, Florida USA

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# General Information

## Registration \_\_\_\_\_

### Registration Hours

Orlando World Center Marriott Resort & Convention Center  
Arrival Concourse next to Canary Ballroom

Sunday 16 March . . . . .7:30 am to 4:00 pm  
Monday 17 March . . . . .7:15 am to 4:00 pm  
Tuesday 18 March . . . . .7:30 am to 5:00 pm  
Wednesday 19 March . . . . .7:30 am to 5:00 pm  
Thursday 20 March . . . . .7:30 am to 2:00 pm

### Exhibition Hours

Orlando World Center Marriott Resort &  
Convention Center · Cypress Ballroom

Tuesday 18 March . . . . .10:00 am to 5:00 pm  
Wednesday 19 March . . . . .10:00 am to 5:00 pm  
Thursday 20 March . . . . .10:00 am to 2:00 pm

### Course Materials Desk

Crystal Registration Desk  
Open during registration hours

If you have registered to attend a course, stop by the Course Materials Desk after you pick up your badge, to obtain your course notes and course location. Pick up a copy of the latest Education Services catalog to see SPIE Courses at symposia, on video and CD-ROM, and to discover the opportunities of customized In-Company courses.

### SPIE Membership

SPIE Members receive 15% off conference and course registration fees. Sign up for SPIE Membership when you register and take immediate advantage of member pricing.

### Media/Press Representatives

For credentialed press and media representatives, please email contact information, title and organization to [media@spie.org](mailto:media@spie.org).

### SPIE Receipts, Badge Corrections, Cashier

**Receipts** - Preregistered attendees who did not receive a receipt prior to the meeting may obtain a new copy of their registration receipt onsite at the Badge Corrections and Receipts counter in the registration area.

**Badge Corrections** - Attendees who need a correction to their badge information onsite may do so at the Badge Corrections and Receipts counter in the registration area.

**Cashier Station** - If you are paying by cash or check as part of your onsite registration, wish to add a short course, workshop, or special event requiring payment, or have questions regarding your registration, please see the onsite cashier at the Cashier station in the registration area.

## Author/Presenter Information \_\_\_\_\_

### Speaker Check-In Desk/Preview Station

Across from Grand Ballroom

Sunday through Thursday . . . . .7:30 am to 5:00 pm

All conference rooms will have a computer workstation, LCD projector, screen, lapel microphone, and laser pointer. All presenters are requested to come to the speaker check-in desk to confirm display settings of their presentations from their memory devices or laptops with the audiovisual equipment being used at this symposium.

### Poster Setup Instructions

Palms Ballroom, Royal Room

Tuesday 18 March . . . . .6:00 to 7:30 pm

Poster presenters may set up between 10:00 am and 5:00 pm Tuesday. Poster presenters who have not set up by 5:00 pm on Tuesday will be considered a “no show” and their manuscript will not be published. Presenters must remove their posters immediately after the poster session. Posters not removed will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session. Poster authors are required to be by their posters from 6:00 to 7:30 pm to answer questions from attendees.



8701 World Center Drive, Orlando, FL 32821  
Phone: +1 407 239 4200  
Fax: +1 407 238 8777



## SPIE Onsite Services

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### SPIE Marketplace

*Grand Atrium*

*Open during registration hours, Monday–Thursday*

The SPIE Marketplace is your source for the latest SPIE Press books, Proceedings, and Educational and Professional Development materials. Become a member of SPIE, explore the Digital Library, and take home a souvenir.

### Industry Resources Booth #1B

*Sago/Sabal Ballroom*

The SPIE Industry Resources Booth provides the tools you need to move ideas and technology to the market. Visit the booth for information on events, marketing opportunities, education, and training that SPIE can provide you to make your venture a success. Books from SPIE Publications will be available for purchase.

### SPIEWorks Career Fair

*Sabal Ballroom*

In addition to the onsite recruitment activities, SPIEWorks offers you on-line services to help you with your search for employment before, during and after the conference. Visit the online Career Fair being held in conjunction with Defense+Security; post your resume, view jobs, or sign-up for “Job Alerts” and receive opportunities by email long after this event is over. For more information see p. 14.

### Press & Media Center

*Crystal Foyer*

The Press & Media Center provides press conference facilities, refreshments, and press releases from exhibitors. Credentialed media are invited to communicate news via the provided telephone and high-speed internet connections. Registration and exhibition fees are waived for working journalists and editors. Preregister by e-mailing name, organization, title, address, e-mail, and phone number to [media@spie.org](mailto:media@spie.org).

### Guest Hospitality Suite

Guests of attendees are invited to meet, relax, and enjoy a cup of coffee and breakfast breads in the SPIE Guest Hospitality Suite. The Suite will be open Tuesday through Thursday from 8:30 to 10:00 am. This event is for guests of Defense+Security attendees only.

### Internet Pavilion

*Crystal Foyer*

SPIE will have a complimentary Internet Pavilion at the meeting site Sunday through Thursday where attendees can use provided workstations or hook up their laptop to an Ethernet connection to access the Internet.

### Complimentary Internet Wireless Access

*Sabal Ballroom/Grand Foyer/Atrium*

SPIE is pleased to provide complimentary wireless access to the Internet for all conference attendees bringing 802.11b wireless-enabled laptops or PDAs.

## Business Services

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### Concierge Desk

The Marriott Group Concierge will have a fully staffed Concierge Desk near SPIE registration to assist attendees with discounted attraction tickets, restaurant reservations, golf tee times, and local information.

### SPIE Copy Center

San Diego Copy will provide a copy service during the week for symposium attendees. The rates are 5 cents per copy and \$1 per transparency (\$2.50 for color). The Copy Center will be located in the Atrium across from the Crystal Ballrooms.

### SPIE Message Center

The SPIE Message Center telephone number is 407 238 4000. Messages will be taken during registration hours Sunday through Thursday. Please check the message board at the message center near SPIE registration daily to receive your messages.

### Child Care

All About Kids Professional Child Care, toll free 1-800-728-6506, Phone (407) 812-9300, [www.All-About-Kids.com](http://www.All-About-Kids.com), or email [AAboutKids@aol.com](mailto:AAboutKids@aol.com)

**Note:** SPIE does not imply an endorsement nor recommendation of these services. They are provided on an “information only” basis for your further analysis and decision. Other services may be available.

## Food and Beverage Services

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### Breakfast Breads

Breakfast breads and coffee will be served from 7:30 to 8:30 am Monday through Thursday for registered conference attendees.

### Coffee Breaks

Complimentary coffee will be served Sunday through Thursday at approximately 10:00 am and 3:00 pm. Please check the individual technical conference listings for exact times and locations.

### Lunch Locations

The Marriott will provide concessions in the Sago/Sabal ballroom with a variety of hot and cold items. There are also various choices in the Marriott Food Court. Champions and the Poolside Grill will also be open.

### Desserts

*Tuesday through Thursday*

Dessert snacks will be served from 3:00 to 3:30 pm. Complimentary tickets for the dessert snacks will be included in attendee registration packets.

### Free Popcorn

Popcorn carts will be located in Exhibition Hall, back of 1500 Aisle and will be open Tuesday and Wednesday from 11:00 am to 3:00 pm; Thursday from 11:00 am to 2:00 pm.

# General Information

## Policies

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### Refund Policy for Preregistration

There is a \$35 service charge for processing refunds. Requests for registration refunds must have been received no later than 6 March 2008. All registration fees will be forfeited after this date. Membership dues are not refundable. SPIE Digital Library subscriptions are not refundable.

### Audio, Video, Digital Recording Policy

*In the Meeting Rooms and Poster Sessions:* For copyright reasons, recordings of any kind are strictly prohibited without prior written consent of the presenter in any conference session, course or of posters presented. Each presenter being taped must file a signed written consent form. Individuals not complying with this policy will be asked to leave a given session and asked to surrender their film or recording media. Consent forms are available at the SPIE Audiovisual Desk.

*In the Exhibition Hall:* For security and courtesy reasons, photographing or videotaping individual booths and displays in the exhibit hall is allowed ONLY with explicit permission from on-site company representatives. Individuals not complying with this policy will be asked to surrender their film and to leave the exhibit hall.

### Laser Pointer Safety Information

SPIE supplies tested and safety approved laser pointers for all conference meeting rooms, and for short course rooms if instructors request one. For safety reasons, SPIE requests that presenters use our provided laser pointers available in each meeting room.

If using your own laser pointer, have it tested at your facility to make sure it has <5 mW power output. Laser pointers in Class II and IIIa (<5 mW) are eye safe if power output is correct - but don't automatically trust the labeling. Commercially available laser pointers, red or green (or any color), could be incorrectly labeled as to their wavelength and power output.

Presenters intending to use their own laser pointer for presentations are required to come to the Speaker Check In Desk onsite and test their pointer on our power meter. If the pointer fails the safe power level you may not use the pointer at the conference. You will be required to sign a waiver releasing SPIE of any liability for use of potentially non-safe laser pointers.

Use of a personal laser pointer at an SPIE event represents user's acceptance of liability for use of a non-SPIE supplied laser pointer device. Misuse of any laser pointer could lead to eye damage.

### Underage Persons on Exhibition Floor

For safety and insurance reasons, no persons under the age of 16 will be allowed in the exhibition area during move-in and move-out. During open exhibition hours, only children over the age of 12 accompanied by an adult will be allowed in the exhibition area.

### Unauthorized Solicitation

Any manufacturer or supplier who is not an exhibitor and is observed to be soliciting business in the aisles, or in another company's booth, will be asked to leave immediately. Unauthorized solicitation in the Exhibition Hall is prohibited.

### Photography or Video Guidelines

Taking photos or video of booths, without the consent of the exhibiting company, is prohibited. Your film and/or camera will be confiscated and you will be asked to leave immediately.

Please report any violations you may observe to Show Management.

### Unsecured Items

Personal belongings such as briefcases, backpacks, coats, book bags, etc. should not be left unattended in meeting rooms or public areas. These items will be subject to removal by security upon discovery.

## SPIE Industry Resources Booth

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Visit Booth #1B in the  
Robotics and Unmanned  
Systems Pavilion

- ▶ Get the latest information on ITAR
- ▶ Access a free set of defense-related technical papers from the SPIE Digital Library
- ▶ Build an exhibition and promotion plan that reaches your target audience
- ▶ Recruit the best and the brightest in the defense industry
- ▶ Find the courses and in-company training your team needs to stay competitive



**SPIE**



# General Information

## About Orlando

The Orlando area of central Florida is one of the world's favorite family vacation locations, featuring Disney World, Animal Kingdom, MGM Studios, Epcot, Universal, Sea World, and Wet 'n Wild. Beyond these theme parks, there is also golf, tennis, sporting and cultural events, ballooning, auto racing, canoeing, outdoor recreation and fishing.

Orlando's average yearly temperature is a mild 72°F (22°C). Though the summer months experience hotter weather, most of the year is very comfortable.

## Attractions Tickets or Activities

All attendees who ordered tickets on-line including International orders can pick-up their tickets at the concierge desk near SPIE Registration at the Orlando World Center Marriott upon arrival at no cost.

## Marriott Village Shuttles

Shuttles are available to the Orlando Marriott World Center for attendees staying at the Marriott Village. Shuttles will operate Sunday through Thursday. Drop off and pickup will occur on the Arrival Concourse outside the Palms Ballroom, shuttle schedule will be posted onsite.

## Parking

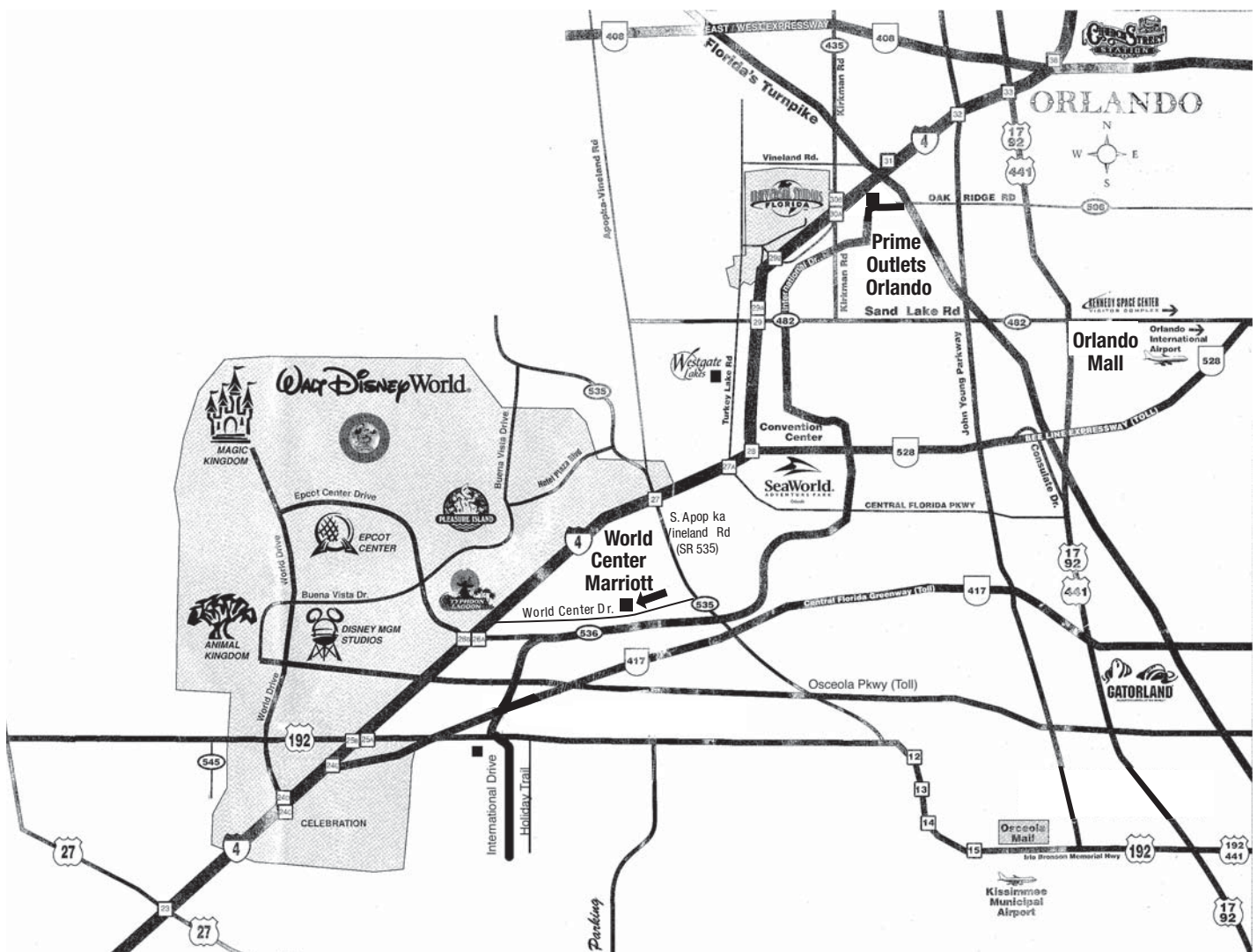
(Note: All rates are subject to change)

Self-parking at the Marriott is \$7.00. Valet parking is \$18. Both include in/out privileges. Tax is extra @ 7.5%. Parking can be billed to the guest's room.



Hertz Car Rental is the official car rental agency for this Symposium. To reserve a car, identify yourself as a Defense & Security Conference attendee using the Hertz Meeting Code CV# 029B0011.

- In the United States call 1-800-654-2240.



## Mears Motor Shuttle

Clip out the enclosed coupon and present it to the Mears Transportation booth attendant to receive an SPIE attendee discount of \$4 off the round trip fare of \$31 on shuttle transportation between the airport and the hotel. This coupon also applies to children (ages 4-11) - children's round trip fare is \$23. The discount coupon can only be used towards round-trip fares, not one-way fares. (One way fare for adults is \$19 and one way fare for children is \$15.) Mears Shuttle runs 24 hours a day between the airport and the hotel, departing from the airport approximately every 30 minutes.

To arrange shuttle travel to your hotel, go to the nearest Mears Transportation counter in the baggage claim areas, Level 2, of Orlando International Airport when you arrive. All transportation will depart from Level 1. The counter personnel will direct you to the shuttle.

Arrival reservations are encouraged but not required. Return reservations are required. One day prior to your return to the airport at the end of your stay at the symposium, make a return reservation by calling Mears Transportation at 407-423-5566 or book on-line from the Defense+Security website. Please plan to allow three hours prior to your flight time for your transfer to the airport.

## Taxi

Yellow Cab sedans will accommodate up to five passengers and Yellow Cab vans will accommodate up to seven passengers. Rates are not per person, but per vehicle; up to five or seven can ride for the price of one. Yellow Cab offers direct service to your destination with no stopping to pick up or drop off additional passengers. The approximate rate, based on time and mileage, is \$45 one way from the airport to the Orlando World Center Marriott. At the airport, go to the ground transportation site located outside Level 1 below baggage claim. Ask the Taxi Starter for a Yellow Cab. Yellow Cab is a licensed, insured and permitted taxi service. Beware of any type of solicitation in the baggage claim area. Any driver, skycap or anyone else soliciting on behalf of a transportation company is unauthorized and either underinsured or not insured at all. For more information requesting Taxi Service while in Orlando, call (407) 422-2222, or email [taxiquote@mearstransportation.com](mailto:taxiquote@mearstransportation.com)

## Chauffeur-Driven Luxury Sedans

American Executive Town Car offers chauffeur driven luxury sedans which accommodate up to four passengers comfortably for one flat rate. The flat rate from the airport to the Orlando Marriott World Center is \$50 one way, \$95 round trip (rates are subject to change without notice). Gratuity is extra. On arrival at the airport, you will be met by your driver at the base of the escalator in the baggage claim area with a sign reading you or your party's name. You will be assisted with your luggage and taken directly to your destination. Reservations are required. All credit cards (except Diners), traveler's checks, and cash are accepted (no personal checks). Call toll free 1-877-248-9965, local phone (407) 854-3999 or book on-line at [www.goamericantowncar.com](http://www.goamericantowncar.com).

## Bus Transportation

LYNX is the Central Florida Regional Transportation Authority Bus Service. All LYNX rides start and end at officially designated LYNX stops. See [www.golynx.com](http://www.golynx.com) or call 1-407-841-5969 for schedule and fare information. At this time, LYNX has no service to or from the Orlando Marriott World Center. However, there is service from the airport to the Orlando Premium Outlet Malls (8200 Vineland Ave., Orlando, 32821) which are in the general area of the Marriott. Take the #42 bus from A side, level 1, of Orlando International Airport. The trip from the airport to the Orlando Premium Outlet Malls will take approximately 90 minutes followed by a short inexpensive taxi ride from the Malls to the Orlando World Center Marriott. The bus fare is tentatively increasing to \$1.75 effective March 2008 (subject to change).



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- Upon your arrival at Orlando International Airport, proceed to one of the Mears Motor Shuttle ticket counters and present this coupon to the Mears Counter Attendant.
- After redeeming your coupon below for a round trip ticket, please present your ticket to the Mears "Starter" located on level one at the curb.
- The starter will then direct you to a designated shuttle servicing the hotel. Our shuttles run 24-hours a day, 7 days a week, departing the curb approximately every 30 minutes providing shuttle service between the airport and your hotel.
- One day prior to your departure, please make a return reservation by calling our reservation number listed below.
- Plan to allow three hours prior to your flight time for your transfer to the airport.
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- For questions / reservations, please call our toll free number at **1-800-759-5219**  
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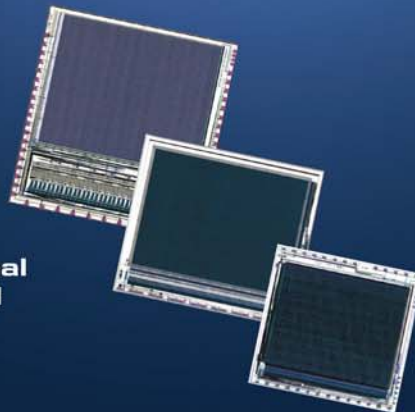
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