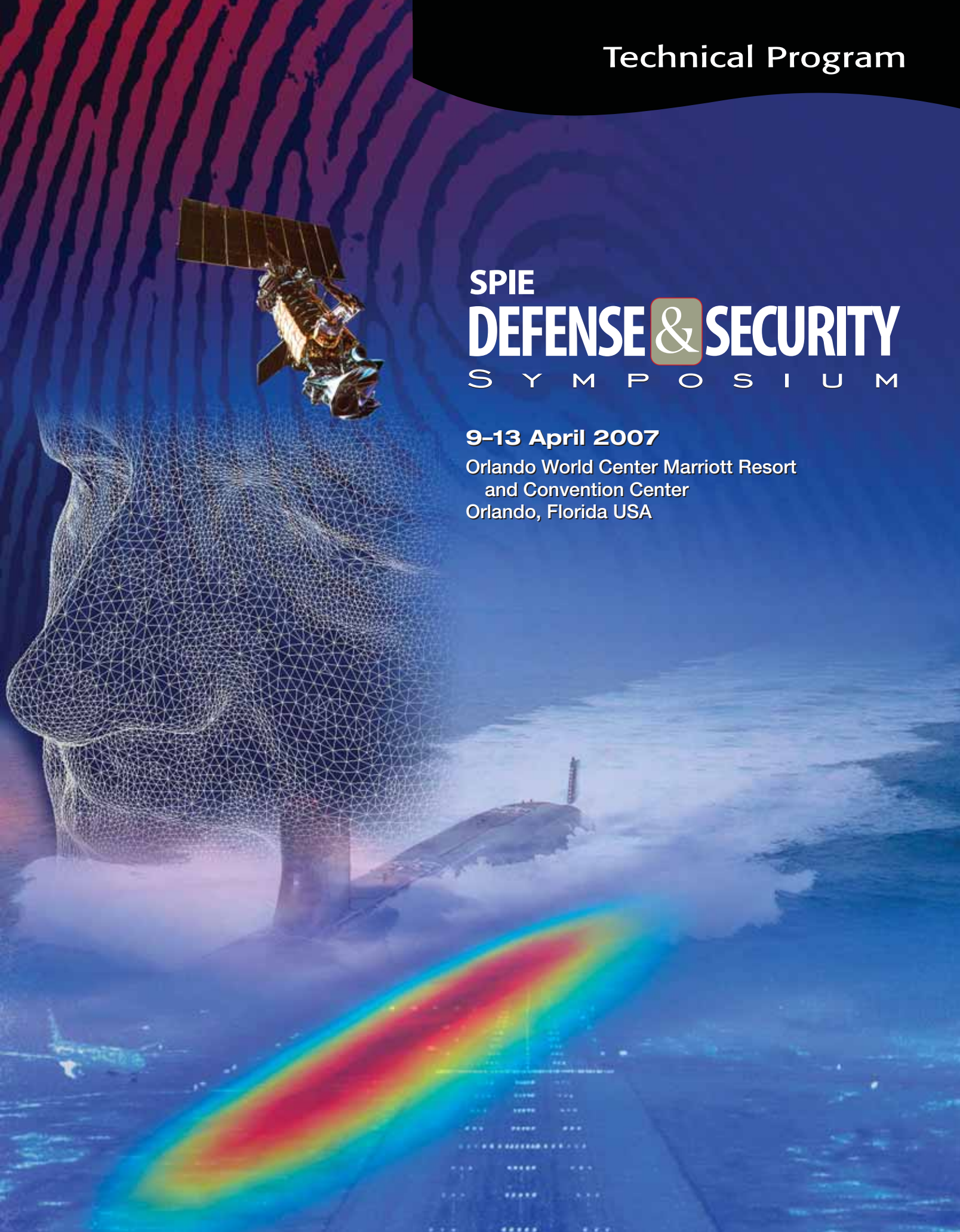
Technical Program



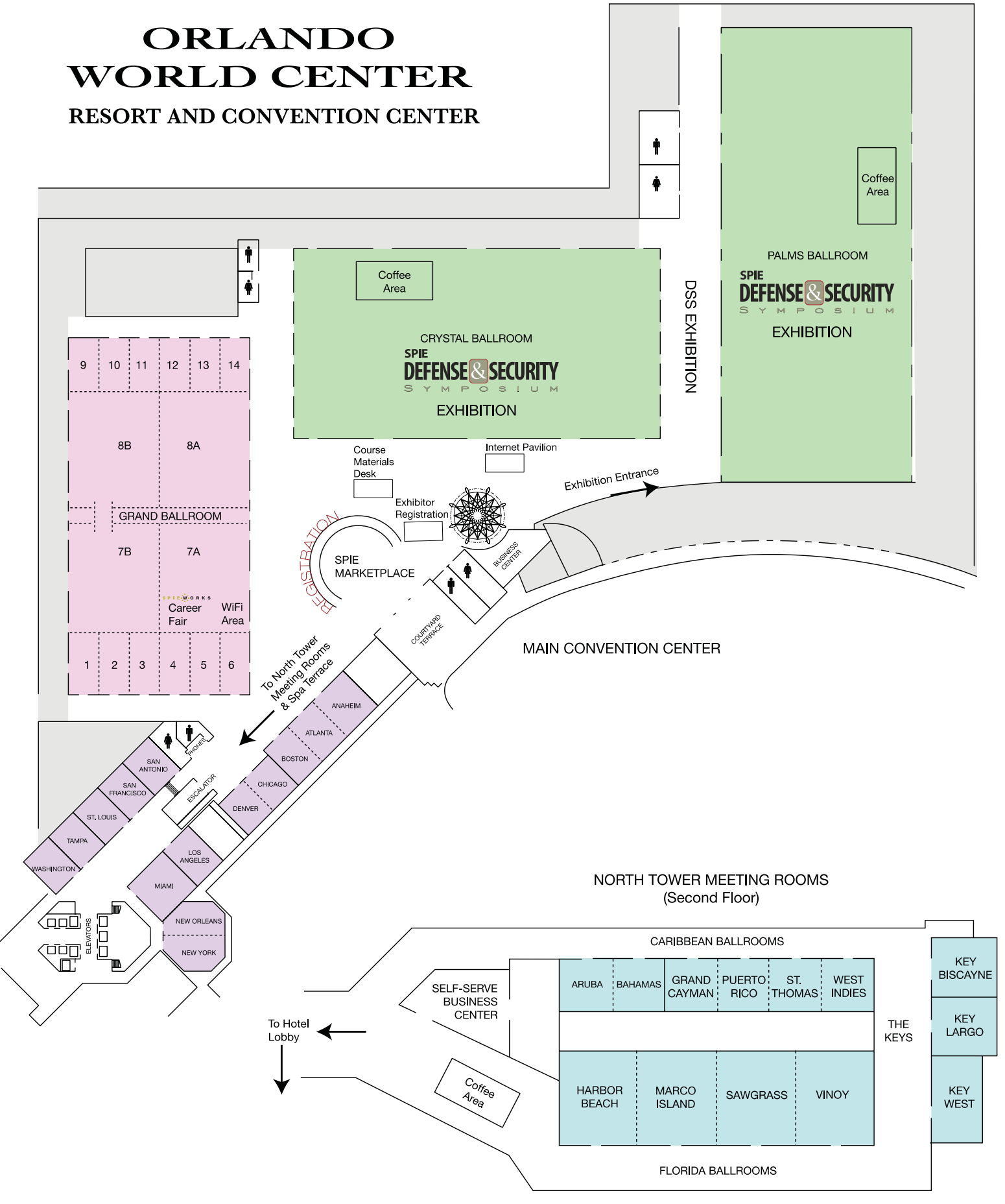
SPIE DEFENSE & SECURITY SYMPOSIUM

9–13 April 2007

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

ORLANDO WORLD CENTER

RESORT AND CONVENTION CENTER



SPIE DEFENSE & SECURITY SYMPOSIUM

Conferences and Courses: 9–13 April 2007
Exhibition: 10–12 April 2007

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

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This program is based on commitments received up to the time of publication and is subject to change without notice.

SPIE would like to express its deepest appreciation to the program chairs, conference chairs, cochairs, program committees, and session chairs who have so generously given of 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.

Cover: 3D face model image © Fraunhofer Institute for Computer Graphics Research IGD, Fraunhoferstraße 5, Darmstadt, Germany

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Monday	Tuesday	Wednesday	Thursday
9 April	10 April	11 April	12 April
Conferences p. 22–127			
Courses p. 16–21			
	Exhibition p. 12–15		
	10:00 am to 5:00 pm	10:00 am to 5:00 pm	10:00 am to 2:00 pm
Student Lunch with the Experts, 12:30 pm to 1:30 pm, p. 9	*Special 2-Day Event!* spieworks.com SPIEWORKS **Career Fair** 11:00 am to 3:00 pm, p. 27		**Automatic Target Recognition Technical Meeting** *(Sadjadi)* 1:30 to 5:30 pm, Location: North Tower-Vinoy, p. 100
			Panel Discussion: **Unattended Ground Sensors** *(Kolodny)* 3:30 to 5:00 pm, Location: Grand 4, p. 91
Panel Discussion: **Real World Biometrics Deployments** *(Prabhakar, Ross)* 3:55 to 5:25 pm, Location: Grand 12, p. 32	**Government Programs Panel Discussion** *(Brendle, Bornstein)* 10:20 am to 12:00 pm, Location: Grand 1-2, p. 84	**Forensics Workshop,** 8:30 am to 6:30 pm, Location: North Tower-Grand Cayman, p. 8	*Panel Discussion:* **Choosing the Right Tool for the Job** *(Blowers)* 4:00 to 5:00 pm, Location: North Tower-Key Largo, p. 92
Vendor Presentations and Reception *(Rozlosnik, Peacock)*, 5:30 to 8:00 pm, Location: Grand 8B, p. 37	**SPIE Women in Optics Lunch,** Noon to 1:00 pm, p. 9	*Signal Image and Neural Net Processing Plenary Presentation:* **Speaking of sensing in the language of quantum mechanics** (Myers) 9:00 to 10:00 am, Location: North Tower-Aruba, p. 6	
Invited Panel: **Issues and Challenges in Uncertainty Representation and Management with Applications to Real-World Problems** *(Kadar, Mahler)* 7:00 to 9:40 pm, Location: North Tower - Marco Island, p. 102	**Global Homeland Security Technical Group Meeting,** *(Saito),* 5:00 to 6:15 pm, Location: Grand 14, p. 34		
	Infrared Image Gallery and Thermosense Technical Meeting *(Kaplan, Dinwiddie)* 5:00 to 6:30 pm, Location: Grand 11, p. 36	*Tactical Sensors and Imagers Plenary Presentation:* **Broadband THz Wave Photonics for Defense and Security Applications** *(Zhang)*, 11:40 am to 12:20 pm, Location: Grand 7B, p. 6	**Poster Sessions**, 6:00 to 7:30 pm, Location: Spa Terrace, p. 8
	Poster Sessions, 6:00 to 7:30 pm, Location: Spa Terrace, p. 8	*Display Plenary Presentation:* **Pixels, People, Perception, Pet Peeves and Possibilities: a Look at Displays** *(Task)*, 2:00 to 3:00 pm, Location: Atlanta/Boston, p. 7	**Defense and Security Displays Workshop,** 8:00 to 10:00 pm, Location: Atlanta/Boston, p. 9
	Executive Forum: **The Next Tech Boom—Innovation, Megatrends and Money Flow,** 6:00 to 8:30 pm, p. 4	*Workshop:* **V50, E-zoom, and Boost Modeling Approaches** *(Holst)* 5:45 to 6:45 pm, Location: Grand 9-10, p. 47	
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Executive Forum

The Next Tech Boom

Innovation, Megatrends and Money Flow

Network with military and business leaders who have successfully bridged the gap between discovery and delivery!

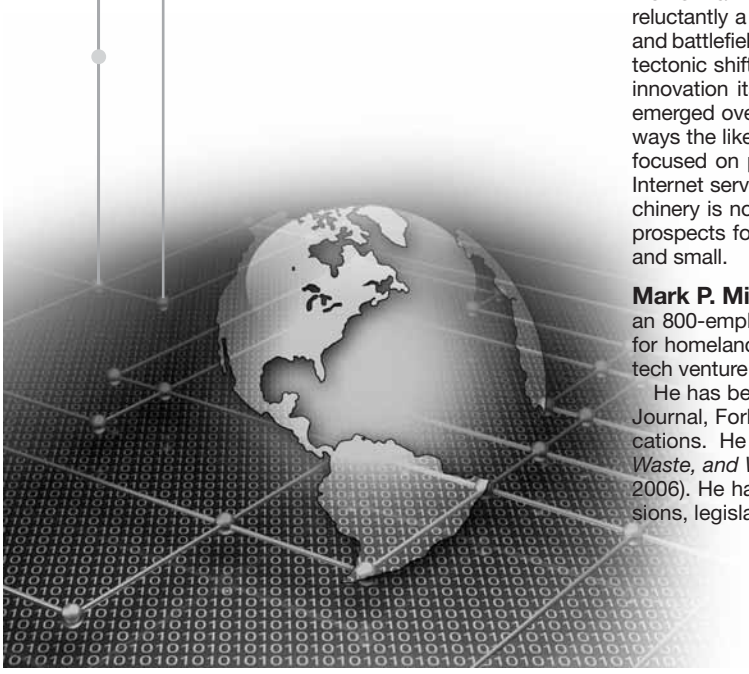
Join best-selling author, venture capitalist and tech executive Mark Mills for an eye- opening look at the trends and opportunities that will shape our future and the dramatic changes that lie immediately ahead.

The evening starts with a 40-minute presentation by Mills, whose book *The Bottomless Well* has been praised by everyone from the chairman of Citicorp to tech wiz George Gilder. Following the talk is an interactive panel session with leadership from the DoD, DHS, industry and academia who will share insights and predictions. The talk and panel session will be followed by a networking reception where you can meet other leaders, share ideas and develop teaming relationships.

Are you prepared to prosper in the next tech boom?

This forum is a strategic "wake-up" call and look over the horizon that will help you devise a winning strategy.

> ***"We have scarcely begun to tap technology's potential to make our homeland more secure against terror."***
>
> **Mark P. Mills**
> *Quoted in Forbes Magazine*



KEYNOTE

Photons, Electrons and Paradigms

Mark P. Mills, ICX Technologies, Inc.

Security is hardly a new concept. But 9/11, a seismic geopolitical event, caught America still locked in a Cold War paradigm. In response, the creation of a new Federal Cabinet Agency was telegraphic evidence of a structural shift in America. But more was, and is, still required. The underlying technology-policy paradigm must shift. And it's harder to switch paradigms than it is to move, or create, federal bureaucracies. Making the right decisions, both for governments and businesses, requires that we operate within the correct paradigm.

The confluence of two deep trends illuminates the emerging paradigm shift. The first is that America's way of thinking about conflicts is changing, accommodating reluctantly a complicated world of distributed, highly variable threats both in civilian and battlefield environments where the front lines are no longer brightly lit. The second tectonic shift fortunately mirrors the threat environment: the nature and character of innovation itself. Radically different technological machinery of the digital age has emerged over the past two decades. We can now employ photons and electrons in ways the likes of which the world has never seen. While much of this capability has focused on producing iPods, cell phones, video games, gigabit data streams, and Internet server farms, the digital economy's underlying intellectual property and machinery is now turning to civilian and military security. All of this augers well for the prospects for better security, and robust new opportunities for entrepreneurs, large and small.

Mark P. Mills is a co-founder and Chairman of the Board of ICx Technologies Inc., an 800-employee company developing and selling new and emerging technologies for homeland security and force protection. He is also a co-founding partner in the tech venture fund Digital Power Capital.

He has been published in various popular publications, including the Wall Street Journal, Forbes, and the New York Times, as well as numerous professional publications. He is co-author of *The Bottomless Well: The Twilight of Fuel, the Virtue of Waste, and Why We Will Never Run Out of Energy,* (Basic Books, 2005, paperback 2006). He has also testified before and briefed many state public service commissions, legislative groups, state legislators, and the U.S. Congress.

Executive Forum
Tuesday 10 April 2007 · 6:00 to 8:30 pm
See SPIE Cashier to Register, sign up using WS844
$135 SPIE Member · $155 SPIE Non-member

Don't miss these three workshops of related interest!

Intellectual Property Issues in the Defense and Security Industries
WS639 · *Course level: Introductory*
CEU .35 $295 / $340 USD
Wednesday 1:30 to 5:30 pm

Playing the SBIR Game to Win
WS843 · *Course level: Introductory*
CEU .35 $295 / $340 USD
Wednesday, 8:30 am to 12:30 pm

Compliance with the International Traffic in Arms Regulations (ITAR)
WS845 · *Course level: Introductory*
CEU .35 $305 / $350 USD
Thursday, 8:30 am to 12:30 pm

See Course Materials Desk, located near the SPIE Registration Area for course information.

Interactive Panel Discussion

Join these experts for an evening of thought-provoking discussion and networking.

Dr. John Carrano
Vice President, Research & Development
Luminex Corporation

John C. Carrano joined Luminex Corporation in July 2005, and currently serves as Vice President, Research & Development, and is a member of the Luminex Scientific Advisory Board. Prior to joining Luminex, Dr. Carrano was a program manager at DARPA, where he led several major Defense Department programs related to biological and chemical sensing. His other recent positions include Assistant Professor of Electrical Engineering, Department of Electrical Engineering and Computer Science, United States Military Academy, and Research Scientist, U.S. Army Research Laboratory, Adelphi, Maryland. Dr. Carrano retired from the military as a Lieutenant Colonel in June 2005, after over 24 years of active duty service to the nation. Dr. Carrano received his B.S. from the United States Military Academy, West Point, in 1981, and received his M.S. and Ph.D. in Electrical Engineering from the University of Texas at Austin. Dr. Carrano is also a graduate of the U.S. Army Command and General Staff College. He has co-authored over 50 scholarly publications, and numerous conference presentations, including one best paper award, and he has authored one book chapter. Dr. Carrano is a member of Phi Kappa Phi, Eta Kappa Nu, OSA, SPIE, and IEEE.

Panelists

Major General Steve Reeves
Joint Program Executive Officer for Chemical and Biological Defense, U.S. DoD

Major General Steve Reeves is the Joint Program Executive Officer for Chemical and Biological Defense for the U.S. Department of Defense. His responsibilities include the research, development and acquisition of all chemical and biological defense equipment and medical countermeasures for the U.S. Armed Services.

He has served in a variety of command and staff positions in Europe, Korea and the United States and has served in nearly every aspect of acquisition leadership and management.

Dr. C. Kumar Patel
Pranalytica, Inc. and Dept of Physics and Astronomy, Univ. of California/Los Angeles

Dr. Patel is the CEO and Chairman of the Board of Pranalytica. He is the inventor of the carbon dioxide, carbon monoxide, and the Spin-Flip Raman lasers. He pioneered the use of these and other lasers to measure trace gases in difficult environments. He was at AT&T (now Lucent Technologies) Bell Laboratories for 32 years and was Executive Director of the Physics Division and of the Materials Research Division. From 1993 to 1999 he was the Vice Chancellor for Research at UCLA. Dr. Patel has over 40 years of experience in the field of lasers and holds 39 patents.

Dr. Lynne Zydowsky
President and Managing Principal,
Zydowsky Consultants

Dr. Zydowsky works with emerging companies to build foundations that position for growth, develop strategies, and establish partnerships with corporate and government entities.

Dr. Zydowsky is an experienced executive in the life science industry who has been involved in the launching and building of several successful companies. Her biotechnology experience spans over 15 years in all aspects of corporate development, operations and finance. As the President of Zydowsky Consultants, she works closely with emerging companies to develop corporate strategies and company-wide operating plans; obtain funding through venture capital, asset-based debt financings and other non-dilutive sources, and establish strategic partnerships.

Dr. Allen Northrup
Founder, President and CEO,
MicroFluidic Systems, Inc.

Dr. Northrup will bring several perspectives to the conference, including having been developing unique biothreat detection systems since the 1990s, and the experience of co-founding two companies which have produced successful products for pathogen detection.

Dr. Northrup received a Ph.D. in Biomedical Engineering from the University of California, Davis. His Ph.D. research was carried out at Lawrence Livermore National Laboratory (LLNL), where he developed fiber optic biosensors and microfluorescence imaging techniques. In 1997, Dr. Northrup co-founded Cepheid, where he was the Chief Technology Officer and Vice President of Research. At Cepheid he led the effort to develop biothreat detection systems, which ultimately led to the deployment of the Cepheid detection components into in the USPS Biological Detection System (BDS). In 2001, Dr. Northrup founded Microfluidic Systems Inc (MFSI). MFSI has been focused on the development of automated pathogen processing and detection systems for the DoD and the Department of Homeland Security.

Plenary Presentations

Signal Image and Neural Net Processing Plenary Presentation

Location: North Tower-Aruba

Wednesday 11 April 2007 . . . . . 9:00 to 10:00 am

Speaking of sensing in the language of quantum mechanics

John M. Myers, Harvard Univ.

Currently there is interest in the possibility of using quantum-mechanically entangled light to enhance the spatial resolution of remote sensors. In response to this interest, this talk reviews some applications of equations in quantum-mechanical form to the design of sensors and related systems. I distinguish mathematical models as mathematical formulas, whether quantum-mechanical or classical, from experiments with devices such as lasers and light detectors. After outlining the two known ways to connect quantum models to experiments (one statistical-mechanical, the other by way of probabilities) I sketch:

(1) an approximate way to translate from equations of classical electromagnetism to the quantum language of photons and detection probabilities;
(3) some rough-cut mathematical models of interferometers that exploit probabilities of coincidences in light detections, with applications to sensing;
(4) quantum-mechanically suggested possibilities and limits with respect to enhancing both positional accuracy and spatial resolution;
(5) remarks on the relation of rough-cut models to other models that account better for experimental challenges that surely arise when one tries to implement designs inspired by the rough-cut models;
(6) a discussion of a recently proved universal gap between, on one hand, quantum-mechanical models composed of equations and, on the other hand, experiments with devices, with consequent opportunities for a designer to invent.

Dr. Myers was a member of the team led by BBN Technologies that fielded a working prototype of quantum key distribution: the DARPA Quantum Network. In classical electromagnetics, he has solved scattering problems, worked on effects of glint in radar tracking, and served on a Defense Science Board Task Group on Electronic Warfare. With Howard Brandt, he is co-inventor of a quantum light receiver. In quantum mechanics he is the author or a co-author of papers showing (a) how feedback reduces the probability of error in the detection of weak coherent light, (b) how synchronization failures afflict any universal quantum Turing machine, (c) experimental demonstrations of nuclear magnetic resonance to solve problems posed in quantum computing, (d) decoherence in quantum computing, and (e) how quantum-mechanical models can never be uniquely determined by experiments, and how that non-uniqueness gives a scientist a certain freedom to invent.

Tactical Sensors and Imagers Plenary Presentation

Location: Grand 7B

Wednesday 11 April 2007 . . . . . 11:40 am to 12:20 pm

Broadband THz Wave Photonics for Defense and Security Applications

Xi-Chang Zhang, Center for THz Research, School of Science, Rennsselaer Polytechnic Institute

Terahertz (THz) radiation offers innovative sensing and imaging technologies that can provide information unavailable through conventional methods such as microwave and X-ray techniques. With the advancement of THz technologies, THz wave sensing and imaging will impact a broad range of interdisciplinary fields, in particular, the opportunity for transformational advances in defense and security. In recent work THz technologies have shown promise regarding the standoff detection and identification of explosives and their related compounds. Handheld broadband THz spectrometry with real-time detection capability in short distance for defense and security applications is available.

This presentation will report on an all-air THz photonic system which uses ambient air as a broadband emitter and sensor with a commercial pulsed laser as an optical source. By transmitting and focusing optical beams in close proximity to the target(s), broadband far-infrared/THz waves can be generated and detected locally. This process reduces the far-infrared/THz wave beam path in order to minimize the water vapor attenuation in the far-infrared region. Preliminary results on the generation, manipulation, enhancement, amplification, and detection of highly directional far-IR/THz waves through the use of ambient air as an emitter, modulator, amplifier, and sensor medium will be presented.

Dr. Xi-Cheng Zhang is an Eric Jonsson Professor of Science, Professor of Physics and Professor of Electrical Engineering at Rensselaer. Dr. Zhang has received 18 patents, published 10 books and book chapters, and has authored or co-authored over 300 refereed journal papers. He is a Fellow of IEEE, the Optical Society of America, and the American Physics Society.

Display Plenary Presentation

Location: Atlanta

Wednesday 11 April 2007 . . . . . 2:00 to 3:00 pm

Pixels, people, perception, pet peeves and possibilities: a look at displays

H. Lee Task, Task Consulting

This presentation touches on several topics starting with the basic building block of any display, the pixel, and continuing through to future possibilities and directions for displays and display technology. Along the pathway from pixels to possibilities points pertaining to people, perception, and pet peeves will be presented. In particular, a brief discussion of human visual capability and perception will take a look at the consumer side of the display (the human visual system – the reason we bother building displays!) to see what insight might be obtained with respect to display constraints, deficiencies or future directions. In addition, this presentation will also address a few issues and irritations (pet peeves) collected over the past 35+ years of experience in the display and display related areas.

Dr. H. Lee Task is a Senior Consultant (and the only consultant!) with Task Consulting and has provided technical consulting services to the Air Force Research Laboratory Visual Display Systems Branch, Ball Aerospace, Motorola, Northrop Grumman and the Department of Justice. In 2001 he retired from the Air Force Research Laboratory, where he served in the scientific research area for 31 years, including the position of Chief Scientist of the Armstrong Aerospace Medical Research Laboratory (now part of the Air Force Research Laboratory). Dr. Task holds a Ph.D. in Optical Sciences from the University of Arizona Optical Sciences Center. He has published more than 120 journal articles, proceedings papers, and technical reports and has been granted 45+ US patents. His research interests involve the optical and visual aspects of human systems interface with emphasis on display image quality, night vision devices, vision through aircraft transparencies, helmet mounted displays, and vision in space. He is a member and past editor of the journal of the SAFE Association, a past member of the Human Factors and Ergonomics Society, a member and past chairman of the American Society for Testing and Materials (ASTM) main committee on Aerospace and Aircraft (F7) and the subcommittee, F7.08, on aerospace transparencies. He is also a Fellow of ASTM.

Education: BS – Physics— Ohio University 1968
MS – Physics— Purdue University 1971
MS – Optics – University of Arizona 1978
MS – Management of Technology – M.I.T. – 1985
PhD – Optics – University of Arizona 1978

Banquet and Award Presentation

Location will be listed on ticket.

Wednesday 11 April . . . . . 7:00 to 9:30 pm

$85 per person. Sign up by 1:00 pm Monday 9 April at the SPIE Cashier.

Don't Miss the Opportunity to Hear The Honorable Richard Danzig at the Banquet and Award Presentation

Presentation on Sensing and Coping with Terrorist Biological Aerosol Attacks

All attendees are invited to the banquet on Wednesday evening. Dinner will start at 7:00 pm, followed by a presentation highlighting the works of Sec. Danzig. Tickets for the banquet and presentation are $85 per person and are sold separately from the conference registration. Ensure your place and purchase your tickets with your registration.

DSS Honoree of the Year

The Honorable Richard Danzig has served his nation and our society with distinction during an illustrious career spanning four decades. Sec. Danzig has contributed in many ways to the betterment of our country, including the particularly notable achievement of serving as the 71st Secretary of the Navy during the Clinton administration. Sec. Danzig not only helped to improve our naval forces, but also embraced technology as a key element in successful policy making. Sec. Danzig continued this practice of deftly combining technology issues with policy planning in his subsequent role as a key thought leader in defense and security strategy. Specifically, Sec. Danzig has been a key consultant to the executive leadership of both the Department of Defense and the Department of Homeland Security. In this capacity, Sec. Danzig has helped shape our nation's policies and preparedness for acts of terrorism, including the especially pernicious threat of bioterrorism. Sec. Danzig has written widely on the topic of bioterrorism, technology, and policy making. His report entitled "**Catastrophic Bio-Terrorism: What is to be Done**" has been hailed by many as the seminal work on how the new threat of bio-terrorism must be met with not only clever technologies, but just as importantly with integrated policies and strategies that properly employ those technical solutions. Sec. Danzig is an exemplar of dedication, selfless service, and passionate commitment worthy of our gratitude and emulation.

Forensics Workshop

Location: North Tower-Grand Cayman

Wednesday 11 April . . . . . 8:30 am to 6:30 pm

8:30 am: **Opening Remarks**
Chair: **Colleen Fitzpatrick,** Yeiser and Associates

8:40 to 10:40 am:
SESSION 1: DNA Identification for Mass Fatalities

8:40 am **Using DNA for Identification Purposes: The Basics**
Presenter: **Amanda C. Sozer,** PhD, President, Sozer, Niezgoda and Associates, LLC

9:20 am: **The Use of Geneticists in the Louisiana Hurricane Katrina Identification Efforts**
Presenter: **Tammy Pruet Northup,** Attorney-at-Law

10:00 am: **Rapidly Evolving Forensic DNA Addresses Issues Brought Forth from the 9-11 Disaster**
Presenter: **Susan Ballou**, Program Manager for Forensic Sciences, Office of Law Enforcement Standards/National Institute of Standards and Technology

10:40 to 11:10 am: Coffee Break

11:10 am to 12:30 pm
SESSION 2: Case Studies in Forensic Science

11:10 am: **Optical Systems and Uses in Forensic Casework**
Presenter: **George Duncan, PhD,** DNA Unit Manager, Broward Sheriff's Office Broward County Crime Lab.

11:50 am: **Caught in the Iraqi War: How DNA was used to confirm the Genetic Link between an Injured Four-Year Old Girl and her Family**
Presenter: **Kimberly Murga,** Supervisory DNA Analyst, Armed Forces DNA Identification Lab

12:30 to 1:30 pm: Lunch Break

1:30 to 3:30 pm
SESSION 3: DNA Identification and Trace Element Analysis

1:30 pm: **Getting Blood from a Rock: Getting More and More from Less and Less**
Presenter: **Jack Ballantyne,** PhD, Associate Professor, Department of Chemistry, Associate Director for Research, National Center for Forensic Science, Univ. of Central Florida

2:10 pm: **Spy versus Spy: Outsmarting Tricky Forensic Samples and Scenarios with Novel Assays and Multiple Marker Systems**
Presenter: **Michael Coble,** Chief of Research, Armed Force DNA Identification Laboratory

2:50 pm: **Forensic Analytical Toxicology: Matrices, Analyses and Sensitivities**
Presenter: **Harold Schueler,** PhD, Chief Toxicologist, Broward County Medical Examiner's Office

3:30 to 4:00 pm: Coffee Break

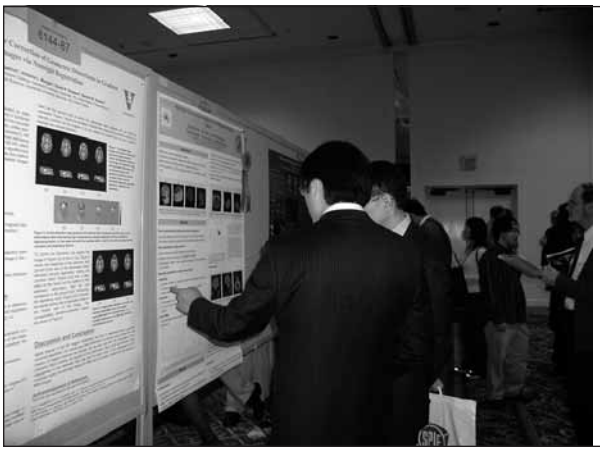
4:00 to 5:20 pm
SESSION 4: Applications of Facial Recognition

4:00 pm: **Facial Recognition: Overview of Applications Including a Summary of the Facial Recognition Vendor Test**
Presenter: **Joan Lurie,** PhD, Consultant - Remote Sensing and Biometrics, VP, GCC, Inc.

4:40 pm: **Facial Recognition Technology: A Case History from Theory to Commercial Product**
Presenter: **Joseph Atick**, PhD, Executive Vice President and Chief Strategic Officer of L-1 Identity Solutions

5:20 to 6:30 pm

PANEL DISCUSSION: The Development of New Forensic Science Techniques by the Optical Community
Panelists to include: **Kimberley Murga,** Armed Forces DNA Identification Lab.



Poster Sessions

Location: Spa Terrace

Tuesday and Thursday 10 & 12 April . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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.
See p. 151 for poster set up instructions.

Student Lunch with the Experts

Monday 9 April . . . . . 12:30 pm 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. Lunch is complimentary to all students.

Students receive one complimentary ticket with registration.

SPIE Women in Optics Lunch

Tuesday 10 April . . . . . 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 and 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.

Hosted by:

Prof. Maria Yzuel,
SPIE Vice-President
Universidad Autónoma de Barcelona

Defense and Security Displays Workshop

Location: Atlanta

Thursday 12 April . . . . . 8:00 to 10:00 pm

Chairs: **John T. Thomas**, General Dynamics Canada, Ltd. (Canada); **Andrew Malloy,** Naval Research Lab.

Please join us for this informal gathering to discuss display technologies and military applications for displays. The floor will be open for audience participation and any display related topics are welcome.

Some suggested topics for discussion are:

- COTS displays: Good enough for the cockpit?
- Commercial video interface "standards" such as DVI: Stable enough for MIL applications?
- Video over the new extended 1553 bus: But can we afford this?
- Head mounted displays in military applications: Time to assess pro's and Con's.
- LED backlights vs. florescent tubes
- OLED's: Ready for military applications?
- Are Bi-stable displays ready for battlefield applications?
- 3-D displays technology for military applications: Is it ready and for which applications?

Displays workshops are free to all registered attendees at SPIE Defense and Security Symposium. Snacks and beverages will be provided.

Conference Related Special Events

Monday • 9 April

Panel Discussion

Real World Biometrics Deployments

Location: Grand 12

Monday 9 April . . . . . 3:55 to 5:25 pm

Chairs: **Salil Prabhakar**, Digital Persona Inc.
Participants: **Mr. Dan Nickell,** National Biometrics Security Project; **Dr Robert K. Rowe,** Lumidigm Inc.; **Dr. Marios Savvides,** Carnegie Mellon Univ.

See conference 6539 for further details, p.32

Vendor Presentations and Reception

Location: Grand 8B

Monday 9 April . . . . . 5:30 to 8:00 pm

Chairs: **Andrés E. Rozlosnik,** SI Termografía Infrarroja (Argentina); **G. Raymond Peacock,** Temperatures.com, Inc.
Brief presentations from hardware and software vendors on what is new this year in their product lines that impact thermal imaging applications and practices.

See conference 6541 for further details, p. 37.

Invited Panel

Issues and Challenges in Uncertainty Representation and Management with Applications to Real-World Problems

Location: North Tower-Marco Island

Monday 9 April . . . . . 7:00 to 9:40 pm

Organizers: **Ivan Kadar,** Interlink Systems Sciences, Inc.; **Ronald P. Mahler**, Lockheed Martin Tactical Systems

See conference 6567 for further details, p. 102.

Tuesday • 10 April

Government Programs Panel Discussion

Location: Grand 1-2

Tuesday 10 April . . . . . 10:20 am to 12:00 pm

Chairs: **Bruce E. Brendle, Jr.**, U.S. Army TARDEC/RDECOM; **Jonathan A. Bornstein**, Army Research Lab.

See conference 6561 for further details, p. 84.

Global Homeland Security Technical Group Meeting

Location: Grand 14

Tuesday 10 April . . . . . 5:00 to 6:15 pm

Chair: **Theodore T. Saito**, Lawrence Livermore National Lab.

See conference 6540 for further details, p. 34.

Infrared Image Gallery and Thermosense Technical Meeting

Location: Grand 11

Tuesday 10 April . . . . . 5:00 to 6:30 pm

Chair: **Herbert Kaplan,** Honeyhill Technical Co.; **Ralph Dinwiddie,** Oak Ridge National Lab.

See conference 6541 for further details, p. 36.

Wednesday • 11 April

Workshop

V50, E-zoom, and Boost Modeling Approaches

Location: Grand 9-10

Wednesday 11 April . . . . . 5:45 to 6:45 pm

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

See conference 6543 for further details, p. 47.

Automatic Target Recognition Technical Meeting

Location: North Tower-Vinoy

Thursday 12 April . . . . . 1:30 to 5:30 pm
Chair: **Firooz A. Sadjadi,** Lockheed Martin Corp.
Includes three ATR method tutorials and results on common infrared imaging training and test data.

See conference 6566 for further details, p. 100.

Panel Discussion

Unattended Ground Sensors

Location: Grand 4

Thursday . . . . . 3:30 to 5:00 pm
Moderator: **Michael A. Kolodny,** Army Research Lab.

See conference 6562 for further details, p.91.

Panel Discussion

Choosing the Right Tool for the Job

Location: North Tower-Key Largo

Thursday . . . . . 4:00 to 5:00 pm
Chair: **Misty Blowers,** Air Force Research Lab. and Syracuse Univ.
You could build a house with just a screwdriver... but why would you? Is it because you're a screwdriver expert and can make it do anything? Or is it merely because that's the only tool you own? In this session, we will discuss many of the evolutionary and bio-inspired tools, techniques and approaches being researched in the community today, their strengths and shortcomings, and the classes of problems for which they are most — and least — appropriate.

See conference 6563 for further details, p. 92.

NEWS FROM YOUR FIELD.
DELIVERED DAILY.

SPIE Newsroom reporters are experts from Academia and Industry covering news from your technical field. The Newsroom features first-person articles and interviews with international leaders in their technologies, like **Tuan Vo-Dinh**, Director of the Fitzpatrick Institute for Photonics Duke University, and **Naomi Halas**, Head of Halas Nanophotonics Group, Rice University.

newsroom.spie.org

News Feeds • Video Interviews • Patent News • E Alerts

Make time for the

Defense & Security Exhibition

The largest showcase of unclassified defense and security equipment

Location: Crystal Ballroom, Palms Ballroom and Palms Foyer

Exhibition Hours

Tues. 10 April	10:00 am to 5:00 pm
Wed. 11 April	10:00 am to 5:00 pm
Thurs. 12 April	10:00 am to 2:00 pm

SPIE Defense & Security Symposium has grown into the number one event in the world for Infrared imaging, optics, and sensors equipment.

Don't miss your opportunity to tap into the multi-billion dollar budgets currently being invested in defense products. Defense & Security Symposium is the place to connect with the right people, discover where the industry is going, and increase your revenue. There is no better place for business and science to coalesce than at the DSS Exhibition tailored to your market.

See exhibitors displaying

- Defense and security applications
- Laser and sensor technologies and systems
- Displays, guidance, and navigation
- Modeling, simulation, and visualization
- Signal and image processing
- Sensor testing and calibration instrumentation
- Data mining technology
- C3I, airborne reconnaissance, space and systems operations
- Navigation for tactical applications
- Biometrics and aviation security
- Forensic technologies
- Unmanned vehicles

See new applications in action at the Product Spotlights.

Exhibitor Product Spotlights

FREE to Attend!

The half hour Demos are open to all attendees and visitors.
Located in the Exhibiton Hall, Crystal Ballroom Coffee Area, mid-1600 aisle.

TIME	Tuesday 10 April	Wednesday 11 April	Thursday 12 April
10:30 am	**Tiny cryogenic piezoelectric motor for hyperspectral imaging and other applications** **Fred Haas,** New Scale Technologies New Scale's miniature piezoelectric SQUIGGLE motor provides 20nm resolution with very low heating in cryogenic systems (to 4K). Our customer Wavefront Research joins us to discuss applications including cryogenic imaging.	**Shortwave infrared (SWIR) imaging for all low-light-level imaging tasks** **Doug Malchow,** SUI (Sensors Unlimited, Inc.), part of Goodrich Corporation New shortwave infrared imagers w / high frame rate, ultra high sensitivity and compact designs will be presented. These are used for defense and security applications such as surveillance with passive or active illumination, laser designation, camouflage detection and for unattended aerial or ground sensor payloads.	**Using MATLAB for Distributed and Parallel Computing Applications** **Dave Forstot,** The MathWorks Learn how to use the Distributed Computing Toolbox and MATLAB Distributed Computing Engine to speed up repetitive calculations and/or deal more effectively with large data sets.
11:30 am	**Optical Thermal Imaging for Everyone—Affordable Thermal Imaging for Mass Market Applications** **Stuart Nixdorff,** RedShift Systems RedShift's Thermal Light Valve ™ and its OpTIC™ optical thermal imaging camera engines enable OEMs to bring affordable thermal imaging to mass market applications today.	**Quantum 5™ Real-Time 3D Spherical Scatterometer** **Raymond Castonguay,** Engineering Synthesis Design, Inc. The Quantum 5™ measures 3D Scattered or radiated light in real-time at 0.2 degrees resolution over the entire hemisphere (or sphere) in 60 milliseconds with a dynamic range of 16000:1. Applications include measurement of high speed events such as particle detection/characterization and biomedical imaging.	**QPC Introduces On-Chip Internal Grating Technologies** **Dr. Paul Rudy,** QPC Lasers, Inc. High power high brightness semiconductor lasers with precise wavelength control are now available at near infrared and eye-safe wavelengths. These products utilize QPC's proprietary BrightLase™ and on-chip Internal Grating technologies.
12:30 pm	**Transparent Heaters for Optical and NIR Applications** **Brian Herr,** Dontech Dontech, Inc. announces Therma-Klear™ Series Transparent Heaters for electronic displays, touchscreens, camera windows, laser optics and other custom applications. Therma-Klear™ Heaters can extend the lower thermal range of LCD's, AMLCD's, resistive touchscreens and optical systems used in outdoor, military, security or avionic applications. Additionally, they are used for anti-fog, anti-icing and de-icing applications.	**New Developments in High Performance Infrared Imaging for Demanding Applications** **Chris Alicandro,** Electrophysics Corp. Electrophysics will be demonstrating their Silver family of high performance infrared imaging and measurement systems. Featuring high sensitivity and fast frame rates, the Silver is the best in its class for your applications.	**Capabilities and Applications of Molded Chalcogenide Infrared Optics** **George Curatu,** LightPath Technologies Molded Chalcogenide Glass optics is exciting technology that can provide high quality, cost effective infrared lenses. LightPath Technologies will review the advantages of chalcogenide lenses for infrared applications.
1:30 pm	**Recent Advances in High Performance Imaging Spectrometers** **David Bannon,** Headwall Photonics, Inc. Discussion of spectral imaging performance requirements necessary for hyperspectral and raman applications. Spectral and spatial resolution capabilities are presented as key drivers of enhanced photometric accuracy.		

Exhibitor Product Spotlights

FREE to Attend!

The half hour Demos are open to all attendees and visitors.
Located in the Exhibiton Hall, Crystal Ballroom Coffee Area, mid-1600 aisle.

TIME	Tuesday 10 April	Wednesday 11 April	Thursday 12 April
2:30 pm	**High Resolution Imaging in Military Target Scoring** **Greg Combs,** Princeton Instruments Live demo of how digital imaging systems can be used for automated scoring of weapons systems.	**Precise control of semiconductor light** **Dr. Michel Têtu,** Teraxion TeraXion is a photonics engineering company specializing in the generation and conditioning of light wave signals for the Telecommunication, Defense and Aerospace and Industrial markets. For these markets TeraXion has developed a portfolio of precisely frequency controlled semiconductor lasers. Absolute frequency value setting, highly improved long term frequency stability and ultra linewidth narrowing are achieved by locking the laser frequency to optical references. A description of the main available products will be given and a discussion on their performances and applications presented.	**EXHIBITION CLOSED**
3:30 pm	**Target Detection & Automated Tools to Speed Image Analysis for Defense Applications** **Amanda Warner,** ITT Learn more about how to detect targets and speed your image analysis using automated tools in ENVI.	**Hyper-Spectral Imaging** **Fred Tzafrir,** CI Systems, Inc.	
4:30 pm	**Miniaturization Trends in SCD's Detectors** **Fabian Shapiro,** SCD-Semi Conductor Devices The introduction of small pitch FPAs and miniaturized micro-coolers allowed the fabrication of ultra compact high-performance IDCAs which are optimized for low power/weight applications such as IR goggles and rifle sights.	**Designing with Molded Glass Aspheres** **Brian Bundschuh,** Rochester Precision Optics This presentation will highlight the advantages and considerations of using precision glass molded aspheres in a design. It will cover glass selection, preform requirements, tool requirements and post-molding processes.	

SPIE thanks the following sponsors for their generous support of Defense & Security 2007

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The Continuing Education Unit®

SPIE is an authorized provider of Continuing Education Units (CEUs) though ICAET—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.

Professional Development from SPIE

spie.org/education

SPIE Foundation Courses

Look for this symbol to identify SPIE Foundation Courses FC

What are 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.

SPIE Foundation Courses are ideal for:

- Technical sales professionals looking to increase their knowledge to better work with customers
- Early career professionals who need an in-depth background in their specialization
- Mid-career professionals interested in changing focus to a new field
- Companies looking for training for their entry-level engineers
- Professionals seeking to broaden their skills with interdisciplinary training
- Anyone looking to gain a fundamental understanding of the subject

Daily Course Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
9 April	10 April	11 April	12 April	13 April

Law Enforcement and Homeland Security

Monday	Tuesday	Wednesday	Thursday	Friday
SC836 **Using IR Thermographic Instruments - A Primer for Thermographers** *(Kaplan)* 1:30 to 5:30 pm, $350 / $405 (NEW, FC)	SC719 **Chemical & Biological Detection: Overview of Point and Standoff Sensing Technologies** *(Gardner)* 8:30 am to 12:30 pm, $295 / $340 (FC)			
	SC766 **Information Processing for Video Surveillance** *(Ebrahimi, Dufaux)* 8:30 am to 5:30 pm $490 / $580			

Thermosense

Monday	Tuesday	Wednesday	Thursday	Friday
SC836 **Using IR Thermographic Instruments - A Primer for Thermographers** *(Kaplan)* 1:30 to 5:30 pm, $350 / $405 (NEW, FC)	SC711 **Techniques for Accurate Infrared Temperature Measurement** *(Seffrin)* 8:30 am to 12:30 pm, $295 / $340 (FC)	SC786 **Practical Thermography for Nondestructive Testing** *(Shepard)* 1:30 to 5:30 pm, $295 / $340 (FC)		
	SC710 **NIR and SWIR Imaging Applications** *(Richards)* 8:30 am to 12:30 pm, $330 / $375			

Registration is required.
See SPIE Cashier to Register.

Price Key

SPIE Member/Non-Member

FC = SPIE Foundation Course

Daily Course Schedule

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April

Infrared Systems Engineering

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April
SC545 **Infrared Characterization of Sources and Backgrounds** *(Jacobs)* 8:30 am to 5:30 pm, $505 / $595	SC214 **Infrared Window and Dome Materials** *(Harris)* 8:30 am to 5:30 pm, $490 / $580	SC710 **NIR and SWIR Imaging Applications** *(Richards)* 8:30 am to 12:30 pm, $330 / $375	SC164 **Dynamic Infrared Scene Projection** *(Williams)* 8:30 am to 12:30 pm, $295 / $340	
SC835 NEW FC **Infrared Systems - Technology & Design** *(Daniels)* 8:30 am to 5:30 pm and 8:30 am to 12: 30 pm, $945 / $1080			SC152 **Infrared Focal Plane Arrays** *(Dereniak, Hubbs)* 8:30 am to 12:30 pm, $295 / $340	
SC789 FC **Introduction to Optical and Infrared Sensor Systems** *(Shaw)* 8:30 am to 5:30 pm, $490 / $580	SC839 NEW **Novel Uncooled Infrared Detectors and Systems** *(Hanson)* 8:30 am to 5:30 pm, $490 / $580		SC278 **Infrared Detectors** *(Dereniak)* 1:30 to 5:30 pm, $410 / $455	
SC134 FC **Optical Design Fundamentals for Infrared Systems** *(Riedl)* 8:30 am to 5:30 pm, $530 / $520	SC796 **Allowable Stresses in Glass and Engineering Ceramics** *(Pepi)* 1:30 to 5:30 pm $295 / $340			
SC165 **Uncooled Thermal Imaging Arrays, Systems, and Applications** *(Hanson)* 8:30 am to 12:30 pm, $330 / $375	SC178 FC **Introduction to Radiometry and Photometry** *(McCluney)* 1:30 to 5:30 pm, $410 / $455			
SC840 NEW **IR Detector Cryocoolers** *(Rühlich)* 1:30 to 5:30 pm, $295 / $340				

Unmanned Systems and GPS Technology

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April
SC841 NEW **Unmanned Systems 101** *(Moore, Berkemeier, Flann)* 8:30 am to 5:30 pm, $490 / $580		SC549 **Incorporating GPS Technology into Commercial and Military Applications** *(Uijt de Haag)* 8:30 am to 12:30 pm, $295 / $340		

Displays

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April
		SC159 **Head-Mounted Displays: Design and Applications, Including Night Vision** *(Melzer, Browne)* 8:30 am to 5:30 pm, $490 / $580		

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April

Tactical Sensors and Imagers

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April
SC713 FC **Engineering Approach to Imaging System Design** *(Holst)* 8:30 am to 5:30 pm, $540 / $630	SC157 **MTF in Optical and Electro-Optical Systems** *(Ducharme)* 8:30 am to 5:30 pm, $525 / $615		SC782 **Zone Plate Antennas for Millimeter-Wave and Terahertz Frequencies** *(Wiltse)* 8:30 am to 12:30 pm, $295 / $340	SC154 **Electro-Optical Imaging System Performance** *(Holst)* 8:30 am to 5:30 pm, $560 / $650
SC789 FC **Introduction to Optical and Infrared Sensor Systems** *(Shaw)* 8:30 am to 5:30 pm, $490 / $580	SC067 **Testing and Evaluation of E-O Imaging Systems** *(Holst)* 8:30 am to 5:30 pm, $555 / $645			
SC547 FC **Terahertz Wave Technology and Applications** *(Zhang)* 8:30 am to 12:30 pm, $295 / $340	SC178 FC **Introduction to Radiometry and Photometry** *(McCluney)* 1:30 to 5:30 pm, $410 / $455			
SC068 **Use of CCD and CMOS Sensors in Visible Imaging Applications** *(Lomheim)* 8:30 am to 12:30 pm, $295 / $340				
SC194 **Multispectral and Hyperspectral Image Sensors** *(Lomheim)* 1:30 to 5:30 pm, $295 / $340				

Laser Sensing and Systems

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April
SC838 *NEW* **Laser Range Gated Imaging Techniques** *(Duncan)* 1:30 to 5:30 pm, $295 / $340	SC167 FC **Introduction to Laser Radar** *(Kamerman)* 1:30 to 5:30 pm, $295 / $340	SC784 **Fiber Lasers for Defense Applications: Fibers, Components and System Design Considerations** *(Samson, Torruellas)* 8:30 am to 5:30 pm, $540 / $630	SC717 **3D Visualization Techniques for Laser Radar** *(Roth)* 1:30 to 5:30 pm, $295 / $340	
		SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** *(Phillips, Andrews)* 8:30 am to 5:30 pm, $610 / $700		
		SC725 **Optical & Laser Scanning Technology: Devices, Systems & Applications** *(Marshall)* 8:30 am to 5:30 pm, $665 / $755		
		SC160 **Precision Stabilization and Laser Pointing Systems** *(Hilkert)* 8:30 am to 5:30 pm, $490 / $580		

Registration is required.
See SPIE Cashier to Register.

Price Key

SPIE Member/Non-Member

FC = SPIE Foundation Course

Daily Course Schedule

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April
Modeling and Simulation				
	SC783 **How to Validate Your Models and Simulations** *(Law)* 8:30 am to 5:30 pm, $605 / $695			
Target Acquisition and Recognition				
	SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers** *(Vollmerhausen)* 8:30 am to 5:30 pm, $490 / $580		SC158 **Fundamentals of Automatic Target Recognition** *(Nasr)* 8:30 am to 5:30 pm, $490 / $580	
Multisource, Multisensor Information Fusion and Knowledge Discovery Techniques				
SC149 **Multi-Sensor, Multi-Source Information Fusion: Architectures, Algorithms, and Applications** *(Dasarathy)* 8:30 am to 5:30 pm, $490 / $580				SC174 **Multispectral Image Processing** *(Schowengerdt)* 8:30 am to 5:30 pm, $575 / $665
Signal and Image Processing				
SC066 **Fundamentals of Electronic Image Processing** *(Weeks)* 8:30 am to 5:30 pm, $550 / $640	SC714 **From FFTs to Wavelets for Image & Signal Processing** *(Burrus, DeVore)* 8:30 am to 12:30 pm, $295 / $340	SC197 **Fundamentals of Digital Signal/ Image Processing** *(Dianat)* 8:30 am to 5:30 pm, $490 / $580	SC162 **SAR Signal Processing** *(Soumekh)* 8:30 am to 5:30 pm, $585 / $675	
	SC715 **Independent Component Analysis and Beyond: Blind Signal Processing and its Applications** *(Szu, Lee)* 1:30 to 5:30 pm, $410 / $455	SC189 **Image Recognition Using Statistical Filtering Techniques, Wavelets and Neural Networks** *(Javidi)* 8:30 am to 5:30 pm, $545 / $635		
		SC837 NEW **Multivariate Analysis of Imaging and Sensor Data** *(Bajorski)* 8:30 am to 5:30 pm, $490 / $580		

Registration is required.
See SPIE Cashier to Register.

Monday 9 April	Tuesday 10 April	Wednesday 11 April	Thursday 12 April	Friday 13 April

Sensor Networks

SC640 **Introduction to Sensor Networks** *(Rao)* 8:30 am to 5:30 pm, $490 / $580 (FC)

Optical and Optomechanical Engineering

SC156 **Basic Optics for Engineers** *(Ducharme)* 8:30 am to 5:30 pm, $525 / $615 (FC)

SC178 **Introduction to Radiometry and Photometry** *(McCluney)* 1:30 to 5:30 pm, $410 / $455 (FC)

SC447 **Principles for Mounting Optical Components** *(Yoder, Jr.)* 8:30 am to 5:30 pm, $955 / $1175 (FC)

SC010 **Introduction to Optical Alignment Techniques** *(Ruda)* 8:30 am to 5:30 pm, $885 / $1105

SC220 **Optical Alignment Mechanisms** *(Guyer)* 8:30 am to 12:30 pm, $295 / $340

SC840 ***NEW*** **IR Detector Cryocoolers** *(Rühlich)* 1:30 to 5:30 pm, $295 / $340

SC796 **Allowable Stresses in Glass and Engineering Ceramics** *(Pepi)* 1:30 to 5:30 pm $295 / $340

SC781 **Optomechanical Analysis** *(Hatheway)* 8:30 am to 5:30 pm, $490 / $580 (FC)

Professional Development Workshops

WS639 **Intellectual Property Issues in the Defense and Security Industries** *(Gortych, Stanley)* 1:30 to 5:30 pm, $295 / $340

WS845 ***NEW*** **Compliance with the International Traffic in Arms Regulations (ITAR)** *(Palmer)* 8:30 am to 12:30 pm, $305 / $350

WS843 ***NEW*** **Playing the SBIR Game to Win** *(Patterson)* 8:30 am to 12:30 pm, $295 / $340

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

WS846 ***NEW*** **Essential Skills for Engineering Project Leaders** *(Hinkle)* 1:30 to 5:30 pm, $140 / $165

Price Key

SPIE Member/Non-Member

(FC) = SPIE Foundation Course

Technologies for Homeland Security and Law Enforcement

Chair: **Edward M. Carapezza,** Visiting Scientist, Univ. of Connecticut

6538 **Sensors, and Command, Control, Communications, and Intelligence (C3I) Technologies for Homeland Security and Homeland Defense VI** *(Carapezza)* 29

6539 **Biometric Technology for Human Identification IV** *(Prabhakar/Ross)* 32

6540 **Optics and Photonics in Global Homeland Security III** *(Saito/Lehrfeld/DeWeert)* 34

IR Sensors and Systems Engineering

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

6541 **Thermosense XXIX** *(Knettel/Vavilov/Miles)* 36

6542 **Infrared Technology and Applications XXXIII** *(Andresen/Fulop/Norton)* 40

6543 **Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XVIII** *(Holst)* 47

6544 **Technologies for Synthetic Environments: Hardware-in-the-Loop Testing XII** *(Murrer)* 50

6545 **Window and Dome Technologies and Materials X** *(Tustison)* 51

Tactical Sensors and Imagers

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

6546 **Airborne Intelligence, Surveillance, Reconnaissance (ISR) Systems and Applications IV** *(Henry)* 53

6547 **Radar Sensor Technology XI** *(Kurtz/Tan)* 54

6548 **Passive Millimeter-Wave Imaging Technology X** *(Appleby/Wikner)* 56

6549 **Terahertz for Military and Security Applications V** *(Jensen/Cui)* 57

Laser Sensors and Systems

Chair: **Gary W. Kamerman,** FastMatrix, Inc.

6550 **Laser Radar Technology and Applications XII** *(Turner/Kamerman)* 59

6551 **Atmospheric Propagation IV** *(Young/Gilbreath)* 61

6552 **Laser Source Technology for Defense and Security III** *(Wood/Dubinskii)* 63

Battlespace Technologies

Chairs: **John H. Holloway,** Naval Surface Warfare Ctr. Panama City

Patrick J. Gardner, General Dynamics Armament and Technical Products

6553 **Detection and Remediation Technologies for Mines and Minelike Targets XII** *(Harmon/Holloway/Broach)* 65

6554 **Chemical and Biological Sensing VIII** *(Fountain)* 69

Space Technologies and Operations

Chairs: **Peter Tchoryk,** Michigan Aerospace Corp.

Roger Hall, Advanced Research Projects Agency

6555 **Sensors and Systems for Space Applications** *(Howard/Richards)* 71

6556 **Micro (MEMS) and Nanotechnologies for Defense and Security II** *(George/Cheng)* 74

Displays

Chairs: **Clarence E. Rash,** U.S. Army Aeromedical Research Lab.

Jacques Verly, Univ. de Liège (Belgium)

6557 **Head- and Helmet-Mounted Displays XII: Design and Applications** *(Brown/Reese)* 77

6558 **Display Technologies & Applications for Defense, Security, & Avionics** *(Thomas/Malloy)* 79

6559 **Enhanced and Synthetic Vision 2007** *(Verly/Güell)* 81

Intelligent and Unmanned Systems

Chair: **Grant R. Gerhart,** U.S. Army TARDEC-RDECOM

6560 **Intelligent Computing: Theory and Applications V** *(Priddy/Ertin)* 82

6561 **Unmanned Systems Technology IX** *(Gerhart/Gage/Shoemaker)* 84

6562 **Unattended Ground, Sea, and Air Sensor Technologies and Applications IX** *(Carapezza)* 89

Modeling and Simulation

Chairs: **Alex F. Sisti,** Air Force Research Lab.

Dawn A. Trevisani, Air Force Research Lab.

6563 **Evolutionary and Bio-inspired Computation: Theory and Applications** *(Blowers/Sisti)* 92

6564 **Modeling and Simulation for Military Operations II** *(Schum/Trevisani)* 93

Sensor Data Exploitation and Target Recognition

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

6565 **Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XIII** *(Shen/Lewis)* 95

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6569 **Acquisition, Tracking, Pointing, and Laser Systems Technologies XXI** *(Chodos/Thompson)* 106

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

Chair: **Belur V. Dasarathy,** Consultant Information Fusion Technologies

6570 **Data Mining, Intrusion Detection, Information Assurance, and Data Networks Security 2007** *(Dasarathy)* 108

6571 **Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2007** *(Dasarathy)* 110

Signal Image and Neural Net Processing

Chair: **Andrew Pirich,** Air Force Research Lab.-Ret.

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6573 **Quantum Information and Computation V** *(Donkor/Pirich/Brandt)* 114

6574 **Optical Pattern Recognition XVIII** *(Casasent/Chao)* . . . 116

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6576 **Independent Component Analyses, Wavelets, Unsupervised Nano-Biomimetic Sensors and Neural Networks V** *(Szu/Agee)* 119

Communications and Networking Technologies and Systems

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

6577 **Wireless Sensing and Processing II** *(Rao/Dianat/Zoltowski)* 122

6578 **Defense Transformation and Net-Centric Systems 2007** *(Suresh)* 123

6579 **Mobile Multimedia/Image Processing for Military and Security Applications 2007** *(Agaian/Jassim)* 126

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Technologies for Homeland Security and Law Enforcement

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

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- 6539 **Biometric Technology for Human Identification IV** *(Prabhakar, Ross)* p. 32
- 6540 **Optics and Photonics in Global Homeland Security III** *(Saito, Lehrfeld, DeWeert)* p. 34

IR Sensors and Systems Engineering

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

- 6541 **Thermosense XXIX** *(Knettel, Vavilov, Miles)* p. 36
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- 6543 **Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XVIII** *(Holst)* p. 47
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Tactical Sensors and Imagers

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

- 6549 **Terahertz for Military and Security Applications V** *(Jensen, Cui)* p. 57
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Laser Sensors and Systems

Program Chair: **Gary W. Kamerman,** FastMatrix, Inc.

- 6552 **Laser Source Technology for Defense and Security III** *(Wood, Dubinskii)* p. 63
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Battlespace Technologies

Program Chairs: **John H. Holloway,** Naval Surface Warfare Ctr. Panama City; **Patrick J. Gardner,** General Dynamics Armament and Technical Products

- 6553 **Detection and Remediation Technologies for Mines and Minelike Targets XII** *(Harmon, Broach, Holloway)* p. 65
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Space Technologies and Operations

Program Chairs: **Peter Tchoryk,** Michigan Aerospace Corp.; **Roger Hall,** Advanced Research Projects

6555 **Sensors and Systems for Space Applications** *(Howard, Richards)* p. 71

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Displays

Program Chairs: **Clarence E. Rash,** U.S. Army Aeromedical Research Lab.; **Jacques Verly,** Univ. de Liège (Belgium)

6557 **Head- and Helmet-Mounted Displays XII: Design and Applications** *(Brown, Reese)* p. 77

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Intelligent and Unmanned Systems

Program Chair: **Grant R. Gerhart,** U.S. Army TARDEC-RDECOM

6560 **Intelligent Computing: Theory and Applications V** *(Priddy, Ertin)* p. 82

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Modeling and Simulation

Program Chairs: **Alex F. Sisti,** Air Force Research Lab.; **Dawn A. Trevisani,** Air Force Research Lab.

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6563 **Evolutionary and Bio-inspired Computation: Theory and Applications** *(Blowers, Sisti)* p. 92

Sensor Data Exploitation and Target Recognition

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

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

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

Program Committee: **John G. Blitch**, ARACAR: Alliance for Robot Assisted Crisis Assessment and Response; **Antonio A. Cantu**, U.S. Secret Service; **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 and Naval Warfare Systems Ctr., 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; **Parsa Mirhaji**, The Univ. of Texas Health Science Ctr. at Houston; **Paul F. Morgan**, U.S. Special Operations Command; **Dennis J. Reimer**, National Memorial Institute for the Prevention of Terrorism; **Nino Srour**, Army Research Lab.

Monday 9 April

SESSION 1

Room: Grand 13 . . . . . Mon. 9:00 to 9:50 am

Keynote Session

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

Keynote Presentation

9:00 am: **Internet security challenges for the future** *(Invited Paper)***,** P. K. Khosla, Carnegie Mellon Univ. . . . . [6538-01]

SESSION 2

Room: Grand 13 . . . . . Mon. 9:50 am to 12:10 pm

Infrastructure Protection and Cyber Security

Chairs: **George V. Cybenko**, Dartmouth College; **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego

9:50 am: **Secret communication by using data hiding in IPv6,** M. Carli, A. De Castro, A. Neri, Univ. degli Studi di Roma Tre (Italy) . . . . . [6538-02]

10:10 am: **Innovative, wearable snap connector technology for improved device networking in electronic garments,** K. Lee, E. Gans, T. P. Jannson, Physical Optics Corp. . . . . [6538-03]

Coffee Break . . . . . 10:30 to 10:50 am

10:50 am: **Enterprise network intrusion detection and prevention system (ENIDPS),** C. M. Akujuobi, N. K. Ampah, Prairie View A&M Univ. . . . . [6538-04]

11:10 am: **Securing wireless sensor systems,** M. Blaser, Certicom Inc. (Canada) . . . . . [6538-05]

11:30 am: **An integrated wireless sensor network for tranporattion safety and security,** M. A. Chowdhury, Clemson Univ. . . . . [6538-06]

11:50 am: **iScout™ low-cost ad-hoc networked sensor enhancements** *(Presentation Only)***,** M. A. Winston, McQ, Inc. . . . . [6538-07]

Lunch Break . . . . . 12:10 to 1:10 pm

SESSION 3

Room: Grand 13 . . . . . Mon. 1:10 to 2:50 pm

Urban and Through-the-Wall Sensor Systems

Chairs: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego; **Edward M. Carapezza**, Univ. of Connecticut and DARPA

1:10 pm: **Experiments on through-the-wall motion detection and ranging,** P. Setlur, M. G. Amin, F. Ahmad, Villanova Univ.; P. D. Zemany, BAE Systems North America . . . . . [6538-08]

1:30 pm: **Through-the-wall sensor systems based on hard x-ray imaging optics,** T. P. Jannson, M. Gertsenshteyn, V. Grubsky, P. Amouzou, Physical Optics Corp. . . . . [6538-09]

1:50 pm: **THz identification of humans and concealed weapons for law enforcement, government, and commercial applications,** A. U. Sokolnikov, Visual Solutions and Applications . . . . . [6538-10]

2:10 pm: **Unique facility for law enforcement applicable CWD and TWS technologies test and evaluation,** S. E. Borek, J. F. Seif, D. L. Stevens, D. E. Warren, Air Force Research Lab. . . . . [6538-11]

2:30 pm: **Biometric identification using holographic radar imaging techniques,** D. L. McMakin, D. M. Sheen, T. E. Hall, H. P. Foote, Pacific Northwest National Lab. . . . . [6538-83]

Coffee Break . . . . . 2:50 to 3:20 pm

SESSION 4

Room: Grand 13 . . . . . Mon. 3:20 to 4:20 pm

Container Inspection Sensor Systems

Chairs: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego; **Bahram Javidi**, Univ. of Connecticut

3:20 pm: **A real-time tracking system for monitoring shipments of hazardous materials,** M. W. Humphrey, NorthWest Nuclear, LLC; P. C. Womble, J. Paschal, L. Hopper, Western Kentucky Univ.; D. Pinson, F. J. Schultz, NorthWest Nuclear, LLC . . . . . [6538-12]

3:40 pm: **Associated particle imaging,** K. Warman, S. Thordarson, D. T. Kuo, D. G. Penn, M. Clements, Applied Signal Technology, Inc. . . . . [6538-13]

4:00 pm: **Directional gamma-ray detection,** K. Warman, J. Weckel, D. G. Penn, M. Clements, Applied Signal Technology, Inc. . . . . [6538-14]

SESSION 5

Room: Grand 13 . . . . . Mon. 4:20 to 6:00 pm

Vehicle and Weapons Detection and Tracking Systems

Chairs: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego; **Bahram Javidi**, Univ. of Connecticut

4:20 pm: **Aerostat acoustic payload for transient and helicopter detection,** M. V. Scanlon, C. G. Reiff, L. Solomon, Army Research Lab. . . . . [6538-15]

4:40 pm: **Electronic system for de-activation of clock-bombs with help of liquid nitrogen,** A. Rahmani Nejad, Civil Aviation Organization (Iran) . . . [6538-16]

5:00 pm: **A novel shoe scanner using an open-access quadrupole resonance sensor,** C. W. Crowley, GE Infrastructure . . . . . [6538-17]

5:20 pm: **De-activation of nuclear missiles by electromagnetic bomb-head missiles,** A. Rahmani Nejad, Civil Aviation Organization (Iran) . . . . . [6538-18]

5:40 pm: **Magnetic gradiometer for detection and localization of IEDs,** Y. Dalichaouch, B. W. Whitecotton, S. Kuhn, Quantum Magnetics, Inc.; D. O. Walsh, Vista Clara, Inc. . . . . [6538-19]

Tuesday 10 April

SESSION 6

Room: Grand 4 . . . . . Tues. 8:00 to 9:30 am

Joint Keynote Session with Conference 6562

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

Keynote Presentation
8:00 am: **Real-time automated 3D sensing, imaging, and monitoring of dynamic microscopic biological events** *(Invited Paper)*, B. Javidi, I. Moon, S. Yeom, Univ. of Connecticut; E. M. Carapezza, Univ. of Connecticut and DARPA . . . . . [6538-21]

Keynote Presentation
8:50 am: **TBD, The Boeing Co.** *(Invited Paper, Presentation Only)*, M. Smith, The Boeing Co.. . . . . [6562-28]

Coffee Break . . . . . 9:30 to 10:20 am

SESSION 7

Room: Grand 13 . . . . . Tues. 10:20 to 11:40 am

Chemical and Biological Agent Sensors and Systems

Chairs: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego

10:20 am: **Detection of chemical agents using a novel energy cell,** J. Shewchun, Wayne State Univ. . . . . [6538-22]

10:40 am: **Chemical sensors based on functionalized microcantilever arrays,** P. G. Datskos, N. V. Lavrik, Oak Ridge National Lab.; M. J. Sepaniak, P. Dutta, P. J. Chapman, The Univ. of Tennessee . . . . . [6538-24]

11:00 am: **Bio-aerosol optical sensor model development and initial validation,** S. D. Campbell, MIT Lincoln Lab. . . . . [6538-26]

11:20 am: **A new paradigm for video cameras: optical sensors,** K. Grottle, ENSCO, Inc.; A. Nathan, IntelliVision; C. Smith, ENSCO, Inc. . . . . [6538-27]

Lunch/Exhibition Break . . . . . 11:40 am to 1:20 pm

SESSION 8

Room: Grand 13 . . . . . Tues. 1:20 to 2:40 pm

Autonomous Air, Underwater, and Ground Vehicles

Chairs: **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command

1:20 pm: **Evaluation of robot deployment in live missions with the police, military, and fire brigade,** C. Lundberg, R. Reinhold, H. I. Christensen, Kungliga Tekniska Högskolan (Sweden) . . . . . [6538-29]

1:40 pm: **Mini-RNV,** D. R. Erickson, Defence Research and Development Canada Suffield (Canada) . . . . . [6538-30]

2:00 pm: **OmniBird: a miniature PTZ NIR sensor system for UCAV day/night autonomous operations,** S. X. Yi, H. Li, Genex Technologies, Inc. . . . . [6538-32]

2:20 pm: **Improving the power, bandwidth, and latency performance of UAV-based imaging systems by structural computation methods,** A. Cernasov, Honeywell Defense and Space Electronic Systems . . . . . [6538-33]

Coffee Break . . . . . 2:40 to 3:20 pm

SESSION 9

Room: Grand 13 . . . . . Tues. 3:20 to 5:40 pm

Command, Control, Communications and Intelligence (C3I)

Chairs: **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command

3:20 pm: **Effects of prior knowledge on the effectiveness of a hybrid user model for information retrieval,** H. Nguyen, Univ. of Wisconsin/Whitewater; E. Santos, Jr., Dartmouth College . . . . . [6538-34]

3:40 pm: **A disaster recovery system featuring uncertainty visualization and distributed infrastructure,** L. L. Grewe, California State Univ./East Bay [6538-35]

4:00 pm: **Determination of flight composite risk factor for optimal federal air marshal resource allocation,** H. M. Jaenisch, J. Handley, M. P. Carroll, Tec-Masters, Inc. . . . . [6538-36]

4:20 pm: **The application of image processing techniques and technology for security and surveillance applications,** M. I. Smith, T. Riley, Waterfall Solutions Ltd. (United Kingdom) . . . . . [6538-37]

4:40 pm: **Blending real and simulated worlds in an AI-augmented sensor fusion and decision support system for homeland security,** J. A. Williams, SimiGon, Ltd. . . . . [6538-38]

5:00 pm: **Bayesian inferance and conditional probabilities as performance metrics for homeland security sensors,** T. P. Jannson, Physical Optics Corp. . . . . [6538-39]

5:20 pm: **Three-dimensional visual mechinism by neural networkings,** S. Sugiyama, Gifu Univ. (Japan) . . . . . [6538-40]

Wednesday 11 April

SESSION 10

Room: Grand 13 . . . . . Wed. 8:20 am to 12:00 pm

Unattended Sensors and Sensor Networks

Chairs: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.

8:20 am: **Unattended ground sensor system architecture for reduced information dissemination timeline,** P. E. Voglewede, S. Hironori, Harris Corp. . . . . [6538-41]

8:40 am: **Intelligent management of distributed sensor networks,** P. S. Sapaty, National Academy of Sciences of Ukraine (Ukraine) . . . . . [6538-42]

9:00 am: **Low-cost acoustic sensors for littoral anti-submarine warfare (ASW),** J. P. Towle, R. Johnson, SI2 Technologies, Inc.; H. T. Vincent II, MIKEL Inc. . . . . [6538-43]

9:20 am: **Acoustic threatening sound recognition system,** H. Deng, H. Xu, Intelligent Automation Inc. . . . . [6538-44]

9:40 am: **Seismic refraction tomography for detecting shallow buried pipes,** C. J. Hickey, W. B. Howard, L. Duddu, The Univ. of Mississippi . . . . . [6538-45]

10:00 am: **Acoustic leak-detection system for railroad transportation security,** P. C. Womble, A. P. Barzilov, D. Harper, Western Kentucky Univ.; M. A. F. Harrison, Institute for Scientific Research, Inc.; L. Hopper, E. Houchins, Western Kentucky Univ.; B. Lemoff, R. Martin, Institute for Scientific Research, Inc.; C. McGrath, R. Moore, I. Novikov, J. Paschal, Western Kentucky Univ.; S. C. Rogers, J. F. Spadaro, Institute for Scientific Research, Inc. . . . . [6538-46]

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

10:40 am: **Piezoelectric micromachined ultrasonic transducers with rectangular diaphragms for dual-frequency reception,** C. Chao, The Hong Kong Polytechnic Univ. (Hong Kong China) . . . . . [6538-47]

11:00 am: **ATDR-based tomographic optical sonar (ATOS),** R. M. Kurtz, R. D. Pradhan, K. Chua, Y. Yang, J. Piranian, G. Fathi, T. R. Forrester, T. P. Jannson, Physical Optics Corp. . . . . [6538-48]

11:20 am: **A new clustering strategy,** J. Feng, J. Tang, G. Wang, Northeastern Univ. (China) . . . . . [6538-49]

11:40 am: **Development of a mechanically coupled 6-axis force-torque sensor,** T. Noh, W. Yoo, Pusan National Univ. (South Korea) . . . . . [6538-50]

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

SESSION 11

Room: Grand 13 . . . . . Wed. 1:30 to 2:50 pm

Counter-Sniper Systems

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

1:30 pm: **Acoustical model of small caliber ballistic shock waves in air for automatic sniper localization applications,** J. R. Aguilar, R. A. Salinas, Univ. de Santiago de Chile (Chile); M. A. Abidi, The Univ. of Tennessee . . . . . [6538-52]

1:50 pm: **Time difference of arrival blast localization using a network of disposable sensors,** R. A. Knobler, T. J. Plummer, McQ, Inc. . . . . [6538-53]

2:10 pm: **Search-matching algorithm for acoustics-based automatic sniper localization,** J. R. Aguilar, R. A. Salinas, Univ. de Santiago de Chile (Chile); M. A. Abidi, The Univ. of Tennessee . . . . . [6538-54]

2:30 pm: **A strong tracking extended Kalman observer (EKO) for projectile attitude and position estimation,** M. Boutayeb, Univ. Louis Pasteur (France); S. Changey, Institut Franco-Allemand de Recherches de Saint-Louis (France); J. Bara, Univ. Louis Pasteur (France) . . . . . [6538-55]

Coffee Break . . . . . 2:50 to 3:30 pm

SESSION 12

Room: Grand 13 . . . . . Wed. 3:30 to 4:30 pm

Laser and Radar Systems

Chair: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego

3:30 pm: **Deployment of laser illuminated CCD cameras as part of an integrated perimeter management system,** D. J. Natelson, Vumii Inc. [6538-56]

3:50 pm: **Remote Raman sensor system for testing of rocks and minerals,** C. S. Garcia, Old Dominion Univ.; M. N. Abedin, NASA Langley Research Ctr.; S. K. Sharma, A. K. Misra, Univ. of Hawai'i at Manoa; S. Ismail, S. P. Sandford, NASA Langley Research Ctr.; H. E. Elsayed-Ali, Old Dominion Univ. . . . [6538-57]

4:10 pm: **Automatic linear feature extraction from lidar and imagery,** C. Poullis, S. You, U. Neumann, Univ. of Southern California . . . . . [6538-58]

Thursday 12 April

SESSION 13

Room: Grand 13 . . . . . Thurs. 8:00 to 9:40 am

Electro-Optical and FO Systems

Chairs: **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.

8:00 am: **Configuration of electro-optic fire source detection system,** R. Z. Fabian, Z. Steiner, N. Hoffman, RAFAEL Armament Development Authority Ltd. (Israel) . . . . . [6538-60]

8:20 am: **Novel optical sensor system for missile canisters continuous monitoring,** L. Bukshpun, R. D. Pradhan, N. Tun, V. Esterkin, Physical Optics Corp.; G. Tomczyk, Naval Surface Warfare Ctr. . . . . [6538-61]

8:40 am: **Electro-optical signature analysis for personnel detection in urban environments,** J. M. Cathcart, T. Harrell, T. West, Georgia Institute of Technology [6538-62]

9:00 am: **Rayleigh backscatter mitigation by RF modulation in a 100-km remote fiber sensing system,** J. H. Chow, D. E. McClelland, M. B. Gray, The Australian National Univ. (Australia) . . . . . [6538-63]

9:20 am: **Hot embossing of LCP using silicon master tool for short-distance optical interconnects,** K. Yadav, S. R. Kirkpatrick, A. Siahmakoun, Rose-Hulman Institute of Technology . . . . . [6538-64]

SESSION 14

Room: Grand 13 . . . . . Thurs. 9:40 am to 12:20 pm

Security and Surveillance Systems

Chairs: **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.

9:40 am: **Real-time air quality monitoring by using internet video surveillance camera,** H. S. Lim, M. Z. Mat Jafri, K. Abdullah, Univ. Sains Malaysia (Malaysia) . . . . . [6538-65]

10:00 am: **Animal eyes in homeland security systems,** A. A. Kostrzewski, M. Gertsenshteyn, V. Grubsky, P. I. Schnitser, I. P. Agurok, M. J. Bennahmias, T. P. Jannson, Physical Optics Corp. . . . . [6538-66]

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

10:40 am: **24/7 security system: 60-FPS color EMCCD camera with integral human recognition,** T. L. Vogelsong, Salvador Imaging; T. E. Boult, Securics, Inc. and Univ. of Colorado/Colorado Springs; D. W. Gardner, Salvador Imaging; R. Woodworth, Securics, Inc.; R. C. Johnson, B. Heflin, Univ. of Colorado/Colorado Springs . . . . . [6538-67]

11:00 am: **Ultra-real-time video processing and compression in homeland security applications,** A. A. Kostrzewski, S. Ro, W. Wang, T. P. Jannson, Physical Optics Corp. . . . . [6538-68]

11:20 am: **High-speed high-resolution imagers for aerial reconnaissance,** K. L. Boggs, R. Bredthauer, Semiconductor Technology Associates Inc. [6538-69]

11:40 am: **Evolution of surveillance: 2001 to present,** G. L. Francisco, L-3 Communications Infrared Products; K. LaFleur, M/C/C, Inc. . . . . [6538-70]

12:00 pm: **Aerial video reconnaissance using large sensor arrays,** D. B. Pollock, The Univ. of Alabama/Huntsville; G. Egnal, Argusight, Inc.; R. Klepfer, P. J. Reardon, T. Rogers, C. N. Underwood, The Univ. of Alabama/Huntsville; B. Wilburn, Argusight, Inc. . . . . [6538-71]

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

SESSION 15

Room: Grand 13 . . . . . Thurs. 1:30 to 3:10 pm

Infrared and Low-Light-Level Systems

Chair: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego

1:30 pm: **Infrared and visible combat identification marking materials,** E. S. O'Keefe, A. J. Butler, A. J. Shohet, M. Swan, QinetiQ Ltd. (United Kingdom) . . . . . [6538-72]

1:50 pm: **Infrared remote sensing of hazardous vapors: surveillance of public areas during the Soccer World Cup 2006,** R. Harig, Technische Univ. Hamburg-Harburg (Germany) . . . . . [6538-73]

2:10 pm: **Critical infrastructure security confidence through automated thermal imaging,** G. L. Francisco, L-3 Communications Infrared Products [6538-74]

2:30 pm: **Improved night vision demonstrator program results,** W. Robinson, T. L. Haran, D. Roberts, J. C. James, J. M. Cathcart, K. Lyons, T. Wasilewski, L. West, Georgia Institute of Technology . . . . . [6538-75]

2:50 pm: **Toward single-photon imaging for defense applications,** S. Vasile, aPeak . . . . . [6538-76]

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

SESSION 16

Room: Grand 13 . . . . . Thurs. 3:40 to 5:40 pm

Forensic Sciences, Technologies, and Systems

Chair: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego

3:40 pm: **CBRN Crime Scene Modeler (C2SM),** P. Jasiobedzki, MacDonald, Dettwiler and Associates Ltd. (Canada) . . . . . [6538-77]

4:00 pm: **Enhanced Raman scattering of nitro-explosives on nanoparticles substrates: Ag and Au colloids and Au-Ag alloys,** J. I. Jerez-Rozo, S. P. Hernández-Rivera, A. M. Chamoun, Univ. de Puerto Rico Mayagüez . . . [6538-78]

4:20 pm: **Effects of isotopic substitution on the vibrational spectra of RDX,** R. Infante-Castillo, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez . . . . . [6538-79]

4:40 pm: **Surface enhanced Raman scattering of TNT on colloidal nanoparticles of Ag/TiO2,** E. De La Cruz-Montoya, S. P. Hernández-Rivera, T. Luna-Pineda, G. Pérez-Acosta, Univ. de Puerto Rico Mayagüez . . . . . [6538-80]

5:00 pm: **Characterization of thermal conductivity of liquids through a metallic skin,** M. L. Ramirez, S. P. Hernández-Rivera, O. Ruiz, L. Pacheco-Londoño, Univ. de Puerto Rico Mayagüez . . . . . [6538-81]

5:20 pm: **Characterization and differentiation of high-energy amine peroxides by direct analysis in real-time-TOF,** A. J. Peña-Quevedo, S. P. Hernández-Rivera, N. Mina, Univ. de Puerto Rico Mayagüez . . . . . [6538-82]

Monday-Tuesday 9-10 April 2007 • Proceedings of SPIE Vol. 6539 *(On-site Proceedings)*

Biometric Technology for Human Identification IV

Conference Chairs: **Salil Prabhakar**, Digital Persona Inc.; **Arun A. Ross**, West Virginia Univ.

Program Committee: **Behnam Bavarian**, Motorola; **Bir Bhanu**, Univ. of California/Riverside; **Josef Bigun**, Halmstad Univ. (Sweden); **Terrance E. Boult**, Univ. of Colorado at Colorado Springs; **James L. Cambier**, Iridian Technologies, Inc.; **Jean-Luc E. Dugelay**, Institut Eurécom (France); **Patrick J. Flynn**, Univ. of Notre Dame; **Jean-Christophe Fondeur**, Sagem Morpho Inc. (France); **Venu Govindaraju**, SUNY/Univ. at Buffalo; **Patrick J. Grother**, National Institute of Standards and Technology; **Vincent Hsu**, Identix Inc.; **Anil K. Jain**, Michigan State Univ.; **Ioannis A. Kakadiaris**, Univ. of Houston; **Josef Kittler**, Univ. of Surrey (United Kingdom); **Stan Z. Li**, Chinese Academy of Sciences (China); **David Maltoni**, Univ. degli Studi di Bologna (Italy); **James R. Matey**, Sarnoff Corp.; **Nicholas Orlans**, U.S. Dept. of Defense Biometrics Fusion Ctr. and The MITRE Corp.; **Sharath Pankanti**, IBM Thomas J. Watson Research Ctr.; **Jonathon Phillips**, National Institute of Standards and Technology; **Sudeep Sarkar**, Univ. of South Florida; **Marios Savvides**, Carnegie Mellon Univ.; **Michael E. Schuckers**, St. Lawrence Univ.; **Diego A. Socolinsky**, Equinox Corp.; **Elham Tabassi**, National Institute of Standards and Technology; **Umut Uludag**, Lumidigm, Inc.; **B.V.K. Vijaya Kumar**, Carnegie Mellon Univ.; **David Zhang**, The Hong Kong Polytechnic Univ. (Hong Kong China)

Monday 9 April

SESSION 1

Room: Grand 12 . . . . . Mon. 8:45 to 10:00 am

Sensing Technology

Chair: **Dr. Salil Prabhakar,** Digital Persona Inc.

8:45 am: **Performance analysis of three-dimensional ridge acquisition from live finger and palm surface scans,** L. G. Hassebrook, D. L. Lau, V. Yalla, A. Fatehpuria, Q. Lao, Univ. of Kentucky . . . . . [6539-02]

9:10 am: **Robust fingerprint acquisition,** R. K. Rowe, K. A. Nixon, S. Parthasaradhi, U. Uludag, Lumidigm, Inc. . . . . [6539-03]

9:35 am: **Three-dimensional surface reconstruction and recognition,** D. J. Bardsley, B. Li, The Univ. of Nottingham (United Kingdom) . . . . . [6539-27]

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

SESSION 2

Room: Grand 12 . . . . . Mon. 10:30 to 11:25 am

Keynote Session

Chair: **Dr. Salil Prabhakar,** Digital Persona Inc.

Keynote Presentation

10:30 am: **Quality dependent fusion of intramodal and multimodal biometric experts,** J. Kittler, Univ. of Surrey (United Kingdom) . . . . [6539-04]

11:15 am: **Advanced Technology Program (ATP): funding opportunities for high-risk research and development,** C. Grinspon, National Institute of Standards and Technology . . . . . [6539-31]

SESSION 3

Room: Grand 12 . . . . . Mon. 11:25 am to 12:15 pm

Signature and Hand

Chair: **Dr. Salil Prabhakar,** Digital Persona Inc.

11:25 am: **Classification of handwritten signatures based on name legibility,** J. Galbally-Herrero, J. Fierrez-Aguilar, J. Ortega-Garcia, Univ. Autónoma de Madrid (Spain) . . . . . [6539-05]

11:50 am: **A new approach to hand-based authentication system,** G. Amayeh, G. N. Bebis, A. Erol, M. Nicolescu, Univ. of Nevada/Reno . . . . . [6539-06]

Lunch Break . . . . . 12:15 to 1:45 pm

SESSION 4

Room: Grand 12 . . . . . Mon. 1:45 to 3:25 pm

Fingerprint Recognition

Chair: **Dr. Robert Towe,** Lumidigm Inc.

1:45 pm: **Using support vector machines to eliminate false minutiae matches during fingerprint verification,** P. Mansukhani, S. Tulyakov, V. Govindaraju, Univ. at Buffalo . . . . . [6539-07]

2:10 pm: **Augmenting ridge curves with minutiae triplets for fingerprint indexing,** A. A. Ross, R. Mukherjee, West Virginia Univ. . . . . [6539-08]

2:35 pm: **Use of ridge points in partial fingerprint matching,** G. Fang, S. N. Srihari, H. Srinivasan, P. Phatak, Univ. at Buffalo . . . . . [6539-09]

3:00 pm: **A geometric transformation to protect minutiae-based fingerprint templates,** Y. Sutcu, H. T. Sencar, N. D. Memon, Polytechnic Univ. . . . . [6539-10]

Coffee Break . . . . . 3:25 to 3:55 pm

Panel Discussion . . . . . Mon. 3:55 to 5:25 pm

Real World Biometrics Deployments

Chair: **Dr. Salil Prabhakar**, Digital Persona Inc.

Participants: **Mr. Dan Nickell,** National Biometrics Security Project; **Dr. Robert K. Rowe,** Lumidigm Inc.; **Dr. Marios Savvides,** Carnegie Mellon Univ.

Tuesday 10 April

SESSION 5

Room: Grand 12 . . . . . Tues. 8:45 to 10:00 am

Face Recognition I

Chair: **Dr. Arun Ross,** West Virginai Univ.

8:45 am: **Correlation filters for large population face recognition** *(Invited Paper)***,** B. Vijaya Kumar, C. Xie, M. Savvides, Carnegie Mellon Univ. . . . . [6539-11]

9:10 am: **Application of superresolution to long-range face images,** Y. Yao, B. R. Abidi, The Univ. of Tennessee; N. D. Kalka, N. A. Schmid, West Virginia Univ.; M. A. Abidi, The Univ. of Tennessee . . . . . [6539-12]

9:35 am: **Locality preserving projections as a new manifold analysis approach for robust face superresolution,** S. W. Park, M. Savvides, Carnegie Mellon Univ. . . . . [6539-13]

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

SESSION 6

Room: Grand 12 . . . . . Tues. 10:30 to 11:25 am

Keynote Session

Chair: **Dr. Arun Ross,** West Virginai Univ.

Keynote Presentation

10:30 am: **Biometric identification: a holistic perspective,** L. D. Nadel, Mitretek Systems . . . . . [6539-14]

11:15 am: **Advanced Technology Program (ATP): funding oppportunities for high-risk research & development,** C. Grinspon, National Institute of Standards and Technology . . . . . [6539-31]

SESSION 7

Room: Grand 12 . . . . . Tues. 11:25 am to 12:40 pm

Statistical Analysis

Chair: **Dr. B. Vijaya Kumar,** Carnegie Mellon Univ.

11:25 am: **Neyman-Pearson biometric score fusion: as an extension of the sum rule,** J. P. Hube, L-1 Identity Solutions . . . . . [6539-15]

12:00 noon: **Nonparametric statistical data analysis of fingerprint minutiae exchange with two-finger fusion,** J. C. Wu, M. D. Garris, National Institute of Standards and Technology . . . . . [6539-16]

12:05 pm: **Empirical-mode decomposition for removal of specular reflections and cast shadow effects,** R. Bhagavatula, M. Savvides, Carnegie Mellon Univ. . . . . [6539-30]

Lunch/Exhibition Break . . . . . 12:30 to 1:45 pm

SESSION 8

Room: Grand 12 . . . . . Tues. 1:45 to 3:00 pm

Face Recognition II

Chair: **Dr. Venu Govindaraju,** Univ. at Buffalo

1:45 pm: **Robust low-dimensional Kernel correlation feature spaces,** R. Abiantun, M. Savvides, B. Vijaya Kumar, Carnegie Mellon Univ. . . . . [6539-17]

2:10 pm: **Multi-stream face recognition for crime fighting,** S. A. Jassim, Univ. of Buckingham (United Kingdom); H. Sellahewa, Gray Cancer Institute (United Kingdom) and Univ. of Buckingham (United Kingdom) . . . . . [6539-18]

2:35 pm: **Real-time face tracking and pose correction for face recognition using active appearance models,** J. Heo, M. Savvides, Carneige Mellon Univ. . . . . [6539-19]

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

SESSION 9

Room: Grand 12 . . . . . Tues. 3:30 to 4:20 pm

Eye and Behavioral Biometrics

Chair: **Dr. Marios Savvides,** Carnegie Mellon Univ.

3:30 pm: **Similarity measure functions for strategy-based biometrics,** R. V. Yampolskiy, V. Govindaraju, Univ. at Buffalo . . . . . [6539-20]

3:55 pm: **An eye model for uncalibrated eye gaze estimation under variable head pose,** J. M. Hnatow, A. E. Savakis, Rochester Institute of Technology . . . . . [6539-22]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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-show and their manuscript 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.

✔ **Indexing biometric database of binary feature template,** P. Gupta, A. Sana, H. Mehrotra, Indian Institute of Technology Kanpur (India) . . . . . [6539-25]

✔ **Template protection and its implementation in 3D face recognition systems,** X. Zhou, Fraunhofer-Institut für Graphische Datenverarbeitung (Germany) . . . . . [6539-28]

✔ **Ear authentication using log-Gabor wavelets,** A. Kumar, Indian Institute of Technology Delhi (India); D. Zhang, The Hong Kong Polytechnic Univ. (Hong Kong China) . . . . . [6539-29]

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Tuesday-Thursday 10-12 April 2007 • Proceedings of SPIE Vol. 6540

Optics and Photonics in Global Homeland Security III

Conference Chairs: **Theodore T. Saito**, Lawrence Livermore National Lab.; **Daniel Lehrfeld**, Photonic Products Group, Inc.; **Michael J. DeWeert**, BAE Systems

Program Committee: **Susan F. Hallowell**, Federal Aviation Administration; **Daniel T. Holslin**, Science Applications International Corp.; **Dan J. Kroll**, Hach Co., Inc.; **Ashok K. Sood**, Magnolia Optical Technologies, Inc.; **Sarka O. Southern**, GAIA Medical Institute

Tuesday 10 April

SESSION 1

Room: Grand 14 . . . . . Tues. 8:30 to 9:10 am

Overview of Status and Plans

Chair: **Theodore T. Saito**, Lawrence Livermore National Lab.

8:30 am: **Opening Remarks** *(Presentation Only)*, T. T. Saito, Lawrence Livermore National Lab.

8:40 am: **Homeland security R&D budgets and conference overview** *(Invited Paper)*, T. T. Saito, Lawrence Livermore National Lab. . . . . [6540-01]

SESSION 2

Room: Grand 14 . . . . . Tues. 9:10 to 11:30 am

Drinking Water Safety

Chair: **Dan J. Kroll**, Hach Co., Inc.

9:10 am: **Drinking Water Safety Overview** *(Presentation Only)*, D. J. Kroll, Hach Co., Inc.

9:20 am: **Combination of an on-line biomonitor using light emitting bacteria and a UV spectrometer probe for homeland security and drinking water safety,** J. Appels, microLAN B.V. (Netherlands) . . . . . [6540-02]

9:40 am: **AquaSentinel: a real-time reagentless biosensor system for standoff detection and classification of toxins in source water** *(Presentation Only)*, E. Greenbaum, M. Rodriguez, Jr., Oak Ridge National Lab. . . . . [6540-03]

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

10:30 am: **Rapid response toxicity and chemical agent kits for initial threat assessment,** D. C. Deardorff, Abraxis . . . . . [6540-04]

10:50 am: **Nectophotometer: an infrared motility monitor used to rapidly quantify toxicity,** R. W. Lo Pinto, J. Santelli, Fairleigh Dickinson Univ. . . [6540-05]

11:10 am: **Water security: continuous monitoring of water distribution systems for chemical agents by SERS,** S. R. Farquharson, F. E. Inscore, Real-Time Analyzers, Inc. . . . . [6540-06]

Lunch/Exhibition Break . . . . . 11:30 am to 1:00 pm

SESSION 3

Room: Grand 14 . . . . . Tues. 1:00 to 4:30 pm

Border Security

Chair: **Ashok K. Sood**, Magnolia Optical Technologies, Inc.

1:00 pm: **Border Security Overview** *(Presentation Only)*, A. K. Sood, Magnolia Optical Technologies, Inc.

1:10 pm: **Use of robotics and EO/IR sensors for border security** *(Invited Paper)*, R. A. Bell, iRobot Corp. . . . . [6540-07]

1:40 pm: **Remote optical interrogation of radiation sensitive infrared polarizers,** R. R. Boye, S. A. Kemme, P. Nandy, D. R. Wheeler, S. M. Dirk, Sandia National Labs.; S. Samora, Sandia National Labs. and L&M Technologies, Inc.; C. M. Washburn, Sandia National Labs. . . . . [6540-08]

2:00 pm: **True-color night vision cameras,** J. M. Kriesel, Opto-Knowledge Systems, Inc.; N. Gat, Opto Knowledge Systems, Inc. . . . . [6540-09]

2:20 pm: **Enhanced surveillance system based on panomorph panoramic lenses,** S. Thibault, ImmerVision (Canada) . . . . . [6540-10]

2:40 pm: **360 degrees optical system,** W. Tan, M. X. Lu, STELOP Pte. Ltd. (Singapore) . . . . . [6540-11]

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

3:30 pm: **EO/IR sensors for border security applications,** R. V. McDaniel, Kollsman, Inc. . . . . [6540-12]

3:50 pm: **Application of IR microbolometers in border surveillance,** D. K. Breakfield, P. Norton, D. Plemons, C. Rodriguez, D. Sustare, BAE Systems . . . . . [6540-13]

4:10 pm: **Polarization-holographic protection system,** B. N. Kilosanidze, G. A. Kakauridze, Institute of Cybernetics (Georgia) . . . . . [6540-14]

Technical Group Meeting

Room: Grand 14 . . . . . Tues 5:00 to 6:15 pm

Global Homeland Security

Chair: **Theodore T. Saito**, Lawrence Livermore National Lab.

Everyone is invited to join our technical meeting as we'll discuss the key plans for the coming year as well as briefly review our two initiatives:

- Port & Harbor Security
- Drinking Water Security.

We will also discuss the interest in starting a Bio-Health Security initiative following up on Dr. Sarka Southern's excellent work in putting together a session at this meeting.

In addition to our plans for the upcoming year, we'll entertain ideas that colleagues have for integrating new ideas into our Technical Group.

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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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✔ **A simple nucleic acid dipstick for rapid field pathogen detection,** H. Cai, Los Alamos National Lab. . . . . [6540-43]

✔ **Large area x-ray detectors for 9 MV cargo radiology,** C. Bueno, F. Hopkins, J. Bendahan, W. Ross, C. Gordon, D. Albagli, D. Castleberry, GE Global Research Ctr. . . . . [6540-58]

Wednesday 11 April

SESSION 4

Room: Grand 14 . . . . . Wed. 8:00 to 10:20 am

Transportation Security

Chair: **Daniel Lehrfeld**, Photonic Products Group, Inc.

8:00 am: **Transportation Security Overview** *(Presentation Only)*, D. Lehrfeld, Photonic Products Group, Inc.

8:10 am: **DHS Counter-MANPADS Program update** *(Invited Paper)*, K. D. Wilson, U.S. Department of Homeland Security . . . . . [6540-15]

8:40 am: **Northrop Grumman Counter-MANPADS Guardian™ system** *(Presentation Only)*, L. Danielides, Northrop Grumman Corp. . . . . [6540-16]

9:00 am: **JETEYE™: commercial airliner IR missile protection system,** S. S. duMont, BAE Systems . . . . . [6540-17]

9:20 am: **Countering MANPADS: study of new concepts and applications II,** J. P. Robineau, D. Maltese, M. Renaudat, Sagem SA (France); F. Gendry, Sagem Communication (France) . . . . . [6540-18]

9:40 am: **Improved self-protection using dynamically optimized expendable countermeasures,** H. Hovland, Forsvarets Forsknings Institute (Norway)[6540-19]

10:00 am: **Advances in Raman spectroscopy for explosive identification in aviation security,** J. D. Santillan, Ahura Corp. . . . . [6540-20]

Coffee Break . . . . . 10:20 to 10:50 am

SESSION 5

Room: Grand 14 . . . . . Wed. 10:50 am to 12:10 pm

Port and Harbor Security I

Chair: **Michael J. DeWeert**, BAE Systems

10:50 am: **Port and Harbor Security Overview** *(Presentation Only)*, M. J. DeWeert, BAE Systems

11:00 am: **Virtual sea border** *(Invited Paper)*, D. V. Ferriere, National Infrastructure Institute . . . . . [6540-21]

11:30 am: **Maritime security laboratory for maritime security research,** B. J. Bunin II, A. M. Sutin, M. S. Bruno, Stevens Institute of Technology [6540-22]

11:50 am: **Houston ship channel security: a case study,** P. A. Bellamy, H. Q. Le, S. S. S. Pei, Univ. of Houston . . . . . [6540-23]

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

SESSION 6

Room: Grand 14 . . . . . Wed. 1:30 to 5:20 pm

Port and Harbor Security II

Chair: **Michael J. DeWeert**, BAE Systems

1:30 pm: **A smart camera system for fixed facility security surveillance,** J. T. Love, D. K. Van Dover, S. W. Law, Night Vision Systems . . . . . [6540-24]

1:50 pm: **Underwater olfaction for real-time detection of submerged unexploded ordnance,** R. J. Harper, M. L. Dock, Nomadics, Inc. . . . . [6540-25]

2:10 pm: **Low cost MEMS hydrophones,** K. J. Rebello, D. Kitchin, R. Henrick, F. Tejada, Johns Hopkins Univ. . . . . [6540-27]

2:30 pm: **Low-dose optically stimulated luminescence of exotic materials,** D. I. Godfrey-Smith, S. M. Khanna, Defence Research and Development Canada (Canada) . . . . . [6540-28]

2:50 pm: **Sensing and characterization of explosive vapors near 700 cm^{-1},** A. R. Ford, W. A. Burns, S. W. Reeve, Arkansas State Univ. . . . . [6540-29]

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

3:40 pm: **Automatic high throughput empty ISO container verification,** A. L. Chalmers, American Science and Engineering, Inc. . . . . [6540-30]

4:00 pm: **Novel all-optical gamma-ray spectrometer,** N. V. Menon, T. P. Jannson, R. D. Pradhan, Physical Optics Corp. . . . . [6540-32]

4:20 pm: **Determining water properties with remote sensing in littoral zones...What's available?...What's possible?,** P. Pratt, B. K. Baldauf, Northrop Grumman Space Technology . . . . . [6540-33]

4:40 pm: **Network of wireless gamma-ray sensors for radiological detection and identification,** A. P. Barzilov, P. C. Womble, I. Novikov, J. Paschal, J. Board, K. Moss, Western Kentucky Univ. . . . . [6540-34]

5:00 pm: **An underwater system for explosive detection,** V. Valkovic, D. Sudac, Institut Ruder Bo_kovic (Croatia); D. Matika, Institute for Researches and Development of Defense Systems (Croatia); G. Nebbia, S. Pesente, Istituto Nazionale di Fisica Nucleare (Italy) . . . . . [6540-35]

Thursday 12 April

SESSION 7

Room: Grand 14 . . . . . Thurs. 8:00 am to 12:00 pm

Health Security

Chair: **Sarka O. Southern**, GAIA Medical Institute

8:00 am: **Health Security Overview** *(Presentation Only)*, S. O. Southern, GAIA Medical Institute

8:10 am: **Biological and chemical terrorism scenarios and implications for detection system needs** *(Invited Paper)*, S. P. Gordon, Sandia National Labs. . . . . [6540-36]

8:40 am: **Field-capable biodetection devices for homeland security missions,** G. Dougherty, Lawrence Livermore National Lab. . . . . [6540-37]

9:00 am: **A simple nucleic acid dipstick for rapid field pathogen detection,** H. Cai, Los Alamos National Lab. . . . . [6540-43]

9:20 am: **Portable field-capable decontamination system for chemical, biological, and radiological agents (SPEEDS),** N. L. Teta, Technical Solutions Group International; S. Darby Piedrahita, SPARTA, Inc.; R. Miceli, SPARTA, Inc. and U.S. Army Dugway Proving Ground . . . . . [6540-39]

9:40 am: **Challenges and opportunities in nanotechnology for defense and homeland security,** M. J. Heller, Univ. of California/San Diego . . . . . [6540-38]

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

10:30 am: **Environmental biomarkers: the challenge and the promise,** T. L. Stewart, J. G. Pounds, A. L. Miracle, J. R. Campbell, Pacific Northwest National Lab. . . . . [6540-42]

10:50 am: **Saliva-based diagnostics for disease monitoring,** D. T. Wong, Univ. of California/Los Angeles . . . . . [6540-40]

11:10 am: **Saliva-based early-warnings system for civilian exposures to health threats,** S. O. Southern, GAIA Medical Institute . . . . . [6540-41]

11:30 am: **System integration and development for BW agent surveillance,** P. S. White, Los Alamos National Lab. . . . . [6540-44]

Health Security Panel Discussion . . . . . 11:50 am to 12:00 pm

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

Conference 6540

SESSION 8

Room: Grand 14 . . . . . Thurs. 1:00 to 6:00 pm

Non-Intrusive Inspection Technologies

Chairs: **Daniel T. Holslin**, Science Applications International Corp.; **F. Patrick Doty**, Sandia National Labs.

1:00 pm: **Non-Intrusive Inspection Technologies Overview** *(Presentation Only)***,** D. T. Holslin, Science Applications International Corp.

1:10 pm: **Effectiveness of electrostatic shielding and electronic subtraction to correct for the hole trapping in CdZnTe semiconductor detectors** *(Invited Paper)***,** R. B. James, A. E. Bolotnikov, G. S. Camarda, G. A. Carini, Y. Cui, Brookhaven National Lab. . . . . [6540-45]

1:40 pm: **Transportable neutron-based probes for the detection of explosives and landmines** *(Invited Paper)***,** G. Vourvopoulos, Science Applications International Corp. . . . . [6540-46]

2:10 pm: **The role of non-intrusive inspection technologies in nuclear-counter terrorism for homeland security,** J. C. Rynes, U.S. Department of Homeland Security . . . . . [6540-47]

2:30 pm: **Special nuclear material detection using pulsed neutron interrogation,** F. H. Ruddy, J. G. Seidel, R. W. Flammang, Westinghouse Electric Co. . . . . [6540-48]

2:50 pm: **Fast digitization and discrimination of prompt neutron and photon signals using a novel silicon carbide detector,** B. W. Blackburn, J. T. Johnson, S. W. Watson, Idaho National Lab.; F. H. Ruddy, Westinghouse Electric Co.; D. L. Chichester, Idaho National Lab. . . . . [6540-49]

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

3:40 pm: **Neutron and photon dosimetry using plastic scintillators in pulsed radiation fields,** D. L. Chichester, B. W. Blackburn, J. T. Johnson, D. T. Rohrbaugh, Idaho National Lab. . . . . [6540-50]

4:00 pm: **Statistical signal processing for UXO fill material classification using pulsed fast/thermal neutron analysis,** S. L. Tantum, Duke Univ.; C. Shyu, D. T. Holslin, Science Applications International Corp.; L. M. Collins, Duke Univ. . . . . [6540-51]

4:20 pm: **Active millimeter wave detection of concealed layers of dielectric material,** N. J. Bowring, Manchester Metropolitan Univ. (United Kingdom); J. G. Baker, The Univ. of Manchester (United Kingdom); N. Rezgui, M. Southgate, Manchester Metropolitan Univ. (United Kingdom) . . . . . [6540-52]

4:40 pm: **Non-scanning x-ray backscattering inspection systems based on x-ray focusing,** M. Gertsenshteyn, V. Grubsky, G. D. Savant, T. P. Jannson, Physical Optics Corp. . . . . [6540-53]

5:00 pm: **Bimodal detection of underground detection in two dimensional systems,** M. F. Serrano-Guzman, I. Y. Padilla, R. Rodriguez, Univ. de Puerto Rico Mayagüez; C. M. Rappaport, Northeastern Univ. . . . . [6540-54]

5:20 pm: **Neutron and Gamma generators developed at LBNL for homeland security applications,** J. Reijonen, N. Andresen, F. M. Gicquel, R. A. Gough, T. V. Kalvas, M. J. King, T. P. Lou, J. H. Vainionpaa, S. B. Wilde, Lawrence Berkeley National Lab. . . . . [6540-55]

5:40 pm: **Remote explosive and chemical agent detection using broadly tunable min-infrared external cavity quantum cascade lasers,** T. Day, M. J. Weida, M. B. Pushkarsky, T. J. Rayner, Daylight Solutions . . . . . [6540-57]

SPIE Marketplace

Books · Professional Development · Souvenirs

Located next to registration

Conference 6541

Room: Grand 11

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.**

Meetings of related interest

American Society for Testing and Materials

Tues. 4:00 to 5:00 pm · Location: Grand 11

ASTM Subcommittee E20.02 on Radiation Thermometery Standards Committee Meeting

All interested parties who wish to participate in IR Temperature Measurement Standards Development are invited.

Infrared Image Gallery and Thermosense Technical Event

Tues 5:00 to 6:30 pm · Location: Grand 11

Chairs: **Ralph Dinwiddie**, Oak Ridge National Lab., **Herbert Kaplan**, Honeyhill Technical Co.

The Thermal Sensing for Diagnostics and Control (Thermosense) Group provides a forum for information exchange on relevant matters in thermosense technology. Again this year the group will host the Infrared Image Gallery. The Gallery is a Thermographic Image contest. There will be a reception with prizes to the top entries.

ISPOT

Wed. 5:45 to 6:45 pm · Location: Grand 11

Chair: **Gregory R. Stockton,** Stockton Infrared Thermographic Services, Inc.

The International Society of Professional Thermographers, ISPoT, will hold a general membership meeting on Tuesday to discuss membership, review goals for 2007, committee assignments and conduct other business that arises.

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Thermosense XXIX

Conference Chairs: **Kathryn M. Knettel**, United Space Alliance, LLC; **Vladimir P. Vavilov**, Tomsk Polytechnic Univ. (Russia); **Jonathan J. Miles**, James Madison Univ.

Program Committee: **Lee R. Allen**, Allen Applied Infrared Technology; **Nicolas P. Avdelidis**, EBETAM S.A. (Greece); **Pierre Bremond**, Cedip Infrared Systems (France); **Douglas D. Burleigh**, Surfside Consulting; **Antonio Colantonio**, Public Works and Government Services Canada (Canada); **Fred 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 A&M Univ.; **Herbert Kaplan**, Honeyhill Technical Co.; **Timo T. Kauppinen**, VTT (Finland); **Jack M. Kleinfeld**, Kleinfeld Technical Services, Inc.; **Dennis H. LeMieux**, Siemens AG; **Sven-Åke Ljungberg**, Univ. of Gävle (Sweden); **Robert P. Madding**, Infrared training Ctr./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, Inc.; **Andrés E. Rozlosnik**, SI Termografía Infrarroja (Argentina); **Morteza Safai**, The Boeing Co.; **Takahide Sakagami**, Osaka Univ. (Japan); **R. James Seffrin**, Infraspection Institute; **Steven M. Shepard**, Thermal Wave Imaging, Inc.; **Gregory R. Stockton**, Stockton Infrared Thermographic Services, Inc.; **Lisa West Åkerblom**, FLIR Systems, Inc. (Sweden)

Monday 9 April

Vendor Presentations and Reception

Room: Grand 8B . . . . . Mon. 5:30 to 8:00 p.m.

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

What's News in Hardware and Software at the 2007 DSS Exhibition?

For the third year, in conjunction with the Thermosense XXIX conference, hardware, and software vendors will give a brief presentation on what is new for this year in their product lines that impact thermal imaging practices and applications.

NOTE: Companies presenting are listed in inverse alphabetical order. Estimated time for each presentation is 11 minutes. All companies listed below have a booth at the exhibit hall. The Exhibition Floor Plan can be found in the Exhibition Guide or online **spie.org/events/dssexhibit**.

Thermoteknix Systems, Ltd. (Booth 817)
Advances in uncooled thermal imaging for harsh operational requirements
Presenter: **Richard Salisbury,** President

Surface Optics Corp. (Booth 1848)
Emissivity measurements with a hand held reflectometer
Presenter: **M. Martin Szczesniak**, Industrial Spectroscopy Div.

Surface Finishes—Cabot Microelectronics (Booth 1005)
Super-polished aluminum mirrors
Presenter: **Roman Salij,** Market Development Manager

SUI (Sensors Unlimited, Inc.), part of the Goodrich Corp. (Booth 801)
The versatile short-wave infrared KT platform
Presenter: **Marc Hansen,** Applications Engineer

SCD-Semi Conductor Devices (Booth 1706)
Last advances in cooled and uncooled SCD detectors
Presenter: **Fabian Schapiro,** Marketing manager

RedShift Systems (Booth 921)
Optical Thermal Imaging for Mass Market Applications
Presenter: **Stuart Nixdorff**, Co-founder, VP of Sales and Marketing

PVP Advanced E.O. Systems, Inc. (Booth 918)
Ultra-high range surveillance system with visible and infrared capabilities
Presenter: **Goeffrey Miller,** Manager Program and Business Development

OPGAL Optronic Industries Ltd. (Booth 1723)
Thermal infrared software development kit
Presenter: **Dror Sharon,** Vice President Marketing

NEC Corp. (Booth 1546)
IR camera module from NEC
Presenter: **Jun Mochizuki,** Senior Manager, Sales Promotion, Guidance and Electro-Optics Division

Lockheed Martin, Santa Barbara Focalplane (Booth 911)
The digital advantage in focal plane
Presenter: **Arnold Adams,** Senior Application Scientist

JCD Publishing Co. (Booth 1801)
Imaging systems performances simulation
Presenter: **Gerald C. Holst,** President

IRCAM GmbH (Booth 4)
IRCAM Geminis 110k ML: first commercial dual band infrared camera in the world
Presenter: **Mónica López Sáenz**, **Managing Director and Co-founder**

DRS Sensors & Targeting Systems (Booth 400)
DRS Ultra-low power, compact MWIR and LWIR sensor modules
Presenter: **Mike Scholten**

Critical Imaging LLC (Booth 1449)
Modular thermal imaging system for security, surveillance, and industrial applications
Presenter: **Jonathan Knauth,** PE Technical Director

CEDIP Infrared Systems (Booth 311)
New advances on stress analysis using a CEDIP infrared systems/software
Presenter: **Pierre Brémond,** Export sales manager Industrial application and thermography

Tuesday 10 April

Opening Remarks

Room: Grand 11 . . . . . Tues. 9:10 to 9:30 am

Chair: **Kathryn M. Knettel**, United Space Alliance, LLC

SESSION 1

Room: Grand 11 . . . . . Tues. 9:30 to 9:50 am

Infrared Thermography, Calibration, and Radiation Thermometry

Chairs: **G. Raymond Peacock**, Temperatures.com, Inc.; **Robert P. Madding**, Infrared Training Ctr./FLIR Systems Inc.

9:30 am: **The effects of surface reflection and surrounding environment on target temperature estimation using an infrared FPA,** M. Voigt, Siemens Corporate Research; D. H. LeMieux, V. Jonnalagadda, Siemens Power Generation . . . . . [6541-04]

Coffee Break . . . . . 9:50 to 10:30 am

SESSION 2

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

Thermal Image Fusion Applications and Night Vision

Chairs: **Herbert Kaplan**, Honeyhill Technical Co.; **Dennis H. LeMieux**, Siemens Corporate Research

10:30 am: **Application of visible image mixing function for thermography,** A. Ichikawa, Nippon Avionics Co., Ltd. (Japan) . . . . . [6541-05]

10:50 am: **Benefits of IR/visible fusion,** R. N. Schmidt, Fluke Thermography . . . . . [6541-06]

11:10 am: **High-speed short-wave infrared (SWIR) imaging,** D. S. Malchow, Goodrich Corp.; M. H. Ettenberg, Sensors Unlimited, Inc.; J. Battaglia, Goodrich Corp. . . . . [6541-07]

11:30 am: **Retrieval of air quality information using image processing technique,** H. S. Lim, M. Z. Mat Jafri, K. Abdullah, Univ. Sains Malaysia (Malaysia) . . . . . [6541-08]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 3

Room: Grand 11 . . . . . Tues. 1:30 to 2:10 pm

IR Basic Principles: Tutorials

Chairs: **Ralph B. Dinwiddie**, Oak Ridge National Lab.; **Dennis H. LeMieux**, Siemens Corporate Research

1:30 pm: **The importance of spatial resolution in IR thermography temperature measurement: three brief case studies,** R. P. Madding, G. L. Orlove, B. R. Lyon, Infrared Training Ctr. . . . . [6541-09]

1:50 pm: **How water behaves thermally,** J. R. Snell, R. W. Spring, Snell Infrared . . . . . [6541-10]

SESSION 4

Room: Grand 11 . . . . . Tues. 2:10 to 3:00 pm

Biological and Environmental

Chairs: **Morteza Safai**, The Boeing Co.; **Kathryn M. Knettel**, United Space Alliance, LLC

2:10 pm: **Application of thermographic imaging in exotic animal medicine** *(Invited Paper)***,** M. T. Walsh, Univ. of Florida . . . . . [6541-11]

2:40 pm: **Thermal imaging in preventive maintenance and safety applications for mining** *(Presentation Only)***,** P. Pregowski, Pregowski Infrared Services (Poland); J. Cuber, D. Babecki, P. Wiszniowski, EMAG (Poland) . . . . . [6541-13]

SESSION 5

Room: Grand 11 . . . . . Tues. 3:00 to 3:40 pm

Research Topics

Chairs: **Morteza Safai**, The Boeing Co.; **Kathryn M. Knettel**, United Space Alliance, LLC

3:00 pm: **Investigations of proton beam entry window cooling of liquid metal target of spallation neutron source using infrared thermography,** J. A. Patorski, F. Groeschel, Paul Scherrer Institute (Switzerland) . . . . . [6541-15]

3:20 pm: **Evaluation of land surface temperature retrieval over Mecca by digital image processing,** H. S. Lim, M. Z. Mat Jafri, K. Abdullah, Univ. Sains Malaysia (Malaysia) . . . . . [6541-16]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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-show and their manuscript 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.

✔ **Field test of infrared thermography applied to biogas controlling in landfill sites,** F. J. Madruga, J. M. Muñoz, D. A. González, J. I. Tejero, J. M. Lopez-Higuera, J. L. Gil, Univ. de Cantabria (Spain) . . . . . [6541-14]

Wednesday 11 April

SESSION 6

Room: Grand 11 . . . . . Wed. 8:30 to 11:10 am

Products and Processes

Chairs: **Andrés E. Rozlosnik**, SI Termografía Infrarroja (Argentina); **Lisa West Åkerblom**, FLIR Systems AB (Sweden)

8:30 am: **Automated applications of the infrared imagers in the automotive assembly lines: products and process control,** M. A. Omar, Clemson Univ.; O. Suzuki, Hitachi, Ltd. (Japan); J. Liu, Toyota Motor Manufacturing Kentucky . . . . . [6541-17]

8:50 am: **Arc-welding process control based on back face thermography: application to the manufacturing of nuclear steam generators,** A. Cobo, J. M. Mirapeix, O. M. Conde, P. B. Garcia-Allende, F. J. Madruga, J. M. López-Higuera, Univ. de Cantabria (Spain) . . . . . [6541-18]

9:10 am: **Survey of thermal profiling in electronics quality characterization,** S. Hsieh, Texas A&M Univ. . . . . [6541-19]

9:30 am: **Application of on-line infrared thermography in steel making industry,** M. Viale, O. A. Martin, Ternium (Argentina) . . . . . [6541-20]

Coffee Break . . . . . 9:50 to 10:30 am

10:30 am: **Process control monitoring of gasification units in petrochemical and power plants,** G. E. Strahan, Infrared Cameras, Inc. . . . . [6541-21]

10:50 am: **Images processing and flow measurement applied to the thermographic analysis of heat-losses in boilers_ isolation,** M. A. Hurtado, H. Benítez, H. Loaiza, Univ. del Valle (Colombia); J. Millan, Anter Ltda (Colombia); J. A. Gonzalez, Univ. del Valle (Colombia); C. Ibarra-Castanedo, Univ. Laval (Canada) . . . . . [6541-23]

Lunch/Exhibition Break . . . . . 11:10 am to 1:15 pm

Annual Adronicus G. Kantsios Award
Wed. 1:15 to 1:30 pm · Location: Grand II
Chair: **Vladimir P. Vavilov**, Tomsk Polytechnic Univ. (Russia)

SESSION 7

Room: Grand 11 . . . . . Wed. 1:30 to 3:40 pm

Buildings and Infrastructure

Chairs: **Timo T. Kauppinen**, VTT (Finland);
Gregory R. Stockton, Stockton Infrared Thermographic Services, Inc.

1:30 pm: **Building thermography surveys for moisture detection and assessment,** N. P. Avdelidis, EBETAM S.A. (Greece) . . . . . [6541-24]

1:50 pm: **A nondestructive method for diagnostic of insulated building walls using infrared thermography,** M. Larbi Youcef, A. Mazioud, Univ. Paris 12 Val-de-Marne (France); P. Bremond, Cedip Infrared Systems (France); L. Ibos, Y. Candau, Univ. Paris 12 Val-de-Marne (France); M. Piro, EDF (France) . [6541-25]

2:10 pm: **Integration of optical, active, and passive IRT procedures for characterization of restoration mortars surface,** N. Ludwig, Univ. degli Studi di Milano (Italy); E. Rosina, Politecnico di Milano (Italy) . . . . . [6541-26]

2:30 pm: **Trestles anyone? a thermographic nightmare** *(Invited Paper)***,** J. L. Grossman, Hi-Tech Inspection Services, Inc. . . . . [6541-27]

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

3:30 pm: **Requesting and specifying thermographic inspection services through National Master Specification (NMS) Canada,** A. Colantonio, M. Theauvette, Public Works and Government Services Canada (Canada) . . . . . [6541-28]

3:50 pm: **Building thermography as a tool in energy audits and building commissioning procedure,** T. T. Kauppinen, VTT (Finland) . . . . . [6541-29]

SESSION 8

Room: Grand 11 . . . . . Wed. 4:10 to 4:50 pm

NDT of Building Materials and Concrete

Chairs: **Nicolas P. Avdelidis**, EBETAM S.A. (Greece);
Gregory R. Stockton, Stockton Infrared Thermographic Services, Inc.

4:10 pm: **Heat-transfer mechanisms in fiber-reinforced polymer composites bonded to concrete,** J. R. Brown, R. L. Baker, L. Kallemeyn, Hope College . . . . . [6541-30]

4:30 pm: **Control of CFRP strengthening applied to civil structures by IR thermography,** R. Trentin, E. G. Grinzato, P. G. Bison, S. Marinetti, Consiglio Nazionale delle Ricerche (Italy) . . . . . [6541-31]

Thursday 12 April

SESSION 9

Room: Grand 11 . . . . . Thurs. 8:30 to 10:10 am

NDT: Numerical Analysis and Applications

Chairs: **Douglas D. Burleigh**, Surfside Consulting;
Vladimir P. Vavilov, Tomsk Polytechnic Univ. (Russia);
Steven M. Shepard, Thermal Wave Imaging, Inc.

8:30 am: **IR thermographic inspection of filament wound CFRP shell samples,** J. Lahiri, S. Kuchipudi, A. O. Siddiqui, Advanced Systems Lab. (India); V. P. Vavilov, Tomsk Polytechnic Univ. (Russia) . . . . . [6541-33]

8:50 am: **Development of thermal response spectroscopy technique for determination of defect parameters,** T. Sakagami, D. Imanishi, S. Kubo, Osaka Univ. (Japan) . . . . . [6541-34]

9:10 am: **Alternative approaches to modeling the thermographic NDT process** *(Presentation Only)*, S. M. Shepard, Y. Hou, J. R. Lhota, J. Golden, Thermal Wave Imaging, Inc. . . . . [6541-35]

9:30 am: **Defect quantification with reference-free thermal contrast and artificial neural networks,** H. D. Benitez Restrepo, Univ. del Valle (Colombia); C. Ibarra-Castanedo, A. Bendada, X. P. V. Maldague, Univ. Laval (Canada); H. Loaiza, E. Caicedo, Univ. del Valle (Colombia) . . . . . [6541-36]

9:50 am: **Identifying hidden defects in thermal insulation of revolving kilns by IR thermographic monitoring,** V. P. Vavilov, V. G. Torgunakov, Tomsk Polytechnic Univ. (Russia) . . . . . [6541-37]

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

SESSION 10

Room: Grand 11 . . . . . Thurs. 10:40 to 11:40 am

Space Shuttle NDT and Aerospace Applications

Chairs: **K. Elliott Cramer**, NASA Langley Research Ctr.;
Douglas D. Burleigh, Surfside Consulting

10:40 am: **The application of thermal NDE to assist damage repair of the shuttle remote manipulator arm system** *(Presentation Only)***,** K. E. Cramer, P. Howell, NASA Langley Research Ctr. . . . . [6541-39]

11:00 am: **Results of on-orbit testing of an extra-vehicular infrared camera inspection system** *(Presentation Only)***,** K. E. Cramer, P. Howell, M. Gazarik, NASA Langley Research Ctr. . . . . [6541-40]

11:20 am: **Infrared thermographic diagnostic aid to aircraft maintenance,** M. Delo, S. Delo, Mission Thermal Infrared Inc. . . . . [6541-41]

Lunch/Exhibition Break . . . . . 11:40 am to 1:00 pm

SESSION 11

Room: Grand 11 . . . . . Thurs. 1:00 to 3:30 pm

NDT Methods and Applications

Chairs: **Douglas D. Burleigh**, Surfside Consulting;
K. Elliott Cramer, NASA Langley Research Ctr.

1:00 pm: **Detecting low-velocity impact damage in composite plates using infrared thermography** *(Invited Paper)***,** J. R. Brown, R. Anderson, Hope College; D. Visser, Hope Colege . . . . . [6541-42]

1:30 pm: **The influence of crack shapes and geometries on the results of the thermo-inductive crack detection,** G. Wally, B. Oswald-Tranta, Montan Univ. Leoben (Austria) . . . . . [6541-43]

1:50 pm: **Nondestructive inspection of open micro-cracks in thermally sprayed coatings using ultrasound excited vibrothermography,** J. A. Piau, A. Bendada, X. P. V. Maldague, Univ. Laval (Canada); J. Legoux, National Research Council Canada (Canada) . . . . . [6541-45]

2:10 pm: **Arc-welding defect detection by means of principal component analysis and artificial neural networks,** P. B. Garcia-Allende, J. M. Mirapeix, A. Cobo, O. M. Conde, J. M. López-Higuera, Univ. de Cantabria (Spain) [6541-46]

2:30 pm: **Thermal nondestructive evaluation of scaling in boiler tubes,** S. Awasthi, R. Mulaveesala, S. Tuli, Indian Institute of Technology Delhi (India) . . . . . [6541-47]

2:50 pm: **Investigation of metals and metallic composites for defect detection and fatigue monitoring in the micro scale using thermography,** N. P. Avdelidis, EBETAM S.A. (Greece); C. A. Charitidis, National Technical Univ. of Athens (Greece); Z. P. Marioli-Riga, Hellenic Aerospace Industry S.A. (Greece); C. Ibarra-Castanedo, X. P. V. Maldague, Univ. Laval (Canada) . . . . . [6541-48]

3:10 pm: **Inspection of aerospace materials by pulsed thermography, lock-in thermography, and vibrothermography: a comparative study,** C. Ibarra-Castanedo, X. P. V. Maldague, A. Bendada, Univ. Laval (Canada) . . . . . [6541-49]

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

SESSION 12

Room: Grand 11 . . . . . Thurs. 4:00 to 5:20 pm

Materials Evaluation and Fatigue Studies

Chairs: **Takahide Sakagami**, Osaka Univ. (Japan);
Jonathan J. Miles, James Madison Univ.;
Pierre Bremond, Cedip Infrared Systems (France)

4:00 pm: **Detection of localized fatigue damage in steel by thermography,** J. Medgenberg, T. Ummenhofer, Technische Univ. Braunschweig (Germany) . . . . . [6541-50]

4:20 pm: **Identification of heterogeneous fatigue properties by the use of thermography,** M. Poncelet, École Normale Supérieure de Cachan (France); C. Doudard, S. Calloch, ENSIETA (France); F. Hild, École Normale Supérieure de Cachan (France); B. Weber, ARCELOR S.A. (France) . . . . . [6541-51]

4:40 pm: **Influence of the mean stress on the thermoelastic coupling,** H. Sawadogo, S. Panier, A. Mouftiez, Ecole des Mines de Douai (France) [6541-52]

5:00 pm: **Study of the heat generated by a rolling bearing degradation by IR thermography,** A. Mazioud, J. Durastanti, L. Ibos, Univ. Paris 12 Val-de-Marne (France); P. Bremond, Cedip Infrared Systems (France); Y. Candau, Univ. Paris 12 Val-de-Marne (France) . . . . . [6541-53]

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Infrared Technology and Applications XXXIII

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

Program Committee: **Christopher C. Alexay**, StingRay Optics, LLC; **Raymond S. Balcerak**, Defense Advanced Research Projects Agency; **Stefan T. Baur**, Raytheon Vision Systems; **Philippe F. 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**, Sensors Unlimited, 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); **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 L. Miller**, FLIR Systems, Inc.; **A. Fenner Milton**, U.S. Army Night Vision & Electronic Sensors Directorate; **Ofer Nesher**, SemiConductor Devices (Israel); **Peter W. Norton**, BAE Systems North America; **Francis P. Pantuso**, U.S. Army Night Vision & Electronic Sensors Directorate; **Herbert K. Pollehn**, Army Research Lab.; **Ingmar G. E. Renhorn**, Swedish Defence Research Agency (Sweden); **Antoni Rogalski**, Wojskowa Akademia Techniczna (Poland); **Ingo Rühlich**, AIM Infrarot-Module GmbH (Germany); **Myron J. Scholten**, DRS Sensors & Targeting Systems, 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 9 April

Opening Remarks

Room: Grand 8A . . . . . Mon. 8:00 am to 8:10 am

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

SESSION 1

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

Type II Superlattice FPAs

Chairs: **Meimei Z. Tidrow**, Missile Defense Agency;
Manijeh Razeghi, Northwestern Univ.

8:10 am: **Progress with type-II superlattice IR detector arrays** *(Invited Paper)*, D. R. Rhiger, R. E. Kvaas, S. F. Harris, Raytheon Vision Systems; C. J. Hill, Jet Propulsion Lab. . . . . [6542-01]

8:30 am: **Passivation of W-structured type-II superlattice long-wave infrared photodiodes.,** E. H. Aifer, J. H. Warner, R. Stine, I. Vurgaftman, C. L. Canedy, Naval Research Lab.; E. M. Jackson, SFA, Inc.; J. G. Tischler, J. R. Meyer, L. J. Whitman, Naval Research Lab. . . . . [6542-02]

8:50 am: **256 × 256 infrared focal plane array based on type-II InAs/GaSb superlattice with a 12-μm cutoff wavelength** *(Invited Paper)*, M. Razeghi, P. Delaunay, B. M. Nguyen, D. Hoffman, Northwestern Univ. . . . . [6542-03]

9:10 am: **MBE grown type-II superlattice photodiodes for LWIR imaging applications,** C. J. Hill, J. V. Li, J. M. Mumolo, S. D. Gunapala, Jet Propulsion Lab.; D. R. Rhiger, R. Kvass, S. F. Harris, M. A. Gritz, S. M. Johnson, Raytheon Vision Systems . . . . . [6542-04]

9:30 am: **InAs/GaSb type-II short-period superlattices for advanced single and dual-color focal plane arrays** *(Invited Paper)*, M. Walther, R. H. Rehm, J. Fleissner, J. Schmitz, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany); J. Ziegler, W. A. Cabanski, R. Breiter, AIM Infrarot-Module GmbH (Germany) . . . . . [6542-05]

9:50 am: **Dual-color IR detection modules, trends, and applications,** M. O. Muenzberg, R. Breiter, W. A. Cabanski, J. C. Wendler, J. Ziegler, AIM Infrarot-Module GmbH (Germany); R. H. Rehm, M. Walther, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany) . . . . . [6542-06]

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

10:40 am: **High operating temperature InAs/GaSb type-II strain layer superlattice detectors,** J. Rodriguez, E. Plis, S. J. Lee, Y. D. Sharma, R. Dawson, S. Krishna, Univ. of New Mexico . . . . . [6542-07]

11:00 am: **Recent advances in theoretical study of type-II superlattice infrared photodetectors** *(Invited Paper)*, B. M. Nguyen, M. Razeghi, Northwestern Univ.; V. Nathan, Air Force Research Lab. . . . . [6542-08]

11:20 am: **Modeling of type-II superlattice photodiodes,** M. DeFlumere, H. Stewart, W. Watson, BAE Systems plc . . . . . [6542-09]

11:40 am: **Comparison of type-II superlattice and HgCdTe detector technologies,** J. Bajaj, D. L. Lee, Teledyne Imaging Sensors; G. J. Sullivan, Teledyne Scientific Co.; E. H. Aifer, Naval Research Lab.; M. Razeghi, Northwestern Univ. . . . . [6542-10]

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

SESSION 2

Room: Grand 8A . . . . . Mon. 1:30 to 1:50 pm

Keynote Session

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

Keynote Presentation

1:30 pm: **IR material research at the Army Research Laboratory** *(Invited Paper)*, H. K. Pollehn, Army Research Lab. . . . . [6542-11]

SESSION 3

Room: Grand 8A . . . . . Mon. 1:50 to 4:30 pm

HgCdTe

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

1:50 pm: **Advanced HgCdTe technologies in France,** G. L. Destefanis, CEA-LETI (France); P. M. Tribolet, Sofradir (France) . . . . . [6542-12]

2:20 pm: **1/f noise in HgCdTe infrared gated photodiodes,** R. Westerhout, C. A. Musca, J. Antoszewski, J. M. Dell, L. Faraone, The Univ. of Western Australia (Australia) . . . . . [6542-13]

2:40 pm: **IR-detectors from 0.9 μm to 13 μm spectral range at AIM,** J. Ziegler, M. Bruder, D. Eich, M. Finck, M. Haiml, T. Simon, J. C. Wendler, R. Wollrab, AIM Infrarot-Module GmbH (Germany) . . . . . [6542-14]

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

3:30 pm: **Pronounced Auger suppression in long-wavelength HgCdTe devices grown by molecular beam epitaxy,** P. S. Wijewarnasuriya, G. N. Brill, Y. Chen, N. K. Dhar, Army Research Lab.; C. H. Grein, H. Jung, S. Velicu, S. Sivanathan, EPIR Technologies, Inc.; A. I. D'Souza, M. G. Stapelbroek, J. P. Reekstin, DRS Sensors & Targeting Systems, Inc. . . . . [6542-15]

3:50 pm: **Development of mid-wave 320 × 256 infrared focal plane array in Korea** *(Invited Paper)*, J. Choi, S. Kim, Agency for Defense Development (South Korea); C. W. Kim, Agency for Defence Development (South Korea); J. Kim, N. Kim, S. Park, Agency for Defense Development (South Korea); S. H. Bae, Y. H. Kim, B. Kim, M. Jung, H. Jung, i3system Corp. (South Korea) . . . [6542-119]

4:10 pm: **Affordable high-performance LW IRFPAs made from HgCdTe grown by MOVPE,** L. G. Hipwood, C. L. Jones, C. J. Shaw, P. Abbott, R. A. Catchpole, M. Ordish, C. D. Maxey, H. Lau, P. Knowles, M. C. Wilson, SELEX Sensors and Airborne Systems Ltd. (United Kingdom) . . . . . [6542-16]

SESSION 4

Room: Grand 8A . . . . . Mon. 4:30 to 5:50 pm

Short-Wave IR FPAs

Chair: **Martin H. Ettenberg**, Sensors Unlimited, Goodrich Corp.

4:30 pm: **Performance of focal plane arrays for the Photon Counting Arrays (PCAR) program,** M. A. Blessinger, M. Enriquez, J. V. Groppe, K. Flynn, T. M. Sudol, B. M. Onat, Sensors Unlimited, Goodrich Corp.; W. E. Kleinhans, Valley Oak Semiconductor, Inc. . . . . [6542-17]

4:50 pm: **Ultra-low dark current InGaAs technology for focal plane arrays for low-light level visible-shortwave infrared imaging,** B. M. Onat, W. Huang, N. G. Masaun, M. Lange, M. H. Ettenberg, C. Dries, Sensors Unlimited, Goodrich Corp. . . . . [6542-19]

5:10 pm: **Extending the tuning range of SWIR microspectrometers,** J. Milne, A. J. Keating, J. Antoszewski, J. M. Dell, C. A. Musca, L. Faraone, The Univ. of Western Australia (Australia) . . . . . [6542-21]

5:30 pm: **Quantum manipulation of infrared single photons for upconversion detection, polarization encoding, and quantum interface** *(Invited Paper)***,** H. Zeng, East China Normal Univ. (China); W. Lu, Shanghai Institute of Technical Physics (China); G. Wu, H. Pan, East China Normal Univ. (China) . . . . . [6542-22]

Tuesday 10 April

SESSION 5

Room: Grand 8A . . . . . Tues. 8:00 to 9:00 am

QDIP FPA Advances

Chair: **Venkataraman S. Swaminathan**, U. S. Army RDECOM-ARDEC

8:00 am: **Dual-band infrared imaging analyses for 256 × 256 InAs/GaAs quantum dot infrared photodetector focal plane array,** S. Tang, Chung-Shan Institute of Science and Technology (Taiwan); C. Lee, Chung Cheng Institute of Technology (Taiwan); C. Shih, C. D. Chiang, Y. Gau, S. C. Yang, F. Lu, Chung-Shan Institute of Science and Technology (Taiwan); H. Hsieh, Chung Cheng Institute of Technology (Taiwan) . . . . . [6542-23]

8:20 am: **Electrically controllable multispectral (SWIR/MWIR/LWIR) infrared photodetector,** X. Lu, Univ. of Massachusetts/Lowell; M. J. Meisner, Raytheon Missile Systems . . . . . [6542-24]

8:40 am: **Self-assembled semiconductor quantum dot infrared photodetector operating at room temperature and focal plane array** *(Invited Paper)***,** M. Razeghi, H. Lim, S. Tsao, M. Taguchi, W. Zhang, A. Quivy, Northwestern Univ. . . . . [6542-25]

SESSION 6

Room: Grand 8A . . . . . Tues. 9:00 to 11:10 am

QWIP FPAs and Applications

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

9:00 am: **C-QWIP material design and growth,** K. Choi, Army Research Lab.; J. W. Devitt, D. P. Forrai, D. Endres, L-3 Communications Cincinnati Electronics, Inc.; J. Marquis, J. Bettge, P. Pinsukanjana, Intelligent Epitaxy Technology, Inc. . . . . [6542-26]

9:20 am: **Development of a 1 megapixel far-IR QWIP focal plane array,** M. D. Jhabvala, NASA Goddard Space Flight Ctr.; K. Choi, C. J. Monroy, Army Research Lab.; A. T. La, NASA Goddard Space Flight Ctr.; J. W. Devitt, D. P. Forrai, D. Endres, L-3 Communications Cincinnati Electronics, Inc. . . . . [6542-27]

9:40 am: **Small pitch, full-TV format LWIR QWIP FPAs for polarimetric imaging,** A. Nedelcu, Alcatel-Thales III-V Lab. (France) and Thales Research & Technology (France); E. M. Costard, P. F. Bois, Thales Research & Technology (France) . . . . . [6542-28]

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

10:30 am: **Recent advances of QWIP development in Sweden,** H. H. Martijn, S. Smuk, C. Asplund, H. Malm, Acreo AB (Sweden) . . . . . [6542-29]

10:50 am: **Toward dual-band megapixel QWIP focal plane arrays,** S. D. Gunapala, Jet Propulsion Lab. . . . . [6542-30]

SESSION 7

Room: Grand 8A . . . . . Tues. 11:10 am to 12:10 pm

Development of Technologies for 3rd-Generation IR Imagers I

Chairs: **Paul R. Norton**, U.S. Army Night Vision & Electronic Sensors Directorate; **Paul L. McCarley**, Air Force Research Lab.; **John T. Caulfield**, Cyan Systems

11:10 am: **Two color QWIP and extended waveband,** E. M. Costard, J. Truffer, O. Huet, L. Dua, A. Nedelcu, J. Robo, X. Marcadet, N. Briere de l'Isle, P. F. Bois, Thales Research & Technology (France) . . . . . [6542-31]

11:30 am: **Variable cold stop for matching IR cameras to multiple f-number optics,** N. Gat, J. Zhang, M. Li, J. Garman, L. Chen, Opto Knowledge Systems, Inc.; H. Gurrola, United States Army . . . . . [6542-32]

11:50 am: **Recent advances in negative luminescent technologies,** S. J. Smith, M. K. Haigh, N. T. Gordon, J. W. Edwards, D. J. Hall, A. J. Hydes, A. Graham, J. Giess, J. E. Hails, G. R. Nash, T. Ashley, QinetiQ Ltd. (United Kingdom) . . . . . [6542-117]

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

SESSION 8

Room: Grand 8A . . . . . Tues. 1:30 to 2:50 pm

Development of Technologies for 3rd-Generation IR Imagers II

Chairs: **Paul R. Norton**, U.S. Army Night Vision & Electronic Sensors Directorate; **Paul L. McCarley**, Air Force Research Lab.; **John T. Caulfield**, Cyan Systems

1:30 pm: **Multi-color IRFPAs made from HgCdTe grown by MOVPE,** C. L. Jones, L. G. Hipwood, J. Price, C. J. Shaw, P. Abbott, C. D. Maxey, H. Lau, R. A. Catchpole, M. Ordish, P. Knowles, SELEX Sensors and Airborne Systems Ltd. (United Kingdom); N. T. Gordon, QinetiQ Ltd. (United Kingdom) . . . [6542-33]

1:50 pm: **Enhanced numerical analysis of two and three-color HgCdTe detectors,** K. Józwikowski, A. Rogalski, Wojskowa Akademia Techniczna (Poland) . . . . . [6542-34]

2:10 pm: **Smart IR FPAs developed in QinetiQ,** D. J. Lees, J. W. Cairns, P. C. Haynes, C. J. Hollier, QinetiQ Ltd. (United Kingdom) . . . . . [6542-35]

2:30 pm: **Techniques for image preprocessing in variable acuity focal plane arrays,** J. T. Caulfield, Cyan Systems . . . . . [6542-36]

Coffee Break . . . . . 2:50 to 3:20 pm

SESSION 9

Room: Grand 8A . . . . . Tues. 3:20 to 6:00 pm

Development of 3rd-Generation IR Imagers and Their Technologies

Chairs: **Paul R. Norton**, U.S. Army Night Vision & Electronic Sensors Directorate; **Peter N. J. Dennis**, QinetiQ Ltd. (United Kingdom); **R. Kennedy McEwen**, SELEX Sensors and Airborne Systems Ltd. (United Kingdom)

3:20 pm: **Albion: the UK 3rd-generation high-performance thermal imaging program** *(Invited Paper)***,** R. K. McEwen, M. C. Lupton, M. Lawrence, P. Knowles, M. C. Wilson, SELEX Sensors and Airborne Systems Ltd. (United Kingdom); P. N. J. Dennis, N. T. Gordon, D. J. Lees, QinetiQ Ltd. (United Kingdom); J. F. Parsons, Thales Optronics Staines Ltd. (United Kingdom) . . . . . [6542-37]

3:40 pm: **A signal processing core for high-performance thermal imaging,** M. Lawrence, S. F. N. Ashley, M. C. Lupton, R. K. McEwen, M. C. Wilson, SELEX Sensors and Airborne Systems Ltd. (United Kingdom) . . . . . [6542-38]

4:00 pm: **Overview of range gated imaging at FOI,** O. K. Steinvall, P. Andersson, M. Emkvist, Swedish Defence Research Agency (Sweden) . . . . . [6542-39]

4:20 pm: **Gated IR imaging with 128 × 128 HgCdTe electron avalanche photodiode FPA,** J. D. Beck, M. Woodall, R. E. Scritchfield, L. A. Wood, M. Ohlson, P. Mitra, J. E. Robinson, DRS Infrared Technologies LP . . . . [6542-40]

4:40 pm: **Performance modeling and simuation of range-gated imaging systems,** O. K. Steinvall, T. R. Chevalier, P. Andersson, M. Elmkvist, Swedish Defence Research Agency (Sweden) . . . . . [6542-41]

5:00 pm: **Noiseless very high-gain avalanche photodiodes made with HgCdTe,** J. Rothman, G. Perrais, J. P. Baylet, P. Castelein, J. Chamonal, G. L. Destefanis, Commissariat à l'Energie Atomique (France) . . . . . [6542-42]

5:20 pm: **MBE based HgCdTe APDS,** M. D. Jack, Raytheon Vision Systems . . . . . [6542-43]

5:40 pm: **Uncooled or minimally cooled 10-μm photodetectors with subnanosecond response time,** A. Piotrowski, K. Klos, W. Gawron, J. Pawluczyk, Z. Orman, J. F. Piotrowski, VIGO System S.A. (Poland) . [6542-146]

Poster/Oral Standby

✔ **Dual-band camera system with advanced image processing capability,** O. Schreer, M. López Sáenz, C. Peppermueller, U. Schmidt, IRCAM GmbH (Germany) . . . . . [6542-141]

Wednesday 11 April

Sessions 10-11-12, 14, and 16 run concurrently

SESSION 10

Room: Grand 8A . . . . . Wed. 8:00 to 9:40 am

Novel Uncooled Technologies I

Chair: **Francis P. Pantuso**,
U.S. Army Night Vision & Electronic Sensors Directorate

8:00 am: **High frame rate IR imaging using optical readout photomechanical sensor,** J. P. Salerno, Agiltron, Inc. . . . . [6542-45]

8:20 am: **Uncooled MEMS IR imagers with optical readout,** N. V. Lavrik, R. K. Archibald, Oak Ridge National Lab.; D. Gbrovic, The Univ. of Tennessee; S. Rajic, P. G. Datskos, Oak Ridge National Lab. . . . . [6542-46]

8:40 am: **High-sensitivity 25μm and 50μm pitch microcantilever IR imaging arrays,** S. R. Hunter, G. S. Maurer, G. Simelgor, S. Radhakrishnan, J. Gray, Multispectral Imaging, Inc. . . . . [6542-144]

9:00 am: **Wavelength-selective infrared detectors based on patterned resistive sheets,** J. Jung, S. Han, D. P. Neikirk, The Univ. of Texas at Austin; A. S. Weling, Foster-Miller Inc.; J. H. Goldie, Infoscitex Corp.; P. D. Willson, U.S. Army TARDEC-RDECOM . . . . . [6542-47]

9:20 am: **Uncooled nanoscale infrared high-speed sensors for missile seeker applications,** N. Kislov, Nano CVD Co.; M. Sarehraz, Phoenix International; E. Stefanakos, Univ. of South Florida . . . . . [6542-48]

SESSION 11

Room: Grand 8A . . . . . Wed. 9:40 to 10:00 am

Keynote Session

Chair: **Bjørn F. Andresen**,
Elbit Systems Electro-Optics ElOp Ltd. (Israel)

Keynote Presentation

9:40 am: **HgCdTe-on-Si (SWIR to LWIR): opportunities, challenges, and innovations** *(Invited Paper, Presentation Only)*, P. Perconti, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6542-54]

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

SESSION 12

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

Novel Uncooled Technologies II

Chair: **Francis P. Pantuso**,
U.S. Army Night Vision & Electronic Sensors Directorate

10:30 am: **First THz and IR characterization of nanometer scaled antenna coupled InGaAs/InP Schottky diode detectors for room temperature infrared imaging,** H. Kazemi, Teledyne Scientific Co.; E. N. Grossman, National Institute of Standards and Technology; K. Shinohara, Teledyne Scientific Co.; G. D. Boreman, College of Optics & Photonics/Univ. of Central Florida; B. A. Lail, Florida Institute of Technology; G. Zummo, W. R. Folks, J. Alda, College of Optics & Photonics/ Univ. of Central Florida; G. Nagy, W. Ha, Teledyne Scientific Co. . . . . [6542-49]

10:50 am: **Non-equilibrium free carriers overcome cooling need in quantum IR detectors,** V. Garber, A. Fayer, N. Shuall, Z. Kopolovich, E. Baskin, D.C. Sirica Ltd. (Israel) . . . . . [6542-50]

11:10 am: **Low-cost far infrared bolometer camera for automotive use** *(Invited Paper)*, C. Vieider, S. Wissmar, P. Ericsson, U. Halldin, Acreo AB (Sweden); F. Niklaus, G. Stemme, Kungliga Tekniska Högskolan (Sweden); J. O. Källhammer, H. Pettersson, D. Eriksson, Autoliv Development AB (Sweden); H. Jakobsen, T. Kvisteroy, Infineon Technologies SensoNor AS (Norway); J. Franks, J. Van Nylen, H. Vercammen, Umicore Optics (Belgium); A. Van Hulsel, Vito (Belgium) . . . . . [6542-51]

11:30 am: **Uncooled infrared bolometer arrays operating in a low to medium vacuum atmosphere: performance model and tradeoffs,** F. Niklaus, C. Jansson, A. Decharat, Kungliga Tekniska Högskolan (Sweden); J. O. Källhammer, H. Pettersson, Autoliv Development AB (Sweden); G. Stemme, Kungliga Tekniska Högskolan (Sweden) . . . . . [6542-52]

11:50 am: **Performance evaluation and analysis for carbon nano-tube (CNT) based IR detectors,** N. Xi, J. Zhang, K. W. C. Lai, Michigan State Univ. [6542-53]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 14

Room: Grand 8B . . . . . Wed. 9:00 am to 12:10 pm

Infrared Optics and Applications

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

9:00 am: **A new moldable infrared glass for thermal imaging and low-cost sensing,** Y. M. Guimond, Y. Bellec, Umicore IR Glass (France) . . . . . [6542-67]

9:20 am: **Fabrication and test of compact high-aperture IR telescope lenses for airborne use,** T. Weyh, M. Esselbach, S. Franz, S. Belke, J. Taubert, H. Lauth, JENOPTIK Laser, Optik, Systeme GmbH (Germany) . . . . . [6542-68]

9:40 am: **The trials (and tribulations) of light-weight UAV optical system design,** T. A. Palmer, C. C. Alexay, StingRay Optics, LLC . . . . . [6542-69]

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

10:30 am: **A compact dual-band MWIR + LWIR hyperspectral imaging sensor,** T. A. Mitchell, Wavefront Research, Inc.; J. G. Zeibel, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6542-70]

10:50 am: **Cumulative gradient-based image sharpness evaluation algorithm for auto-focus control of thermal imagers,** A. K. Srivastava, N. Kandpal, Instruments Research and Development Establishment (India) . . . . . [6542-71]

11:10 am: **Effective use of computational imaging degrees of freedom in LWIR systems,** K. S. Kubala, CDM Optics, Inc. . . . . [6542-72]

11:30 am: **Motheye structured surface fabrication as durable anti-reflection treatment on CdZnTe for space-based LWIR detector devices,** N. Agarwal, L. M. Goldman, S. A. Sastri, Surmet Corp.; P. H. Kobrin, Teledyne Scientific Co. . . . . [6542-73]

11:50 am: **Advanced electro-mechanical micro-shutters for thermal infrared night vision imaging and targeting systems,** D. Durfee, W. Johnson, S. McLeod, Melles Griot . . . . . [6542-149]

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

SESSION 16

Room: North Tower-Key Biscayne . . . . . Wed. 8:00 to 11:50 am

Joint session with conference 6569

Vibration Control and Stabilization in EO Equipment

Chairs: **Alexander M. Veprik**, Ricor-Cryogenic & Vacuum Systems (Israel); **Dan C. Herrick**, Air Force Research Lab. Directed Energy Directorate

8:00 am: **Adaptive filtering and feed-forward control for suppression of vibration and jitter,** E. H. Anderson, R. Blankinship, L. P. Fowler, R. Glaese, P. Janzen, CSA Engineering, Inc. . . . . [6569-29]

8:20 am: **Real-time optimal sensing strategies for active control of optical systems,** S. Moon, Adaptive Technologies, Inc.; L. P. Fowler, CSA Engineering, Inc.; R. L. Clark, Jr., Duke Univ.; E. H. Anderson, CSA Engineering, Inc. . [6569-30]

8:40 am: **Jitter control in actively illuminated laser tracking,** Y. Wang, L. Liu, B. G. Fitzpatrick, Tempest Technologies LLC . . . . . [6569-31]

9:00 am: **Real-time, low-latency stabilization for micro-autonomous unmanned vehicles,** S. D. Martinez, Honeywell, Inc. . . . . [6569-32]

9:20 am: **Vibration evaluation of a precision inertial reference unit,** P. H. Merritt, J. Friel, B. Spanbauer, Air Force Research Lab.; J. Donaldson, R. E. Walter, Boeing-SVS, Inc. . . . . [6569-33]

9:40 am: **Adaptive suppression of optical jitter with a new liquid crystal beam steereing device,** P. Orzechowski, S. Gibson, T. Tsao, Univ. of California/ Los Angeles; D. C. Herrick, Air Force Research Lab.; M. Mahajan, B. Wen, Teledyne Scientific Co. . . . . [6569-34]

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

10:30 am: **IR detector dewar and cooler assemblies for stringent environmental conditions,** X. Breniere, M. Molina, A. Kessler, P. M. Tribolet, Sofradir (France) . . . . . [6542-85]

10:50 am: **Optimal snubbers for the system of vibration protection of sensitive electronic and electro-optic instrumentation,** A. M. Veprik, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel); S. Djerassi, RAFAEL Armament Development Authority Ltd. (Israel) . . . . . [6542-86]

11:10 am: **Portable cryogenically cooled infrared imager: how silent it might be?,** A. M. Veprik, H. Vilenchik, R. Broyde, N. Pundak, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel); A. Struckhoff, Kollsman, Inc. . . . . [6542-88]

11:30 am: **Identification of vibration sources in pulse tube cryogenic refrigerator,** S. V. Riabzev, A. M. Veprik, H. Vilenchik, N. Pundak, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel) . . . . . [6542-90]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

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Session 13 runs concurrently with session 15.

SESSION 13

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

Uncooled FPAs and Applications

Chairs: **Raymond S. Balcerak**, Defense Advanced Research Projects Agency; **Masafumi Kimata**, Ritsumeikan Univ. (Japan); **Jean-Luc Tissot**, ULIS (France)

1:30 pm: **Solid state optical thermal imagers,** M. Wagner, E. Ma, J. Heanue, S. Wu, RedShift Systems Corp. . . . . [6542-147]

1:50 pm: **PIR security sensors: developing the next generation,** K. C. Liddiard, Electro-optic Sensor Design (Australia) . . . . . [6542-55]

2:10 pm: **Infrared sensor module using uncooled 320 × 240/640 × 480 detector,** K. Egashira, T. Yamamoto, K. Kawano, Y. Tanaka, K. Iida, T. Fujishima, Y. Kakimoto, N. Oda, NEC Corp. (Japan) . . . . . [6542-56]

2:30 pm: **Toward lower uncooled IR-FPA system integration cost,** B. Dupont, ULIS (France) . . . . . [6542-57]

2:50 pm: **New IRCMOS architecture applied to uncooled microbolometers developed at LETI,** F. Simoens, M. Tchagaspanian, A. Arnaud, P. Imperinetti, G. Chammings, C. Bour, P. Villard, J. Yon, Commissariat à l'Energie Atomique (France); J. Tissot, ULIS (France) . . . . . [6542-58]

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

3:40 pm: **Uncooled VOx thermal imaging sensors,** M. D. Joswick, P. W. Norton, BAE Systems North America . . . . . [6542-59]

4:00 pm: **Uncooled amorphous silicon 160 × 120 IRFPA with 25-μm pixel-pitch for large volume applications,** C. Trouilleau, B. Fieque, J. Tissot, P. Robert, A. Crastes, C. Minassian, O. Legras, ULIS (France); J. Yon, A. Arnaud, Lab. d'Electronique de Technologie de l'Information (France) . . . . . [6542-60]

4:20 pm: **Design of ADC in 25 μm pixels pitch dedicated for IRFPA image processing at LETI,** M. Tchagaspanian, P. Villard, B. Dupont, G. Chammings, J. Martin, C. Chantre, A. Arnaud, J. Yon, F. Simoens, Commissariat à l'Energie Atomique (France); J. Tissot, ULIS (France) . . . . . [6542-61]

4:40 pm: **Large format and high-sensitivity VOx μ-bolometer detectors,** U. Mizrahi, L. Bikov, A. Giladi, A. Adin, N. Shiloah, E. Malkinson, T. Czyzewski, D. Seter, Y. Sinai, R. Frenkel, SemiConductor Devices (Israel) . . . . . [6542-62]

5:00 pm: **Recent development of ultra-small pixel uncooled focal plane arrays at DRS** *(Invited Paper)***,** C. C. Li, DRS Nytech Imaging Systems; G. D. Skidmore, C. G. Howard, DRS Infrared Technologies LP; E. Clarke, DRS Nytech Imaging Systems; D. Peysha, L. A. Wood, C. J. Han, DRS Infrared Technologies LP . . . . . [6542-63]

5:20 pm: **640 × 512, 17 μm pixel microbolometer and sensor development,** T. E. Sessler, D. F. Murphy, Raytheon Vision Systems . . . . . [6542-64]

5:40 pm: **Uncooled polycrystalline PbSe monolithic devices: a real alternative,** G. Vergara, M. d. C. Torquemada, M. T. Rodrigo, L. J. Gómez, V. Villamayor, M. Álvarez, M. Verdú, F. J. Sánchez, R. M. Almazán, J. Plaza, P. Rodriguez, I. Catalán, M. T. Montojo, Ctr. de Investigación y Desarrollo de la Armada (Spain) . . . . . [6542-65]

SESSION 15

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

Cryocoolers for Focal Plane Arrays

Chair: **Ingo Rühlich**, AIM Infrarot-Module GmbH (Germany)

1:30 pm: **Microminiature linear split Stirling cryogenic cooler for portable infrared imagers,** A. M. Veprik, H. Vilenchik, S. V. Riabzev, N. Pundak, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel) . . . . . [6542-75]

1:50 pm: **Life testing of Ricor linear cryocooler,** I. Nachman, A. M. Veprik, N. Pundak, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel) . . . . . [6542-76]

2:10 pm: **Raytheon dual-use cryocooler development,** R. C. Hon, C. S. Kirkconnell, Raytheon Space and Airborne Systems; J. Ikegami, South Bay Science and Technology Corp.; M. M. Pillar, Raytheon Space and Airborne Systems . . . . . [6542-77]

2:30 pm: **Flexure bearing compressor in the one-watt linear interface** *(Invited Paper)***,** I. Rühlich, T. Wiedmann, M. Mai, J. J. Petrie, AIM Infrarot-Module GmbH (Germany) . . . . . [6542-78]

2:50 pm: **Improvements and extensions in Thales Cryogenics product portfolio,** T. Benschop, P. C. Bruins, W. L. van de Groep, Thales Cryogenics B.V. (Netherlands); J. Martin, R. Griot, J. C. Bourdaudhui, Thales Cryogénie SA (France) . . . . . [6542-79]

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

3:40 pm: **Performance testing of a large heat lift 40 to 80K pulse tube cooler for space applications,** T. Trollier, J. Tanchon, J. Buquet, A. Ravex, Air Liquide (France); I. Charles, L. Duband, Commissariat à l'Energie Atomique (France); T. Benschop, J. C. Mullié, Thales Cryogenics B.V. (Netherlands); M. Linder, European Space Agency (Netherlands) . . . . . [6542-80]

4:00 pm: **The advantages of using a digital temperature controller in a miniature Stirling cryogenic refrigerator for infrared imagers,** A. Ganot, N. Pundak, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel) . . . . . [6542-83]

4:20 pm: **Cryocooler selection considerations for gamma-ray sensor cooling,** N. GurArye, Cryo Solutions Inc. . . . . [6542-84]

Thursday 12 April

SESSION 17

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

Infrared in Future Soldier Systems

Chairs: **Gabor F. Fulop**, Maxtech International, Inc.;
Gary L. Jinks, GLJ Group

8:00 am: **Introduction to infrared in future soldier systems** *(Presentation Only)*, G. F. Fulop, Maxtech International, Inc.; G. L. Jinks, GLJ Group . . . . . [6542-91]

8:20 am: **Digital image fusion systems: color imaging and low-light targets** *(Invited Paper)*, J. P. Estrera, Northrop Grumman Corp. . . . . [6542-93]

8:40 am: **Video visor for German army soldier-of-the-future program** *(Invited Paper)*, J. Fritze, H. Lenz, Carl Zeiss Optronics GmbH (Germany) [6542-94]

9:00 am: **Long-range thermal weapon sights for the German future infantryman program IdZ,** R. Breiter, T. Ihle, K. Mauk, M. Münzberg, W. Rode, AIM Infrarot-Module GmbH (Germany) . . . . . [6542-95]

9:20 am: **The handheld multifunctional thermal imager and surveillance instrument of Jena-Optronik within the German project: IDZ-Infanterist der Zukunft,** J. Heinrich, Jena-Optronik GmbH (Germany) . . . . . [6542-142]

9:40 am: **Surveillance and target acquisition applied to FIST,** S. Modica, J. Foley, Thales FIST PCMO (United Kingdom) . . . . . [6542-96]

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

10:30 am: **The Felin combat system improves several essential capabilities,** P. Le Sueur, Sagem Defense Securite (France) . . . . . [6542-97]

10:50 am: **Optronics sensors suitable for dismounted soldier,** P. Le Sueur, Sagem Defense Securite (France) . . . . . [6542-98]

SESSION 18

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

IRST/Target Acquisition: Systems and Technologies I

Chairs: **Michael T. Eismann**, Air Force Research Lab.;
Herbert K. Pollehn, Army Research Lab.;
Gil A. Tidhar, Optigo Systems, Ltd. (Israel)

11:10 am: **Narrowband infrared emitters for combat ID,** M. U. Pralle, I. Puscasu, J. T. Daly, K. Fallon, P. G. Loges, A. C. Greenwald, E. A. Johnson, ICx Ion Optics Inc. . . . . [6542-99]

11:30 am: **EO system concepts in the littoral,** P. B. W. Schwering, TNO (Netherlands) . . . . . [6542-100]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 19

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

IRST/Target Acquisition: Systems and Technologies II

Chairs: **Gil A. Tidhar**, Optigo Systems, Ltd. (Israel);
Michael T. Eismann, Air Force Research Lab.;
Herbert K. Pollehn, Army Research Lab.

1:30 pm: **Pelican: SCD's 640 × 512/15 μm pitch InSb detector,** J. O. Schlesinger, Z. Calahorra, E. Uri, O. Shick, T. A. Fishman, I. Shtrichman, E. Sinbar, V. Nahum, E. Kahanov, B. Shlomovich, SemiConductor Devices (Israel); S. Hasson, SemiCondutor Devices (Israel); N. Fishler, D. Chen, T. Markovitz, SemiConductor Devices (Israel) . . . . . [6542-101]

1:50 pm: **Elta's IRST defense and self-protection system,** Z. Schneider, Elta Systems Ltd. (Israel); M. Meidan, A. Lottan, A. Gershikov, S. Schijvarg, Israel Aircraft Industries Ltd. (Israel) . . . . . [6542-103]

2:10 pm: **Artemis: Staring IRST for the FREMM frigate,** V. Megaides, C. Grollet, Thales Optronique SA (France) . . . . . [6542-104]

2:30 pm: **QWIP compact thermal imager: Catherine-XP and its evolution,** O. Cocle, C. Rannou, B. Forestier, P. Jougla, Thales Optronique SA (France); E. M. Costard, P. F. Bois, Thales Research & Technology (France); A. Manissadjian, D. Gohier, Sofradir (France) . . . . . [6542-127]

2:50 pm: **Large format staring IR-FPAs for persistent surveillance applications** *(Invited Paper)*, J. W. Devitt, M. E. Greiner, R. L. Rawe, Jr., D. P. Forrai, P. Henry, L-3 Communications Cincinnati Electronics, Inc.; M. T. Eismann, R. Mack, J. S. Harris, Air Force Research Lab.; J. Dennison, L-3 Communications Cincinnati Electronics, Inc.; C. C. Alexay, StingRay Optics, LLC; S. D. Gaalema, Black Forest Engineering . . . . . [6542-105]

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

3:40 pm: **Compact modular reconnaissance and targeting platform for various military and security tasks,** M. Gerken, M. Spieweck, H. Ziegner, H. Flack, Carl Zeiss Optronics GmbH (Germany) . . . . . [6542-106]

4:00 pm: **SWAD: small arms fire warning and direction finding system: a passive IR concept,** M. Zahler, M. Danino, Elisra Electronic Systems Ltd. (Israel) . . . . . [6542-107]

4:20 pm: **TANDIR: projectile warning system using uncooled bolometric technology,** Z. Horovitz-Limor, M. Zahler, Elisra Electronic Systems Ltd. (Israel) . . . . . [6542-108]

4:40 pm: **Anti-tank missile system MILAN: optronic sensors for the new generation firing post MILAN ADT/ER,** J. Barth, A. Fendt, H. Kuffner, R. Pröls, R. Rüger, C. Schmid, EADS Lenkflugkoerper GmbH (Germany) . . . . . [6542-109]

5:00 pm: **TED: a novel miniaturized infrared detection and situation awareness system,** G. A. Tidhar, R. Manor, Optigo Systems, Ltd. (Israel) . . . . . [6542-110]

5:20 pm: **Dual-mode seeker with imaging sensor and semi-active laser detector,** J. Barth, A. Fendt, R. Florian, W. Kieslich, T. Kuligk, EADS Lenkflugkoerper GmbH (Germany) . . . . . [6542-111]

5:40 pm: **Track extraction algorithms for rocket motor ejecta,** C. L. Edwards, M. P. Mattix, L. M. Howser, L. R. Gauthier, Johns Hopkins Applied Physics Lab. . . . . [6542-112]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 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. Each evening will represent a different set of conferences to promote opportunities 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 Thursday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-show and their manuscript 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.

Poster/Oral Standby

✔ **Dual-band camera system with advanced image processing capability,** O. Schreer, M. López Sáenz, C. Peppermueller, U. Schmidt, IRCAM GmbH (Germany) . . . . . [6542-141]

Posters

✔ **Pixelwise readout integrated circuits with pixel-level ADC for microbolometers,** C. H. Hwang, C. B. Kim, Y. S. Lee, Korea Advanced Institute of Science and Technology (South Korea); B. G. Yu, Electronics and Telecommunications Research Institute (South Korea); H. C. Lee, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6542-66]

✔ **Multispectral thermal imaging with interferometers at Brewster angle of incidence,** L. D. Saginov, A. M. Filachev, A. N. Sviridov, A. Kononov, Orion Research and Production Association (Russia); N. V. Kravtchenko, Volgograd State Univ. (Russia) . . . . . [6542-74]

✔ **An infrared solution to a national priority NASA ice detection and measurement problem,** T. J. Meitzler, U.S. Army TARDEC-RDECOM; D. J. Gregoris, MDA (Canada); T. J. Moss, NASA Kennedy Space Ctr. . . . . [6542-116]

✔ **A high fill-factor uncooled infrared detector with thermomechanical bimaterial structure,** I. W. Kwon, C. H. Hwang, T. S. Kim, Y. S. Lee, H. C. Lee, Korea Advanced Institute of Science and Technology (South Korea) [6542-128]

✔ **Successful MWIR FPA fabrication using gas cluster ion-beam InSb surface finishing,** L. P. Allen, G. Dallas, K. Blanchat, Galaxy Compound Semiconductors, Inc.; S. R. Vangala, C. Santeufemio, W. D. Goodhue, Univ. of Massachusetts/Lowell; E. L. Roehl, C. E. Jones, Lockheed Martin Missile & Fire; J. B. Barton, FLIR Systems; B. Zide, V. DiFilippo, Epion Corp.; K. S. Jones, Univ. of Florida . . . . . [6542-131]

✔ **Improved bias equalization method for suppression temperature-induced errors in microbolometer FPA over 20-K substrate temperature change,** M. A. Dem'yanenko, Z. A. Evgenievich, Institute of Semiconductor Physics (Russia) . . . . . [6542-132]

✔ **A high-SNR readout circuit design for TDI array with adaptive charge capacity control,** C. B. Kim, C. H. Hwang, Y. S. Lee, H. C. Lee, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6542-133]

✔ **Dim moving target detection based on detection index using local gamma correction and motion information,** J. Kim, Kyungpook National Univ. (South Korea); K. Kim, Agency for Defense Development (South Korea); D. Kim, Kyungpook National Univ. (South Korea) . . . . . [6542-134]

✔ **The geometric design of microbolometer elements for uncooled focal plane arrays,** M. Russ, J. Bauer, H. Vogt, Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme (Germany) . . . . . [6542-135]

✔ **Uniformity studies of inductively coupled plasma etching in fabrication of HgCdTe detector arrays,** R. Bommena, S. Velicu, P. Boieriu, T. S. Lee, C. H. Grein, EPIR Technologies, Inc.; K. K. Tedjojuwono, NASA Langley Research Ctr. . . . . [6542-136]

✔ **Detection of 2,4,6-trinitrotoluene on non-traditional surfaces using fiber optic coupled grazing angle probe: FTIR,** S. P. Hernández-Rivera, O. M. Primera-Pedrozo, L. Pacheco-Londoño, N. Rodríguez-Cardona, D. E. Nieves, Univ. de Puerto Rico Mayagüez . . . . . [6542-137]

✔ **Short-wave infrared radiometers design and characterizations,** G. P. Eppeldauer, H. W. Yoon, National Institute of Standards and Technology . . . . . [6542-138]

✔ **Characterization of layer of Tetryl, TNB, and HMX using grazing angle-FTIR,** S. P. Hernández-Rivera, A. Santiago-Morales, L. Pacheco-Londoño, O. M. Primera-Pedrozo, Univ. de Puerto Rico Mayagüez . . . . . [6542-139]

✔ **The uncooled microbolometer trade-off: a new figure of merit for uncooled IR FPA,** A. Crastes, J. Tissot, ULIS (France) . . . . . [6542-140]

✔ **Singlemode step-index and microstructured fibers for the middle infrared,** L. N. Butvina, O. V. Sereda, E. M. Dianov, General Physics Institute (Russia); N. V. Lichkova, V. N. Zagorodnev, Institute of Microelectronics Technology (Russia) . . . . . [6542-148]

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Friday 13 April

SESSION 20

Room: Grand 5-6 . . . . . Fri. 8:00 to 9:20 am

Selected Application Presentations

Chair: **John L. Miller**, FLIR Systems, Inc.

8:00 am: **First responder homeland disaster protection,** G. L. Francisco, L-3 Communications Infrared Products . . . . . [6542-130]

8:20 am: **Fire service and first responder thermal imaging camera (TIC) advances and standards,** L. Konsin, Mine Safety Appliances Co. . . . [6542-113]

8:40 am: **Fabry-Pérot MEMS-based integrated microspectrometers spanning the SWIR and MWIR,** A. J. Keating, J. Antoszewski, The Univ. of Western Australia (Australia); K. K. Silva, K. J. Winchester, MRX Technologies (Australia); T. H. Nguyen, Origin Energy Solar (Australia); J. M. Dell, C. A. Musca, L. Faraone, The Univ. of Western Australia (Australia) . . . . . [6542-114]

9:00 am: **The Infrared Cloud Ice Radiometer (IRCIR),** J. K. Taylor, H. E. Revercomb, F. A. Best, R. O. Knuteson, M. P. Mulligan, D. J. Thielman, D. D. LaPorte, R. K. Garcia, S. A. Ackerman, Univ. of Wisconsin/Madison; D. O. Starr, J. D. Spinhirne, R. S. Lancaster, NASA Goddard Space Flight Ctr. . . . . [6542-115]

SESSION 21

Room: Grand 5-6 . . . . . Fri. 9:20 to 11:30 am

Selected Technology Presentations

Chair: **John L. Miller**, FLIR Systems, Inc.

9:20 am: **Noise characteristics of HDVIP HgCdTe LWIR detectors,** A. I. D'Souza, M. G. Stapelbroek, C. Yoneyama, H. Mills, DRS Sensors & Targeting Systems, Inc.; M. Kinch, M. R. Skokan, H. Shih, DRS Infrared Technologies LP . . . . . [6542-118]]

9:40 am: **Spatial resolution of SCD's InSb 2D detector arrays,** I. Shtrichman, T. Fishman, U. Mizrahi, V. Nahum, Z. Calahorra, SemiConductor Devices (Israel) . . . . . [6542-120]

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

10:30 am: **Sigma-delta column-wise A/D conversion for cooled ROIC,** F. Guellec, P. Villard, F. Rothan, L. Alacoque, C. Chancel, P. Martin, P. Castelein, Commissariat à l'Energie Atomique (France); S. Dugalleix, P. Costa, SOFRADIR (France) . . . . . [6542-121]

10:50 am: **A pixel-level analog to digital conversion circuit based on single-slope integration for infrared FPA applications,** R. Ding, W. Gan, F. Li, Shanghai Institute of Technical Physics (China) . . . . . [6542-122]

11:10 am: **Recent advances in negative luminescent technologies,** S. J. Smith, M. K. Haigh, N. T. Gordon, J. W. Edwards, D. J. Hall, A. J. Hydes, A. Graham, J. Giess, J. E. Hails, G. R. Nash, T. Ashley, QinetiQ Ltd. (United Kingdom) . . . . . [6542-117

Lunch Break . . . . . 11:30 am to 1:00 pm

SESSION 22

Room: Grand 5-6 . . . . . Fri. 1:00 to 2:20 pm

ROIC and Non-uniformity Correction

Chair: **Ingmar G. E. Renhorn**, Swedish Defence Research Agency (Sweden)

1:00 pm: **Non-uniformity correction results for SOFRADIR infrared 2D staring arrays,** D. Billon Lanfrey, A. Combette, F. P. Pistone, M. Vuillermet, Sofradir (France) . . . . . [6542-124]

1:20 pm: **Scene-based nonuniformity correction using texture-based adaptive filtering,** D. R. Droege, L-3 Communications Cincinnati Electronics, Inc. . . . . [6542-125]

1:40 pm: **Nonuniformity correction algorithm based on a noise-cancellation system for infrared focal plane arrays,** S. E. Godoy, S. N. Torres, Univ. de Concepción (Chile); J. E. Pezoa, M. M. Hayat, The Univ. of New Mexico; Q. Wang, Shanghai Jiao Tong Univ. (China) . . . . . [6542-126]

2:00 pm: **A resistance non-uniformity correction method using bias heating for resistive type uncooled microbolometer FPAs,** T. Akin, M. Tepegoz, Middle East Technical Univ. (Turkey) . . . . . [6542-145]

Wednesday-Friday 11-13 April 2007 • Proceedings of SPIE Vol. 6543

Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XVIII

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

Program Committee: **Piet Bijl**, TNO Human Factors (Netherlands); **Frank R. Carlen**, U.S. Army Aberdeen Test Ctr.; **Dieter Clement**, Forschungsfesellschaft 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.; **Thomas Holland**, Naval Surface Warfare Ctr.; **Keith A. Krapels**, Office of Naval Research; **Terrence S. Lomheim**, The Aerospace Corp.; **Stephen W. McHugh**, Santa Barbara Infrared, Inc.; **Luanne P. Obert**, U.S. Army Night Vision & Electronic Sensors Directorate; **Hector M. Reyes**, Raytheon Co.; **Michael A. Soel**, FLIR Systems, Inc.; **John J. Szymanski**, Los Alamos National Lab.; **Curtis M. Webb**, Northrop Grumman Corp.

Wednesday 11 April

SESSION 1

Room: Grand 9-10 . . . . . Wed. 8:20 to 10:00 am

Target, Backgrounds, and Atmospherics I

Chairs: **Frank R. Carlen**, U.S. Army Aberdeen Test Ctr.; **Dieter Clement**, Forschungsfesellschaft für Angewandte Naturwissenschaften e.V. (Germany)

Keynote Presentation

8:20 am: **Simulation of passive and active infrared images using the SE-WORKBENCH** *(Invited Paper)*, J. Latger, T. Cathala, N. Douchin, OKTAL Synthetic Environment (France); A. Y. Le Goff, DGA/DCE/CELAR (France) . . . . . [6543-01]

9:00 am: **Modeling and analysis of ship surface BRDF,** D. A. Vaitekunas, W. R. Davis Engineering, Ltd. (Canada) . . . . . [6543-02]

9:20 am: **Cameo-SIM reflections from exact surfaces,** A. A. Mitchell, J. Brewster, A. W. Haynes, Defence Science and Technology Lab. (United Kingdom) . . . . . [6543-03]

9:40 am: **Measured and modeled temperatures for the CUBI test body,** A. Malaplate, A. Schwarz, M. Kremer, Forschungsfesellschaft für Angewandte Naturwissenschaften e.V. (Germany) . . . . . [6543-04]

Coffee Break . . . . . 10:00 to 10:20 am

SESSION 2

Room: Grand 9-10 . . . . . Wed. 10:20 to 11:40 am

Target, Backgrounds, and Atmospherics II

Chairs: **Frank R. Carlen**, U.S. Army Aberdeen Test Ctr.; **Dieter Clement**, Forschungsfesellschaft für Angewandte Naturwissenschaften e.V. (Germany)

10:20 am: **Measurement of soot particles in different combustion processes and their contribution to the IR emission of these processes,** A. D. Devir, A. B. Lessin, Institute for Advanced Research and Development (Israel) [6543-05]

10:40 am: **Computer-aided camouflage assessment in real time,** T. Muller, M. Müller, Fraunhofer-Institut für Informations- und Datenverarbeitung (Germany) . . . . . [6543-06]

11:00 am: **A new instrument for measuring optical transmission in the atmosphere,** T. A. Kaurila, The Finnish Defence Forces (Finland) . . . . . [6543-07]

11:20 am: **Modeling night sky radiance for night vision systems,** J. M. Cathcart, T. L. Haran, J. C. James, W. Robinson, T. Wasilewski, L. West, D. Roberts, K. Lyons, Georgia Institute of Technology . . . . . [6543-08]

Lunch/Exhibition Break . . . . . 11:40 am to 1:00 pm

SESSION 3

Room: Grand 9-10 . . . . . Wed. 1:00 to 2:50 pm

Modeling I

Chairs: **Piet Bijl**, TNO Human Factors (Netherlands); **Michael A. Soel**, FLIR Systems, Inc.; **Hector M. Reyes**, Raytheon Co.

1:00 pm: **An engineer's approach to system performance** *(Invited Paper)*, G. C. Holst, JCD Publishing . . . . . [6543-09]

1:30 pm: **Range performance benefit of contrast enhancement,** R. H. Vollmerhausen, EO Consultant; V. A. Hodgkin, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-10]

1:50 pm: **NVThermIP versus TOD: matching the target acquisition range criteria,** P. Bijl, M. A. Hogervorst, J. Beintema, A. Toet, TNO Human Factors (Netherlands) . . . . . [6543-11]

2:10 pm: **Avoiding and mitigating cell imbalance in tank identification perception tests,** R. K. Moore, E. L. Jacobs, C. E. Halford, The Univ. of Memphis . . . . . [6543-12]

2:30 pm: **Superresolution reconstruction and local area processing performance,** G. C. Holst, JCD Publishing; E. Cloud, H. C. Lee, T. L. P. Olson, D. Mansville, J. Puritz, DRS Technologies, Inc. . . . . [6543-13]

Coffee Break . . . . . 2:50 to 3:30 pm

SESSION 4

Room: Grand 9-10 . . . . . Wed. 3:30 to 5:30 pm

Modeling II

Chairs: **Piet Bijl**, TNO Human Factors (Netherlands); **Michael A. Soel**, FLIR Systems, Inc.; **Hector M. Reyes**, Raytheon Co.

3:30 pm: **Direct-view optics model for facial recognition,** R. G. Driggers, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-14]

3:50 pm: **The effects of spatial band-limited noise on human performance for tank identification,** S. M. Salem, R. K. Moore, The Univ. of Memphis; P. Bijl, M. A. Hogervorst, TNO Human Factors (Netherlands); C. E. Halford, The Univ. of Memphis . . . . . [6543-15]

4:10 pm: **Temporal/spatial tracking requirements for tracking humans,** A. L. Robinson, The Univ. of Memphis; B. S. Miller, S. K. Moyer, C. Ra, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-16]

4:30 pm: **An image sharpness metric for image processing applications using feedback,** E. P. Lam, Thales Raytheon Systems . . . . . [6543-17]

4:50 pm: **Sine wave contrast target for direct view optics field performance measurements,** K. A. Krapels, Office of Naval Research; R. G. Driggers, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-18]

5:10 pm: **Third-generation FLIR simulation at NVESD,** B. S. Miller, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-55]

Workshop

Room: Grand 9-10 . . . . . Wed. 5:45 to 6:45 pm

V50, E-zoom, and Boost Modeling Approaches

Night Vision and Electronic Sensors Directorate will host an open forum on modeling issues. Brian Teaney will open with the workshop with "Guidance on Methods and Parameters for Army Target Acquisition Models." Issues to be discussed include determining V50 values, e-zoom, and boost modeling methodologies.

Guidance on methods and parameters for Army target acquisition models, B. P. Teaney, J. P. Reynolds, J. D. O'Connor, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-56]

Thursday 12 April

SESSION 5

Room: Grand 9-10 . . . . . Thurs. 8:20 to 9:40 am

Modeling III

Chairs: **Keith A. Krapels**, Office of Naval Research; **Ronald G. Driggers**, U.S. Army Night Vision & Electronic Sensors Directorate

8:20 am: **Electronic zoom and its application in sampled IR systems,** S. D. Burks, U.S. Army Night Vision & Electronic Sensors Directorate . . [6543-19]

8:40 am: **Finding a fusion metric that best reflects human observer preference,** R. K. Moore, C. L. Howell, E. L. Jacobs, C. E. Halford, The Univ. of Memphis . . . . . [6543-20]

9:00 am: **The impact of atmospheric path radiance on MWIR and LWIR sensor performance,** V. A. Hodgkin, U.S. Army Night Vision & Electronic Sensors Directorate; C. E. Halford, The Univ. of Memphis; T. Maurer, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-21]

9:20 am: **A new optical flow estimation method in joint EO/IR visual surveillance,** H. Man, J. Wang, R. Martini, Stevens Institute of Technology; R. J. Holt, Queensborough Community College/CUNY; R. Netravali, I. Mukherjee, Stevens Institute of Technology . . . . . [6543-22]

Coffee Break . . . . . 9:40 to 10:30 am

SESSION 6

Room: Grand 9-10 . . . . . Thurs. 10:30 to 11:50 am

Modeling IV

Chairs: **Luanne P. Obert**, U.S. Army Night Vision & Electronic Sensors Directorate; **Terrence S. Lomheim**, The Aerospace Corp.

10:30 am: **Correlation between human observer performance and the number of spatial, thermal, and total cues in LWIR imagery,** M. A. Brickell, The Univ. of Memphis; T. C. Edwards, U.S. Army Redstone Technical Test Ctr.; C. E. Halford, The Univ. of Memphis; K. M. Dennen, ERC, Inc. . . . . [6543-24]

10:50 am: **Silhouette and background information analysis,** M. N. Moore, J. D. O'Connor, U.S. Army Night Vision & Electronic Sensors Directorate [6543-25]

11:10 am: **Quantitative analysis of infrared contrast enhancement algorithms,** S. Weith-Glushko, C. Salvaggio, Rochester Institute of Technology . . . . [6543-26]

11:30 am: **Active imaging system performance model for target acquisition,** R. L. Espinola, U.S. Army Night Vision & Electronic Sensors Directorate; E. L. Jacobs, C. E. Halford, The Univ. of Memphis; D. H. Tofsted, Army Research Lab. . . . . [6543-27]

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

SESSION 7

Room: Grand 9-10 . . . . . Thurs. 1:00 to 3:00 pm

Modeling V

Chairs: **Luanne P. Obert**, U.S. Army Night Vision & Electronic Sensors Directorate; **Terrence S. Lomheim**, The Aerospace Corp.

1:00 pm: **Modeling the blur associated with vibration and motion,** R. H. Vollmerhausen, EO Consultant; V. A. Hodgkin, J. P. Reynolds, S. D. Burks, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-28]

1:20 pm: **An evaluation of fusion algorithms using image metrics and human identification performance,** C. L. Howell, C. E. Halford, The Univ. of Memphis; S. D. Burks, U.S. Army Night Vision & Electronic Sensors Directorate; R. K. Moore, The Univ. of Memphis . . . . . [6543-29]

1:40 pm: **EO/IR sensor model for evaluating SWIR, MWIR, and LWIR system performance,** A. K. Sood, Magnolia Optical Technologies, Inc.; R. A. Richwine, K. S. Freyvogel, The Pennsylvania State Univ.; R. S. Balcerak, Defense Advanced Research Projects Agency . . . . . [6543-30]

2:00 pm: **Modeling the effects of high contrast and saturated images on target acquisition performance,** B. P. Teaney, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-31]

2:20 pm: **Error metric for superresolution enhanced IR passive ranging,** J. H. Cha, U.S. Army Night Vision & Electronic Sensors Directorate . . . . [6543-32]

2:40 pm: **Field performance of sensors using superresolution,** J. D. Fanning, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-33]

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

SESSION 8

Room: Grand 9-10 . . . . . Thurs. 3:30 to 4:50 pm

Systems and Testing I

Chairs: **David P. Forrai**, L-3 Communications Cincinnati Electronics, Inc.; **John J. Szymanski**, Los Alamos National Lab.

3:30 pm: **Real-time image processing and fusion for a new high-speed dual-band infrared camera,** M. Müller, Fraunhofer- Institut für Informations- und Datenverarbeitung (Germany); O. Schreer, M. López Sáenz, IRCAM GmbH (Germany) . . . . . [6543-34]

3:50 pm: **Broad-band optical test bench (OPTISHOP) to measure MTF and transmittance of visible and IR optical components,** D. Cabib, A. Rahav, T. Barak, CI Systems (Israel) Ltd. (Israel) . . . . . [6543-35]

4:10 pm: **Detector spatial response testing of LWIR FPAs,** K. A. Lindahl, W. Burmester, K. Whiteaker, E. E. Penniman, P. B. Johnson, R. Banks, Ball Aerospace & Technologies Corp. . . . . [6543-36]

4:30 pm: **Automated testing of ultraviolet, visible, and infrared sensors using shared optics,** J. A. Mazzetta, S. D. Scopatz, Electro Optical Industries, Inc. . . . . [6543-37]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 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. Each evening will represent a different set of conferences to promote opportunities 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 Thursday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-show and their manuscript 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.

✔ **FMRI for functional localization and task difficulty assessment during visual search,** T. J. Meitzler, U.S. Army Tank-automotive and Armaments Command; J. Hirsch, Columbia Univ. Medical School; M. E. Bienkowski, E. Sohn, U.S. Army Tank-automotive and Armaments Command . . . [6543-52]

✔ **Multimodal human verification using stereo-based 3D face inforamtion, IR, and speech,** C. Park, Chung-Ang Univ. (South Korea) . . . . . [6543-53]

✔ **Navy and Marine Corps utility of the 2 - 2.3 micron waveband,** J. C. Wilson, U.S. Navy Reserve . . . . . [6543-54]

Friday 13 April

SESSION 9

Room: Grand 9-10 . . . . . **Fri. 8:00 to 10:40 am**

Systems and Testing II

Chairs: **Thomas Holland**, Naval Surface Warfare Ctr.;
Curtis M. Webb, Northrop Grumman Corp.;
Stephen W. McHugh, Santa Barbara Infrared, Inc.

8:00 am: **An advance in infrared lens characterization: measurement of the lens modulation transfer function using common undersampled IR systems,** C. A. Nichols, StingRay Optics, LLC; P. T. Bryant, Left Coast Consulting; C. C. Alexay, StingRay Optics, LLC . . . . . [6543-39]

8:20 am: **Radiometric calibration of infrared target projector systems in uncontrolled environments,** G. P. Matis, Santa Barbara Infrared, Inc. . . [6543-40]

8:40 am: **New radiometers for NIST: traceable calibrations of pW infrared signals,** S. I. Woods, T. M. Jung, Jung Research and Development Corp.; A. C. Carter, R. U. Datla, National Institute of Standards and Technology [6543-41]

9:00 am: **Characterization of a C-QWIP LWIR camera,** D. P. Forrai, M. D. Sempsrott, R. C. Fischer, L-3 Communications Cincinnati Electronics, Inc.; K. Choi, Army Research Lab.; J. W. Devitt, L-3 Communications Cincinnati Electronics, Inc. . . . . [6543-44]

9:20 am: **A very near-infrared tactical testbed,** R. Sanderson, J. F. McCalmont, Air Force Research Lab.; J. B. Montgomery, M&M Aviation; R. Johnson, MacAulay-Brown, Inc.; D. McDermott, Air Force Research Lab. . . . . [6543-45]

9:40 am: **Design of a compact all-refractive double-pass MWIR + LWIR hyperspectral imager,** T. A. Mitchell, Wavefront Research, Inc.; J. G. Zeibel, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6543-46]

10:00 am: **Real-time processing of low-SNR at high-rate FPA data,** M. K. Rafailov, Booz Allen Hamilton Inc. . . . . [6543-47]

10:20 am: **Laser dazzling of focal plane array cameras,** R. H. M. A. Schleijpen, J. C. van den Heuvel, TNO (Netherlands) . . . . . [6543-48]

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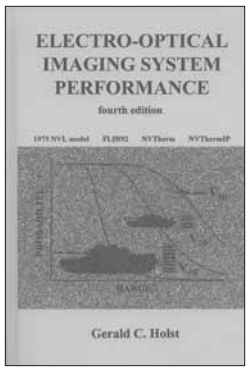

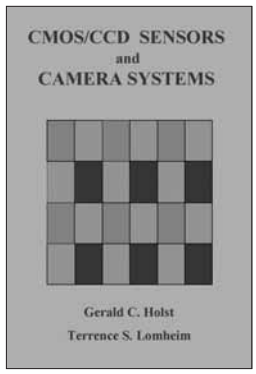

Electro-Optical Imaging System Performance
by **Gerald C. Holst**
Vol. PM160 · November 2005

CMOS/CCD Sensors and Camera Systems
by **Gerald C. Holst and Terrence S. Lomheim**
Vol. PM172 · April 2007

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Tuesday 10 April 2007 • Proceedings of SPIE Vol. 6544

Technologies for Synthetic Environments: Hardware-in-the-Loop Testing XII

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

Cochair: **James A. Buford, Jr.**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

Program Committee: **Amenda Amick**, U.S. Air Force; **David B. 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**, Air Force Research Lab.; **Alexander G. Hayes**, MIT Lincoln Lab.; **Jay B. James**, Santa Barbara Infrared, Inc.; **John M. Lannon**, Research Triangle Institute; **Heard S. Lowry**, U.S. Air Force; **Scott B. Mobley**, U.S. Army Aviation and Missile Command; **Randy A. Nicholson**, Aerospace Testing Alliance; **Robert M. Patchan**, Johns Hopkins Univ.; **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)

Tuesday 10 April

SESSION 1

Room: Grand 10 . . . . . Tues. 8:00 to 10:00 am

Infrared Projector Device Design/ Characterization/Optimization

Chairs: **George C. Goldsmith II**, Air Force Research Lab.; **Heard S. Lowry,** U.S. Air Force

8:00 am: **Spectral radiant emission of dynamic resistive arrays,** A. G. Hayes, A. Puryear, J. M. Swenson, MIT Lincoln Lab. . . . . [6544-01]

8:20 am: **Resistor array infrared projector non-uniformity correction: search for performance improvement II,** L. Swierkowski, R. A. Joyce, O. M. Williams, Defence Science and Technology Organisation (Australia) . . . . . [6544-02]

8:40 am: **LFRA: developments in large-format resistive arrays and advanced IRSP system technologies,** J. B. James, J. LaVeigne, G. P. Matis, J. Oleson, Santa Barbara Infrared, Inc.; J. M. Lannon, Research Triangle Institute; S. Solomon, Acumen Scientific; P. T. Bryant, Left Coast Consulting . . . . [6544-03]

9:00 am: **OASIS: cryogenically optimized resistive arrays and IRSP subsystems for space-background IR simulation,** J. B. James, J. LaVeigne, G. P. Matis, Santa Barbara Infrared, Inc.; J. M. Lannon, A. Huffman, Research Triangle Institute; R. Stockbridge, B. Goldsmith, Air Force Research Lab.; S. Solomon, Acumen Scientific; P. T. Bryant, Left Coast Consulting . . . . [6544-04]

9:20 am: **NIST traceable infrared test chamber calibrations using the BXR and MDXR,** A. C. Carter, R. U. Datla, T. M. Jung, National Institute of Standards and Technology; A. W. Smith, J. A. Fedchak, S. I. Woods, Jung Research and Development Corp. . . . . [6544-05]

9:40 am: **LWIR autoNUC performance issues for resistor arrays,** J. R. Lippert, Dynetics, Inc. . . . . [6544-06]

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

SESSION 2

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

HWIL Facilities

Chairs: **James A. Buford,** U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Robert Lee Murrer, Jr.,** Millennium Engineering and Integration Co.

10:30 am: **Air Force Electronic Warfare Evaluation Simulator (AFEWES) infrared test and evaluation capabilities,** H. D. Jackson II, T. L. Blair, B. A. Ensor, U.S. Air Force . . . . . [6544-07]

10:50 am: **Hybrid Infrared Scene Projector (HIRSP): a high dynamic range infrared scene projector,** T. M. Cantey, D. B. Beasley, B. M. Robinson, C. B. Naumann, Optical Sciences Corp.; H. J. Kim, J. A. Buford, Jr., U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6544-21]

11:10 am: **Implementation of a hardware-in-the-loop evaluation facility for student test and evaluation,** S. B. Mobley, G. Ballard, U.S. Army Aviation and Missile Command; R. N. Brindley, J. P. Gareri, Simulation Technologies, Inc. . . . . [6544-09]

Lunch/Exhibition Break . . . . . 11:30 am to 1:00 pm

SESSION 3

Room: Grand 10 . . . . . Tues. 1:00 to 2:20 pm

HWIL Component Technology

Chairs: **Amenda Amick**, U.S. Air Force; **Robert M. Patchan**, Johns Hopkins Univ.

1:00 pm: **Improving the fidelity of hydraulic flight motion simulators,** M. L. Avory, R. L. Schneider, Ideal Aerosmith, Inc. . . . . [6544-10]

1:20 pm: **Graphics Processing Unit (GPU) real-time infrared scene generation,** C. L. Christie, E. Gouthas, O. M. Williams, Defence Science and Technology Organisation (Australia) . . . . . [6544-11]

1:40 pm: **Flight motion simulators for the advanced multispectral sensor test acceptance resource (AMSTAR),** M. H. Swamp, Acutronic USA, Inc.; K. G. LeSueur, U.S. Army Redstone Technical Test Ctr. . . . . [6544-12]

2:00 pm: **COTS PC-based real-time scene generation for IR and SAL sensors,** J. A. Buford, Jr., U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6544-13]

SESSION 4

Room: Grand 10 . . . . . Tues. 2:20 to 5:10 pm

IR Projection: Enabling Technologies

Chairs: **Naresh C. Das**, Army Research Lab.; **Jay B. James**, Santa Barbar Infrared, Inc.; **Scott B. Mobley**, U.S. Army Aviation and Missile Command; **Steven L. Solomon**, Acumen Scientific

2:20 pm: **Versatile plasma display technology for UV-visible scene projector,** R. P. Ginn, Acumen Scientific; P. R. Mackin, Air Force Research Lab.; J. G. Eden, S. Park, Univ. of Illinois at Urbana-Champaign; C. Wedding, Imaging Systems Technology, Inc. . . . . [6544-15]

2:40 pm: **Really high-temperature emitter pixels,** S. L. Solomon, Acumen Scientific . . . . . [6544-16]

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

3:30 pm: **Is there life after thermal emitters?,** V. K. Malyutenko, Institute of Semiconductor Physics (Ukraine) . . . . . [6544-17]

3:50 pm: **Advances in 3D integration of heterogeneous materials and technologies,** D. Temple, J. M. Lannon, D. M. Malta, RTI International; J. E. Robinson, P. R. Coffman, T. B. Welch, M. R. Skokan, DRS Infrared Technologies LP; A. J. Moll, W. B. Knowlton, Boise State Univ. . . . . [6544-18]

4:10 pm: **Design and fabrication of 64 × 64 MWIR LED array for high-temperature target simulation,** N. C. Das, Army Research Lab.; J. Kramer, F. Kimilev, Univ. of Delaware . . . . . [6544-19]

4:30 pm: **Fiber optic source projector,** L. B. Shaw, Naval Research Lab. . . . . [6544-20]

4:50 pm: **Multicolor IR emissive pixels,** J. M. Lannon, S. Grego, RTI International; S. L. Solomon, Acumen Scientific . . . . . [6544-22]

Wednesday-Thursday 11-12 April 2007 • Proceedings of SPIE Vol. 6545

Window and Dome Technologies and Materials X

Conference Chair: **Randal W. Tustison**, Raytheon Co.

Program Committee: **Joel Askinazi**, Goodrich Corp.; **Richard L. Gentilman**, Raytheon Co.; **Daniel C. Harris**, Naval Air Warfare Ctr.; **James C. Kirsch**, U.S. Army Research, Development and Engineering Command; **John McCloy**, Raytheon Missile Systems; **Robert J. Ondercin**, Air Force Research Lab.; **Roger M. Sullivan**, Naval Air Systems Command; **Michael E. Thomas**, Johns Hopkins Applied Physics Lab.

Wednesday 11 April

SESSION 1

Room: Grand 11 . . . . . Wed. 8:20 to 10:00 am

Long-wavelength Infrared Transparent Materials

Chair: **Michael E. Thomas**, Johns Hopkins Applied Physics Lab.

8:20 am: **History of the development of hot-pressed and chemical-vapor-deposited zinc sulfide and zinc selenide in the United States** *(Invited Paper)*, D. C. Harris, Naval Air Warfare Ctr. . . . . [6545-01]

9:00 am: **International development of chemical vapor deposited zinc sulfide,** J. McCloy, Raytheon Missile Systems . . . . . [6545-02]

9:20 am: **Optical properties of epitaxial single-crystal chemical-vapor-deposited diamond,** G. Turri, Y. Chen, M. A. Bass, College of Optics & Photonics/Univ. of Central Florida; D. Orchard, QinetiQ Ltd. (United Kingdom); J. E. Butler, S. Magana, T. Feygelson, D. Thiel, K. Fourspring, Naval Research Lab.; J. M. Pentony, S. Hawkins, M. Baronowski, R. V. Dewees, M. D. Seltzer, A. Guenthner, D. C. Harris, Naval Air Warfare Ctr.; C. Martin Stickley, Defense Research Projects Agency . . . . . [6545-03]

9:40 am: **Spectral characterization of diffractively structured GaAs using the ARISTMS,** M. Wilson, P. Coulter, MilSys Technologies LLC . . . . . [6545-04]

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

SESSION 2

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

Glasses

Chair: **Richard L. Gentilman**, Raytheon Co.

10:30 am: **Amorphous materials molded IR lens progress report,** R. A. Hilton, Sr., J. McCord, R. Timm, Amorphous Materials Inc. . . . . [6545-05]

10:50 am: **Fluorinated silicate glass for conventional and holographic optical elements,** L. B. Glebov, College of Optics & Photonics/Univ. of Central Florida . . . . . [6545-06]

11:10 am: **Development of a laser glass for the National Ignition Facility,** J. S. Hayden, SCHOTT North America, Inc.; J. H. Campbell, S. A. Payne, Lawrence Livermore National Lab. . . . . [6545-07]

Lunch/Exhibition Break . . . . . 11:30 am to 12:50 pm

SESSION 3

Room: Grand 11 . . . . . Wed. 12:50 to 2:50 pm

Micro- and Nano-crystalline Optical Materials and Structures

Chair: **Daniel C. Harris**, Naval Air Warfare Ctr.

12:50 pm: **Optically transparent polycrystalline Al_2O_3 window and dome produced by spark plasma sintering,** D. Jiang, D. M. Hulbert, U. Anselmi-Tamburini, Univ. of California/Davis; D. P. Land, Univ. of California/Irvine; T. C. Ng, A. Muhkerjee, Univ. of California/Davis . . . . . [6545-49]

1:10 pm: **Nano-composite optical ceramics for infrared windows and domes,** T. S. Stefanik, R. Gentilman, P. K. Hogan, Raytheon Co. . . . . [6545-09]

1:30 pm: **Optical nano-composites with novel architecture,** D. Routkevitch, R. Wind, Synkera Technologies, Inc.; S. M. George, Univ. of Colorado/Boulder; E. Mirowski, C. Kostelecky, Synkera Technologies, Inc. . . . . [6545-10]

1:50 pm: **Fine-grain polycrystalline yttria for IR applications,** M. T. Koslowske, M. R. Pascucci, M. V. Parish, CeraNova Corp.; W. H. Rhodes, Rhodes Consulting . . . . . [6545-11]

2:10 pm: **Polycrystalline alumina for aerodynamic IR domes,** M. V. Parish, M. T. Koslowske, M. R. Pascucci, CeraNova Corp.; W. H. Rhodes, Rhodes Consulting . . . . . [6545-12]

2:30 pm: **Polycrystalline yttrium aluminum garnet (YAG) for IR transparent missile domes and windows,** J. C. Huie, Raytheon Co.; C. B. Dudding, J. McCloy, Raytheon Missile Systems . . . . . [6545-13]

Coffee Break . . . . . 2:50 to 3:40 pm

SESSION 4

Room: Grand 11 . . . . . Wed. 3:40 to 6:00 pm

Modeling, Characterization, and Fabrication I

Chair: **John McCloy**, Raytheon Missile Systems

3:40 pm: **Optical properties of Nd-doped and undoped polycrystalline YAG,** M. E. Thomas, Johns Hopkins Applied Physics Lab.; J. C. Huie, Raytheon Co. . . . . [6545-15]

4:00 pm: **Water impact experiments on infrared transparent materials,** R. M. Sullivan, Naval Air Systems Command . . . . . [6545-16]

4:20 pm: **Determination of hydrometeor deformations during supersonic encounter with a missile,** R. K. Frazer, R. P. Roger, H. N. Oguz, Johns Hopkins Applied Physics Lab.; W. F. Adler, Aquila Lab., LLC; B. E. Moylan, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6545-17]

4:40 pm: **BRDF and BSDF models for diffuse surface and bulk scatter from transparent windows,** M. E. Thomas, D. D. Duncan, Johns Hopkins Applied Physics Lab. . . . . [6545-18]

5:00 pm: **Application of nondestructive optical techniques in the detection of surface and subsurface defects in sapphire,** I. Akwani, D. L. Hibbard, Exotic Electro-Optics, Inc. . . . . [6545-19]

5:20 pm: **Characterization AFB® sapphire single crystal composites for infrared windows,** H. Lee, H. E. Meissner, Onyx Optics Inc. . . . . [6545-20]

5:40 pm: **Simulation and experimental results of sub-aperture transmitted wavefront measurements of a window using a time-delayed source,** M. B. Dubin, Breault Research Organization, Inc.; W. P. Kuhn, William P. Kuhn, Ph.D., LLC . . . . . [6545-21]

Thursday 12 April

SESSION 5

Room: Grand 11 . . . . . Thurs. 8:00 to 10:20 am

Modeling, Characterization, and Fabrication II

Chair: **James C. Kirsch**, U.S. Army Research, Development and Engineering Command

8:00 am: **Non-contact aspheric, deep parabolic, ogive measurement system** *(Presentation Only)*, D. E. Mohring, M. J. Bechtold, J. Meisenzahl, OptiPro Systems . . . . . [6545-22]

8:20 am: **Transmitted wavefront metrology of hemispheric domes using a scanning low-coherence dual-interferometry (SLCDI),** D. W. Diehl, C. Cotton, C. J. Ditchman, ASE Optics, Inc. . . . . [6545-23]

8:40 am: **Time-delayed source and interferometric measurement of domes and windows,** W. P. Kuhn, William P. Kuhn, Ph.D., LLC; M. B. Dubin, Breault Research Organization, Inc. . . . . [6545-24]

9:00 am: **Laser-assisted pre-finishing of optical ceramic materials,** J. C. Rozzi, O. H. Clavier, Creare Inc. . . . . [6545-25]

9:20 am: **Developments in the finishing of domes and conformal optics,** A. B. Shorey, W. Kordonski, J. Tracy, M. Tricard, QED Technologies Inc. [6545-26]

9:40 am: **Contact mechanics models and algorithms for dome polishing with UltraForm finishing (UFF),** C. Bouvier, S. M. Gracewski, S. J. Burns, Univ. of Rochester . . . . . [6545-27]

10:00 am: **Improving surface figure and microroughness of IR materials and diamond turned surfaces with Magneto-Rheological Finishing (MRF®),** C. Supranowitz, C. Hall, P. Dumas, B. Hallock, QED Technologies Inc. . . [6545-28]

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

SESSION 6

Room: Grand 11 . . . . . Thurs. 10:40 am to 12:40 pm

Optical Coatings and Surface Structures

Chair: **Robert J. Ondercin**, Air Force Research Lab.

10:40 am: **High-durability antireflection coatings for silicon and multispectral ZnS,** S. Joseph, O. Marcovitch, Y. Yadin, D. Klaiman, N. Koren, H. Zipin, RAFAEL Armament Development Authority Ltd. (Israel) . . . . . [6545-29]

11:00 am: **Durable optical coatings for windows and domes,** L. M. Goldman, S. K. Jha, S. A. Sastri, Surmet Corp.; J. C. Kirsch, U.S. Army Research, Development and Engineering Command; R. Raman, R. Cooke, N. Gunda, Surmet Corp. . . . . [6545-30]

11:20 am: **iDLC: hardcoat for GASIR and other IR materials,** K. A. Rogers, Umicore Coating Services (United Kingdom); Y. M. Guimond, Umicore IR Glass (France); J. Ward, Umicore Coating Services (United Kingdom) . . . . . [6545-31]

11:40 am: **Eclipse IR-TEC: IR transparent conductive coating,** H. Demiryont, Eclipse Energy Systems, Inc. . . . . [6545-32]

12:00 pm: **The effects of mesh voids on the insertion loss of metallic mesh coatings,** J. I. Halman, K. A. Ramsey, S. Rodenbaugh, Battelle Memorial Institute . . . . . [6545-33]

12:20 pm: **Update on the development of high-performance antireflecting surface relief microstructures,** D. S. Hobbs, B. D. MacLeod, J. R. Riccobono, TelAztec LLC . . . . . [6545-34]

Lunch/Exhibition Break . . . . . 12:40 to 1:40 pm

SESSION 7

Room: Grand 11 . . . . . Thurs. 1:40 to 5:40 pm

Visible to Mid-wavelength Infrared Transparent Materials and Applications

Chair: **Joel Askinazi**, Goodrich Corp.

1:40 pm: **Recent advances in ALON optical ceramic,** J. M. Wahl, T. M. Hartnett, L. M. Goldman, R. Twedt, C. Warner, Surmet Corp. . . . . [6545-35]

2:00 pm: **Grinding and polishing of polycrystalline alumina, AlON and spinel domes, utilizing the UltraForm 5 axis finishing system** *(Presentation Only)***,** M. J. Bechtold, D. E. Mohring, OptiPro Systems; E. M. Fess, Univ. of Rochester . . . . . [6545-36]

2:20 pm: **Near-net shape forming of AlON domes via wet processing techniques,** B. J. Robinson, K. McNeal, Materials Systems, Inc. . . . . [6545-37]

2:40 pm: **An improved soft-chemistry approach to the preparation of spinel powders,** R. L. Cook, TDA Research, Inc. . . . . [6545-38]

3:00 pm: **Recent advances in magnesium aluminate spinel,** T. J. Mroz, L. M. Goldman, R. Twedt, C. Warner, Surmet Corp. . . . . [6545-39]

Coffee Break . . . . . 3:20 to 3:40 pm

3:40 pm: **Polycrystalline transparent spinel domes for multimode seeker applications,** A. A. DiGiovanni, A. LaRoche, L. Schubel, L. Fehrenbacher, Technology Assessment and Transfer; D. W. Roy, Consultant . . . . . [6545-40]

4:00 pm: **Recent developments in transparent polycrystalline spinel and other transparent ceramics,** I. Aggarwal, Naval Research Lab. . . . . [6545-41]

4:20 pm: **Spinel and BGG glass composite domes,** S. S. Bayya, J. S. Sanghera, I. Aggarwal, Naval Research Lab.; E. Welsh, Lockheed Martin Missiles and Fire Control; R. Twedt, L. M. Goldman, Surmet Corp.; J. C. Kirsch, U.S. Army Research, Development and Engineering Command . . . . . [6545-42]

4:40 pm: **Investigation of critical parameters for grinding large sapphire window panels,** J. Bashe, I. Akwani, G. Dempsey, D. L. Hibbard, Exotic Electro-Optics, Inc. . . . . [6545-43]

5:00 pm: **Clear large aperature sapphire sheets (CLASS™) for aerospace and transparent armor applications,** C. D. Jones, Saint Gobain Crystals; J. W. Locher, J. B. Rioux, H. E. Bates, S. A. Zanella, Saint-Gobain Crystals . . [6545-44]

5:20 pm: **Improvements in large window and optics production,** B. Hallock, W. Messner, C. Hall, C. Supranowitz, QED Technologies Inc. . . . . [6545-45]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 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. Each evening will represent a different set of conferences to promote opportunities 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 Thursday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-show and their manuscript 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.

✔ **Polarization discriminating optical filters based on surface relief microstructures,** D. S. Hobbs, TelAztec LLC . . . . . [6545-46]

✔ **Particle impact/erosion phenomena and materials failure for supersonic KV(S),** K. George, Jr., M. Wilson, MilSys Technologies LLC; B. E. Moylan, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6545-47]

✔ **Reduced angle-shift infrared bandpass filter coatings,** B. M. Lairson, J. Mosier, K. Gibbons, J. H. Sternbergh, M. George, Deposition Sciences, Inc. . . . . [6545-48]

Wednesday 11 April 2007 • Proceedings of SPIE Vol. 6546

Airborne Intelligence, Surveillance, Reconnaissance (ISR) Systems and Applications IV

Conference Chair: **Daniel J. Henry**, Recon/Optical, Inc.

Wednesday 11 April

SESSION 1

Room: New York . . . . . Wed. 8:40 to 10:00 am

ISR Sensors I

Chair: **Daniel J. Henry**, Recon/Optical, Inc.

8:40 am: **Key performance requirements for military low-light television cameras,** G. B. Heim, S. E. Shimer, Ball Aerospace & Technologies Corp. . . . . [6546-01]

9:00 am: **Signal processor for acoustic sensors on UAV platforms and ground vehicles,** R. A. Wagstaff, The Univ. of Mississippi . . . . . [6546-02]

9:20 am: **High performance Sagnac interferometers for LWIR hyperspectral imaging,** P. G. Lucey, K. A. Horton, T. J. Williams, Univ. of Hawaii at Manoa . . . . . [6546-03]

9:40 am: **A rugged 65-gram IR dual FOV MAV payload,** J. Wisted, J. Leighton, Fluke Electronics . . . . . [6546-04]

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

SESSION 2

Room: New York . . . . . Wed. 10:30 to 11:30 am

ISR Sensors II

Chair: **Daniel J. Henry**, Recon/Optical, Inc.

10:30 am: **GlobalScanner: a very high resolution miniaturized EO reconnaissance airborne system,** H. J. Guiot, G. Kryze, B. Achddou, COSE (France) . . . . . [6546-05]

10:50 am: **DB-110 reconnaissance: the 3rd generation system: an update,** M. A. Iyengar, D. A. Lange, Goodrich Corp.; G. R. Dyer, Goodrich (United Kingdom) . . . . . [6546-18]

11:10 am: **The longer, not always the better,** S. Larroque, Thales Optronique (France) . . . . . [6546-07]

Tactical Sensors and Imagers Track Plenary Presentation

Room: Grand 7B . . . . . Wed. 11:40 am to 12:20 pm

Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

Broadband THz Wave Photonics for Defense and Security Applications

(Invited Paper, Presentation Only)

Xi-Cheng Zhang, Rensselaer Polytechnic Institute

Lunch/Exhibition Break . . . . . 12:20 to 1:40 pm

SESSION 3

Room: New York . . . . . Wed. 1:40 to 3:00 pm

Motion Image Evaluation

Chair: **Daniel J. Henry**, Recon/Optical, Inc.

1:40 pm: **Perceived interpretability of motion imagery: implications for scale development,** J. M. Irvine, G. O'Brien, S. A. Israel, D. M. Cannon, Science Applications International Corp.; C. P. Fenimore, J. W. Roberts, National Institute of Standards and Technology; J. Bartolucci, The Boeing Co. . . . . [6546-08]

2:00 pm: **Metrics to estimate image quality in compressed video sequences,** G. O'Brien, J. M. Irvine, D. M. Cannon, Science Applications International Corp.; J. Bartolucci, The Boeing Co.; C. P. Fenimore, J. W. Roberts, National Institute of Standards and Technology; J. R. Miller, S. A. Israel, Science Applications International Corp. . . . . [6546-09]

2:20 pm: **User-oriented evaluation of compression for motion imagery,** J. M. Irvine, G. O'Brien, S. A. Israel, Science Applications International Corp.; C. P. Fenimore, J. W. Roberts, National Institute of Standards and Technology; J. Bartolucci, The Boeing Co.; D. M. Cannon, Science Applications International Corp. . . . . [6546-10]

2:40 pm: **Perceptual evaluation of frame rate effects on the interpretability of motion imagery II,** C. P. Fenimore, National Institute of Standards and Technology; J. M. Irvine, D. M. Cannon, Science Applications International Corp.; J. W. Roberts, A. I. Aviles, National Institute of Standards and Technology; J. R. Miller, L. Simon, S. A. Israel, Science Applications International Corp.; J. Bartolucci, The Boeing Co. and Science Applications International Corp. . . . . [6546-11]

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

SESSION 4

Room: New York . . . . . Wed. 3:30 to 4:10 pm

ISR Platforms

Chair: **Daniel J. Henry**, Recon/Optical, Inc.

3:30 pm: **An OEF/OIF study of close combat missions using small unmanned aircraft systems,** G. Lifschitz, R. J. Tierney, J. Vitalie, U.S. Army Test and Evaluation Command . . . . . [6546-13]

3:50 pm: **Field test of an air-to-ground communication link using a bare optical fiber,** J. C. Juarez, A. Dwivedi, R. M. Sova, J. E. Sluz, D. W. Young, Johns Hopkins Applied Physics Lab. . . . . [6546-14]

SESSION 5

Room: New York . . . . . Wed. 4:10 to 5:10 pm

ISR Algorithms/Image Processing

Chair: **Daniel J. Henry**, Recon/Optical, Inc.

4:10 pm: **Unlimited-size mosaicking of airborne image data,** N. Jiang, C. Li, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems; J. Si, Arizona State Univ. . . . . [6546-15]

4:30 pm: **Reconfigurable device for enhancement of long-range imagery,** F. E. Ortiz, E. J. Kelmelis, P. F. Curt, EM Photonics, Inc. . . . . [6546-16]

4:50 pm: **On a nascent latency-information theory,** E. H. Feria, College of Staten Island/CUNY . . . . . [6546-17]

Thursday-Friday 12-13 April 2007 • Proceedings of SPIE Vol. 6547

Radar Sensor Technology XI

Conference Chairs: **James L. Kurtz**, Univ. of Florida; **Robert J. Tan**, Army Research Lab.

Program Committee: **Armin W. Doerry**, Sandia National Labs.; **John E. Gray**, Naval Surface Warfare Ctr.; **Todd A. Kastle**, Air Force Research Lab.; **Thomas J. Pizzillo**, Army Research Lab.; **Jeffrey P. Sichina**, Army Research Lab.; **Lars M. Wells**, Sandia National Labs.

Wednesday 11 April

Tactical Sensors and Imagers Track Plenary Presentation
Room: Grand 7B . . . . . Wed. 11:40 am to 12:20 pm

Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

Broadband THz Wave Photonics for Defense and Security Applications
(Invited Paper, Presentation Only)
Xi-Cheng Zhang, Rensselaer Polytechnic Institute

Thursday 12 April

SESSION 1

Room: New Orleans . . . . . Thurs. 8:00 to 9:40 am

SAR Techniques

Chair: **Armin W. Doerry**, Sandia National Labs.

8:00 am: **Wideband SAR processing with segmented chirps for phased-array radars,** A. W. Doerry, Sandia National Labs. . . . . [6547-01]

8:20 am: **Anisotropic diffusion techniques on synthetic aperture radar data,** J. D. Allen, E. Ganthier, Harris Corp.; G. B. Tenali, Florida Institute of Technology . . . . . [6547-02]

8:40 am: **Results from an x-band synthetic aperture radar collection in Antarctica,** D. L. Bickel, G. Sander, Sandia National Labs.; W. Hallman, The National Guard Bureau; J. Bradley, Sandia National Labs.; M. Armstrong, New York Air National Guard . . . . . [6547-03]

9:00 am: **Bistatic VHF and UHF SAR for urban environments,** J. R. Rasmusson, G. Stenstrom, B. Larsson, A. Gustavsson, L. M. H. Ulander, Swedish Defence Research Agency (Sweden) . . . . . [6547-04]

9:20 am: **Two joint time-frequency transforms for velocity separation of moving target synthetic aperture radar data,** M. A. Ferrara, D. G. Arnold, Air Force Research Lab.; M. Cheney, Rensselaer Polytechnic Institute . . . . [6547-05]

SESSION 2

Room: New Orleans . . . . . Thurs. 9:40 am to 12:10 pm

Through-the-wall and Human Detection Radar

Chairs: **Robert J. Tan**, Army Research Lab.; **Thomas J. Pizzillo**, Army Research Lab.

9:40 am: **Detection and tracking of humans and vehicle targets using high definition television signals in urban areas,** E. F. Greneker III, Georgia Tech Research Institute . . . . . [6547-06]

10:00 am: **Estimation of electromagnetic parameters and thickness of a wall using synthetic aperture radar,** H. C. Khatri, C. Le, Army Research Lab. . . . . [6547-07]

Coffee Break . . . . . 10:20 to 10:50 am

10:50 am: **Performance of autofocusing schemes for single target and populated scenes behind unknown walls,** F. Ahmad, M. G. Amin, Villanova Univ. . . . . [6547-08]

11:10 am: **Micro-Doppler analysis of multiple frequency continuous wave radar signatures,** M. G. Anderson, R. L. Rogers, The Univ. of Texas at Austin . . . . . [6547-10]

11:30 am: **Sparse array of RF sensors for sensing through the wall,** R. Innocenti, Army Research Lab. . . . . [6547-11]

11:50 pm: **Microwave and millimeter-wave Doppler radar heart sensing,** O. Boric-Lubecke, A. Host-Madsen, V. M. Lubecke, Univ. of Hawaii at Manoa and SensCorp, Inc.; J. Lin, Univ. of Florida; T. Sizer, Bell Labs. . . . . [6547-12]

Lunch/Exhibition Break . . . . . 12:10 to 2:00 pm

SESSION 3

Room: New Orleans . . . . . Thurs. 2:00 to 4:30 pm

Radar Systems, Techniques, and Phenomenology

Chairs: **James L. Kurtz**, Univ. of Florida; **Robert J. Tan**, Army Research Lab.

2:00 pm: **Generating precision nonlinear FM chirp waveforms,** A. W. Doerry, Sandia National Labs. . . . . [6547-13]

2:20 pm: **Vehicle-mounted UWB radar for improvised explosive device detection,** O. Kegege, C. Ibarra, J. Li, H. Foltz, The Univ. of Texas-Pan American . . . . . [6547-14]

2:40 pm: **SAR image formation using phase-history data from non-uniform aperture,** L. H. Nguyen, J. P. Sichina, Army Research Lab. . . . . [6547-15]

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

3:30 pm: **Localization of nodes and personnel in multi-static radar node sensor network,** J. R. Yee, V. M. Lubecke, Univ. of Hawaii . . . . . [6547-16]

3:50 pm: **Polarimetric, combined, short pulse scatterometer-radiometer system at 15GHz for platform and vessel application,** A. K. Arakelyan, A. K. Hambaryan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia); S. F. Clifford, Univ. of Colorado . . . . . [6547-17]

4:10 pm: **C band, polarimetric, combined, short pulse scatterometer-radiometer system for platform and vessel application,** A. K. Hambaryan, A. K. Arakelyan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia) [6547-18]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 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. Each evening will represent a different set of conferences to promote opportunities 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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✔ **A portfolio of products from the rapid terrain visualization interferometric SAR,** D. L. Bickel, A. W. Doerry, Sandia National Labs. . . . . [6547-28]

Friday 13 April

SESSION 4

Room: New Orleans . . . . . Fri. 8:00 to 10:00 am

Signal and Image Processing, Simulation, and Analysis

Chairs: **James L. Kurtz**, Univ. of Florida;
Robert J. Tan, Army Research Lab.

8:00 am: **Multipath data analysis and exploitation for the design of distributed radar systems,** A. K. Mitra, P. Robinson, J. P. LaRue, A. Vega-Irizarry, J. Glett, Air Force Research Lab. . . . . [6547-19]

8:20 am: **Performance analysis of dual-frequency CW radars for motion detection and ranging in urban sensing applications,** F. Ahmad, M. G. Amin, Villanova Univ.; P. D. Zemany, BAE Systems . . . . . [6547-20]

8:40 am: **Indication of slowly-moving targets via change detection,** K. I. Ranney, A. Martone, Army Research Lab.; M. Soumekh, Univ. at Buffalo . . . . . [6547-21]

9:00 am: **Prediction and detection of multiple-scattering events from 3D GTD-based parametric scattering models,** M. A. Ferrara, Air Force Research Lab.; M. Cheney, Rensselaer Polytechnic Institute; D. G. Arnold, Air Force Research Lab. . . . . [6547-22]

9:20 am: **Development and assessment of a complete ATR algorithm based on ISAR Euler imagery,** C. S. Baird, R. H. Giles, Univ. of Massachusetts/Lowell; W. E. Nixon, U.S. Army National Ground Intelligence Ctr. . . . . [6547-23]

9:40 am: **A novel change detection method in polarimetric SAR data,** M. Qong, Kyushu Tokai Univ. (Japan) . . . . . [6547-24]

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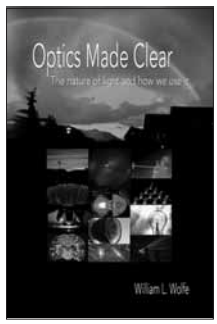

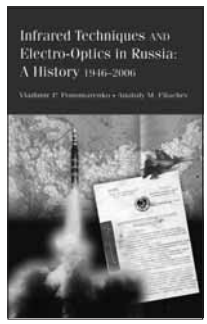

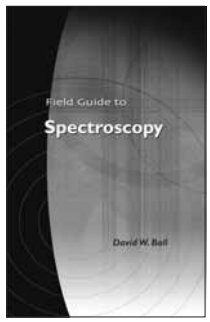

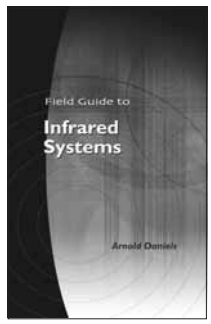

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Wednesday 11 April 2007 • Proceedings of SPIE Vol. 6548

Passive Millimeter-Wave Imaging Technology X

Conference Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

Wednesday 11 April

SESSION 1

Room: New Orleans . . . . . Wed. 8:20 to 9:40 am

Systems

Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

8:20 am: **New steps for passive millimeter imaging,** A. N. Pergande, Lockheed Martin Missiles and Fire Control . . . . . [6548-01]

8:40 am: **Millimeter-wave propagation through a controlled dust environment,** D. A. Wikner, Army Research Lab. . . . . [6548-02]

9:00 am: **A 190 GHz active millimeter-wave imager,** M. Brothers, G. P. Timms, J. D. Bunton, J. Archer, J. Tello, G. C. Rosolen, Y. Li, A. Hellicar, Commonwealth Scientific and Industrial Research Organisation (Australia) . . . . . [6548-03]

9:20 am: **Influence of complicated background noise on passive ground-based radiometer with low elevation angle,** L. Wu, Huazhong Univ. of Science and Technology (China) . . . . . [6548-04]

SESSION 2

Room: New Orleans . . . . . Wed. 9:40 to 11:30 am

Security Scanning

Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

9:40 am: **High resolution passive millimeter-wave security screening using few amplifiers,** C. A. Martin, A. Shek, V. G. Kolinko, Trex Enterprises Corp. . . . . [6548-05]

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

10:30 am: **Spectral decomposition of ultrawideband terahertz imagery,** E. N. Grossman, National Institute of Standards and Technology; C. R. Dietlein, National Institute of Standards and Technology and Univ. of Colorado/Boulder; J. Chisum, National Institute of Standards and Technology; A. R. M. Luukanen, MilliLab (Finland) . . . . . [6548-07]

10:50 am: **Passive Euro-American terahertz camera (PEAT-CAM): passive indoors THz imaging at video rates for security applications,** A. R. M. Luukanen, L. Grönberg, P. Helistö, J. S. Penttilä, H. Seppä, H. Sipola, MilliLab (Finland); C. R. Dietlein, National Institute of Standards and Technology and Univ. of Colorado and MilliLab (Finland); E. N. Grossman, National Institute of Standards and Technology . . . . . [6548-08]

11:10 am: **Speckle in active millimeter-wave and terahertz imaging and spectroscopy,** D. M. Sheen, D. L. McMakin, T. E. Hall, Pacific Northwest National Lab. . . . . [6548-09]

SESSION 3

Tactical Sensors and Imagers Track Plenary Presentation

Room: Grand 7B . . . . . Wed. 11:40 am to 12:20 pm

Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

Broadband THz Wave Photonics for Defense and Security Applications

(Invited Paper, Presentation Only)

Xi-Cheng Zhang, Rensselaer Polytechnic Institute

Lunch/Exhibition Break . . . . . 12:20 to 1:20 pm

SESSION 4

Room: New Orleans . . . . . Wed. 1:20 to 2:40 pm

Electronic Beam Forming

Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

1:20 pm: **Sparse aperture millimeter-wave imaging using optical detection and correlation techniques,** C. A. Schuetz, Univ. of Delaware; R. Martin, EM Photonics, Inc.; M. S. Mirotznik, The Catholic Univ. of America; S. Shi, G. J. Schneider, J. A. Murakowski, D. W. Prather, Univ. of Delaware . . . . [6548-11]

1:40 pm: **Passive millimeter-wave camera with interferometric processing,** H. Nohmi, NEC Corp. (Japan) . . . . . [6548-12]

2:00 pm: **Electronic scanning for passive millimeter wave imaging,** N. A. Salmon, QinetiQ Ltd. (United Kingdom) . . . . . [6548-13]

2:20 pm: **Passive mm-wave imaging using two scanning fan-beam antennas,** Y. Li, G. P. Timms, J. Archer, G. C. Rosolen, J. Tello, M. Brothers, A. Hellicar, Y. J. Guo, Commonwealth Scientific and Industrial Research Organisation (Australia) . . . . . [6548-14]

SESSION 5

Room: New Orleans . . . . . Wed. 2:40 to 5:50 pm

Enabling Technology

Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

2:40 pm: **Unamplified direct detection W-band imaging array,** J. N. Schulman, J. J. Lynch, H. P. Moyer, J. H. Schaffner, P. H. Lawyer, R. L. Bowen, Y. Royter, M. Sokolich, R. D. Rajavel, HRL Labs., LLC . . . . . [6548-15]

3:00 pm: **The development of affordable front end hardware for millimeter wave imaging using multi-layer soft board technology,** D. C. Bannister, QinetiQ Ltd. (United Kingdom) . . . . . [6548-16]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **Performance of 94GHz MMIC receivers,** R. G. Humphreys, QinetiQ Ltd. (United Kingdom) . . . . . [6548-17]

4:10 pm: **LiNbO3 optical modulator for MMW sensing and imaging,** C. Huang, C. A. Schuetz, R. Shireen, S. Shi, D. W. Prather, Univ. of Delaware . . . . . [6548-18]

4:30 pm: **Direct detection antenna-coupled mmW sensors for the detection of explosive vapors,** M. A. Gritz, Raytheon Vision Systems and Raytheon Network Centric Systems; R. Hernandez, A. Larussi, Raytheon Co. and Raytheon Space and Airborne Systems; E. E. Gordon, Raytheon Vision Systems and Raytheon Network Centric Systems; G. Zummo, College of Optics & Photonics/ Univ. of Central Florida; G. D. Boreman, Univ. of Central Florida; L. P. Chen, Raytheon Vision Systems and Raytheon Network Centric Systems . . . . [6548-19]

4:50 pm: **FPGA acceleration of superresolution algorithms for embedded processing in millimeter-wave sensors,** F. E. Ortiz, E. J. Kelmelis, EM Photonics, Inc.; D. W. Prather, Univ. of Delaware . . . . . [6548-20]

5:10 pm: **Determination of dielectric material properties with passive MMW measurements for security applications,** S. Dill, M. Peichl, H. Suess, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6548-21]

5:30 pm: **Aqueous blackbody system: a novel THz absolute calibration source,** C. R. Dietlein, National Institute of Standards and Technology and Univ. of Colorado/Boulder; E. N. Grossman, National Institute of Standards and Technology . . . . . [6548-22]

Monday-Tuesday 9-10 April 2007 • Proceedings of SPIE Vol. 6549

Terahertz for Military and Security Applications V

Conference Chairs: **James O. Jensen**, U.S. Army Edgewood Chemical Biological Ctr.; **Hong-Liang Cui**, Stevens Institute of Technology

Cochairs: **Dwight L. Woolard**, U.S. Army Research Office; **R. Jennifer Hwu**, INNOSYS Inc.

Monday 9 April

SESSION 1

Room: New York/New Orleans . . . . . Mon. 8:10 to 10:00 am

THz Science and Applications

Chair: **James O. Jensen**, U.S. Army Edgewood Chemical Biological Ctr.

8:10 am: **Advanced terahertz imaging system performance model for concealed weapon identification** *(Invited Paper)*, S. R. Murrill, B. C. Redman, Army Research Lab.; R. L. Espinola, U.S. Army Night Vision & Electronic Sensors Directorate; C. C. Franck, U.S. Army; F. C. De Lucia, The Ohio State Univ.; D. T. Petkie, Wright State Univ.; E. L. Jacobs, S. T. Griffin, C. E. Halford, The Univ. of Memphis; J. P. Reynolds, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6549-01]

8:40 am: **Terahertz spectroscopy of TNT for explosive detection,** R. E. Peale, A. V. Murajov, Univ. of Central Florida; L. P. Chen, M. D. Jack, M. A. Gritz, Raytheon Vision Systems . . . . . [6549-02]

9:00 am: **Modeling and characterization of cloth at sub-millimeter wavelengths,** E. L. Jacobs, S. T. Griffin, The Univ. of Memphis . . . . . [6549-03]

9:20 am: **Broadband terahertz time-domain and Raman spectroscopy of explosives,** A. D. Burnett, W. Fan, P. Upadhya, J. E. Cunnigham, Univ. of Leeds (United Kingdom); H. G. M. Edwards, J. Kendrick, T. Munshi, M. Hargreaves, Univ. of Bradford (United Kingdom); E. H. Linfield, A. G. Davies, Univ. of Leeds (United Kingdom) . . . . . [6549-04]

9:40 am: **Terahertz measurement and imaging detection of delamination and water intrusion in ground based radome panels,** D. A. Zimdars, J. S. White, G. Fichter, G. Stuk, Picometrix LLC . . . . . [6549-05]

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

SESSION 2

Room: New York/New Orleans . . . . . Mon. 10:30 am to 12:00 pm

THz Systems Development I

Chair: **Hong-Liang Cui**, Stevens Institute of Technology

10:30 am: **Towards an active real-time THz camera: first realization of a hybrid system** *(Invited Paper)*, T. Löffler, C. am Weg, A. Alcin, B. Hils, H. G. Roskos, Univ. Frankfurt am Main (Germany) . . . . . [6549-06]

11:00 am: **Terahertz standoff imaging testbed design and performance for concealed weapon and device identification model development,** C. C. Franck, CACI Technologies Inc.; R. L. Espinola, U.S. Army Night Vision & Electronic Sensors Directorate; S. T. Griffin, E. L. Jacobs, The Univ. of Memphis; S. R. Murrill, Army Research Lab.; D. Lee, E-OIR Measurements, Inc.; D. H. Tofsted, S. O'Brien, Western Space Missile Range; C. E. Halford, The Univ. of Memphis; J. P. Reynolds, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6549-07]

11:20 am: **Terahertz interferometric imaging of RDX,** A. M. Sinyukov, R. B. Barat, D. E. Gary, Z. Michalopoulou, I. K. Zorych, J. F. Federici, New Jersey Institute of Technology . . . . . [6549-08]

11:40 am: **Terahertz imaging system for stand-off detection of threats,** H. Hübers, A. D. Semenov, H. Richter, U. Böttger, Deutsches Zentrum für Luft und Raumfahrt e.V. (Germany) . . . . . [6549-09]

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

SESSION 3

Room: New York/New Orleans . . . . . Mon. 1:00 to 2:00 pm

THz Systems Development II

Chair: **Dwight L. Woolard**, U.S. Army Research Office

1:00 pm: **A high resolution terahertz spectrometer for chemical detection,** A. J. Majewski, Goodrich Corp. . . . . [6549-10]

1:20 pm: **Real-time THz detection using microbolometer infrared camera,** B. N. Behnken, G. Karunasiri, M. Lowe, Naval Postgraduate School; D. R. Chamberlin, P. R. Robrish, Agilent Technologies, Inc.; J. Faist, Univ. of Neuchatel (Switzerland) . . . . . [6549-11]

1:40 pm: **A superconducting terahertz imager,** T. May, V. Zakosarenko, S. Anders, H. Meyer, Institut für Physikalische Hochtechnologie e.V. (Germany); E. Kreysa, N. Jethava, Max-Planck-Institut für Radioastronomie (Germany); G. Thorwirth, Jena-Optronik GmbH (Germany); M. Siegel, Univ. Karlsruhe (Germany) . . . . . [6549-12]

SESSION 4

Room: New York/New Orleans . . . . . Mon. 2:00 to 3:30 pm

Novel THz Concepts and Phenomenology I

Chair: **R. Jennifer Hwu**, INNOSYS Inc.

2:00 pm: **An integrated continuous-wave terahertz biosensor** *(Invited Paper)*, M. Neshat, D. Saeedkia, Univ. of Waterloo (Canada); R. Sabri, Defence Research and Development Canada (Canada); S. Safavi-Naeini, Univ. of Waterloo (Canada) . . . . . [6549-13]

2:30 pm: **Reflectivity and emissivity modeling for metals and plastics at THz frequencies,** S. T. Griffin, E. L. Jacobs, The Univ. of Memphis; S. R. Murrill, Army Research Lab. . . . . [6549-14]

2:50 pm: **Guided-wave propagation on a cylindrical conductor at millimeter-wave or terahertz frequencies,** J. C. Wiltse, Georgia Institute of Technology . . . . . [6549-15]

3:10 pm: **THz-frequency vibrational-spectrum of DNA nucleotides bounded to Si substrates,** B. N. Woolard, Athens Drive Senior High School; P. Zhao, North Carolina State Univ. . . . . [6549-16]

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

SESSION 5

Room: New York/New Orleans . . . . . Mon. 4:00 to 5:40 pm

Novel THz Concepts and Phenomenology II

Chair: **James O. Jensen**, U.S. Army Edgewood Chemical Biological Ctr.

4:00 pm: **Examining explosive residues on surfaces with terahertz technology,** M. J. Fitch, M. R. Leahy-Hoppa, R. Osiander, Johns Hopkins Applied Physics Lab. . . . . [6549-17]

4:20 pm: **Unsupervised image segmentation for passive THz broadband images for concealed weapon detection,** M. D. Ramirez-Velez, C. R. Dietlein, Z. Popovic, Univ. of Colorado/Boulder; E. N. Grossman, National Institute of Standards and Technology . . . . . [6549-18]

4:40 pm: **THz wave generation in inert gases and molecular vapors,** M. Yamaguchi, Y. Chen, M. Wang, X. Zhang, Rensselaer Polytechnic Institute . . . . . [6549-19]

5:00 pm: **Comparison of the THz absorption feature in lactose to related saccharides,** J. E. Bjarnason, E. R. Brown, Univ. of California/Santa Barbara; T. M. Korter, Syracuse Univ. . . . . [6549-20]

5:20 pm: **Gain and far-field patterns for phase-correcting Fresnel zone plate antennas at millimeter-wave and terahertz frequencies,** J. C. Wiltse, Georgia Institute of Technology . . . . . [6549-27]

Tuesday 10 April

SESSION 6

Room: New York/New Orleans . . . . . Tues. 8:30 to 10:00 am

THz Technology and Methodology I

Chair: **Hong-Liang Cui**, Stevens Institute of Technology

8:30 am: **Performance comparison of Nb and NbN broadband antenna-coupled microbolometers** *(Invited Paper)*, C. R. Dietlein, National Institute of Standards and Technology and Univ. of Colorado/Boulder and VTT Technical Research Ctr. of Finland (Finland); A. R. M. Luukanen, J. S. Penttilä, L. Grönberg, H. Seppä, P. Helistö, MilliLab (Finland); E. N. Grossman, National Institute of Standards and Technology . . . . . [6549-21]

9:00 am: **Carbon nanotube field-emission based Orotron scanning THz source,** S. J. Papadakis, Johns Hopkins Univ.; A. H. Monica, Georgetown Univ.; R. Osiander, Johns Hopkins Univ. . . . . [6549-22]

9:20 am: **Compact, mission configurable mm-wave spectrometer based on a channel drop filter,** E. I. Smirnova, A. G. Bailey, L. M. Earley, S. S. Kurennoy, Los Alamos National Lab. . . . . [6549-23]

9:40 am: **Compact fiber pumped terahertz source,** D. Creeden, J. C. McCarthy, P. A. Ketteridge, T. Southward, P. G. Schunemann, J. J. Komiak, W. Dove, E. P. Chicklis, BAE Systems . . . . . [6549-24]

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

SESSION 7

Room: New York/New Orleans . . . . . Tues. 10:30 to 11:40 am

THz Technology and Methodology II

Chair: **R. Jennifer Hwu**, INNOSYS Inc.

10:30 am: **Semiconductor based optically controlled THz optics** *(Invited Paper)*, I. A. Chen, S. Park, C. Karaalioglu, Stevens Institute of Technology; N. Vallestro, A. Meshal, U.S. Army Communications-Electronics Command; R. Martini, Stevens Institute of Technology . . . . . [6549-25]

11:00 am: **Terahertz scanning Fabry-Perot interferometer based on dielectric mirrors,** J. W. Cleary, C. J. Fredricksen, A. V. Muravjov, R. E. Peale, T. W. Du Bosq, Univ. of Central Florida; W. R. Folks, S. Pandey, College of Optics & Photonics/Univ. of Central Florida; G. D. Boreman, Univ. of Central Florida; O. J. Edwards, Zyberwear, Inc. . . . . [6549-26]

11:20 am: **Processing multi-species terahertz spectra for detection of a particular species,** R. J. Noll, Goodrich Corp. . . . . [6549-28]

Wednesday 11 April

Tactical Sensors and Imagers Track Plenary Presentation

Room: Grand 7B . . . . . Wed. 11:40 am to 12:20 pm

Chairs: **Roger Appleby**, QinetiQ Ltd. (United Kingdom); **David A. Wikner**, Army Research Lab.

Broadband THz Wave Photonics for Defense and Security Applications

(Invited Paper, Presentation Only)

Xi-Cheng Zhang, Rensselaer Polytechnic Institute

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Laser Radar Technology and Applications XII

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 V. Molebny**, National Technical Univ. of Ukraine (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 11 April

SESSION 1

Room: San Antonio . . . . . Wed. 8:00 to 9:00 am

Coherent Systems

Chair: **Monte D. Turner**, Defense Advanced Research Projects Agency

8:00 am: **High-resolution 3D coherent laser radar imaging,** J. R. Buck, A. I. R. Malm, A. Zakel, B. W. Krause, B. G. Tiemann, Lockheed Martin Coherent Technologies . . . . . [6550-01]

8:20 am: **The angle-angle-range-Doppler imaging (AARDI) ladar,** L. A. Jiang, J. Luu, D. R. Schue, MIT Lincoln Lab. . . . . [6550-02]

8:40 am: **Coherent ladar imaging of the SEASAT satellite retro-reflector ring,** D. G. Youmans, SPARTA, Inc.; J. M. Ceniceros, The Boeing Co. . . . . [6550-03]

SESSION 2

Room: San Antonio . . . . . Wed. 9:00 to 11:30 am

3D Imaging Systems and Applications I

Chair: **Monte D. Turner**, Defense Advanced Research Projects Agency

9:00 am: **Chirped amplitude modulation ladar for range and Doppler measurements and 3D imaging,** B. L. Stann, B. C. Redman, Army Research Lab. . . . . [6550-04]

9:20 am: **Multiscale target manifold characterization for 3D imaging ladar,** E. Whittenberger, D. E. Waagen, N. N. Shah, D. R. Hulsey, Raytheon Missile Systems . . . . . [6550-05]

9:40 am: **Dual-band spacecraft sensor suite for lunar and small-body landing,** B. G. Boone, Johns Hopkins Applied Physics Lab. . . . . [6550-06]

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

10:30 am: **Characterization of 3-D imaging lidar for hazard avoidance and autonomous landing on the Moon,** D. F. Pierrottet, Coherent Applications, Inc. . . . . [6550-07]

10:50 am: **Correlation between LIDAR reflux intensity and the accuracy of the associated elevation information,** G. Heidelmeyer, U. Klingauf, Technische Univ. Darmstadt (Germany) . . . . . [6550-10]

11:10 am: **Distributed aperture active imaging,** J. C. Marron, R. L. Kendrick, Lockheed Martin Coherent Technologies . . . . . [6550-11]

Lunch/Exhibition Break . . . . . 11:30 am to 1:00 pm

SESSION 3

Room: San Antonio . . . . . Wed. 1:00 to 1:40 pm

3D Imaging Systems and Applications II

Chair: **Monte D. Turner**, Defense Advanced Research Projects Agency

1:00 pm: **Aerial vehicle navigation over unknown terrain environments using inertial measurements and dual airborne laser scanners or flash ladar,** M. Uijt de Haag, A. Vadlamani, Ohio Univ. . . . . [6550-08]

1:20 pm: **Use of 3D laser radar for navigation of unmanned aerial and ground vehicles in urban and indoor environments,** M. Uijt de Haag, D. Venable, M. Smearcheck, Ohio Univ. . . . . [6550-09]

SESSION 4

Room: San Antonio . . . . . Wed. 1:40 to 4:50 pm

Test and Evaluation

Chair: **Monte D. Turner**, Defense Advanced Research Projects Agency

1:40 pm: **ASTM-57: 3D Ladar Standards Development Committee** *(Invited Paper)***,** G. S. Cheok, National Institute of Standards and Technology . . . . . [6550-12]

2:10 pm: **The advanced measurements optical range ladar test facility,** C. E. Keffer, T. J. Papetti, CAS, Inc.; E. Johnson, U.S. Army Space and Missile Defense Command . . . . . [6550-13]

2:30 pm: **3D imagery quality metrics,** G. W. Kamerman, FastMetrix, Inc. . . . . [6550-14]

2:50 pm: **A validation procedure for a ladar system radiometric simulation model,** B. C. Leishman, S. E. Budge, R. T. Pack, Utah State Univ. . . . . [6550-15]

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

3:40 pm: **MRDF and BRDF measurements of low scatter materials,** B. E. Walker, T. J. Papetti, C. E. Keffer, CAS, Inc.; E. Johnson, U.S. Army Space and Missile Defense Command . . . . . [6550-16]

4:10 pm: **Analysis of Geiger-mode APD direct detection ladar receivers,** P. Gatt, Lockheed Martin Coherent Technologies . . . . . [6550-17]

4:20 pm: **Analysis of Geiger-mode APD ladar systems** *(Invited Paper)***,** R. M. Heinrichs, MIT Lincoln Lab. . . . . [6550-18]

Thursday 12 April

SESSION 5

Room: San Antonio . . . . . Thurs. 8:20 to 10:00 am

Imaging through Obscurants I

Chair: **Monte D. Turner**, Defense Advanced Research Projects Agency

8:20 am: **High resolution foliage penetration with gimbaled lidar** *(Invited Paper)***,** M. W. Roth, Johns Hopkins Univ. . . . . [6550-19]

8:50 am: **Sandblaster: addressing the helicopter landing brown-out problem** *(Invited Paper)***,** L. R. Brothers, Defense Advanced Research Projects Agency . . . . . [6550-20]

9:20 am: **Full wave form processing,** A. Ullrich, RIEGL Laser Measurement Systems GmbH (Austria) . . . . . [6550-21]

9:40 am: **Jigsaw phase 3: a miniaturized airborne 3D imaging laser radar with photon-counting sensitivity for foliage penetration,** R. M. Marino, J. E. Drover, R. Hatch, D. R. Schue, R. Freehart, G. Rowe, J. Mooney, MIT Lincoln Lab. . . . . [6550-22]

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

SESSION 6

Room: San Antonio . . . . . Thurs. 10:30 am to 12:10 pm

Imaging through Obscurants II

Chair: **Gary W. Kamerman**, FastMetrix, Inc.

10:30 am: **A texture-based technique for DEM generation from lidar data,** D. Charalampidis, Univ. of New Orleans; K. Alphonso, Diamond Data Systems, Inc. . . . . [6550-23]

10:50 am: **TriDAR for obstacle detection inside aerosol,** X. Zhu, L. Gagnon, S. Gagnon, C. Smith, P. M. Church, Neptec Design Group Ltd. (Canada) [6550-24]

11:10 am: **Performance of laser penetration through forest vegetation,** T. R. Chevalier, O. K. Steinvall, H. Larsson, Swedish Defence Research Agency (Sweden) . . . . . [6550-25]

11:30 am: **Identification of littoral targets with a laser range profiler,** J. C. van den Heuvel, H. H. P. T. Bekman, F. J. M. van Putten, TNO-FEL (Netherlands) . . . . . [6550-26]

11:50 am: **Utilization of full-waveform data in airborne laser scanning applications,** A. Ullrich, N. Studnicka, RIEGL Laser Measurement Systems GmbH (Austria) . . . . . [6550-36]

Lunch/Exhibition Break . . . . . 12:10 to 1:40 pm

SESSION 7

Room: San Antonio . . . . . Thurs. 1:40 to 3:00 pm

Security Applications

Chair: **Monte D. Turner**, Defense Advanced Research Projects Agency

1:40 pm: **Container integrity verification using laser triangulation,** A. Busboom, V. Sequeira, Joint Research Ctr. (Italy) . . . . . [6550-27]

2:00 pm: **A low-cost multi-static, networked approach to 3D ladar for surveillance,** Y. Wang, B. Hu, H. Q. Le, Univ. of Houston . . . . . [6550-29]

2:20 pm: **Detection of small sea-surface targets with a search lidar,** J. C. van den Heuvel, H. H. P. T. Bekman, F. J. M. van Putten, TNO-FEL (Netherlands) . . . . . [6550-30]

2:40 pm: **Long distance open path lidar for small molecules,** S. Wu, California Institute of Technology . . . . . [6550-31]

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

SESSION 8

Room: San Antonio . . . . . Thurs. 3:30 to 4:50 pm

Components

Chair: **Monte D. Turner**, Defense Advanced Research Projects Agency

3:30 pm: **Closed loop optimization of optomechanical structure via mechanical and optical analysis software,** D. Bonin, B. M. McMaster, Corning Tropel Corp. . . . . [6550-32]

3:50 pm: **Progress in laser risk reduction for 1 micron lasers at GSFC,** W. S. Heaps, NASA Goddard Space Flight Ctr. . . . . [6550-33]

4:10 pm: **Progress on 2-micron laser transmitter for space-based wind and carbon dioxide measurements,** U. N. Singh, J. Yu, M. J. Kavaya, NASA Langley Research Ctr. . . . . [6550-34]

4:30 pm: **Improving lifetime of quasi-CW laser diode arrays for pumping 2-micron solid state lasers,** F. Amzajerdian, NASA Langley Research Ctr. [6550-35]

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Atmospheric Propagation IV

Conference Chairs: **Cynthia Y. Young**, Univ. of Central Florida; **G. Charmaine Gilbreath**, Naval Research Lab.

Program Committee: **Larry C. Andrews**, Univ. of Central Florida; **Gary J. Baker**, Lockheed Martin Advanced Technology Ctr.; **Harris R. Burris, Jr.**, Research Support Instruments, Inc.; **Lewis F. DeSandre**, Consultant; **Frank D. Eaton**, Air Force Research Lab.; **Kenneth J. Grant**, Defence Science and Technology Organisation (Australia); **Norman S. Kopeika**, Ben-Gurion Univ. of the Negev (Israel); **Aaron J. Masino**, Science Applications International Corp.; **Christopher I. Moore**, Naval Research Lab.; **Hakki H. Refai**, Univ. of Oklahoma; **Sergio R. 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); **Linda M. Wasiczko**, Naval Research Lab.

Wednesday 11 April

Opening Remarks

Room: San Francisco . . . . . Wed. 1:10 to 1:30 pm

Cynthia Y. Young, Univ. of Central Florida;
G. Charmaine Gilbreath, Naval Research Lab.

SESSION 1

Room: San Francisco . . . . . Wed. 1:30 to 3:00 pm

Turbulence and Threat Impact

Chair: **Sergio R. Restaino**, Naval Research Lab.

1:30 pm: **Dust in the wind: challenges for urban aerodynamics** *(Invited Paper)*, J. Boris, Naval Research Lab. . . . . [6551-01]

2:00 pm: **Predicting radiance obscuration during a high altitude nuclear event using the advanced systems survivability integrated simulation toolkit (ASSIST),** M. A. Johnson, M. Hopkins, S. Sokolsky, The Aerospace Corp. . . . . [6551-02]

2:20 pm: **Worldwide estimates and uncertainty assessments of laser propagation for diverse geometries for paths in the altitude regime of 24 km and below at wavelengths 0.355 to 14 μm,** S. T. Fiorino, R. Bartell, G. P. Perram, M. Krizo, D. Fedyk, S. Cusumano, Air Force Institute of Technology . . . . [6551-03]

2:40 pm: **High-speed communications enabling real-time video for battlefield commanders using tracked FSO,** M. K. Al-Akkoumi, R. C. Huck, J. J. Sluss, Jr., Univ. of Oklahoma . . . . . [6551-04]

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

SESSION 2

Room: San Francisco . . . . . Wed. 3:30 to 4:40 pm

Propagation in Extended Wavelength Regimes

Chair: **Gary G. Gimmestad**, Georgia Tech Research Institute

3:30 pm: **Corrections to published information about atmospheric attenuation between 10 GHz and 1 THz** *(Invited Paper)*, J. C. Wiltse, Georgia Institute of Technology . . . . . [6551-05]

4:00 pm: **Comparison of near to mid infrared (0.9–10 μm) laser propagation through the New York City metro area,** P. A. Corrigan, R. Martini, E. Whittaker, Stevens Institute of Technology; C. Gmachl, Princeton Univ. . . . . [6551-06]

4:20 pm: **Minimization of acquisition time in a wavelength diversified FSO link between mobile platforms,** A. Harris, Univ. of North Florida . . . . . [6551-07]

Break . . . . . 4:40 to 4:50 pm

SESSION 3

Room: San Francisco . . . . . Wed. 4:50 to 6:00 pm

Ground to Space Links

Chair: **Gary J. Baker**, Lockheed Martin Advanced Technology Ctr.

4:50 pm: **PDF model for uplink to space in the presence of beam wander** *(Invited Paper)*, L. C. Andrews, R. L. Phillips, Univ. of Central Florida; R. R. Parenti, R. J. Sasiela, Massachusetts Institute of Technology . . . . . [6551-08]

5:20 pm: **Laser beam propagation in the ground-to-OICETS laser communication experiments,** M. Toyoshima, T. Takahashi, K. Suzuki, S. Kimura, K. Takizawa, T. Kuri, W. Klaus, M. Toyoda, H. Kunimori, National Institute of Information and Communications Technology (Japan); Y. Takayama, T. Jono, K. Arai, Japan Aerospace Exploration Agency (Japan) . . . . . [6551-09]

5:40 pm: **Development of laser beam transmission strategies for future ground-to-space optical communications,** K. E. Wilson, W. T. Roberts, J. M. Kovalik, A. Biswas, Jet Propulsion Lab. . . . . [6551-11]

Thursday 12 April

Opening Remarks

Room: San Francisco . . . . . Thurs. 8:50 to 9:00 am

Cynthia Y. Young, Univ. of Central Florida;
G. Charmaine Gilbreath, Naval Research Lab.

SESSION 4

Room: San Francisco . . . . . Thurs. 9:00 to 10:00 am

Theoretical Studies

Chair: **Linda M. Wasiczko**, Naval Research Lab.

9:00 am: **Demonstration of non-log normal irradiance behavior in weakly-scintillated beams,** G. J. Baker, K. R. Bock, Lockheed Martin Advanced Technology Ctr. . . . . [6551-12]

9:20 am: **A new marine atmospheric spectrum for laser propagation,** K. J. Grayshan, F. E. Strömqvist Vetelino, C. Y. Young, Univ. of Central Florida; K. J. Grant, Defence Science and Technology Organisation (Australia); L. Wasiczkoc, Naval Research Lab.; H. R. Burris, Jr., Research Support Instruments, Inc; C. I. Moore, Naval Research Lab.; R. Mahon, L-3 Titan Group; M. R. Suite, G. C. Gilbreath, Naval Research Lab. . . . . [6551-14]

9:40 am: **Angle of arrival fluctuations for free space laser beam propagation through non Kolmogorov turbulence,** I. Toselli, Politecnico di Torino (Italy); L. C. Andrews, R. L. Phillips, Univ. of Central Florida; V. Ferrero, Politecnico di Torino (Italy) . . . . . [6551-15]

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

SESSION 5

Room: San Francisco . . . . . Thurs. 10:30 am to 12:10 pm

Experimental Studies

Chair: **Harris R. Burris, Jr.**, Research Support Instruments, Inc.

10:30 am: **Atmospheric propagation studies at the U.S. Naval Research Laboratory free-space lasercom test facility,** L. M. Wasiczko, Naval Research Lab. . . . . [6551-16]

10:50 am: **Comparison study of packet error rates and bit error rates at the U.S. Naval Research Laboratory free-space lasercom test facility,** M. R. Suite, Naval Research Lab.; H. R. Burris, Jr., Research Support Instruments, Inc.; C. I. Moore, L. M. Wasiczko, Naval Research Lab.; M. F. Stell, Research Support Instruments, Inc.; R. Mahon, L-3 Communications Titan Group; W. S. Rabinovich, G. C. Gilbreath, W. J. Scharpf, Naval Research Lab. . . . . [6551-17]

11:10 am: **Lidar system for monitoring turbulence profiles,** G. G. Gimmestad, D. W. Roberts, J. M. Stewart, J. W. Wood, Georgia Tech Research Institute . . . . . [6551-18]

11:30 am: **Comparing horizontal path Cn2 measurements over 0.5 km in the tropical littoral environment and in the desert,** E. S. Oh, C. Font, G. C. Gilbreath, Naval Research Lab.; M. Chang, Univ. de Puerto Rico Mayagüez . . . . . [6551-19]

11:50 am: **Characterization of atmospheric turbulence during the NATO RTG-40 land field trials,** D. H. Tofsted, D. Quintis, S. O'Brien, J. Yarbrough, M. Bustillos, Army Research Lab. . . . . [6551-20]

Lunch/Exhibition Break . . . . . 12:10 to 2:00 pm

SESSION 6

Room: San Francisco . . . . . Thurs. 2:00 to 3:00 pm

Mitigation Strategies I

Chair: **Hakki H. Refai**, Univ. of Oklahoma

2:00 pm: **Mitigating angular misalignment from atmospheric effects in FSO links,** P. G. LoPresti, Univ. of Tulsa; H. Refai, J. J. Sluss, Jr., Univ. of Oklahoma . . . . . [6551-22]

2:20 pm: **Patching Cn2 time series data holes using principal component analysis,** M. Chang, H. Nazari, Univ. de Puerto Rico Mayagüez; E. S. Oh, C. Font, G. C. Gilbreath, Naval Research Lab. . . . . [6551-23]

2:40 pm: **Focal plane phase modulation for improved fiber coupling in LaserCom systems,** P. Crabtree, Air Force Research Lab. . . . . [6551-24]

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

SESSION 7

Room: San Francisco . . . . . Thurs. 3:30 to 4:50 pm

Mitigation Strategies II: Technology

Chair: **Aaron J. Masino**, Science Applications International Corp.

3:30 pm: **Fiber bundles in transceivers to mitigate scintillation effects on free-space optical networks,** P. G. LoPresti, Univ. of Tulsa; H. Refai, Univ. of Oklahoma; N. Brooks, Univ. of Tulsa . . . . . [6551-25]

3:50 pm: **Omnidirectional free-space optical (FSO) receivers,** H. H. Refai, J. J. Sluss, Jr., Univ. of Oklahoma; G. A. Cap, Oral Roberts Univ. . . . . [6551-26]

4:10 pm: **Large area, high sensitivity, InGaAs receiver development for free-space lasercom,** H. R. Burris, Jr., Research Support Instruments, Inc.; M. S. Ferraro, Sachs Freeman Associates, Inc.; P. G. Goetz, C. I. Moore, Naval Research Lab.; W. R. Clark, W. D. Waters, OptoGration Inc.; L. M. Wasiczko, M. R. Suite, Naval Research Lab.; M. F. Stell, Research Support Instruments, Inc.; W. S. Rabinovich, Naval Research Lab.; R. Mahon, L-3 Communications Titan Group; G. C. Gilbreath, W. J. Scharpf, Naval Research Lab. . . . . [6551-27]

4:30 pm: **Closed-loop field conjugation using decentralized multi-conjugate adaptive optics,** L. H. Lee, Lockheed Martin Advanced Technology Ctr. [6551-28]

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Monday-Tuesday 9-10 April 2007 • Proceedings of SPIE Vol. 6552

Laser Source Technology for Defense and Security III

Conference Chairs: **Gary L. Wood**, Army Research Lab.; **Mark A. Dubinskii**, Army Research Lab.

Program Committee: **Ishwar D. Aggarwal**, Naval Research Lab.; **Michael A. Bass**, College of Optics and Photonics/Univ. of Central Florida; **Joseph Mangano**, Defense Advanced Research Projects Agency; **Mark Neice**, High Energy Laser Joint Technology Office; **Alan H. Paxton**, Air Force Research Lab.; **Stephen G. Post**, Missile Defense Agency

Monday 9 April

SESSION 1

Room: San Antonio . . . . . Mon. 8:00 to 10:30 am

High Power Lasers and Advanced Thermal Management

Chair: **Gary L. Wood**, Army Research Lab.

8:00 am: **Two-micron thulium-pumped-holmium laser source for DIRCM applications** *(Invited Paper)*, W. L. Bohn, G. Renz, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [6552-01]

8:30 am: **HEL laser amplifier slab development and fabrication,** P. K. Hogan, R. L. Gentilman, M. Holz, Raytheon Co. . . . . [6552-02]

8:50 am: **Strategic illuminator (SILL) laser: provides state-of-the-art power and beam quality at 5 kHz,** G. P. Brossus, R. St. Pierre, J. Guerin, H. Injeyan, J. Jackson, Northrop Grumman Space Technology . . . . . [6552-03]

9:10 am: **Evolution of a solid state laser,** R. M. Yamamoto, C. D. Boley, K. P. Cutter, S. N. Fochs, K. N. LaFortune, Lawrence Livermore National Lab.; J. M. Parker, Lawrence Livermore National Lab; P. H. Pax, M. D. Rotter, A. M. Rubenchik, Lawrence Livermore National Lab.; T. F. Soules, Lawrence Livermore National Lab . . . . . [6552-04]

9:30 am: **The reflective properties of a volume Bragg grating exposed to a high power laser beam,** H. Shu, M. A. Bass, College of Optics & Photonics/Univ. of Central Florida . . . . . [6552-05]

9:50 am: **A silicon carbide face cooled ceramic Nd:YAG laser,** G. A. Newburgh, M. A. Dubinskii, Army Research Lab. . . . . [6552-06]

10:10 am: **AFB® CVD diamond composites with laser materials,** H. Lee, H. E. Meissner, Onyx Optics Inc. . . . . [6552-07]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 2

Room: San Antonio . . . . . Mon. 11:00 am to 12:10 pm

New Lasers and Ceramic Laser Materials I

Chair: **Michael A. Bass**, College of Optics & Photonics/Univ. of Central Florida

11:00 am: **Progress in Nd:YAG ceramic laser** *(Invited Paper)*, A. Ikesue, Y. L. Aung, Poly-Techno Co., Ltd. (Japan) . . . . . [6552-08]

11:30 am: **Transparent Yb3+:Y2O3 ceramic laser materials,** I. D. Aggarwal, J. S. Sanghera, G. R. Villalobos, W. Kim, L. B. Shaw, S. S. Bayya, Naval Research Lab.; B. Sadowski, Sachs Freeman Associates, Inc.; R. E. Miklos, Naval Research Lab. . . . . [6552-09]

11:50 am: **Domestically produced ceramic YAG laser gain material for high power SSLs,** J. C. Huie, R. Gentilman, T. S. Stefanik, Raytheon Co. . . . [6552-10]

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

SESSION 3

Room: San Antonio . . . . . Mon. 1:30 to 3:10 pm

New Lasers and Ceramic Laser Materials II

Chair: **Michael A. Bass**, College of Optics & Photonics/Univ. of Central Florida

1:30 pm: **Line tunable visible and ultraviolet laser,** N. P. Barnes, B. M. Walsh, NASA Langley Research Ctr. . . . . [6552-11]

1:50 pm: **Novel high-power CW Yb:YAG cryogenic laser,** D. C. Brown, J. M. Singley, E. D. Yager, J. W. Kuper, L. L. Bennett, B. J. Lotito, Snake Creek Lasers, LLC . . . . . [6552-12]

2:10 pm: **High brightness-temperature micro-lasers,** T. Taira, Institute for Molecular Science (Japan) . . . . . [6552-13]

2:30 pm: **Performance and applications of optically-pumped semiconductor lasers,** L. E. Hunziker, C. Ihli, J. L. A. Chilla, Q. Shu, E. S. Weiss, H. Zhou, J. Lofthouse-Zeis, Coherent, Inc. . . . . [6552-14]

2:50 pm: **Compact laser sources for laser designation, ranging and active imaging,** L. Goldberg, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6552-15]

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

SESSION 4

Room: San Antonio . . . . . Mon. 3:40 to 5:40 pm

Eye-Safe Er-Doped Laser Development

Chair: **Stephen G. Post**, Missile Defense Agency

3:40 pm: **Eyesafe diffraction-limited single-frequency 1 ns pulsewidth Er:YAG laser transmitter,** R. C. Stoneman, R. Hartman, E. A. Schneider, C. G. Garvin, S. W. Henderson, Lockheed Martin Coherent Technologies . . . . . [6552-16]

4:00 pm: **A 100mJ Q-switched 1645nm Er:YAG laser,** S. D. Setzler, M. Francis, E. P. Chicklis, BAE Systems . . . . . [6552-17]

4:20 pm: **Experimental and modeling study of Er:YAG kinetics,** H. P. Chou, D. O. Hogenboom, Textron Systems Corp. . . . . [6552-18]

4:40 pm: **Latest developments in resonantly diode-pumped Er:YAG lasers,** I. Kudryashov, D. Garbuzov, Princeton Lightwave Corp.; M. A. Dubinskii, Army Research Lab. . . . . [6552-19]

5:00 pm: **Scalable ultra-low quantum defect Er lasers,** K. Spariosu, M. Cashen, V. Leyva, R. A. Reeder, Raytheon Space and Airborne Systems . . . . . [6552-20]

5:20 pm: **Ultra-low photon defect diode-pumped cryo-cooled Er:YAG laser,** M. A. Dubinskii, N. Ter-Gabrielyan, M. B. Camargo, L. D. Merkle, G. A. Newburgh, Army Research Lab. . . . . [6552-21]

Tuesday 10 April

SESSION 5

Room: San Antonio . . . . . Tues. 8:00 to 10:30 am

Fiber Laser Development

Chair: **Ishwar D. Aggarwal**, Naval Research Lab.

8:00 am: **High efficiency, monolithic LMA fiber lasers and amplifiers operating at 1 micron and 2 micron wavelengths** *(Invited Paper)*, B. N. Samson, Q. Wang, D. P. Machewirth, K. Tankala, M. O'Connor, A. Carter, G. Frith, Nufern . . . . . [6552-22]

8:30 am: **522 W spectrally beam combined fiber laser with near diffraction limited beam quality,** T. H. Loftus, P. R. Hoffman, A. M. Thomas, M. A. Norsen, R. Royse, E. Honea, Aculight Corp. . . . . [6552-23]

8:50 am: **Broadly tunable, high peak power, pulsed fiber laser system for mid-IR applications,** V. V. Ter-Mikirtychev, J. B. Paul, J. J. Scherer, NovaWave Technologies, Inc. . . . . [6552-24]

9:10 am: **High peak power Yb-doped diode pumped fiber amplifier system,** P. Madasamy, F. Kimpel, W. E. Torruellas, Fibertek, Inc. . . . . [6552-25]

9:30 am: **A novel side coupling technique for rugged all-fiber lasers and amplifiers,** Y. Sintov, Y. Glick, Y. Nafcha, O. Katz, T. Koplowitch, R. Lavi, Soreq Nuclear Research Ctr. (Israel) . . . . . [6552-26]

9:50 am: **1-2μm high average power fiber sources,** D. V. Gapontsev, IPG Photonics Corp. . . . . [6552-27]

10:10 am: **High peak power eye-safe coherent EYDFA laser source,** Y. Chen, B. Matheson, W. E. Torruellas, Fibertek, Inc.; J. Faroni, N. Jacobson, K. Tankala, Nufern . . . . . [6552-28]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 6

Room: San Antonio . . . . . Tues. 11:00 am to 12:10 pm

Laser Spectroscopy, Nonlinear Materials, and Novel Laser Architectures

Chair: **Mark Dubinskii**, Army Research Lab.

11:00 am: **Performance enhancement and reduction of heat generation in Nd lasers** *(Invited Paper)*, V. Lupei, Institute of Atomic Physics (Romania); N. A. Pavel, Institute for Molecular Science (Romania) . . . . . [6552-30]

11:30 am: **Room-temperature, near-IR fluorescence of high optical quality KTP,** K. L. Schepler, Air Force Research Lab.; S. M. Hegde, Univ. of Dayton; R. D. Peterson, D. E. Zelmon, Air Force Research Lab. . . . . [6552-31]

11:50 am: **Architectural issues and designs in creating high energy fiber lasers,** D. L. Sipes, Jr., Optical Engines . . . . . [6552-53]

Lunch/Exhibition Break . . . . . 12:10 to 1:40 pm

SESSION 7

Room: San Antonio . . . . . Tues. 1:40 to 3:00 pm

Tunable Lasers, Laser Spectroscopy, and Nonlinear Materials

Chair: **Mark Dubinskii**, Army Research Lab.

1:40 pm: **Walk-off correction using AFB® similar nonlinear crystal composites,** H. Lee, H. E. Meissner, Onyx Optics Inc. . . . . [6552-32]

2:00 pm: **Recent progress in transition metal doped II-VI mid-IR lasers,** S. B. Mirov, V. V. Fedorov, I. S. Moskalev, The Univ. of Alabama/Birmingham . [6552-33]

2:20 pm: **Raman scattering spectroscopy for explosives identification: trend to UV excitation,** L. Nagli, Tel Aviv Univ. (Israel); M. Gaft, Laser Detect Systems, Ltd. (Israel) . . . . . [6552-34]

2:40 pm: **High-power, single-frequency, tunable, CW, Er-fiber laser pumped Cr2+:ZnSe laser,** I. S. Moskalev, V. V. Fedorov, S. B. Mirov, The Univ. of Alabama/Birmingham . . . . . [6552-36]

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

SESSION 8

Room: San Antonio . . . . . Tues. 3:30 to 5:30 pm

Diode Pump Technology Development

Chair: **Mark Neice**, High Energy Laser Joint Technology Office

3:30 pm: **Fiber-coupled diode laser systems for high-power and high-brightness applications,** D. M. Grasso, S. D. Roh, N. P. Ostrom, B. O. Faircloth, Nuvonyx, Inc. . . . . [6552-37]

3:50 pm: **High brightness semiconductor lasers from 780-1064nm,** P. T. Rudy, M. L. Osowski, R. M. Lammert, T. S. Stakelon, C. Panja, S. W. Oh, J. E. Ungar, QPC Lasers, Inc. . . . . [6552-38]

4:10 pm: **High brightness semiconductor lasers at 1300-1600 nm and beyond,** P. T. Rudy, M. L. Osowski, R. M. Lammert, C. Panja, S. W. Oh, T. S. Stakelon, J. E. Ungar, QPC Lasers, Inc. . . . . [6552-39]

4:30 pm: **Recent developments in high power 2.3 μm diode lasers,** L. Shterengas, Stony Brook Univ.; J. G. Kim, Sarnoff Corp.; D. Westerfeld, G. L. Belenky, Stony Brook Univ. . . . . [6552-40]

4:50 pm: **High power wavelength-beam-combined diode arrays,** M. Kanskar, V. Zhao, Alfalight, Inc.; B. Chann, R. L. Aggarwal, T. Y. Fan, MIT Lincoln Lab. . . . . [6552-41]

5:10 pm: **Room temperature high power mid-IR diode laser bars for atmospheric sensing applications,** S. Patterson, W. Dong, M. Grimshaw, P. Crump, nLight Corp. . . . . [6552-42]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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-show and their manuscript 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.

✔ **Time-dependent model of eye-safe erbium-doped YAG laser,** B. Zandi, Army Research Lab.; J. B. Gruber, The Univ. of Texas at San Antonio; A. S. Nijjar, San José State Univ.; R. C. Lee, Georgia Institute of Technology; M. B. Camargo, MegaWatt Lasers, Inc.; J. O. White, Army Research Lab. . . . . [6552-44]

✔ **Thermal lensing in high power solar pumped solid state lasers,** S. Payziyev, ACADEMPRIBOR Scientific and Production Association (Uzbekistan) . . . . . [6552-45]

✔ **Dense spectral beam combining for high power laser applications,** O. G. Andrusyak, I. V. Ciapurin, A. Sevian, College of Optics & Photonics/Univ. of Central Florida; V. I. Smirnov, OptiGrate; G. B. Venus, L. B. Glebov, College of Optics & Photonics/Univ. of Central Florida . . . . . [6552-46]

✔ **1-W laser diode spectrally narrowed to 10 GHz,** A. Gourevitch, G. B. Venus, L. B. Glebov, College of Optics & Photonics/Univ. of Central Florida . [6552-47]

✔ **The progress towards the transparent ceramics fabrication,** Y. A. Barnakov, Z. W. Kabato, G. Zhu, Norfolk State Univ. . . . . [6552-48]

✔ **Fast-tuning narrow-linewidth all polarization-maintaining fiber ring laser,** Z. Meng, Y. M. Hu, Z. Hu, S. Xiong, C. Cao, National Univ. of Defense Technology (China) . . . . . [6552-49]

✔ **Spectroscopic characterization of ceramic laser materials for high-performance solid-state lasers,** V. Lupei, A. Lupei, C. Gheorghe, Institute of Atomic Physics (Romania); A. Ikesue, Poly-Techno Co., Ltd. (Japan) . [6552-51]

✔ **Development of robust solder processes for reliable high power bars enables 70-W on-off output at 50C case from passivated 8xx-nm bars hard soldered to CTE matched passively cooled heatsinks,** J. Wang, M. DeFranza, A. L. Hodges, B. D. Vivian, C. Johnson, D. Wise, V. Liu, M. A. DeVito, R. J. Martinsen, J. Bell, nLight Corp. . . . . [6552-52]

Monday-Thursday 9-12 April 2007 • Proceedings of SPIE Vol. 6553

Detection and Remediation Technologies for Mines and Minelike Targets XII

Conference Chairs: **Russell S. Harmon**, U.S. Army Research Office; **J. Thomas Broach**, U.S. Army RDECOM CERDEC NVESD; **John H. Holloway, Jr.**, Naval Surface Warfare Ctr. Panama City

Program Committee: **Leslie M. Collins**, Duke Univ.; **Yogadhish 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); **Kevin A. O'Neill**, U.S. Army Engineer Research and Development Ctr.; **Nicola A. Playle**, Defence Science and Technology Lab. (United Kingdom); **James M. Ralston**, Institute for Defense Analyses; **James M. Sabatier**, The Univ. of Mississippi; **Motoyuki Sato**, Tohoku Univ. (Japan); **Miranda A. Schatten**, U.S. Army RDECOM CERDEC NVESD; **Waymond R. Scott, Jr.**, Georgia Institute of Technology; **Stefan K. Sjökvist**, Swedish Defence Research Agency (Sweden); **Richard C. Weaver**, U.S. Army RDECOM CERDEC NVESD

Monday 9 April

SESSION 1

Room: Chicago/Denver . . . . . Mon. 8:30 to 9:50 am

Acoustics

Chairs: **James M. Sabatier**, The Univ. of Mississippi; **Steven S. Bishop**, U.S. Army Night Vision & Electronic Sensors Directorate

8:30 am: **Surface velocity phases of the seismic/acoustic ratio and buried landmines,** J. M. Sabatier, G. M. Matalkah, G. Broussard, R. Lirette, C. McNeill, The Univ. of Mississippi . . . . . [6553-01]

8:50 am: **Adaptive CFAR detection algorithm for acoustic-seismic landmine detection,** G. M. Matalkah, M. Matalgah, J. M. Sabatier, The Univ. of Mississippi . . . . . [6553-02]

9:10 am: **Direct mechanical landmine excitation with LDV surface measurements,** S. S. Bishop, U.S. Army Night Vision & Electronic Sensors Directorate; P. Tsopelas, J. A. Judge, J. F. Vignola, The Catholic Univ. of America . . . . . [6553-03]

9:30 am: **Basic experiments on seismo-acoustic waves, interacting with subsurface cylindrical voids and ground-surface sensors,** T. G. Muir, R. Mack, J. M. Sabatier, The Univ. of Mississippi . . . . . [6553-05]

Coffee Break . . . . . 9:50 to 10:30 am

SESSION 2

Room: Chicago/Denver . . . . . Mon. 10:30 am to 12:10 pm

Electromagnetic Induction I

Chairs: **Juan P. Fernández**, Dartmouth College; **Fridon Shubitidze**, Dartmouth College

10:30 am: **Effects of magnetic soil on metal detectors: preliminary experimental results,** Y. Das, Defence Research and Development Canada (Canada) . . . . . [6553-06]

10:50 am: **Toward a model for predicting the magnetic susceptibility of bedrock regolith,** B. J. Harrison, New Mexico Institute of Mining and Technology; R. L. Van Dam, Michigan State Univ.; J. M. H. Hendrickx, New Mexico Institute of Mining and Technology . . . . . [6553-07]

11:10 am: **Estimating soil's effective magnetic susceptible from EMI data,** I. Shamatava, Dartmouth College; B. E. Barrowes, U.S. Army Engineer Research and Development Ctr.; F. Shubitidze, Dartmouth College; K. A. O'Neill, U.S. Army Engineer Research and Development Ctr.; K. Sun, J. P. Fernández, Dartmouth College . . . . . [6553-08]

11:30 am: **Evaluation of the Geonics EM-63 time-domain metal detector/ discriminator,** L. S. Riggs, Auburn Univ.; B. E. Barrowes, K. A. O'Neill, U.S. Army Engineer Research and Development Ctr. . . . . [6553-09]

11:50 am: **Broadband electromagnetic induction sensor,** W. R. Scott, Jr., G. D. Larson, Georgia Institute of Technology . . . . . [6553-10]

Lunch Break . . . . . 12:10 to 1:20 pm

SESSION 3

Room: Chicago/Denver . . . . . Mon. 1:20 to 3:00 pm

Electromagnetic Induction II

Chairs: **Russell S. Harmon**, U.S. Army Research Office; **Yogadhish Das**, Defence Research and Development Canada (Canada)

1:20 pm: **Inferring the location of buried UXO using a support vector machine,** J. P. Fernández, Dartmouth College; B. E. Barrowes, K. A. O'Neill, U.S. Army Engineer Research and Development Ctr.; K. D. Paulsen, I. Shamatava, F. Shubitidze, K. Sun, Dartmouth College . . . . . [6553-11]

1:40 pm: **Buried metalic object identification by EMI sensor,** M. Sezgin, TÜBITAK Marmara Research Ctr. (Turkey) . . . . . [6553-12]

2:00 pm: **Performance of a four-parameter model for landmine signatures in frequency domain wideband electromagnetic induction detection systems,** E. Fails, Duke Univ. Chapter; P. A. Torrione, L. M. Collins, Duke Univ. . . . [6553-13]

2:20 pm: **A combined NSMC and Pole series expansion approach for UXO discrimination,** F. Shubitidze, Dartmouth College; B. E. Barrowes, K. A. O'Neill, U.S. Army Engineer Research and Development Ctr; I. Shamatava, J. P. Fernández, K. Sun, Dartmouth College . . . . . [6553-14]

2:40 pm: **NSMC for UXO discrimination in cases with overlapping signatures,** F. Shubitidze, Dartmouth College; B. E. Barrowes, K. A. O'Neill, U.S. Army Engineer Research and Development Ctr.; I. Shamatava, K. Sun, J. P. Fernández, Dartmouth College . . . . . [6553-15]

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

SESSION 4

Room: Chicago/Denver . . . . . Mon. 3:30 to 6:00 pm

Radar

Chairs: **James M. Ralston**, Institute for Defense Analyses; **Francis Navish III**, U.S. Army Night Vision & Electronic Sensors Directorate

3:30 pm: **An assessment of the fundamental performance of GPR against buried landmines** *(Invited Paper)***,** D. J. Daniels, ERA Technology Ltd. (United Kingdom) . . . . . [6553-16]

4:00 pm: **Obstacle avoidance and concealed target detection using the Army Research Lab Ultra-Wideband Synchronous Impulse Reconstruction (UWB SIRE) forward imaging radar,** L. H. Nguyen, D. C. Wong, M. A. Ressler, F. Koenig, B. Stanton, G. M. Smith, J. P. Sichina, K. A. Kappra, Army Research Lab. . . . . [6553-17]

4:20 pm: **Fusion of disturbed soil feature for down-looking ground-penetrating radar mine detection,** E. M. Rosen, E. Ayers, Institute for Defense Analyses . . . . . [6553-18]

4:40 pm: **Improvements based on ground penetration radar field evaluations in Angola,** F. Navish III, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6553-19]

5:00 pm: **Preliminary measurements of ruffled water surface, snow, and bare soil microwave reflective and emissive characteristics polarization and correlative features by polarimetric, combined scatterometer-radiometer system of 15GHz,** A. K. Arakelyan, A. A. Arakelyan, A. K. Hambaryan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia); S. F. Clifford, CIRES . . . . . [6553-20]

5:20 pm: **Preliminary measurements of ruffled water surface microwave reflective and emissive characteristics results of spatio-temporally combined, microwave active-passive of bare and vegetated soil, snow and water surface at 5.6 GHz,** A. K. Hambaryan, A. K. Arakelyan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia) . . . . . [6553-21]

5:40 pm: **ICA analysis of polarization data in microwave X band region for detection of shallow buried non-metallic dummy landmines without explosives.,** K. C. Tiwari, D. Singh, M. Arora, Indian Institute of Technology Roorkee (India) . . . . . [6553-22]

Tuesday 10 April

SESSION 5

Room: Chicago/Denver . . . . . Tues. 8:40 to 10:00 am

Littoral Studies I

Chairs: **Gerald J. Dobeck**, Naval Surface Warfare Ctr.; **Jason R. Stack**, Naval Surface Warfare Ctr.

8:40 am: **Multisensor, multi-environment learning for underwater object classification,** J. R. Stack, F. J. Crosby, Naval Surface Warfare Ctr.; Y. Hue, L. Carin, Duke Univ. . . . . [6553-23]

9:00 am: **Underwater magnetic gradiometer for magnetic anomaly detection, localization, and tracking,** S. Kumar, D. C. Skvoretz, M. J. Ebbert, S. L. Bennett, A. Tzouris, Quantum Magnetics, Inc.; G. S. Sulzberger, J. T. Bono, G. I. Allen, T. R. Clem, Naval Surface Warfare Ctr. . . . . [6553-24]

9:20 am: **Dynamic tree segmentation of side-scan sonar imagery,** J. T. Cobb, Naval Surface Warfare Ctr.; K. C. Slatton, Univ. of Florida; G. J. Dobeck, Naval Surface Warfare Ctr. . . . . [6553-25]

9:40 am: **Underwater target classification using the wing BOSS and Bayesian sampling-based decision fusion,** N. S. Wachowski, M. R. Azimi-Sadjadi, Colorado State Univ. . . . . [6553-26]

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

SESSION 6

Room: Chicago/Denver . . . . . Tues. 10:30 to 11:50 am

Littoral Studies II

Chairs: **Gerald J. Dobeck**, Naval Surface Warfare Ctr.; **James T. Cobb**, Naval Surface Warfare Ctr.

10:30 am: **Automated sea mine detection, classification, and fusion in high-resolution sonar imagery,** G. J. Dobeck, Naval Surface Warfare Ctr. . . [6553-27]

10:50 am: **Nonlinear feature fusion of processing strings for automated sea-mine classification in HF and BB SAS imagery in shallow water,** T. Aridgides, M. F. Fernández, Lockheed Martin Corp. . . . . [6553-28]

11:10 am: **Impact of image decimation and quantization on the performance of sonar computer-aided detection/computer-aided classification (CAD/CAC) algorithms,** C. M. Ciany, W. C. Zurawski, Raytheon Co. . . . [6553-29]

11:30 am: **Coherent-based feature extraction for detection and classification of underwater objects from sonar imagery,** M. R. Azimi-Sadjadi, J. D. Tucker, Colorado State Univ. . . . . [6553-30]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 7

Room: Chicago/Denver . . . . . Tues. 1:30 to 2:30 pm

Spectral Sensing I

Chairs: **Miranda A. Schatten**, U.S. Army Night Vision & Electronic Sensors Directorate; **John E. McFee**, Defence Research and Development Canada (Canada)

1:30 pm: **Image processing of landmines,** D. J. Daniels, R. Allan, S. Jennings, ERA Technology Ltd. (United Kingdom) . . . . . [6553-31]

1:50 pm: **HYDRUS simulations of surface temperatures,** J. Kleissl, Univ. of California/San Diego and New Mexico Institute of Mining and Technology; J. M. H. Hendrickx, New Mexico Institute of Mining and Technology; J. Simunek, Univ. of California/Riverside . . . . . [6553-32]

2:10 pm: **Assessments of phenomenologies for multi-optical mine detection,** S. K. Sjökvist, M. S. G. Uppsäll, D. Letalick, Swedish Defence Research Agency (Sweden) . . . . . [6553-33]

SESSION 8

Room: Chicago/Denver . . . . . Tues. 2:30 to 5:00 pm

Spectral Sensing II

Chairs: **J. Michael Cathcart**, Georgia Institute of Technology; **Eduardo H. Castro**, Univ. de Buenos Aires (Argentina)

2:30 pm: **Buried mine detection in airborne imagery using co-occurrence texture features,** S. Tiwari, S. Agarwal, Univ. of Missouri/Rolla; A. H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6553-35]

2:50 pm: **Multiclassifier buried mine detection using MWIR images,** B. Ling, Migma Systems, Inc.; A. H. Trang, US Army RDECOM CERDEC NVESD [6553-36]

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

3:40 pm: **Processed infrared images of plastic and metallic landmines in an Argentine project,** E. H. Castro, H. A. Abbate, Univ. de Buenos Aires (Argentina) and Instituto de Investigaciones Científicas y Técnicas de las FFAA (Argentina); M. Costanzo, Instituto de Investigaciones Científicas y Técnicas de las FFAA (Argentina); M. E. Mejail, J. Gambini, J. C. Jacobo Berllés, J. M. Santos, P. Borensztejn, Univ. de Buenos Aires (Argentina) . . . . . [6553-37]

4:00 pm: **Landmine detection using B-spline deformable contours in IR images,** M. E. Mejail, J. Gambini, M. E. Buemi, E. H. Castro, H. A. Abbate, J. C. Jacobo Berllés, P. M. Borenstjn, J. M. Santos, Univ. de Buenos Aires (Argentina) . . . . . [6553-38]

4:20 pm: **A novel patterned and unpatterned minefield detection in cluttered environments using Markov marked point process,** A. H. Trang, J. T. Broach, T. E. Smith, U.S. Army Night Vision & Electronic Sensors Directorate; S. Agarwal, Univ. of Missouri/Rolla; P. Regalia, The Catholic Univ. of America . . . . . [6553-39]

4:40 pm: **Trial of a vehicle-mounted UK electro-optic countermine sensor system as part of a UK/US collaborative program,** R. M. Deas, N. A. Playle, K. Long, Defence Science and Technology Lab. (United Kingdom) . . . . . [6553-86]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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-show and their manuscript 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.

✔ **Influence of environmental conditions in fate and transport of ERCs in a physical 3D model: spatial and temporal assessment effects in a sandy soil,** A. A. Anaya, I. Y. Padilla, Univ. de Puerto Rico Mayagüez . . . . . [6553-82]

✔ **Vapor sampling of ERCs for environmental assessment in atmospheric and soil settings,** D. Acevedo, A. A. Anaya, O. Carrasquillo, I. Y. Padilla, Univ. de Puerto Rico Mayagüez . . . . . [6553-83]

✔ **Angular and intensity dependence of NQR remote explosive detection,** G. Ota, H. Itozaki, Osaka Univ. (Japan) . . . . . [6553-84]

✔ **Physical modeling of 2,4-DNT gaseous diffusion through unsaturated soil,** A. Torres, I. Y. Padilla, Univ. de Puerto Rico Mayagüez . . . . . [6553-85]

Wednesday 11 April

SESSION 9

Room: Chicago/Denver . . . . . Wed. 8:00 to 9:40 am

Spectral Sensing III

Chairs: **Saurabh Agarwal**, Univ. of Missouri/Rolla;
Edwin M. Winter, Technical Research Associates, Inc.

8:00 am: **Real-time airborne hyperspectral imaging of landmines,** T. A. Ivanco, S. B. Achal, ITRES Research Ltd. (Canada); J. E. McFee, Defence Research and Development Canada (Canada); C. D. Anger, ITRES Research Ltd. (Canada) . . . . . [6553-40]

8:20 am: **A thermal hyperspectral imager (tasi) for buried landmine detection,** S. B. Achal, ITRES Research Ltd. (Canada); J. E. McFee, Defence Research and Development Canada (Canada); T. A. Ivanco, C. D. Anger, ITRES Research Ltd. (Canada) . . . . . [6553-41]

8:40 am: **Development of a terrain surface model for optical property computation,** J. M. Cathcart, D. Cash, B. Remesch, Georgia Institute of Technology . . . . . [6553-42]

9:00 am: **Methods for determining best multispectral bands using hyperspectral data,** E. M. Winter, Technical Research Associates, Inc. . [6553-43]

9:20 am: **SPICE: a sparsity promoting iterated constrained endmember extraction algorithm with applications to landmine detection from hyperspectral imagery,** A. Zare, P. D. Gader, Univ. of Florida . . . . . [6553-44]

Coffee Break . . . . . 9:40 to 10:30 am

SESSION 10

Room: Chicago/Denver . . . . . Wed. 10:30 am to 12:20 pm

Multisensor, Systems, and Testing II

Chair: **Mark C. Locke**,
U.S. Army Night Vision & Electronic Sensors Directorate

10:30 am: **Handheld standoff mine detection system (HSTAMIDS) operational field evaluation in Cambodia** *(Invited Paper)***,** R. C. Doheny, Office of Assistant Secretary of Defense; S. P. Burke, R. Cresci, P. Ngan, C. E. Walk, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6553-45]

11:00 am: **MINEHOUND: transition to production,** D. J. Daniels, P. Curtis, N. Hunt, ERA Technology Ltd. (United Kingdom) . . . . . [6553-46]

11:20 am: **The development of the hand-held dual-sensor ALIS,** M. Sato, K. Takahashi, Tohoku Univ. (Japan) . . . . . [6553-47]

11:40 am: **The evaluation test of hand-held dual-sensor ALIS in Croatia and Cambodia,** M. Sato, K. Takahashi, A. G. Gorriti, Tohoku Univ. (Japan) . . [6553-48]

12:00 pm: **Test and evaluation of Japanese GPR-EMI dual-sensor systems at Benkovac Test Site in Croatia,** J. Ishikawa, Japan Science and Technology Agency (Japan) and Tokyo Denki Univ. (Japan); K. Furuta, Tokyo Denki Univ. (Japan); N. Pavkovic, Ctr. for Testing Development and Training (Croatia) [6553-49]

Lunch/Exhibition Break . . . . . 12:20 to 1:20 pm

SESSION 11

Room: Chicago/Denver . . . . . Wed. 1:20 to 3:00 pm

Multisensor, Systems, and Testing II

Chairs: **Motoyuki Sato**, Tohoku Univ. (Japan); **Roger Cresci**, U.S. Army Night Vision & Electronic Sensors Directorate

1:20 pm: **Automated calibration methods for robotic multisensor landmine detection,** J. Keranen, J. Miller, G. Shultz, Applied Research Associates, Inc.; Z. J. Topolosky, U.S. Army Night Vision & Electronic Sensors Directorate [6553-50]

1:40 pm: **Imaging of buried targets using seismic and ground-penetrating radar data,** T. W. Counts, G. D. Larson, A. C. Gurbuz, J. H. McClellan, W. R. Scott, Jr., Georgia Institute of Technology . . . . . [6553-51]

2:00 pm: **Visual cues for landmine detection,** J. J. Staszewski, Carnegie Mellon Univ.; A. Davison, Army Research Lab. . . . . [6553-52]

2:20 pm: **NATO-SCI-133 guides for planning and reporting tests of countermine equipment,** R. H. M. A. Schleijpen, TNO (Netherlands); H. E. Bertrand, Institute for Defense Analyses . . . . . [6553-53]

2:40 pm: **An investigation into landmine neutralisation techniques for a vehicle-mounted countermine system,** D. Lockley, Defence Science and Technology Lab. (United Kingdom) . . . . . [6553-54]

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

SESSION 12

Room: Chicago/Denver . . . . . Wed. 3:30 to 4:50 pm

Explosive Detection I: Environmental

Chairs: **Ingrid Y. Padilla**, Univ. de Puerto Rico Mayagüez;
Aaron La Pointe, U.S. Army Night Vision & Electronic Sensors Directorate

3:30 pm: **Transport of explosive related chemicals from a point source,** I. Y. Padilla, J. P. Gutierrez, M. d. L. Irizarry, A. Torres, S. Hwang, Univ. de Puerto Rico Mayagüez . . . . . [6553-55]

3:50 pm: **Adsorption coefficients for TNT on soil and clay minerals,** N. Mina, R. Rivera, M. A. Muñoz, Univ. de Puerto Rico Mayagüez . . . . . [6553-56]

4:10 pm: **Development of a multiscale packing methodology for evaluating fate and transport processes of explosive-related chemicals in clayey soils,** S. Rodriguez, I. Y. Padilla, S. Hwang, Univ. de Puerto Rico Mayagüez . . [6553-57]

4:30 pm: **Effect of environmental parameters on the chemical signature of TNT in soil,** M. Irrazábal-Aguilera, Univ. de Puerto Rico Mayagüez . . . . [6553-59]

Thursday 12 April

SESSION 13

Room: Chicago/Denver . . . . . Thurs. 8:00 to 10:00 am

Explosive Detection II

Chairs: **Russell S. Harmon**, U.S. Army Research Office;
Yunping Yang, Physical Optics Corp.

8:00 am: **False alarm reduction during landmine detection,** P. J. Prado, L. Doraisamy, G. A. Barrall, A. Chongpison, K. Derby, N. Rusakov, GE Security . . . . . [6553-60]

8:20 am: **Research and development of humanitarian landmine detection system by a compact discharge-type fusion neutron source,** K. Yoshikawa, K. Masuda, T. Takamatsu, S. Shiroya, T. Misawa, Y. Takahashi, Kyoto Univ. (Japan); E. Hotta, K. Yamauchi, Tokyo Institute of Technology (Japan); M. Ohnishi, H. Osawa, Kansai Univ. (Japan) . . . . . [6553-61]

8:40 am: **Development of NQR explosive detector in Japan,** H. Itozaki, Osaka Univ. (Japan) and National Institute for Materials Science (Japan); G. Ota, Osaka Univ. (Japan); M. Tachiki, D. He, National Institute for Materials Science (Japan) . . . . . [6553-62]

9:00 am: **Portable LIBS and Raman spectroscopy standoff chemical analysis system,** Y. Yang, R. D. Pradhan, R. M. Kurtz, N. V. Menon, G. D. Savant, Physical Optics Corp. . . . . [6553-63]

9:20 am: **Femtosecond laser-induced breakdown spectroscopy and femtosecond laser mass spectrometry of explosives,** Y. Dikmelik, C. McEnnis, J. B. Spicer, Johns Hopkins Univ. . . . . [6553-64]

9:40 am: **Development of HPLC-SPME methodology for detection of nitro-explosives,** S. P. Hernández-Rivera, S. L. Peña, E. de la Cruz-Montoya, Univ. de Puerto Rico Mayagüez . . . . . [6553-65]

Coffee Break . . . . . 10:00 to 10:20 am

SESSION 14

Room: Chicago/Denver . . . . . Thurs. 10:20 am to 12:20 pm

Signal Processing I: Fusion

Chairs: **Paul D. Gader**, Univ. of Florida;
Richard C. Weaver, U.S. Army Night Vision &
Electronic Sensors Directorate

10:20 am: **Managing landmine detection sensors: results from application to AMDS data,** M. P. Kolba, L. M. Collins, Duke Univ. . . . . [6553-66]

10:40 am: **Landmine-detection prescreeners based on feature-level fusion of SAR and HSI data,** K. I. Ranney, Army Research Lab. . . . . [6553-67]

11:00 am: **Confidence level fusion of edge histogram descriptor, hidden Markov model, and spectral correlation feature,** D. K. C. Ho, Univ. of Missouri/Columbia; P. D. Gader, Univ. of Florida; H. Frigui, Univ. of Louisville; J. N. Wilson, Univ. of Florida . . . . . [6553-68]

11:20 am: **Context-dependent fusion for landmine detection with ground-penetrating radar,** H. Frigui, L. Zhang, Univ. of Louisville; P. D. Gader, Univ. of Florida; D. K. C. Ho, Univ. of Missouri . . . . . [6553-69]

11:40 am: **Use of the Borda count for landmine discriminator fusion,** J. N. Wilson, P. D. Gader, Univ. of Florida . . . . . [6553-70]

12:00 pm: **Land mine detection applying holographic neural technology (HNeT),** J. G. Sutherland, AND Corp. (Canada); W. C. Radzelovage, Raytheon Co. . . . . [6553-88]

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

SESSION 15

Room: Chicago/Denver . . . . . Thurs. 1:20 to 3:00 pm

Signal Processing II

Chairs: **Peter A. Torrione**, Duke Univ.;
Kenneth I. Ranney, Army Research Lab.

1:20 pm: **Segmentation of labeled GPR data for improved training,** L. Carin, Duke Univ. . . . . [6553-71]

1:40 pm: **Ground bounce tracking for landmine detection using a sequential Monte Carlo method,** L. Tang, P. A. Torrione, L. M. Collins, Duke Univ. . [6553-72]

2:00 pm: **Soil compensation techniques for the detection of buried metallic objects using electromagnetic sensors,** L. R. Pasion, The Univ. of British Columbia (Canada); S. D. Billings, Sky Research; D. W. Oldenburg, The Univ. of British Columbia (Canada) . . . . . [6553-87]

2:20 pm: **Feature learning for a hidden Markov model approach to landmine detection,** X. Zhang, P. D. Gader, Univ. of Florida; H. Frigui, Univ. of Louisville . . . . . [6553-74]

2:40 pm: **Visual detection, recognition, and classification of surface-buried UXO based on soft-computing decision fusion,** A. H. Shirkhodaie, H. Rababaah, Tennessee State Univ. . . . . [6553-75]

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

SESSION 16

Room: Chicago/Denver . . . . . Thurs. 3:30 to 5:30 pm

Signal Processing III

Chairs: **Joseph N. Wilson**, Univ. of Florida;
Peter Howard, U.S. Army Night Vision & Electronic Sensors Directorate

3:30 pm: **Image segmentation techniques for improved processing of landmine responses in ground-penetrating radar data,** P. A. Torrione, L. M. Collins, Duke Univ. . . . . [6553-76]

3:50 pm: **Landmine with ground-penetrating radar using discrete hidden Markov models with symbol dependent features,** H. Frigui, O. Missaoui, Univ. of Louisville; P. D. Gader, Univ. of Florida . . . . . [6553-77]

4:10 pm: **Landmine discrimination using the Kullback-Leibler distance,** J. N. Wilson, Univ. of Florida . . . . . [6553-78]

4:30 pm: **Application of a modified FFT approach to the subsurface imaging problem,** Y. A. Gryazin, Idaho State Univ. . . . . [6553-79]

4:50 pm: **Development of processing algorithm for HSTAMIDS: status and field test results,** P. Ngan, S. P. Burke, R. Cresci, U.S. Army Night Vision & Electronic Sensors Directorate; J. N. Wilson, P. D. Gader, Univ. of Florida; D. K. C. Ho, Univ. of Missouri/Columbia; E. E. Bartosz, H. A. Duvoisin, CyTerra Corp. . . . . [6553-80]

5:10 pm: **CA-CFAR detection against K-distributed clutter in GPR,** Y. Bahadirlar, M. Sezgin, TÜBITAK Marmara Research Ctr. (Turkey) . . . . [6553-81]

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Wednesday-Thursday 11-12 April 2007 • Proceedings of SPIE Vol. 6554

Chemical and Biological Sensing VIII

Conference Chair: **Augustus W. Fountain III**, U.S. Army RDECOM ECBC

Program Committee: **Jerome J. Braun**, MIT Lincoln Lab.; **John C. Carrano**, Luminex Corp.; **Christopher C. Carter**, Johns Hopkins Applied Physics Lab.; **Patrick J. Gardner**, General Dynamics Armament and Technical Products; **Matthew T. Griffin**, General Dynamics Armament and Technical Products; **Paul M. Pellegrino**, Army Research Lab.; **Michael W. P. Petryk**, Defence Research and Development Canada-Suffield (Canada); **Cynthia R. Swim**, U.S. Army Edgewood Chemical Biological Ctr.

Wednesday 11 April

SESSION 1

Room: Grand 5-6 . . . . . Wed. 8:00 to 10:10 am

Sensing Chemical Explosives

Chair: **Augustus W. Fountain III**, U.S. Army RDECOM ECBC

8:00 am: **The challenges of stand-off explosive detection** *(Invited Paper)*, B. L. Shoop, U.S. Military Academy . . . . . [6554-01]

8:30 am: **Micromachined microfluidic chemiluminescent system for explosives detection,** Y. S. Park, H. S. Hewage, D. P. Neikirk, E. V. Anslyn, The Univ. of Texas at Austin . . . . . [6554-02]

8:50 am: **Landmine detection using hyperspectral imaging,** J. E. McFee, Defence Research and Development Canada (Canada); C. D. Anger, S. B. Achal, T. A. Ivanco, ITRES Research Ltd. (Canada) . . . . . [6554-03]

9:10 am: **Stand-off Raman instrument for detection of bulk organic and on-organic compounds,** S. K. Sharma, A. K. Misra, P. G. Lucey, Univ. of Hawaii at Manoa . . . . . [6554-04]

9:30 am: **SERS substrates: a sensitive system for detection and identification of explosive material and chemical agents in liquid and vapor phase,** C. M. Netti, H. M. Stanford, R. Johnson, R. Tailor, P. G. Hargraeves, Mesophotonics Ltd. (United Kingdom) . . . . . [6554-05]

9:50 am: **Matrix effects and design considerations for quartz-bound Au nanoparticle SERS substrates in chemical and biological detection,** E. V. Ni, W. N. Radicic, U.S. Military Academy; A. W. Fountain III, U.S. Army RDECOM ECBC . . . . . [6554-06]

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

SESSION 2

Room: Grand 5-6 . . . . . Wed. 10:40 am to 12:20 pm

Chemical Detection I

Chair: **Paul M. Pellegrino**, Army Research Lab.

10:40 am: **Field test results of standoff chemical detection using the FIRST,** C. C. Carter, T. S. Spisz, P. K. Murphy, Johns Hopkins Applied Physics Lab.; A. Vallières, M. Chamberland, Telops, Inc. (Canada) . . . . . [6554-07]

11:00 am: **Design of CATSI EDM: a passive standoff chemical warfare agent detector,** Y. Montembeault, A. J. Villemaire, F. Marcotte, V. Farley, L. Belhumeur, J. Giroux, Telops, Inc. (Canada); J. Thériault, E. Puckrin, H. Lavoie, C. S. Turcotte, Defence Research and Development Canada (Canada); M. Chamberland, Telops, Inc. (Canada) . . . . . [6554-08]

11:20 am: **Wide-area hyperspectral chemical plume detection using an asymmetric model,** D. S. Rosario, Army Research Lab.; J. M. Romano, U.S. Army Armament Research, Development and Engineering Ctr. . . . . [6554-09]

11:40 am: **Detection of simulants and degradation products of chemical warfare agents by vibrational spectroscopy,** S. P. Hernández-Rivera, O. Ruiz, L. Pacheco-Londoño, O. M. Primera-Pedrozo, W. Ortiz, Y. M. Soto-Feliciano, D. E. Nieves, Univ. de Puerto Rico Mayagüez . . . . . [6554-10]

12:00 pm: **Improvements on standoff differential reflectometry,** A. M. Fuller, C. Schoellhorn, R. E. Hummel, P. H. Holloway, Univ. of Florida . . . . . [6554-11]

Lunch/Exhibition Break . . . . . 12:20 to 2:00 pm

SESSION 3

Room: Grand 5-6 . . . . . Wed. 2:00 to 3:40 pm

Chemical Detection II

Chair: **Christopher C. Carter**, Johns Hopkins Applied Physics Lab.

2:00 pm: **Infrared, near-infrared, and visible spectroscopy of sarin,** M. W. P. Petryk, Defence Research and Development Canada (Canada) [6554-12]

2:20 pm: **Operational characteristics of LWIR AOTF-based multispectral imager,** N. B. Singh, Northrop Grumman Corp.; M. S. Gottlieb, D. R. Suhre, Carnegie Mellon Univ.; D. A. Kahler, D. J. Knuteson, A. Berghmans, B. Wagner, J. Hedrick, J. J. Hawkins, Northrop Grumman Corp. . . . . [6554-13]

2:40 pm: **Investigations of quantum cascade laser sources for a MEMS-scale photoacoustic sensor,** D. A. Heaps, P. M. Pellegrino, Army Research Lab. . . . . [6554-14]

3:00 pm: **Stand-off detection using coherent backscattered spectroscopy,** A. W. Schill IV, P. M. Pellegrino, Army Research Lab.; B. R. Arnold, L. A. Kelly, Univ. of Maryland/Baltimore County . . . . . [6554-15]

3:20 pm: **The feasibility of a nano-inertial measurement unit using chemistry to record position,** M. E. Tanner, J. Protz, Duke Univ. . . . . [6554-16]

Thursday 12 April

SESSION 4

Room: Grand 5-6 . . . . . Thurs. 8:00 am to 12:10 pm

Biological Detection I

Chair: **Jerome J. Braun**, MIT Lincoln Lab.

8:00 am: **Biological substance characterization in water matrices with Raman microspectroscopy,** R. E. Jabbour, A. Tripathi, U.S. Army Edgewood Chemical Biological Ctr.; P. J. Treado, M. P. Nelson, ChemImage Corp.; J. L. Jensen, A. P. Snyder, U.S. Army Edgewood Chemical Biological Ctr. . . . . [6554-17]

8:20 am: **Detection and identification of a water mixture of E. coli cells and B. subtilis spores with Raman chemical imaging microscopy,** A. Tripathi, R. E. Jabbour, Science Applications International Corp.; P. J. Treado, M. P. Nelson, ChemImage Corp.; J. L. Jensen, A. P. Snyder, U.S. Army Edgewood Chemical Biological Ctr. . . . . [6554-18]

8:40 am: **Spectroscopic characterization of biological agents using normal Raman and surface-enhanced Raman spectroscopies,** S. P. Hernández-Rivera, T. Luna-Pineda, L. Pacheco-Londoño, E. De La Cruz-Montoya, K. Soto-Feliciano, C. Ríos-Velázquez, Univ. de Puerto Rico Mayagüez . . . . . [6554-19]

9:00 am: **Rapid, multiplexed, high-sensitivity detection of biowarfare agents by surface plasmon resonance enhanced common path interferometry,** C. Greef, V. Petrapavlovskikh, O. Nilsen, B. Hacioglu, AlphaSniffer, LLC; J. Hall, Hall Stable Lasers, LLC . . . . . [6554-20]

9:20 am: **A study of spore identification from diffraction data,** T. Le, M. A. Fiddy, The Univ. of North Carolina at Charlotte; P. J. Gardner, General Dynamics Armament & Technical Products . . . . . [6554-21]

9:40 am: **Noninvasive forward-scattering system for rapid detection, characterization, and identification of bacterial colonies,** B. P. Rajwa, B. Bayraktar, P. P. Banada, K. Huff, E. Bae, A. K. Bhunia, E. D. Hirleman, J. P. Robinson, Purdue Univ. . . . . [6554-22]

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

10:30 am: **Compact chamber for the spectroscopic analysis of fluorescent aerosols,** B. J. Déry, Univ. Laval (Canada) and Defence Research and Development Canada (Canada); J. Simard, Defence Research and Development Canada (Canada); R. Vallée, Univ. Laval (Canada); G. Roy, H. Lavoie, S. Buteau, Defence Research and Development Canada (Canada) . . . . . [6554-23]

10:50 am: **Developments in on-the-fly biomarking: a new method to rapidly identify chemical and biological aerosols,** M. B. Hart, H. Lin, J. Deich, C. D. Merritt, J. D. Eversole, Naval Research Lab. . . . . [6554-24]

11:10 am: **Extinction and backscatter cross sections of biological materials,** M. E. Thomas, M. B. Airola, C. C. Carter, N. T. Boggs, Johns Hopkins Applied Physics Lab. . . . . [6554-25]

11:30 am: **Field testing results and ambient aerosol measurements using a dual-wavelength fluorescence excitation and elastic scatter-based biosensor,** V. Sivaprakasam, A. L. Huston, H. Lin, J. D. Eversole, P. Falkenstein, A. Schultz, Naval Research Lab. . . . . [6554-26]

11:50 am: **Early detection of chem-bio attacks using biosensors and hyperspectral image processing,** A. K. Shaw, Wright State Univ.; J. I. Medford, M. Antunes, Colorado State Univ.; W. S. McCormick, Wright State Univ.; D. Wicker, Air Force Research Lab. . . . . [6554-27]

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

SESSION 5

Room: Grand 5-6 . . . . . Thurs. 1:30 to 4:40 pm

Biological Detection II

Chair: **Michael W. P. Petryk**,
Defence Research and Development Canada (Canada)

1:30 pm: **Spectrally resolved fluorescence cross sections of BG and BT with a 266-nm pump wavelength,** M. E. Thomas, Johns Hopkins Applied Physics Lab.; J. D. Atkins, Johns Hopkins Univ. . . . . [6554-28]

1:50 pm: **Field portable label-free, reagent-free pathogen detection system,** N. V. Menon, G. Zeltser, P. Sivanesan, V. Esterkin, Physical Optics Corp. [6554-29]

2:10 pm: **Detection and classification of atmospheric aerosols using multi-wavelength CO_2 lidar,** R. E. Warren, EO-Stat, Inc.; R. G. Vanderbeek, U.S. Army Edgewood Chemical Biological Ctr. . . . . [6554-30]

2:30 pm: **Bayesian probabilistic approach for inverse source determination from limited and noisy chemical or biological sensor concentration measurements,** E. Yee, Defence Research and Development Canada Suffield (Canada) . . . . . [6554-31]

2:50 pm: **Binary shaped femtosecond pulses as a multidimensional tool for controlled molecular fragmentation and chemical recognition,** I. Pastirk, Biophotonic Solutions, Inc.; V. V. Lozovoy, T. C. Gunaratne, J. C. Shane, M. Dantus, Michigan State Univ. . . . . [6554-32]

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

3:40 pm: **Biomolecule sensors using high-Q microring resonators,** E. T. Knobbe, J. Clarke, L. Flood, D. Goad, Nomadics, Inc.; A. Ramachandran, Oklahoma State Univ.; L. Wald, S. Wang, Nomadics, Inc. . . . . [6554-33]

4:00 pm: **Investigation of synthetic molecular recognition for biosensing applications,** D. N. Stratis-Cullum, S. McMasters, L. J. Sooter, P. M. Pellegrino, Army Research Lab. . . . . [6554-34]

4:20 pm: **Recent testing and performance improvements of a fluorescence-based biological aerosol sensor,** G. A. Wilson, B. Dable, J. Brady, M. Carrabba, Hach Homeland Security Technologies . . . . . [6554-35]

Monday-Wednesday 9-11 April 2007 • Proceedings of SPIE Vol. 6555

Sensors and Systems for Space Applications

Conference Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Robert D. Richards**, Optech, Inc. (Canada)

Program Committee: **Olivier L. de Weck**, Massachusetts Institute of Technology; **Michael T. Dehring**, Michigan Aerospace Corp.; **Michael E. Dobbs**, ITT Industries, Inc.; **Stephen R. Granade**, Advanced Optical Systems, Inc.; **Shahid Habib**, NASA Goddard Space Flight Ctr.; **Carl G. Henshaw**, Naval Research Lab.; **Brian Holz**, Ball Aerospace & Technologies Corp.; **Floyd E. Hovis**, Fibertek, Inc.; **Daniel L. Lau**, Univ. of Kentucky; **Pejmun Motaghedi**, The Boeing Co.

Monday 9 April

Opening Remarks

Room: San Francisco . . . . . Mon. 8:30 to 8:40 am

Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Robert D. Richards**, Optech, Inc. (Canada)

SESSION 1

Room: San Francisco . . . . . Mon. 8:40 to 10:20 am

Space to Ground Sensing

Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Robert D. Richards**, Optech, Inc. (Canada)

8:40 am: **Remote sensing phase fluorimetry using mercury vapor lamp,** M. J. Bohn, M. A. Lundin, Air Force Institute of Technology . . . . . [6555-01]

9:00 am: **Design and development of ultra-narrow bandpass tunable photonic-crystal interferometers for visible and infrared spectral domains,** V. B. Markov, A. Khizhnyak, MetroLaser, Inc.; W. B. Cook, NASA Langley Research Ctr. . . . . [6555-02]

9:20 am: **High-efficiency UV laser for space-based wind lidar,** F. E. Hovis, Fibertek, Inc.; J. Wang, Raytheon Santa Barbara Remote Sensing . . . . . [6555-03]

9:40 am: **Incoherent scattered lidar from near-space,** T. H. Zurbuchen, Univ. of Michigan; P. Tchoryk, Jr., Michigan Aerospace Corp.; R. Walker, Univ. of Michigan; J. C. Pavlich, M. T. Dehring, Michigan Aerospace Corp.; R. French, R. Swoish, Univ. of Michigan . . . . . [6555-04]

10:00 am: **Optical sensing atmospheric emissions from cubesats and nanosats at Univ. of Illinois with Taylor Univ. collaboration,** G. R. Swenson, V. Coverstone, M. Frank, Univ. of Illinois at Urbana-Champaign; H. Voss, Taylor Univ. . . . . [6555-05]

Coffee Break . . . . . 10:20 to 10:50 am

SESSION 2

Room: San Francisco . . . . . Mon. 10:50 am to 12:40 pm

Camera-Based Sensing

Chairs: **Floyd E. Hovis**, Fibertek, Inc.; **Michael E. Dobbs**, ITT Industries, Inc.

10:50 am: **Optical artifacts in a laser-based spacecraft navigation imaging sensor,** R. T. Howard, NASA Marshall Space Flight Ctr.; J. E. LeCroy, D. S. Hallmark, The Boeing Co. . . . . [6555-06]

11:10 am: **Superresolution structured light illumination,** L. G. Hassebrook, C. J. Casey, V. Yalla, Q. Hao, D. L. Lau, Univ. of Kentucky . . . . . [6555-07]

11:30 am: **Multicamera phase measuring profilometry for accurate distance measurement,** D. L. Lau, W. Wang, Univ. of Kentucky . . . . . [6555-08]

11:50 am: **Composite pattern demodulation and post processing by means of stereo vision,** D. L. Lau, K. Liu, Univ. of Kentucky . . . . . [6555-09]

12:10 pm: **Space-based active optical zoom** *(Invited Paper)***,** D. V. Wick, B. E. Bagwell, Sandia National Labs.; T. Martinez, Air Force Research Lab.; S. R. Restaino, Naval Research Lab; D. M. Payne, Narrascape; R. Romeo, Composite Mirror Applications, Inc.; G. L. Peterson, Breault Research Organization . . . . . [6555-10]

Lunch Break . . . . . 12:40 to 2:00 pm

SESSION 3

Room: San Francisco . . . . . Mon. 2:00 to 3:40 pm

Three-Dimensional Position and Attitude Sensing

Chairs: **Shahid Habib**, NASA Goddard Space Flight Ctr.; **Michael T. Dehring**, Michigan Aerospace Corp.

2:00 pm: **Advancements in pose determination for space operations,** J. M. Trenkle, E. Erlandson, J. C. Pavlich, P. Tchoryk, Jr., Michigan Aerospace Corp. . . . . [6555-11]

2:20 pm: **Processing 3D flash ladar point clouds in real-time for flight applications,** R. Craig, I. Gravseth, R. P. Earhart, J. Bladt, S. Barnhill, L. Ruppert, Ball Aerospace and Technologies Corp. . . . . [6555-12]

2:40 pm: **Stereo-vision-based 3D modeling of space structures,** S. Se, P. Jasiobedzki, MacDonald, Dettwiler and Associates Ltd. (Canada); R. P. Wildes, York Univ. (Canada) . . . . . [6555-13]

3:00 pm: **Developing a pose estimation system development for Hubble space telescope servicing mission,** J. S. Hannah, M. Balch, J. Berry, Advanced Optical Systems, Inc. . . . . [6555-14]

3:20 pm: **Ladar-assisted spacecraft rendezvous and docking laboratory tests,** R. C. Fenton, R. R. Fullmer, R. T. Pack, Utah State Univ. . . . . [6555-15]

Coffee Break . . . . . 3:40 to 4:10 pm

SESSION 4

Room: San Francisco . . . . . Mon. 4:10 to 5:30 pm

Sensors and Systems

Chairs: **Brian Holz**, Ball Aerospace & Technologies Corp.; **Carl G. Henshaw**, Naval Research Lab.

4:10 pm: **Hydra AR&D sensor suite,** F. D. Roe, S. R. Granade, Advanced Optical Systems, Inc. . . . . [6555-16]

4:30 pm: **The lunar orbiter laser altimeter (LOLA),** H. Riris, X. Sun, J. Cavanaugh, G. Jackson, L. Ramos-Izquierdo, D. E. Smith, NASA Goddard Space Flight Ctr.; M. Zuber, Massachusetts Institute of Technology . . . . . [6555-17]

4:50 pm: **Commissioning of the CALIPSO payload,** C. S. Weimer, L. Ruppert, J. Spelman, Ball Aerospace & Technologies Corp. . . . . [6555-18]

5:10 pm: **Utilizing UV and visible sensors on micro-satellites to demonstrate target acquisition and tracking,** S. B. Brown, D. Wada, A. Ghafourian, M. Greenman, C. Howlett, T. Humpherys, Space Dynamics Lab.; V. Nguyen, Missile Defense Agency . . . . . [6555-19]

Tuesday 10 April

Opening Remarks

Room: San Francisco . . . . . Tues. 8:00 to 8:10 am

Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Robert D. Richards**, Optech, Inc. (Canada)

SESSION 5

Room: San Francisco . . . . . Tues. 8:10 to 9:50 am

Spacecraft Sensors Analysis and Results

Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Robert D. Richards**, Optech, Inc. (Canada); **Stephen R. Granade**, Advanced Optical Systems, Inc.

8:10 am: **DART advanced video guidance sensor flight results,** R. T. Howard, T. Bryan, NASA Marshall Space Flight Ctr. . . . . [6555-20]

8:30 am: **Miniature, light weight, coherent optical receiver system for space platforms,** A. M. Joshi, Discovery Semiconductors, Inc. . . . . [6555-21]

8:50 am: **Real-world educational experience through project-oriented graduate classes in collaboration with industry,** T. H. Zurbuchen, Univ. of Michigan; P. Tchoryk, Jr., Michigan Aerospace Corp. . . . . [6555-22]

9:10 am: **High-resolution imaging with small satellites: what are the possibilities and limitations,** R. Sandau, U. Dombrowski, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [6555-23]

9:30 am: **Autonomous docking experiments using the SPHERES testbed inside the ISS,** S. Nolet, A. Saenz-Otero, D. W. Miller, Massachusetts Institute of Technology . . . . . [6555-24]

Coffee Break . . . . . 9:50 to 10:20 am

SESSION 6

Room: San Francisco . . . . . Tues. 10:20 to 11:20 am

Keynote Session

Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Robert D. Richards**, Optech, Inc. (Canada)

Keynote Presentation

10:20 am: **TBD** *(Invited Paper)***,** . . . . . [6555-25]

SESSION 7

Room: San Francisco . . . . . Tues. 11:20 am to 12:00 pm

Propulsion Sensors I

Chair: **Valentin Korman**, Madison Research Corp.

11:20 am: **Health monitoring: propellant ullage pressurization subsystem,** J. L. Edwards, D. B. Buchanan, Boeing North American . . . . . [6555-26]

11:40 am: **Evaluation of holographic subsurface radar for NDE of space shuttle thermal protection tiles,** T. T. Lu, T. Chao, A. P. Thakoor, Jet Propulsion Lab.; C. Snapp, NASA Johnson Space Ctr.; T. Bechtel, Enviroscan, Inc.; S. I. Ivashov, I. A. Vasilyev, Bauman Moscow State Technical Univ. (Russia) . . . . . [6555-27]

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

SESSION 8

Room: San Francisco . . . . . Tues. 1:30 to 2:30 pm

Propulsion Sensors II

Chair: **Valentin Korman**, Madison Research Corp.

1:30 pm: **Fiber optic sensor technologies for detection of hydrogen in space application,** A. A. Kazemi, The Boeing Co.; K. Goswami, InnoSense LLC . . . . . [6555-52]

1:50 pm: **An efficient systematic method for system sensors optimization and analysis,** A. Fijany, F. Vatan, E. Barroth, Jet Propulsion Lab. . . . . [6555-29]

2:10 pm: **Stable 600°C silicon carbide MEMS pressure transducers,** R. S. Okojie, NASA Glenn Research Ctr. . . . . [6555-30]

SESSION 9

Room: San Francisco . . . . . Tues. 2:30 to 3:30 pm

Spacecraft Platforms and Infrastructure

Chairs: **Charles J. Finley**, Air Force Research Lab.; **Robert Smith**, General Dynamics C4 Systems

2:30 pm: **Algorithm development for autonomous assembly demonstrations,** N. R. Hoff III, S. Mohan, S. Nolet, D. W. Miller, Massachusetts Institute of Technology . . . . . [6555-32]

2:50 pm: **Autonomous precision formation flying: a proposed fault tolerant attitude control strategy,** K. Khorasani, T. Jiang, Concordia Univ. (Canada) . . . . . [6555-33]

3:10 pm: **SUMO/FREND vision for unaided spacecraft grappling,** J. L. Obermark, Jr., Naval Research Lab. and DCS Corp.; W. J. Wagner, Naval Research Lab. and Honeywell Corp.; C. G. Henshaw, Naval Research Lab. . . . . [6555-35]

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

SESSION 10

Room: San Francisco . . . . . Tues. 4:00 to 5:40 pm

Optical Modeling and Testing

Chairs: **Pejmun Motaghedi**, The Boeing Co.; **Olivier L. de Weck**, Massachusetts Institute of Technology

4:00 pm: **Quantifying an imagery system's performance with transformational mission data analysis,** A. W. Mauck, Booz Allen Hamilton Inc. . . . . [6555-36]

4:20 pm: **Modeling of electro-statically actuated two-axis tip-tilt MEMS micro-mirrors for laser beamsteering,** C. L. Edwards, B. G. Boone, Johns Hopkins Applied Physics Lab.; C. C. Davis, Univ. of Maryland/College Park . . . . . [6555-38]

4:40 pm: **A low-cost test-bed for real-time landmark tracking,** C. Assad, Jet Propulsion Lab.; J. C. Hanan, Oklahoma State Univ.; A. Csaszar, P. Moreels, California Institute of Technology; C. L. Hughlett, Zion Labs. Inc.; T. Chao, Jet Propulsion Lab.; P. Perona, California Institute of Technology . . . . . [6555-39]

5:00 pm: **Flight robotics laboratory testing of optical sensors for automated rendezvous and docking,** R. T. Howard, NASA Marshall Space Flight Ctr.; J. D. Mitchell, S. P. Cryan, NASA Johnson Space Ctr.; N. S. Johnston, L. Brewster, M. Williamson, NASA Marshall Space Flight Ctr.; D. Strack, Odyssey Space Research, LLC . . . . . [6555-40]

5:20 pm: **New approach to analysis and new principle for optimization of remote sensing systems,** H. H. Asadov, A. T. Hajizadeh, M. J. Kerimov, A. A. Isayev, Azerbaijan National Aerospace Agency (Azerbaijan) . . . . . [6555-41]

Wednesday 11 April

Opening Remarks

Room: San Francisco . . . . . Wed. 8:00 to 8:10 am

Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.;
Robert D. Richards, Optech, Inc. (Canada)

SESSION 11

Room: San Francisco . . . . . Wed. 8:10 to 9:50 am

Spacecraft Modeling and Control

Chairs: **Pejmun Motaghedi**, The Boeing Co.;
Olivier L. de Weck, Massachusetts Institute of Technology

8:10 am: **Optimization of the design of systems that evolve over time using neural networks,** M. K. Nolan, Massachusetts Institute of Technology . [6555-42]

8:30 am: **Modeling and control of active gravity off-loading for deployable space structures,** T. J. Bihl, Ohio Univ. and Air Force Research Lab.; K. D. Pham, T. W. Murphey, Air Force Research Lab. . . . . [6555-43]

8:50 am: **Nonlinear modeling and precise position control of flexible space manipulator joint,** X. Zhang, H. Sun, Q. Jia, Beijing Univ. of Posts and Telecommunications (China) . . . . . [6555-44]

9:10 am: **Differential game barrier model for orbiter under target maneuvering based on relative coordinates,** Q. Zhang, Z. Zhou, S. Sun, Y. Sun, Harbin Institute of Technology (China) . . . . . [6555-45]

9:30 am: **Differential game barrier model for spacecraft under target maneuvering based on minimum error,** Q. Zhang, S. Sun, Y. Sun, Harbin Institute of Technology (China) . . . . . [6555-46]

Coffee Break . . . . . 9:50 to 10:20 am

SESSION 12

Room: San Francisco . . . . . Wed. 10:20 to 11:40 am

Simulation, Robotics, and Testing

Chairs: **Pejmun Motaghedi**, The Boeing Co.;
Olivier L. de Weck, Massachusetts Institute of Technology

10:20 am: **Simulation study of a robotics-based method for on-orbit identification of spacecraft inertia properties,** O. Ma, New Mexico State Univ.; K. D. Pham, Air Force Research Lab.; H. Dan, New Mexico State Univ. . [6555-47]

10:40 am: **Online tribology ball bearing fault detection and identification,** B. Ling, Migma Systems, Inc.; M. Khonsari, Louisiana State Univ. . . . . [6555-48]

11:00 am: **Ground experiment verification of space robotic system,** B. Liang, HIT Research Institute in Shenzhen (China) . . . . . [6555-50]

11:20 am: **A novel method for testing kinematic accuracy of a space manipulator based on electronic theodolite and simulation testing,** H. Sun, Y. Tan, Q. Jia, Beijing Univ. of Posts and Telecommunications (China) . . [6555-51]

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Micro (MEMS) and Nanotechnologies for Defense and Security

Conference Chairs: **Thomas George**, ViaLogy Corp.; **Zhongyang Cheng**, Auburn Univ.

Program Committee: **Debjyoti Banerjee**, Texas A&M Univ.; **Fredrik C. Bruhn**, Ångström Aerospace Corp. (Sweden); **Richard W. Cernosek**, Sandia National Labs.; **Scott D. Collins**, Univ. of Maine; **Xudong Fan**, Univ. of Missouri/Columbia; **Ernest J. Garcia**, Sandia National Labs.; **Sandeep Gulati**, ViaLogy Corp.; **J. Todd Hastings**, Univ. of Kentucky; **Edward A. Johnson**, Ion Optics Inc.; **Jin-Woo Kim**, Univ. of Arkansas; **Choonsup Lee**, Jet Propulsion Lab.; **Sonia E. Letant**, Lawrence Livermore National Lab.; **Qifa Zhou**, Univ. of Southern California

Tuesday 10 April

SESSION 1

Room: St. Louis . . . . . Tues. 1:00 to 3:30 pm

Complex MEMS and Nanodevices

Chairs: **Mary J. Li**, NASA Goddard Space Flight Ctr.; **Reza Ghodssi**, Univ. of Maryland/College Park

1:00 pm: **Complex MEMS device: microshutter array system** *(Invited Paper)*, M. J. Li, C. A. Allen, S. Babu, S. Bajikar, M. A. Beamesderfer, R. Bradley, N. Costen, A. J. Ewin, D. E. Franz, L. A. Hess, R. Hu, M. D. Jhabvala, D. P. Kelly, T. T. King, NASA Goddard Space Flight Ctr.; G. Kletetschka, The Catholic Univ. of America; A. S. Kutyrev, B. Lynch, T. M. Miller, H. Moseley, B. Mott, L. Oh, J. Pontius, D. A. Rapchun, C. Ray, E. Schulte, R. F. Silverberg, W. W. Smith, S. J. Snodgrass, D. Sohl, L. M. Sparr, R. Steptoe-Jackson, V. Valeriano, L. L. Wang, Y. T. Zheng, C. Zincke, NASA Goddard Space Flight Ctr. . . . [6556-01]

1:30 pm: **MEMS and microsystems: future tools for nanodevices** *(Invited Paper)*, R. Ghodssi, Univ. of Maryland/College Park . . . . . [6556-02]

2:00 pm: **Micropolarizer arrays in the MWIR for snapshot-polarimetric imaging,** S. A. Kemme, A. Cruz-Cabrera, P. Nandy, R. R. Boye, J. Wendt, Sandia National Labs.; T. Carter, S. Samora, L&M Technologies, Inc. . . . . [6556-03]

2:20 pm: **Distributed intelligence and cooperative monitoring for sensor networks in space applications,** Y. Wen, A. Agogino, Univ. of California/Berkeley . . . . . [6556-04]

2:40 pm: **Piezoelectric micropower generation devices for autonomous remote sensor systems,** D. Kim, D. Shen, J. Park, S. H. Yoon, J. Ajitsaria, S. Choe, Auburn Univ. . . . . [6556-05]

3:00 pm: **A high-performance MEMS time-of-flight mass spectrometer for investigations in planetary astrobiology** *(Invited Paper)*, P. A. Roman, B. Lynch, F. Herrero, NASA Goddard Space Flight Ctr.; B. Jamieson, Scientific and Biomedical Microsystems, LLC; S. A. Getty, T. T. King, NASA Goddard Space Flight Ctr.; L. Delzeit, NASA Ames Research Ctr.; M. Ellis, K. Tsui, Zyvex Corp.; J. Dworkin, NASA Goddard Space Flight Ctr.; W. Brinckerhoff, Johns Hopkins Applied Physics Lab.; D. Harpold, H. Niemann, P. R. Mahaffy, NASA Goddard Space Flight Ctr. . . . . [6556-06]

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

SESSION 2

Room: St. Louis . . . . . Tues. 4:00 to 5:40 pm

MEMS Adaptive Optics

Chairs: **Eui-Hyeok Yang**, Stevens Institute of Technology; **Brett E. Bagwell**, Sandia National Labs.

4:00 pm: **Micro-actuators for wavefront correction** *(Invited Paper)*, E. Yang, Stevens Institute of Technology . . . . . [6556-07]

4:30 pm: **MEMS deformable mirror optical limiter for dynamic range compression deconvolution,** J. Khoury, C. L. Woods, Air Force Research Lab.; B. Haji-Saeed, S. K. Sengupta, W. D. Goodhue, Univ. of Massachusetts/Lowell; J. Kierstead, Solid State Scientific Corp. . . . . [6556-08]

4:50 pm: **Optically addressed, spring-patterned, membrane mirror MEMS with MegaHertz response,** B. Haji-saeed, G. Griffith, S. K. Sengupta, W. D. Goodhue, Univ. of Massachusetts/Lowell; J. Khoury, C. L. Woods, Air Force Research Lab.; J. Kierstead, Solid State Scientific Corp. . . . . [6556-09]

5:10 pm: **Active imaging systems using MEMS mirrors** *(Invited Paper)*, B. E. Bagwell, D. V. Wick, W. D. Cowan, O. B. Spahn, Sandia National Labs. . . . . [6556-10]

Wednesday 11 April

SESSION 3

Room: St. Louis . . . . . Wed. 8:00 to 10:10 am

Photonic Sensors I

Chairs: **Xudong Fan**, Univ. of Missouri/Columbia; **Zhongyang Cheng**, Auburn Univ.

8:00 am: **Lab-on-a-chip biochemical sensing system based on the liquid core optical ring resonator** *(Invited Paper)*, I. M. White, J. D. Suter, H. Zhu, H. Oveys, X. Fan, Univ. of Missouri/Columbia . . . . . [6556-11]

8:30 am: **A novel chemical and biological fiber optic sensor,** B. L. Scott, C. Ma, G. Pickrell, A. Wang, Virginia Polytechnic Institute and State Univ.; T. Ooi, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. [6556-12]

8:50 am: **Evanescent optical fluorescence excitation: the role of photonic mode density,** B. Menges, W. Knoll, Max-Planck-Institut für Polymerforschung (Germany) . . . . . [6556-13]

9:10 am: **High-speed nano-optical photodetector for free space communication,** R. M. Kurtz, K. A. Alim, R. D. Pradhan, V. Esterkin, G. D. Savant, Physical Optics Corp.; J. E. Nichter, Air Force Research Lab.; A. A. Balandin, Univ. of California/Riverside . . . . . [6556-14]

9:30 am: **Integrated optical microring for high-resolution refractive index and pressure sensing applications,** S. Ja, Nomadics, Inc. . . . . [6556-15]

9:50 am: **Optical micro- and nanofibers for sensing applications,** M. Sumetsky, OFS Fitel, LLC . . . . . [6556-16]

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

SESSION 4

Room: St. Louis . . . . . Wed. 10:40 am to 12:30 pm

Photonic Sensors II

Chairs: **J. Todd Hastings**, Univ. of Kentucky; **Gregory P. Nordin**, Brigham Young Univ.

10:40 am: **Optimal self-referenced sensing with long- and short-range surface plasmons** *(Invited Paper)*, J. T. Hastings, P. Bathae Kumaresh, J. Guo, D. Keathley, L. G. Bachas, S. Law, Univ. of Kentucky . . . . . [6556-17]

11:10 am: **Photonic transduction for microcantilever sensor arrays,** G. P. Nordin, S. Kim, J. Noh, Y. Qian, Brigham Young Univ. . . . . [6556-18]

11:30 am: **Microfluidic device detection of waterborne pathogens through static light scattering of latex immunoagglutination using proximity optical fibers,** J. Yoon, J. Han, B. Heinze, L. J. Lucas, The Univ. of Arizona . . . . [6556-19]

11:50 am: **Small form factor microsensor system using optical MEMS for passive optical digital communication (PODC),** W. Wang, S. Samson, J. Bumgarner, R. Hazen, S. Kedia, G. Gonzalez, R. Agarwal, L. Langebrake, C. Munoz, E. Kaltenbacher, Univ. of South Florida . . . . . [6556-20]

12:10 pm: **Research of spacing stability of tunable F-P filter in ICF facility,** S. Shi, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [6556-21]

Lunch/Exhibition Break . . . . . 12:30 to 1:50 pm

SESSION 5

Room: St. Louis . . . . . Wed. 1:50 to 3:20 pm

Dip Pen/Nanolithography I

Chairs: **Debjyoti Banerjee**, Texas A&M Univ.;
James J. De Yoreo, Lawrence Livermore National Lab.

1:50 pm: **Nanolithography of metal catalysts using dip pen nanolithography (DPN™)** *(Invited Paper)*, D. Banerjee, Texas A&M Univ. . . . . [6556-22]

2:20 pm: **Dip pen nanolithography™: a maturing technology for high-throughput flexible nanopatterning,** J. R. Haaheim, E. Tevaarwerk, NanoInk, Inc. . . . . [6556-23]

2:40 pm: **Nanopatterning of metals by scanning probe lithography,** J. D. Batteas, Texas A&M Univ. . . . . [6556-24]

3:00 pm: **Method of matrix alignment for nanostructure lithography,** A. U. Sokolnikov, Visual Solutions and Applications . . . . . [6556-25]

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

SESSION 6

Room: St. Louis . . . . . Wed. 4:00 to 6:00 pm

Dip Pen/Nanolithography II

Chairs: **Paul E. Sheehan**, Naval Research Lab.;
James D. Batteas, Texas A&M Univ.

4:00 pm: **How diffusion causes problems for nanotechnology (and how to overcome them)** *(Presentation Only, Invited Paper)*, P. E. Sheehan, Naval Research Lab. . . . . [6556-26]

4:30 pm: **Dip pen nanolithography theory and directed-assembly based nanomanufacturing processes,** S. Hong, Seoul National Univ. (South Korea) . . . . . [6556-27]

4:50 pm: **Investigating the conducting polymer micropattern sensor arrays enerated using intermediate-layer lithography,** A. Chakraborty, G. Parthasarathi, C. Luo, Louisiana Tech Univ. . . . . [6556-28]

5:10 pm: **Generation of conducting polymer-based diodes and capacitors using intermediate-layer lithography,** X. Liu, A. Chakraborty, C. Luo, Louisiana Tech Univ. . . . . [6556-29]

5:30 pm: **Using dip pen nanolithography and nanografting as tools for directing the assembly of macromolecular scaffolds** *(Invited Paper)*, J. J. De Yoreo, S. Chung, Lawrence Livermore National Lab.; B. C. L. Cheung, Univ. of Nebraska/Lincoln; J. E. Johnson, Scripps Research Institute . . . . . [6556-30]

Thursday 12 April

SESSION 7

Room: St. Louis . . . . . Thurs. 8:00 to 10:00 am

MEMS/Nanosystems/Algorithms

Chairs: **Wolfgang Fink**, California Institute of Technology;
Dong-Joo Kim, Auburn Univ.

8:00 am: **Tier-scalable reconnaissance: the challenge of sensor optimization, sensor deployment, sensor fusion, and sensor interoperability** *(Invited Paper)*, W. Fink, California Institute of Technology . . . . . [6556-31]

8:30 am: **Fractal analysis of proteins involved in drug design on biosensor surfaces,** A. Sadana, The Univ. of Mississippi . . . . . [6556-32]

8:50 am: **Miniaturized self-adaptive tuning of MEMS gyroscope for space,** D. Keymeulen, Jet Propulsion Lab. . . . . [6556-33]

9:10 am: **Advanced signal processing for enabling next generation MEMS/NEMS sensors,** T. George, ViaLogy Corp. . . . . [6556-34]

9:30 am: **Reliability shortcomings for micro-/nano- technology based systems** *(Invited Paper)*, E. J. Garcia, M. A. Polosky, Sandia National Labs. . . . . [6556-35]

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

SESSION 8

Room: St. Louis . . . . . Thurs. 10:30 am to 12:50 pm

Advanced MEMS Devices I

Chairs: **Amish Desai**, Tanner Research, Inc.;
C. Peter Cho, Naval Sea Systems Command

10:30 am: **GaN-based microchemical sensor nodes** *(Invited Paper)*, K. Son, B. Yang, Jet Propulsion Lab.; N. Prokopuk, Naval Air Warfare Ctr.; J. S. Moon, HRL Labs., LLC; M. Gallegos, Jet Propulsion Lab.; J. Yang, A. M. Khan, Univ. of South Carolina . . . . . [6556-36]

11:00 am: **Highly sensitive chemical sensors by functional integration of nanoporous zeolites with photonic devices,** H. Xiao, J. Montoya, T. Wei, Univ. of Missouri/Rolla; J. Zhang, J. Dong, Univ. of Cincinnati . . . . . [6556-37]

11:20 am: **Carbon nanotube-based electronic devices for spaceflight instruments,** S. A. Getty, NASA Goddard Space Flight Ctr.; L. Delzeit, NASA Ames Research Ctr.; B. Jamieson, Scientific and Biomedical Microsystems, LLC; T. T. King, P. A. Roman, P. R. Mahaffy, NASA Goddard Space Flight Ctr.; G. Kletetschka, The Catholic Univ. of America; P. J. Wasilewski, NASA Goddard Space Flight Ctr.; D. D. Allred, Brigham Young Univ. . . . . [6556-38]

11:40 am: **Detection of bacillus anthracis spore in water using magnetostrictive microcantilever,** L. Fu, S. Li, K. Zhang, Z. Cheng, Auburn Univ. . . . . [6556-39]

12:00 pm: **Micro-initiators as the fundamental building blocks of micro-energetic systems** *(Invited Paper)*, A. Desai, Tanner Research, Inc.; B. Fuchs, U.S. Army Armament Research, Development and Engineering Ctr. . . . . [6556-40]

12:30 pm: **Computational survey of representative energetic materials as propellants for microthruster applications,** B. Fuchs, U.S. Army Armament Research, Development and Engineering Ctr. . . . . [6556-41]

Lunch/Exhibition Break . . . . . 12:50 to 1:50 pm

SESSION 9

Room: St. Louis . . . . . Thurs. 1:50 to 3:40 pm

Advanced MEMS Devices II

Chairs: **Thomas G. Thundat**, Oak Ridge National Lab.;
Kyung-ah Son, Jet Propulsion Lab.

1:50 pm: **Micromechanical sensors** *(Invited Paper)*, T. G. Thundat, Oak Ridge National Lab. . . . . [6556-42]

2:20 pm: **Optical microresonator sensor based on conjugated molecules for trace explosive detection,** A. Chen, A. Pyayt, L. Dalton, A. Jen, J. Luo, Univ. of Washington . . . . . [6556-43]

2:40 pm: **Molecular detection in metal nanocavities,** S. Blair, The Univ. of Utah . . . . . [6556-44]

3:00 pm: **SERS detection of viruses based on silver nanorod A,** Y. Zhao, S. Shanmukh, Y. J. Liu, L. P. Jones, R. A. Dluhy, R. A. Tripp, The Univ. of Georgia . . . . . [6556-45]

3:20 pm: **Piezoelectric diaphragm as a high-performance sensor platform,** L. Odum, K. Zhang, Z. Cheng, Auburn Univ. . . . . [6556-46]

Coffee Break . . . . . 3:40 to 4:10 pm

SESSION 10

Room: St. Louis . . . . . Thurs. 4:10 to 6:20 pm

Nanowire Devices

Chairs: **Nosang V. Myung**, Univ. of California/Riverside;
Cheng Luo, Louisiana Tech Univ.

4:10 pm: **Electrodeposited 1D Nanostructres** *(Invited Paper)*, N. V. Myung, Univ. of California/Riverside . . . . . [6556-47]

4:40 pm: **Growth and characterization of ZNO nanowires for various sensor applications,** A. K. Sood, Y. R. Puri, Magnolia Optical Technologies, Inc.; D. L. Polla, Defense Advanced Research Projects Agency; Z. L. Wang, Georgia Institute of Technology; M. B. Soprano, U.S. Army . . . . . [6556-48]

5:00 pm: **Gas nanosensors: fabrication, performance, and future perspectives for defense and security applications,** M. A. Deshusses, S. Mubeen, T. Zhang, N. V. Myung, Univ. of California/Riverside . . . . . [6556-49]

5:20 pm: **Review of an intermediate-layer lithography approach** *(Invited Paper)*, C. Luo, Louisiana Tech Univ. . . . . [6556-50]

5:50 pm: **Nucleic acid engineering: using DNA as a generic instead of genetic materal** *(Invited Paper)*, D. Luo, Cornell Univ. . . . . [6556-51]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 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. Each evening will represent a different set of conferences to promote opportunities 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 Thursday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-show and their manuscript 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.

✔ **High-performance sensing platform based on surface plasmon-coupled fluorescence,** S. Ja, Nomadics, Inc.; J. A. Krouse, Consultant . . . . . [6556-52]

✔ **Magnetostrictive nanoparticle as a novel biosensor platform,** S. Li, L. Fu, K. Zhang, Z. Cheng, Auburn Univ. . . . . [6556-53]

✔ **Ferroelectric tunable photonic crystals based on $Ba_{0.7}Sr_{0.3}TiO_3$/MgO multilayered thin films,** D. Wang, The Hong Kong Polytechnic Univ. (Hong Kong China) . . . . . [6556-54]

✔ **Theoretical study of ferroelectric barium strontium titanate-based one-dimensional tunable photonic crystals,** K. L. Jim, D. Wang, C. W. Leung, C. L. Choy, L. W. H. Chan Wong, The Hong Kong Polytechnic Univ. (Hong Kong China) . . . . . [6556-55]

✔ **Generation of silicon nanowires using a new thinning and trimming method,** H. Wang, H. Li, A. Chakraborty, X. Liu, C. Luo, Louisiana Tech Univ. . . . . [6556-56]

✔ **Fabrication of silicon nanobridge-based sensor,** H. Li, A. Chakraborty, X. Liu, C. Luo, Louisiana Tech Univ. . . . . [6556-57]

✔ **Piezoelectric-based microcantilevers for MEMS power scavenging device,** J. Park, D. Shen, S. H. Yoon, S. Choe, D. Kim, Auburn Univ. . . . . [6556-58]

✔ **Flexural plate wave devices for biosensor platform,** S. H. Yoon, J. Park, D. Shen, D. Kim, Auburn Univ. . . . . [6556-59]

✔ **Piezoelectric micromachined ultrasonic transducers with rectangular diaphragms for binary frequency ultrasonic applications,** C. Chao, The Hong Kong Polytechnic Univ. (Hong Kong China) . . . . . [6556-60]

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Tuesday-Wednesday 10-11 April 2007 • Proceedings of SPIE Vol. 6557

Head- and Helmet-Mounted Displays XII: Design and Applications

Conference Chairs: **Randall W. Brown**, Air Force Research Lab.; **Colin E. Reese**, U.S. Army Night Vision & Electronic Sensors Directorate

Cochairs: **Peter L. Marasco**, Air Force Research Lab.; **Thomas H. Harding**, Consultant

Program Committee: **Randall E. Bailey**, NASA Langley Research Ctr.; **Laurence Durnell**, QinetiQ Ltd. (United Kingdom); **Sion A. Jennings**, National Research Council Canada (Canada)

Tuesday 10 April

Welcome and Introductions

Room: Atlanta/Boston . . . . . Tues. 8:05 to 8:10 am

SESSION 1

Room: Atlanta/Boston . . . . . Tues. 8:10 to 9:50 am

Component Technology

Chair: **Randall W. Brown**, Air Force Research Lab.

8:10 am: **All solid-state electrochromic device for helmet mounted displays,** H. Demiryont, K. C. Shannon III, J. C. Isidorsson, Eclipse Energy Systems, Inc. . . . . [6557-01]

8:30 am: **Evolution of electrochromic materials for vision-based applications,** R. F. Storm, K. C. Shannon III, Eclipse Energy Systems, Inc. . . . . [6557-02]

8:50 am: **Life test results of OLED-xl long-life materials for use in active matrix organic light emitting diode (AMOLED) displays for head mounted applications,** D. A. Fellowes, M. V. Wood, U.S. Army Night Vision & Electronic Sensors Directorate; O. Prache, eMagin Corp. . . . . [6557-03]

9:10 am: **Head tracker evaluation utilizing the dynamic tracker test apparatus,** J. L. M. Shattuck III, V. M. Parisi, Air Force Research Lab. . . [6557-04]

9:30 am: **Non-contact method for characterization of a rotational table,** J. L. M. Shattuck III, V. M. Parisi, Air Force Research Lab. . . . . [6557-05]

Coffee Break . . . . . 9:50 to 10:20 am

SESSION 2

Room: Atlanta/Boston . . . . . Tues. 10:20 am to 12:00 pm

HMD Technologies

Chair: **Randall E. Bailey**, NASA Langley Research Ctr.

10:20 am: **Digital sensor technology for advanced night vision goggles,** J. C. James, W. Robinson, D. Roberts, J. M. Cathcart, K. Lyons, L. West, T. L. Haran, T. Wasilewski, Georgia Institute of Technology . . . . . [6557-36]

10:40 am: **I-PORT™; a hands-free near-eye display,** J. T. Carollo, M. Hoppe, Creative Display Systems, LLC . . . . . [6557-07]

11:00 am: **Integrated diver display device (ID3) for diver applications,** D. Tremper, Naval Research Lab.; A. Brosky, Cardinal Scientific, Inc. . . . [6557-08]

11:20 am: **Analysis of head-mounted displays for advanced night vision goggles,** L. West, K. Lyons, W. Robinson, D. W. Roberts, J. C. James, J. M. Cathcart, T. L. Haran, T. Wasilewski, Georgia Institute of Technology . . . [6557-09]

11:40 am: **New weather depiction technology for night vision goggle (NVG) training,** J. W. Schroeder, S. Theleman, J. Hegarty, R. Vollmerhausen, C. Scott, ONTAR Corp.; F. Colby, Univ. of Massachusetts/Lowell; S. Napier, Naval Air Warfare Ctr. . . . . [6557-10]

Lunch/Exhibition Break . . . . . 12:00 to 1:20 pm

SESSION 3

Room: Atlanta/Boston . . . . . Tues. 1:20 to 3:00 pm

HMD Human Factors

Chair: **Colin E. Reese**, U.S. Army Night Vision & Electronic Sensors Directorate

1:20 pm: **The legibility of HMD symbology,** T. H. Harding, C. E. Rash, J. S. Martin, U.S. Army Aeromedical Research Lab. . . . . [6557-11]

1:40 pm: **Target acquisition using combined visual and audio cueing,** R. Westergren, U.S. Air Force; P. R. Havig, Air Force Research Lab. . . . . [6557-12]

2:00 pm: **Effects of simple HMD operations on primary visual tasks,** J. McIntire, P. R. Havig, G. A. Reis, Air Force Research Lab. . . . . [6557-13]

2:20 pm: **Helmet-mounted sensor-offset evaluation using manual and locomotion tasks,** J. E. Melzer, Rockwell Collins Optronics; K. Moffitt, Consultant . . . . . [6557-14]

2:40 pm: **Optimizing multispectral sensors through enhanced imagery for the warfighter,** S. Dixon, P. L. Marasco, Air Force Research Lab. . . . . [6557-15]

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

SESSION 4

Room: Atlanta/Boston . . . . . Tues. 3:30 to 5:50 pm

Hyperstereo and Optical Design

Chair: **Thomas H. Harding**, U.S. Army Aeromedical Research Lab.

3:30 pm: **A limited flight study for investigating hyperstereo vision,** C. E. Rash, M. E. Kalich, W. E. McLean, U.S. Army Aeromedical Research Lab. . . . . [6557-16]

3:50 pm: **Effects of hyperstereopsis on visual perception: absolute distance perception,** P. R. Flanagan, Deakin Univ. (Australia); G. W. Stuart, P. Gibbs, Defence Science and Technology Organisation (Australia) . . . . . [6557-39]

4:10 pm: **Hyperstereopsis in helmet mounted NVDs: Slope perception,** G. W. Stuart, Defence Science and Technology Organisation (Australia); P. R. Flanagan, Deakin Univ. (Australia); P. Gibbs, Defence Science and Technology Organisation (Australia) . . . . . [6557-17]

4:30 pm: **Hyperstereo algorithms for the perception of terrain drop-offs,** A. Mohananchettiar, V. Cevher, Univ. of Maryland/College Park; V. G. CuQlock-Knopp, Army Research Lab.; R. Chellappa, Univ. of Maryland/College Park; J. Merritt, The Merritt Group . . . . . [6557-19]

4:50 pm: **Wide-angle optical systems with combiner on the basis of the synthesized volume holograms for HMD,** M. A. Gan, S. Scheglov, I. Gan, A. Tchertkov, S.I. Vavilov State Optical Institute (Russia) . . . . . [6557-20]

5:10 pm: **Advanced helmet-mounted display (AHMD),** A. Sisodia, L-3 Communications Corp.; M. Bayer, Zygo Optical Systems . . . . . [6557-21]

5:30 pm: **Hyperstereopsis in helmet-mounted NVDs: Time to contact estimation,** P. R. Flanagan, Deakin Univ. (Australia); G. W. Stuart, P. Gibbs, Defence Science and Technology Organisation (Australia) . . . . . [6557-18]

Wednesday 11 April

Welcome and Introductions

Room: Atlanta/Boston . . . . . Wed. 8:05 to 8:10 am

SESSION 5

Room: Atlanta/Boston . . . . . Wed. 8:10 to 9:50 am

NVG Human Factors

Chair: **Peter L. Marasco**, Air Force Research Lab.

8:10 am: **Applied and theoretical aspects of night vision goggle resolution and visual acuity assessment,** H. L. Task, Task Consulting; A. R. Pinkus, Air Force Research Lab. . . . . [6557-22]

8:30 am: **Comparison of experimental vision performance testing techniques, including the implementation of an active matrix electrophoretic ink display,** M. W. Swinney, Air Force Research Lab. . . . . [6557-23]

8:50 am: **Hands-free focus technology for night vision applications,** D. Roberts, W. Robinson, J. C. James, J. M. Cathcart, K. Lyons, L. West, T. L. Haran, T. Wasilewski, Georgia Institute of Technology . . . . . [6557-37]

9:10 am: **Changes in distance estimation when using night vision goggles in changing ambient illumination,** S. A. Jennings, T. Macuda, National Research Council Canada (Canada); W. A. Simpson, Defence Research and Development Canada (Canada) . . . . . [6557-25]

9:30 am: **Comparison of an NVG model with experiments to elucidate temporal behaviour,** P. J. Thomas, Topaz Technology Inc. (Canada); H. Mehbratu, York Univ. (Canada); S. A. Jennings, National Research Council Canada (Canada); J. Zacher, York Univ. (Canada); T. Macuda, National Research Council Canada (Canada); R. S. Allison, R. I. Hornsey, York Univ. (Canada) . . . . . [6557-26]

Coffee Break . . . . . 9:50 to 10:20 am

SESSION 6

Room: Atlanta/Boston . . . . . Wed. 10:20 am to 12:40 pm

Operations

Chair: **Sion A. Jennings**, National Research Council Canada (Canada)

10:20 am: **Effects of image intensifier halo on perceived layout,** J. Zacher, T. Brandwood, York Univ. (Canada); P. J. Thomas, Topaz Technologies Inc. (Canada); M. Vinnikov, G. Xu, York Univ. (Canada); S. A. Jennings, T. Macuda, National Research Council Canada (Canada); S. Palmisano, Univ. of Wollongong (Australia); G. Craig, National Research Council Canada (Canada); R. S. Allison, York Univ. (Canada) . . . . . [6557-27]

10:40 am: **Night vision goggles, laser eye protection, and cockpit displays,** G. L. Martinsen, P. Havig, Air Force Research Lab.; J. Dykes, T. Kuyk, Northrop Grumman Corp.; L. McLin, Air Force Research Lab. . . . . [6557-28]

11:00 am: **AH-64 monocular HMD visual assessment during urban combat in operation Iraqi freedom,** C. E. Rash, U.S. Army Aeromedical Research Lab.; J. K. Heinecke, U.S. Army; K. L. Hiatt, Headquarters U.S. Army Forces Command (FORSCOM) . . . . . [6557-29]

11:20 am: **Integrated headgear for the future force warrior: results of first field evaluation,** W. J. Schuyler, J. E. Melzer, Rockwell Collins Optronics [6557-30]

11:40 am: **Evaluation of head-worn display concepts for commercial aircraft taxi operations,** R. E. Bailey, J. J. Arthur III, L. J. Prinzel III, L. J. Kramer, NASA Langley Research Ctr. . . . . [6557-31]

12:00 pm: **Preliminary assessment of the utilization of night vision goggles in airborne forest fire suppression,** S. A. Jennings, G. Craig, R. Erdos, T. Macuda, National Research Council Canada (Canada); D. Filiter, B. Crowell, Ontario Ministry of Natural Resources (Canada) . . . . . [6557-32]

12:20 pm: **Wireless communication technology as applied to head mounted display for a tactical fighter pilot,** G. Saini, Air Force Research Lab. . . [6557-33]

Lunch/Exhibition Break . . . . . 12:40 to 2:00 pm

Display Track Plenary Presentation

Room: Atlanta . . . . . Wed. 2:00 to 3:00 pm

Pixels, people, perception, pet peeves and possibilities: a look at displays [6557-38]

H. L. Task, Task Consulting

For details see p. 7

Thursday 12 April 2007 • Proceedings of SPIE Vol. 6558

Display Technologies & Applications for Defense, Security, & Avionics

Conference Chairs: **John T. Thomas**, General Dynamics Canada Ltd. (Canada); **Andrew Malloy**, Naval Research Lab.

Program Committee: **Eric W. Forsythe**, Army Research Lab.; **Gregory J. Hardy**, The Boeing Co.; **Robert P. Herman**, Astronautics Corp. of America; **David C. Huffman**, L-3 Communications Display Systems; **Kalluri R. Sarma**, Honeywell International, Inc.; **Martin J. Steffensmeier**, Rockwell Collins, Inc.; **Murray Trakalo**, General Dynamics Canada Ltd. (Canada)

Wednesday 11 April

Display Track Plenary Presentation

Room: Atlanta . . . . . **Wed. 2:00 to 3:00 pm**

Pixels, people, perception, pet peeves and possibilities: a look at displays

H. L. Task, Task Consulting

For details see p. 7

Thursday 12 April

SESSION 1

Room: Atlanta/Boston . . . . . **Thurs. 8:50 to 10:10 am**

Military Display Systems and Applications

Chair: **Martin J. Steffensmeier**, Rockwell Collins, Inc.

8:50 am: **Vehicle and dismounted displays in the operational environment,** D. D. Desjardins, Wright-Patterson Air Force Base and Air Force Research Lab.; J. C. Byrd, Wright-Patterson Air Force Base and Aeronautical Systems Ctr. . . . . [6558-02]

9:10 am: **Using ARINC 818 avionics digital video bus (ADVB) for military displays,** J. A. Alexander, T. Keller, Great River Technology, Inc. . . . . [6558-03]

9:30 am: **Upgraded immersive input display device (I2D2),** D. Tremper, Naval Research Lab.; A. Brosky, Cardinal Scientific, Inc. . . . . [6558-04]

9:50 am: **The off-axis viewing device: a rifle-mounted sighting system for search and engagement from covered positions,** T. W. Chapman, C. G. Brady, Defence Science and Technology Organisation (Australia) . . . . . [6558-25]

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

SESSION 2

Room: Atlanta/Boston . . . . . **Thurs. 10:30 am to 12:10 pm**

Avionics Displays

Chair: **Kalluri R. Sarma**, Honeywell International, Inc.

10:30 am: **Validation of resized commercial AMLCD technology for cockpit avionics,** P. Bendale, Interface Displays & Controls, Inc. . . . . [6558-05]

10:50 am: **COTS displays applied to avionics applications,** J. T. Thomas, C. Waitman, General Dynamics Canada Ltd. (Canada) . . . . . [6558-06]

11:10 am: **A COTS derived NVG compatible avionics display,** J. T. Thomas, A. Cavalcanti, General Dynamics Canada Ltd. (Canada) . . . . . [6558-07]

11:30 am: **E-2D advanced Hawkeye: control display unit,** R. Saxena, Northrop Grumman Corp.; P. W. Paolillo, Naval Air Systems Command; J. Garruba, Northrop Grumman Corp.; D. Saelens, Barco N.V. (Belgium) . . . . . [6558-08]

11:50 am: **Black background NVIS radiance for liquid crystal displays,** R. M. Maner, D. Hadlich, Honeywell International . . . . . [6558-09]

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

SESSION 3

Room: Atlanta/Boston . . . . . **Thurs. 1:10 to 2:50 pm**

Image Processing and New Imaging Devices

Chair: **Robert P. Herman**, Astronautics Corp. of America

1:10 pm: **Real time image enhancement for vehicle mounted and man portable display systems,** T. L. P. Olson, H. C. Lee, D. Manville, J. Puritz, DRS Technologies, Inc. . . . . [6558-10]

1:30 pm: **Design flow for implementing image processing in FPGAs,** M. Trakalo, G. Giles, General Dynamics Canada Ltd. (Canada) . . . . . [6558-11]

1:50 pm: **Image analysis and understanding using super resolution,** H. C. Lee, T. L. P. Olson, D. Manville, G. Cloud, DRS Technologies, Inc. . . . . [6558-12]

2:10 pm: **Advances in temporally multiplexed multiscopic displays,** V. B. Markov, S. A. Kupiec, MetroLaser, Inc.; A. R. L. Travis, Univ. of Cambridge; D. G. Hopper, G. Saini, Air Force Research Lab. . . . . [6558-13]

2:30 pm: **Short-wave infrared imager cockpit lighting interface issues,** P. L. Marasco, Air Force Research Lab. . . . . [6558-14]

SESSION 4

Room: Atlanta/Boston . . . . . **Thurs. 2:50 to 4:40 pm**

New Display Technology for Military Applications

Chair: **Murray Trakalo**, General Dynamics Canada Ltd. (Canada)

2:50 pm: **Stainless steel display evaluation,** D. G. Hopper, F. M. Meyer, S. Longo, Air Force Research Lab.; T. L. Trissell, General Dynamics Corp. . . . . [6558-15]

3:10 pm: **Characterization of a monochromatic, 128x64 resolution PLED for military instrumentation applications,** B. Bahadur, T. J. Barnidge, J. Bradshaw, J. D. Sampica, A. N. Stuppi, J. Tchon, Rockwell Collins, Inc. . . . . [6558-16]

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

4:00 pm: **Color and shape perception on the Perspecta 3D volumetric display,** G. A. Reis, P. Havig, E. Heft, J. McIntire, W. Bell, Air Force Research Lab. . . . . [6558-17]

4:20 pm: **Metrics for 3D displays,** P. R. Havig, D. Aleva, J. Moore, G. Saini, E. Heft, J. McIntire, Air Force Research Lab.; T. L. Trissell, General Dynamics Corp. . . . . [6558-18]

SESSION 5

Room: Atlanta/Boston . . . . . **Thurs. 4:40 to 6:00 pm**

Display Metrics and Human Factors and Data Security

Chair: **Eric W. Forsythe**, Army Research Lab.

4:40 pm: **Linear perspective limitations on VR and realistic displays,** L. A. Temme, U.S. Army Aeromedical Research Lab. . . . . [6558-20]

5:00 pm: **Brightness limitations in integrated lighting systems,** T. P. Jannson, M. J. Bennahmias, K. Chua, R. D. Pradhan, T. R. Forrester, Physical Optics Corp.; E. Arik, N. Nathan, K. Yu, Luminit LLC . . . . . [6558-21]

5:20 pm: **Agent-based display adaptation tool for automated visualization,** J. J. Gallimore, Wright State Univ.; R. S. Woodley, 21st Century Systems, Inc.; A. Barnes, Wright State Univ. . . . . [6558-22]

5:40 pm: **Optical security and anti-counterfeiting using 3D screen printing,** W. H. Wu, W. Yang, M. Kuo, H. Lee, National Defense Univ. (Taiwan); C. Chang, MingDao Univ. (Taiwan) . . . . . [6558-23]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 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. Each evening will represent a different set of conferences to promote opportunities 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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✔ **Computational integral imaging reconstruction of 3D objects using simultaneous pickup in real and virtual image fields,** H. J. Lee, D. Shin, E. S. Kim, Kwangwoon Univ. (South Korea) . . . . . [6558-24]

Workshop

Location: Atlanta/Boston . . . . . 8:00 to 10:00 pm

Defense and Security Displays

Chairs: **John T. Thomas**, General Dynamics Canada, Ltd. (Canada); **Andrew Malloy,** Naval Research Lab.

Please join us for this informal gathering to discuss display technologies and military applications for displays. The floor will be open for audience participation and any display related topics are welcome.

Some suggested topics for discussion are:

- COTS displays: Good enough for the cockpit?
- Commercial video interface "standards" such as DVI: Stable enough for MIL applications?
- Video over the new extended 1553 bus: But can we afford this?
- Head mounted displays in military applications: Time to assess pro's and Con's.
- LED backlights vs. florescent tubes
- OLED's: Ready for military applications?
- Are Bi-stable displays ready for battlefield applications?
- 3-D displays technology for military applications: Is it ready and for which applications?

Displays workshops are free to all registered attendees at SPIE Defense and Security Symposium. Snacks and beverages will be provided.

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Monday-Tuesday 9-10 April 2007 • Proceedings of SPIE Vol. 6559

Enhanced and Synthetic Vision 2007

Conference Chairs: **Jacques G. Verly**, Univ. de Liège (Belgium); **Jeff J. Güell**, The Boeing Co.

Program Committee: **Gloria L. Calhoun**, Air Force Research Lab.; **Guy A. French**, Air Force Research Lab.; **Bernd R. Korn**, DLR (Germany); **Jens Schiefele**, Jeppesen GmbH (Germany); **Maarten Uijt de Haag**, Ohio Univ.; **Steven D. Young**, NASA Langley Research Ctr.

Monday 9 April

SESSION 1

Room: Atlanta/Boston . . . . . Mon. 8:10 to 10:30 am

Chairs: **Steven D. Young**, NASA Langley Research Ctr.; **Jeff J. Güell**, The Boeing Co.; **Jacques G. Verly**, Univ. de Liège (Belgium)

8:10 am: **Operations concept for the use of synthetic vision system (SVS) display during precision instrument approach,** D. A. Domino, The Mitre Corp. . . . . [6559-16]

8:30 am: **Synthetic vision systems: operational considerations simulation experiment,** L. J. Kramer, S. P. Williams, R. E. Bailey, L. J. Glaab, NASA Langley Research Ctr. . . . . [6559-01]

8:50 am: **EGPWS on synthetic vision primary flight display,** G. He, T. Feyereisen, Honeywell International, Inc.; K. Conner, Honeywell Defense & Space Electronics Systems; S. Wyatt, J. Engels, Honeywell International, Inc.; A. Gannon, Honeywell Technology; B. Wilson, Honeywell International, Inc. . . . . [6559-02]

9:10 am: **Human factors evaluation of a dynamic channel depiction of navigation procedures in SVS displays,** C. Pschierer, J. Schiefele, Jeppesen GmbH (Germany); D. Howland, Jeppesen; N. Barraci, A. Sindlinger, U. Klingauf, Technische Univ. Darmstadt (Germany) . . . . . [6559-03]

9:30 am: **Fused enhanced and synthetic vision system (EVS/SVS) for rotorcraft operations,** C. L. Tiana, Aireyes, Inc.; R. Hennessy, Monterey Technologies, Inc.; C. W. Jennings, Nav3D Corp. . . . . [6559-04]

9:50 am: **Making a land/go-around decision with runway incursions in near zero-zero weather,** D. M. Murphy, General Dynamics Corp.; D. J. Zimmer, U.S. Air Force; G. A. French, Air Force Research Lab. . . . . [6559-05]

10:10 am: **Flight assessment of an integrated DNAW helicopter pilotage display system; flight trials 'Hawk Owl',** J. Sadler, D. Thorndycraft, P. Longman, D. Marsden, QinetiQ (United Kingdom) . . . . . [6559-06]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 2

Room: Atlanta/Boston . . . . . Mon. 11:00 am to 12:20 pm

Chairs: **Gloria L. Calhoun**, Air Force Research Lab.; **Maarten Uijt de Haag**, Ohio Univ.; **Jacques G. Verly**, Univ. de Liège (Belgium)

11:00 am: **Use of X-band weather radar to support the terrain database integrity monitoring and terrain referenced navigation function,** A. Singh, M. Uijt de Haag, Ohio Univ. . . . . [6559-07]

11:20 am: **Enhanced and synthetic vision system for autonomous all weather approach and landing,** B. R. Korn, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [6559-08]

11:40 am: **Towards an inexpensive computer vision-based automated landing system for unmanned aerial vehicles,** K. Blenkhorn, S. O'Hara, 21st Century Systems, Inc. . . . . [6559-09]

12:00 pm: **Applying SVS technology to improve UAV manual control performance,** J. Tadema, Netherlands Defence Academy (Netherlands); E. Theunissen, J. Koeners, Technische Univ. Delft (Netherlands) . . . . . [6559-10]

Lunch Break . . . . . 12:20 to 1:50 pm

SESSION 3

Room: Atlanta/Boston . . . . . Mon. 1:50 to 3:10 pm

Chairs: **Jens Schiefele**, Jeppesen GmbH (Germany); **Guy A. French**, Air Force Research Lab.; **Jeff J. Güell**, The Boeing Co.

1:50 pm: **Design and testing of an unlimited field-of-regard synthetic vision head-worn display for commercial aircraft surface operations,** J. J. Arthur III, L. J. Prinzel III, L. J. Kramer, S. P. Williams, R. E. Bailey, NASA Langley Research Ctr. . . . . [6559-12]

2:10 pm: **The challenges with displaying EVS and SVS video on a head-up display,** P. Howells, Rockwell Collins Flight Dynamics . . . . . [6559-13]

2:30 pm: **A real-time panoramic video display system for local situational awareness,** J. L. Dale, D. Dwyer, Octec Ltd. (United Kingdom) . . . . . [6559-14]

2:50 pm: **The use of configural displays to promote pilot situation awareness,** J. C. Jenkins, U.S. Air Force; J. J. Gallimore, Wright State Univ. . . . . [6559-15]

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

SESSION 4

Room: Atlanta/Boston . . . . . Mon. 3:40 to 5:20 pm

Chairs: **Bernd R. Korn**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Jeff J. Güell**, The Boeing Co.; **Jacques G. Verly**, Univ. de Liège (Belgium)

3:40 pm: **Prevention of runway incursions due to closed runways or unsuitable runway choices by enhanced crew situational awareness and alerting,** C. Vernaleken, C. Urvoy, U. Klingauf, Technische Univ. Darmstadt (Germany) . . . . . [6559-17]

4:00 pm: **Compact self-contained enhanced-vision sensor (EVS) simulator,** C. L. Tiana, Aireyes, Inc. . . . . [6559-18]

4:20 pm: **Flight assessment of a real time multi-resolution image fusion system for use in degraded visual environments,** M. I. Smith, Waterfall Solutions Ltd (United Kingdom); J. Sadler, QinetiQ (United Kingdom) . . . [6559-19]

4:40 pm: **Applying daytime colors to nighttime imagery with an efficient color transfer method,** G. Li, K. Wang, Jilin Univ. (China) . . . . . [6559-20]

5:00 pm: **Semantic bifurcated importance field visualization,** E. R. Lindahl, P. G. Petrov, 21st Century Systems Inc. . . . . [6559-21]

Tuesday 10 April

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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-show and their manuscript 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.

✔ **Surveillance video with spatially registered graphics for decision support,** A. Majoros, The Boeing Co.; J. Ianni, Air Force Research Lab.; P. Davies, R. P. Higgins, The Boeing Co.; P. R. Havig, Air Force Research Lab. . [6559-24]

Monday-Tuesday 9-10 April 2007 • Proceedings of SPIE Vol. 6560

Intelligent Computing: Theory and Applications V

Conference Chairs: **Kevin L. Priddy**, Air Force Research Lab.; **Emre Ertin**, The Ohio State Univ.

Program Committee: **Gianfranco Basti**, Pontificia Univ. Lateranense (Italy); **Charles W. Glover**, Oak Ridge National Lab.; **William S. Hortos**, Associates in Communication Engineering Research and Technology; **Amy L. Magnus**, Air Force Office of Scientific Research; **Anke Meyer-Bäse**, Florida State Univ.; **Mark E. Oxley**, Air Force Institute of Technology; **Antonio L. Perrone**, Pontificia Univ. Lateranense (Italy); **Todd V. Rovito**, Air Force Research Lab.; **Eugene Santos, Jr.**, Dartmouth College; **Robert L. Williams**, Air Force Research Lab.

Monday 9 April

Opening Remarks

Room: Grand 3 . . . . . Mon. 8:30 to 8:40 am

Chair: **Emre Ertin**, The Ohio State Univ.

SESSION 1

Room: Grand 3 . . . . . Mon. 8:40 to 11:30 am

Image Processing

Chair: **Douglas M. Summers**, W. M. Keck Observatory

8:40 am: **A bio-inspired system for spatio-temporal recognition in static and video imagery,** D. Khosla, C. Moore, D. J. Huber, S. E. Chelian, HRL Labs., LLC . . . . . [6560-01]

9:00 am: **Bio-inspired visual attention and object recognition,** D. Khosla, C. Moore, S. E. Chelian, HRL Labs., LLC . . . . . [6560-02]

9:20 am: **A novel content-based video/image retrieval method for surveillance and forensic applications,** K. Vadakkeveedu, R. Fernandes, Knowledge Based Systems, Inc. . . . . [6560-03]

9:40 am: **Behavior recognition using cognitive swarms and fuzzy graphs,** S. Medasani, Y. Owechko, HRL Labs., LLC . . . . . [6560-04]

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

10:30 am: **A multi-camera system for real-time pose estimation,** A. E. Savakis, J. M. Hnatow, J. Schimmel, M. J. Erhard, Rochester Institute of Technology . . . . . [6560-05]

10:50 am: **Autonomous learning: combining supervising and self-supervising method for on-line incremental learning of discriminative patterns,** S. Xia, J. Chen, W. Hu, National Univ. of Defense Technology (China) . . . . . [6560-06]

11:10 am: **Analysis of the map-seeking circuit in early vision applications,** J. Jelinek, Honeywell Technology . . . . . [6560-07]

Lunch Break . . . . . 11:30 am to 1:00 pm

SESSION 2

Room: Grand 3 . . . . . Mon. 1:00 to 2:40 pm

Optimization

Chair: **Emre Ertin**, The Ohio State Univ.

1:00 pm: **Artificial immune system approach for air combat maneuvering,** J. T. Kaneshige, K. Krishnakumar, NASA Ames Research Ctr. . . . . [6560-08]

1:20 pm: **Parameter optimization of LS-SVM for regression using NGA,** Q. L. Wang, Z. Feng, K. Shida, Harbin Institute of Technology (China) . . [6560-09]

1:40 pm: **ASAS: autonomy en route,** N. Barraci, U. Klingauf, S. Bauer, M. Hartmann, Technische Univ. Darmstadt (Germany) . . . . . [6560-10]

2:00 pm: **Organization capable intelligent sensors,** E. T. Matson, Wright State Univ. and Univ. of Cincinnati; R. K. Bhatnagar, Univ. of Cincinnati . . . . . [6560-11]

2:20 pm: **Game theoretical techniques for designing counter-terrorism systems,** S. U. Khan, The Univ. of Texas/Arlington . . . . . [6560-12]

Coffee Break . . . . . 2:40 to 3:20 pm

SESSION 3

Room: Grand 3 . . . . . Mon. 3:20 to 4:20 pm

Theory

Chair: **Anke Meyer-Bäse**, Florida State Univ.

3:20 pm: **Learning Bayesian network from imperfect data: enhancements to the EM algorithm,** K. K. R. G. K. Hewawasam, K. Premaratne, Univ. of Miami . . . . . [6560-13]

3:40 pm: **Global stability analysis of competitive neural networks with different time-scales under perturbations,** A. Meyer-Bäse, Florida State Univ. . . . . [6560-14]

4:00 pm: **A system for vehicle recognition in video based on SIFT features, mixture models, and support vector machines,** A. Nag, D. J. Miller, The Pennsylvania State Univ.; A. P. Brown, K. J. Sullivan, Toyon Research Corp. . . . . [6560-15]

Tuesday 10 April

SESSION 4

Room: Grand 3 . . . . . Tues. 8:40 to 9:50 am

Information Processing

Chair: **Eugene Santos, Jr.**, Dartmouth College

8:40 am: **A function model for automated path prediction of entities,** S. Nanda, SDS International, Inc.; R. Pray, RPA Electronics Design, LLC [6560-16]

9:00 am: **Information retrieval in heterogeneous search spaces using I-FGM** *(Invited Paper)*, E. Santos, Jr., Dartmouth College; E. E. Santos, Virginia Polytechnic Institute and State Univ.; H. Nguyen, Univ. of Wisconsin/Whitewater; L. Pan, J. Korah, Virginia Polytechnic Institute and State Univ.; Q. Zhao, Dartmouth College; H. Xia, Virginia Polytechnic Institute and State Univ. [6560-17]

9:30 am: **Intelligent algorithms for persistent and pervasive sensing in systems comprised of wireless ad hoc networks of ground-based sensors and mobile infrastructures,** W. S. Hortos, Associates in Communication Engineering Research and Technology . . . . . [6560-32]

Coffee Break . . . . . 9:50 to 10:30 am

SESSION 5

Room: Grand 3 . . . . . Tues. 10:30 am to 12:10 pm

Networking Applications

Chair: **Emre Ertin**, The Ohio State Univ.

10:30 am: **Genetic algorithm approach for adaptive power and subcarrier allocation in multi-user OFDM systems,** Y. B. Reddy, Grambling State Univ.; M. Naraghi-Pour, Louisiana State Univ. . . . . [6560-19]

10:50 am: **Security assurances for intelligent complex systems,** S. Naqvi, Ctr. of Excellence in Information and Communication Technologies (Belgium); M. Riguidel, École Nationale Supérieure des Télécommunications (France) . . . . . [6560-20]

11:10 am: **Distributed mining on intelligent sensor data,** H. Bian, Wright State Univ.; E. T. Matson, Wright State Univ. and Univ. of Cincinnati; R. K. Bhatnagar, Univ. of Cincinnati . . . . . [6560-21]

11:30 am: **Pattern classification on wireless sensor networks,** E. Ertin, The Ohio State Univ. . . . . [6560-22]

11:50 am: **Localized construction of aggregation tree in sensor networks,** R. K. Bhatnagar, K. Andra, Univ. of Cincinnati . . . . . [6560-23]

Lunch/Exhibition Break . . . . . 12:10 to 1:40 pm

SESSION 6

Room: Grand 3 . . . . . Tues. 1:40 to 2:40 pm

Applications

Chair: **Douglas M. Summers**, W. M. Keck Observatory

1:40 pm: **Fast-varying pitch tracking: a new approach to speech modeling,** D. Charalampidis, Univ. of New Orleans . . . . . [6560-24]

2:00 pm: **Universal range bin centroids from SAR imagery for knowledge-aided radar,** E. H. Feria, College of Staten Island/CUNY . . . . . [6560-25]

2:20 pm: **Real-time PM10 concentration monitoring on Penang Bridge by using traffic monitoring CCTV,** H. S. Lim, M. Z. Mat Jafri, K. Abdullah, K. L. Low, Univ. Sains Malaysia (Malaysia) . . . . . [6560-26]

2:40 pm: **Artificial emotion triggered stochastic behavior transitions with motivational gain effects for multi-objective robot tasks,** H. Temeltas, E. Daglari, Istanbul Teknik Univ. (Turkey) . . . . . [6560-33]

Coffee Break . . . . . 2:40 to 3:30 pm

SESSION 7

Room: Grand 3 . . . . . Tues. 3:30 to 5:30 pm

Medical Applications

Chair: **Gianfranco Basti**, Pontificia Univ. Lateranense (Italy)

3:30 pm: **Automatic pattern recognition applied to thermal imaging for large-scale breast cancer detection** *(Invited Paper)***,** A. L. Perrone, Techniteia Advanced Paradigms S.r.l (Italy) and Pontificia Univ. Lateranense (Italy); P. P. Hoekstra III, Therma-Scan Inc.; G. Basti, Pontificia Univ. Lateranense (Italy) . . . . . [6560-27]

4:00 pm: **Evaluation of two key machine intelligence technologies,** W. H. Land, Jr., G. J. Tomko, Binghamton Univ.; J. J. Heine, H. Lee Moffitt Cancer Ctr. & Research Institute; R. Thomas, A. Mizaku, Binghamton Univ. . . . . [6560-28]

4:20 pm: **Small mammographic lesions evaluation based on neural gas network** *(Invited Paper)***,** A. Meyer-Bäse, Florida State Univ. . . . . [6560-29]

4:40 pm: **Performance evaluation of evolutionary computational and conventionally trained support vector machines,** W. H. Land, Jr., Binghamton Univ.; J. J. Heine, H. Lee Moffitt Cancer Ctr. & Research Institute; D. Roye, D. Margols, Binghamton Univ. . . . . [6560-30]

5:10 pm: **Intelligent computing in breast cancer detection,** P. P. Hoekstra III, Therma-Scan, Inc. . . . . [6560-31]

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Unmanned Systems Technology IX

Conference Chairs: **Grant R. Gerhart**, U.S. Army TARDEC/RDECOM; **Douglas W. Gage**, XPM Technologies; **Charles M. Shoemaker**, Robotic Research LLC

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; **Daniel M. Carroll**, Space and Naval Warfare Systems Ctr., San Diego; **Bruce L. Digney**, Defence Research and Development Canada (Canada); **Rajiv V. Dubey**, Univ. of South Florida; **Hobart R. Everett**, Space and Naval Warfare Systems Ctr., San Diego; **Scott Fish**, Science Applications International Corp.; **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 H. 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; **Marc Raibert**, Boston Dynamics; **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.; **Venkatarama Sundareswaran**, Teledyne Scientific Co.; **Mel Torre**, Autonomous Solutions Inc.; **Brian H. Wilcox**, Jet Propulsion Lab.; **Robert M. Wilcox**, L-3 Titan Group; **Gary Witus**, Turing Associates, Inc.

Monday 9 April

SESSION 1

Room: Grand 1-2 . . . . . Mon. 1:00 to 5:30 pm

Perception

Chairs: **Magnús S. Snorrason**, Charles River Analytics, Inc.; **Andreas F. Koschan**, The Univ. of Tennessee

1:00 pm: **UGV-based rapid, high-confidence intelligent interior mapping,** D. C. Roberts, D. Warnaar, A. Menozzi, S. Saadat, S. R. Snarski, Applied Research Associates, Inc. . . . . [6561-01]

1:20 pm: **Negative obstacle detection for off-road autonomous navigation,** A. L. Rankin, A. Huertas, L. H. Matthies, Jet Propulsion Lab. . . . . [6561-02]

1:40 pm: **On-the-move independently moving target detection,** G. Salgian, J. Xiao, S. Samarasekera, R. Kumar, Sarnoff Corp. . . . . [6561-03]

2:00 pm: **The Army Research Laboratory (ARL) synchronous impulse reconstruction (SIRE) forward looking radar,** M. A. Ressler, L. H. Nguyen, F. Koenig, D. C. Wong, G. D. Smith, Army Research Lab. . . . . [6561-04]

2:20 pm: **Detection, tracking, and avoidance of moving objects from a moving semi-autonomous vehicle,** E. J. Rigas, B. A. Bodt, J. A. Bornstein, Army Research Lab. . . . . [6561-05]

2:40 pm: **A new SMART sensing system,** D. C. Zhang, P. Yu, P. Qing, S. J. Beard, Acellent Technologies, Inc. . . . . [6561-06]

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

3:30 pm: **Precise visual navigation in unknown GPS-denied environments using multi-stereo vision and global landmark matching,** Z. Zhu, T. Oskiper, O. Naroditsky, S. Samarasekera, H. S. Sawhney, R. Kumar, Sarnoff Corp. . . . . [6561-07]

3:50 pm: **Angularly sensitive micro-sensor construction and new processing paradigm,** J. B. Franck, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6561-08]

4:10 pm: **Terrain perception for robot navigation,** R. E. Karlsen, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.; G. Witus, Turing Associates . . . . . [6561-09]

4:30 pm: **Daredevil: ultra-wideband radar sensing for small UGVs,** B. M. Yamauchi, iRobot Corp. . . . . [6561-10]

4:50 pm: **Non-GPS navigation with the personal dead-reckoning system,** L. V. Ojeda, J. Borenstein, Univ. of Michigan . . . . . [6561-11]

5:10 pm: **A novel routing and sensor control optimization algorithm for target search and classification,** G. E. Collins, Toyon Research Corp.; J. Riehl, Univ. of California/Santa Barbara; P. E. Vegdahl, Toyon Research Corp. . . . . [6561-12]

Tuesday 10 April

SESSION 2

Room: Grand 1-2 . . . . . Tues. 8:30 to 9:50 am

Government Programs

Chairs: **Bruce E. Brendle, Jr.**, U.S. Army TARDEC/RDECOM; **Jonathan A. Bornstein**, Army Research Lab.

8:30 am: **Intelligent unmanned vehicle systems suitable for individual and cooperative missions,** M. O. Anderson, M. D. McKay, D. C. Wadsworth, Idaho National Lab. . . . . [6561-13]

8:50 am: **Intelligent mobility research at Defence R&D Canada for UGV mobility in complex terrain,** M. Trentini, B. H. Beckman, B. L. Digney, Defence Research and Development Canada (Canada) . . . . . [6561-14]

9:10 am: **Cohort: critical science and immediate realities,** B. L. Digney, Defence Research and Development Canada (Canada) . . . . . [6561-15]

9:30 am: **Establishment of a center for defense robotics,** D. J. Thomas, U.S. Army Tank-automotive and Armaments Command . . . . . [6561-16]

Coffee Break . . . . . 9:50 to 10:20 am

Panel Discussion

Room: Grand 1-2 . . . . . Tues. 10:20 am to 12:00 pm

Government Programs

Chairs: **Bruce E. Brendle, Jr.**, U.S. Army TARDEC/RDECOM; **Jonathan A. Bornstein**, Army Research Lab.

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

SESSION 3

Room: Grand 1-2 . . . . . Tues. 1:30 to 4:30 pm

Safety

Chairs: **Scott Fish**, Science Applications International Corp.; **Bruce L. Digney**, Defence Research and Development Canada (Canada)

1:30 pm: **Preparing for UGV tests with human object detection** *(Invited Paper)*, S. Fish, J. Ruedin, Science Applications International Corp.; M. R. Perschbacher, Defense Advanced Research Projects Agency; J. E. Bares, Carnegie Mellon Univ. . . . . [6561-17]

2:00 pm: **Objective test and performance measurement of automtotive crash warning systems,** S. M. Szabo, National Institute of Standards and Technology . . . . . [6561-18]

2:20 pm: **Micro-UAV collision avoidance,** J. Merchant, RPU Technology; F. Pope, Kanasaska Technology, LLC . . . . . [6561-20]

2:40 pm: **Layered-mode selection logic control with fuzzy sensor fusion network,** T. E. Born, A. B. Wright, Univ. of Arkansas/Little Rock . . . . . [6561-21]

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

3:30 pm: **Effect of collision avoidance for autonomous robot team formation,** M. Seidman, S. J. Yang, Rochester Institute of Technology . . . . . [6561-22]

3:50 pm: **Toward safe navigation in urban environment,** C. Ye, Univ. of Arkansas/Little Rock . . . . . [6561-23]

4:10 pm: **Simulating and testing autonomous behavior in multiple airborne sensor systems,** M. I. Smith, Waterfall Solutions Ltd. (United Kingdom); M. L. Hernandez, M. Cooper, QinetiQ Ltd. (United Kingdom) . . . . . [6561-24]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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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✔ **Component-based open middleware architecture for autonomous navigation systems,** M. K. Ann, Y. W. Park, T. Y. Jee, Agency for Defense Development (South Korea) . . . . . [6561-65]

✔ **Mobility analysis of differential torque steering vehicle,** N. Huh, WIA Co., Ltd. (South Korea) . . . . . [6561-76]

✔ **Design of a skid steer-testing system of 4x4 wheeled-type vehicle,** M. Kim, W. Yoo, T. Noh, H. Noh, H. Kim, Pusan National Univ. (South Korea) . [6561-77]

✔ **Design of a biologically inspired snake-like robot for all terrain use,** R. Manayil John, National Institute of Technology/Tiruchirappalli (India) . . . . . [6561-78]

✔ **Power PC-enabled rapid sensor prototype development platform for unmanned vehicles,** J. N. Falasco, General Electric Co. . . . . [6561-79]

✔ **Integration of the Fido explosives detector onto the PackBot EOD UGV,** P. Rudakevych, S. Clark, J. Wallace, iRobot Corp. . . . . [6561-80]

✔ **Framework for exploring issues in operator span of control: game interface lessons for developers of multi-robot systems** *(Presentation Only)*, R. D. Ellis, Wayne State Univ.; G. Witus, Turing Associates, Inc. . . . . [6561-81]

✔ **Optimal steering of a mobile robot,** G. Cook, George Mason Univ. . [6561-82]

Conference 6561 continued ➥

Wednesday 11 April

Session 4 runs concurrently with Session 6.

SESSION 4

Room: Grand 1-2 . . . . . Wed. 8:00 am to 12:20 pm

Human Robot Interface

Chairs: **Terrance M. Tierney**, U.S. Army TARDEC/RDECOM; **Gary R. Gilbert**, U.S. Army MRMC/TATRC

8:00 am: **Supervised autonomy for robotic inspection** *(Invited Paper)*, K. L. Moore, Colorado School of Mines . . . . . [6561-25]

8:30 am: **Integration of an intelligent systems behavior simulator and a scalable soldier-machine interface,** T. G. Johnson, DCS Corp.; T. M. Tierney, U.S. Army TARDEC/RDECOM . . . . . [6561-26]

8:50 am: **Augmented tele-operation for soldier-robot checkpoint inspection systems, phase I: test results,** G. Witus, Turing Associates, Inc.; R. E. Karlsen, G. R. Gerhart, U.S. Army TARDEC/RDECOM . . . . . [6561-27]

9:10 am: **Results from a long-term study of portable field robot in urban terrain,** C. Lundberg, Kungliga Tekniska Högskolan (Sweden) and National Defence College (Sweden); R. Reinhold, H. I. Christensen, Kungliga Tekniska Högskolan (Sweden) . . . . . [6561-28]

9:30 am: **Layered augmented virtuality,** G. Ahuja, B. Sights, G. T. Kogut, E. B. Pacis, H. R. Everett, F. Birchmore, Space and Naval Warfare Systems Ctr., San Diego . . . . . [6561-29]

9:50 am: **Layered autonomous overwatch: the necessity and feasability of multiple unmanned systems in combat support,** S. P. Monckton, Defence Research and Development Canada (Canada) . . . . . [6561-30]

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

10:40 am: **Head-aimed remote vision for EOD robots,** K. Massey, Chatten Associates, Inc. . . . . [6561-31]

11:00 am: **An agent-based approach to decluttering the interfaces of multi-UAV command and control systems,** S. O'Hara, N. Dwyer, 21st Century Systems, Inc. . . . . [6561-32]

11:20 am: **Stereo-vision based 3D modeling for unmanned ground vehicles,** S. Se, P. Jasiobedzki, MacDonald, Dettwiler and Associates Ltd. (Canada) . . . . . [6561-33]

11:40 am: **A scalable soldier-machine interface for human-robotic interaction,** S. Scheiner, DCS Corp. . . . . [6561-34]

12:00 pm: **Unmanned multi-control based on voice recognition of mobile robot,** S. Cho, UREATac Co., LTD. (South Korea) . . . . . [6561-35]

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

Introduction

Room: Grand 3 . . . . . Wed. 8:00 to 8:10 am

Chairs: **Venkatarama Sundareswaran**, Teledyne Scientific Co.; **George Vachtsevanos**, Georgia Institute of Technology

SESSION 6

Room: Grand 3 . . . . . Wed. 8:10 am to 12:10 pm

Joint Session with Conference 6578

Self-organizing Collaborative ISR Robotic Teams I

Chairs: **Venkatarama Sundareswaran**, Teledyne Scientific Co.; **George Vachtsevanos**, Georgia Institute of Technology

8:10 am: **The DARPA urban challenge** *(Invited Paper)*, N. A. Whitaker, Defense Advanced Research Projects Agency . . . . . [6578-34]

8:40 am: **Multiplatform information-based sensor management: an inverted UAV demonstration,** C. M. Kreucher, J. W. Wegrzyn, M. Beauvais, R. Conti, General Dynamics Advanced Information Systems . . . . . [6578-35]

9:00 am: **Collaborative unmanned vehicle engagement in adversarial missions,** J. Reimann, G. Vachtsevanos, Georgia Institute of Technology; J. Ge, L. Tang, A. Liberson, Impact Technologies; H. Chang, U.S. Army Research Office . . . . . [6578-36]

9:20 am: **Agent-based multiplatform control, collaboration, and target hand-off,** N. P. Coleman, U.S. Army Armament Research, Development and Engineering Ctr.; J. Robbins, B. Tirabassi, Technical Solutions, Inc. . . . . [6578-37]

9:40 am: **Formation control in multiplayer pursuit evasion game with superior evaders,** X. Wang, The Ohio State Univ.; G. Chen, Intelligent Automation Inc.; J. B. Cruz, Jr., The Ohio State Univ.; H. Chang, U.S. Army Research Office; E. Blasch, Air Force Research Lab. . . . . [6578-38]

10:00 am: **Collaborative multitarget tracking using networked robotic vehicles,** S. Biswas, S. Gupta, F. Yu, Michigan State Univ. . . . . [6578-39]

Coffee break . . . . . 10:20 to 10:50 am

10:50 am: **Hunter standoff killer team (HSKT) ground and flight results,** B. M. Moreland, U.S. Army Research, Development and Engineering Command . . . . . [6578-40]

11:10 am: **A man portable hybrid UAV/UGV system,** P. Rudakevych, B. M. Yamauchi, iRobot Corp. . . . . [6561-48]

11:30 am: **Multi-UAV autonomous collaborative behaviors for convoy protection,** Y. Chen, M. A. Peot, J. Lee, V. Sundareswaran, T. W. Altshuler, Teledyne Scientific Co. . . . . [6561-49]

11:50 am: **Development of a GPS/INS/MAG navigation system and waypoint navigator for a VTOL UAV,** O. Meister, R. Mönikes, J. Wendel, N. M. Frietsch, C. Schlaile, G. F. Trommer, Univ. Karlsruhe (Germany) . . . . . [6561-50]

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

Session 5 runs concurrently with Session 7.

SESSION 5

Room: Grand 1-2 . . . . . Wed. 1:30 to 5:30 pm

Extreme Mobility

Chairs: **Karl D. Iagnemma**, Massachusetts Institute of Technology; **Mel W. Torrie**, Autonomous Solutions, Inc.; **Charles M. Shoemaker**, Robotic Research LLC

1:30 pm: **BigDog** *(Invited Paper)***,** M. Raibert, M. G. Buehler, R. R. Playter, Boston Dynamics . . . . . [6561-36]

2:00 pm: **Heading stabilization and anti-rollover for chaos,** M. Berkemeier, E. Poulson, S. King, Autonomous Solutions, Inc. . . . . [6561-37]

2:20 pm: **The OmniTread OT-4 Serpentine Robot: new features and experiments,** J. Borenstein, Univ. of Michigan . . . . . [6561-38]

2:40 pm: **Development of a convertible wheeled robot,** D. Danknick, Applied Minds Inc. . . . . [6561-39]

3:00 pm: **Design and analysis an omnidirectional mobile robot in rough terrain,** M. R. Udengaard, K. D. Iagnemma, Massachusetts Institute of Technology . . . . . [6561-40]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **Design and control of a 12 DOF bipdal robot,** B. T. Krupp, Yobotics, Inc.; J. E. Pratt, Institute for Human and Machine Cognition; A. Vesper, Yobotics, Inc. . . . . [6561-41]

4:10 pm: **Tetrahedral robotics based on addressable reconfigurable architecture,** G. L. Brown, Jr., NASA Goddard Space Flight Ctr. . . . . [6561-43]

4:30 pm: **Fuel-cell powered UGV,** J. S. Meldrum, Sr., Michigan Technological Univ. . . . . [6561-44]

4:50 pm: **Slider walker,** P. L. Muench, U.S. Army Research, Development and Engineering Command . . . . . [6561-45]

5:10 pm: **Solving the mobility issues of unmanned ground vehicles,** S. Odedra, S. Prior, M. Karamanoglu, Middlesex Univ. (United Kingdom) . . . . . [6561-47]

SESSION 7

Room: Grand 3 . . . . . Wed. 1:30 to 4:20 pm

Joint Session with Conference 6578

Self-organizing Collaborative ISR Robotic Teams II

Chairs: **Venkatarama Sundareswaran**, Teledyne Scientific Co.; **George Vachtsevanos**, Georgia Institute of Technology

1:30 pm: **Deployable reconnaissance from a VTOL UAS in urban environments,** S. Barnett, A. Culhane, A. Sharkasi, J. Bird, C. F. Reinholtz, Virginia Polytechnic Institute and State Univ. . . . . [6561-51]

1:50 pm: **Macro-fiber composites for wing morphing micro-air vehicles,** O. Bilgen, D. J. Inman, A. J. Kurdila, Virginia Polytechnic Institute and State Univ. . . . . [6561-52]

2:10 pm: **Toward distributed ATR using subjective logic combination rules with networked UAVs,** S. O'Hara, 21st Century Systems, Inc. and Univ. of Nebraska/Omaha; M. Simon, 21st Century Systems, Inc.; Q. Zhu, Univ. of Nebraska/Omaha . . . . . [6561-53]

2:30 pm: **Detection and tracking of objects in an image sequence captured by a VTOL-UAV,** N. M. Frietsch, O. Meister, C. Schlaile, J. Wendel, G. F. Trommer, Univ. Karlsruhe (Germany) . . . . . [6561-54]

Coffee Break . . . . . 2:50 to 3:20 pm

3:20 pm: **An intelligent algorithm for unmanned aerial vehicle surveillance,** A. Bhargave, B. E. Ambrose, F. S. Lin, Broadata Communications, Inc. . [6561-55]

3:40 pm: **Cooperative control architectures for a team of UAVs subject to communications failures,** K. Khorasani, Concordia Univ. (Canada) . . . [6561-56]

4:00 pm: **Vision-based sensing for autonomous in-flight refueling,** D. A. Scott, M. Toal, J. L. Dale, Octec Ltd. (United Kingdom) . . . . . [6561-57]

Thursday 12 April

SESSION 8

Room: Grand 1-2 . . . . . Thurs. 8:20 to 10:20 am

Standards, Metrics, and Architectures

Chair: **Elena R. Messina**, National Institute of Standards and Technology

8:20 am: **Urban search and rescue robot performance standards: progress update,** E. R. Messina, A. Jacoff, National Institute of Standards and Technology . . . . . [6561-58]

8:40 am: **USARSim: a RoboCup Virtual Urban Search and Rescue competition,** S. B. Balakirsky, C. Scrapper, National Institute of Standards and Technology; S. Carpin, International Univ. Bremen GmbH (Germany); M. Lewis, Univ. of Pittsburgh . . . . . [6561-60]

9:00 am: **Characterizing unmanned system autonomy: the autonomy levels for unmanned systems (ALFUS) framework,** H. Huang, National Institute of Standards and Technology . . . . . [6561-61]

9:20 am: **Prediction in dynamic environments: algorithmic performance evaluation in urban driving scenarios,** C. I. Schlenoff, Z. Kootbally, R. Madhavan, National Institute of Standards and Technology . . . . . [6561-62]

9:40 am: **A time-slotted on-demand routing protocol for mobile ad hoc unmanned vehicle systems,** J. H. Forsmann, Idaho National Lab.; R. Hiromoto, Univ. of Idaho; J. M. Svoboda, Idaho National Lab. . . . . [6561-63]

10:00 am: **Performance evaluation of a 3D imaging system for vehicle safety,** A. M. Lytle, S. M. Szabo, G. S. Cheok, National Institute of Standards and Technology . . . . . [6561-64]

Coffee Break . . . . . 10:20 to 11:10 am

SESSION 9

Room: Grand 1-2 . . . . . Thurs. 11:10 am to 12:10 pm

Intelligent Behaviors and Learning I

Chairs: **Clinton W. Kelly III**, Science Applications International Corp.; **James L. Overholt**, U.S. Army TARDEC/RDECOM

11:10 am: **Terrain aware inversion of predictive models for high-performance UGVs,** A. J. Kelly, Carnegie Mellon Univ. . . . . [6561-66]

11:30 am: **Amphibious modular robot astrobiologist,** M. Yim, Univ. of Pennsylvania . . . . . [6561-67]

11:50 am: **Symbolic perception-based autonomous driving in dynamic environments using 4D/RCS,** M. Foedisch, R. Madhavan, C. I. Schlenoff, National Institute of Standards and Technology . . . . . [6561-68]

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

SESSION 10

Room: Grand 1-2 . . . . . Thurs. 1:30 to 3:30 pm

Intelligent Behaviors and Learning II

Chairs: **Clinton W. Kelly III**, Science Applications International Corp.; **James L. Overholt**, U.S. Army TARDEC/RDECOM

1:30 pm: **Mobile robots traversability awareness based on terrain visual sensory data fusion,** A. H. Shirkhodaie, Tennessee State Univ. . . . . [6561-69]

1:50 pm: **Sensor fusion for intelligent behavior on small unmanned ground vehicles,** G. T. Kogut, B. Sights, G. Ahuja, E. B. Pacis, F. Birchmore, H. R. Everett, Space and Naval Warfare Systems Ctr., San Diego . . . . . [6561-70]

2:10 pm: **Utilizing simulation technologies in the development of autonomous platforms,** O. Har, T. Shintel, HarTech Technologies Ltd. (Israel) . . . . . [6561-71]

2:30 pm: **World representations for unmanned ground vehicles,** G. S. Broten, S. P. Monckton, J. A. Collier, Defence Research and Development Canada (Canada) . . . . . [6561-73]

2:50 pm: **Modeling aerodynamic co-efficients for autonomous trajectory planning of aerial vehicles using neural network approach,** P. Xu, A. Verma, K. Vadakkeveedu, Knowledge Based Systems, Inc. . . . . [6561-74]

3:10 pm: **Real-time prediction and diagnostics for unmanned ground vehicle (UGV) mobility,** H. M. Jaenisch, J. Handley, M. P. Carroll, Tec-Masters, Inc. . . . . [6561-75]

Monday-Thursday 9-12 April 2007 • Proceedings of SPIE Vol. 6562

Unattended Ground, Sea, and Air Sensor Technologies and Applications IX

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

Program Committee: **John G. Blitch**, ARACAR: Alliance for Robot Assisted Crisis Assessment and Response; **John C. Carrano**, Luminex Corp.; **John S. Eicke**, Army Research Lab.; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego; **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.; **Huub A. van Hoof**, TNO (Netherlands); **Graeme van Voorthuijsen**, TNO-FEL (Netherlands)

Monday 9 April

SESSION 1

Room: Grand 4 . . . . . Mon. 1:00 to 1:50 pm

Keynote Session

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

Keynote Presentation

1:00 pm: **The network: a revolutionary capability for the warfighter** *(Invited Paper, Presentation Only)*, J. A. Parmentola, U.S. Army . . . . [6562-01]

SESSION 2

Room: Grand 4 . . . . . Mon. 1:50 to 4:40 pm

Acoustic, Seismic, Magnetics and Multimodal Sensing

Chairs: **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command

1:50 pm: **Passive ultrasonic method for human footsteps detection,** A. E. Ekimov, J. M. Sabatier, The Univ. of Mississippi . . . . . [6562-02]

2:10 pm: **Automated target recognition of humans in infrared images,** D. J. Bankman, T. M. Neighoff, Johns Hopkins Univ. . . . . [6562-03]

2:30 pm: **Personnel detection using ground sensors,** T. R. Damarla, Army Research Lab. . . . . [6562-05]

2:50 pm: **Magnetic tunnel junction technology for low-cost sensing,** C. Nordman, P. Eames, R. Schneider, NVE Corp.; G. Lewis, Lewtech Co., Inc. . . . . [6562-06]

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

3:40 pm: **Joint processing of vector-magnetic and acoustic sensor data,** R. J. Kozick, Bucknell Univ.; B. M. Sadler, Army Research Lab. . . . . [6562-07]

4:00 pm: **Acoustic sensing from small-size UAVs,** D. N. Robertson, T. Pham, Army Research Lab.; H. Edge, B. J. Porter, J. Shumaker, U.S. Army Research Lab.; D. Cline, Scientific Applications and Research Associates, Inc. . . . [6562-08]

4:20 pm: **Capabilities study of airborne acoustic sensor arrays,** W. Prather, Miltec Corp. . . . . [6562-10]

Tuesday 10 April

SESSION 3

Room: Grand 4 . . . . . Tues. 8:00 to 9:30 am

Joint Keynote Session with Conference 6538

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

Keynote Presentation

8:00 am: **Real-time automated 3D sensing, imaging, and monitoring of dynamic microscopic biological events** *(Invited Paper)*, B. Javidi, I. Moon, S. Yeom, Univ. of Connecticut; E. M. Carapezza, Univ. of Connecticut and DARPA . . . . . [6538-21]

Keynote Presentation

8:50 am: **TBD** *(Invited Paper, Presentation Only)*, M. Smith . . . . . [6562-28]

SESSION 4a

Room: Grand 4 . . . . . Tues. 9:30 to 10:00 am

Invited Session

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

9:30 am: **An intelligent video framework for homeland protection** *(Invited Paper)*, P. Tu, G. Doretto, N. Krahnstoever, A. A. Perera, J. Rittscher, X. Liu, F. W. Wheeler, T. B. Sebastian, K. G. Harding, GE Global Research . . . . [6562-57]

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

SESSION 4

Room: Grand 4 . . . . . Tues. 10:30 am to 12:30 pm

Enabling Technologies

Chairs: **Michael A. Kolodny**, Army Research Lab.; **Tien Pham**, Army Research Lab.

10:30 am: **Enabling technologies for force protection,** J. Houser, L. Zong, T. Pham, J. Kovach, Army Research Lab. . . . . [6562-12]

10:50 am: **Progress on the fabrication of integrated multi-parameter MEMS sensor,** S. Rajic, W. Lawrence, P. Datskos, Univ. of Tennessee . . . . . [6562-13]

11:10 am: **Near Earth propagation: physics revealed,** R. Wert, A. Goroch, E. Worthington, V. Wong, Naval Research Lab. . . . . [6562-14]

11:30 am: **Energy efficient joint acoustic-video target detection and tracking,** S. Zhang, College of Staten Island/CUNY; M. Chen, Binghamton Univ. . [6562-15]

11:50 am: **Integrating pan/tilt/zoom and radar in unattended ground sensor systems,** A. Kennedy, B. Jones, R. A. Knobler, R. D. Porter, McQ, Inc. . [6562-16]

12:10 pm: **Self-assembled metal rubber™ interconnects for rugged ultra-lightweight unattended sensors and electronics,** B. Davis, R. Claus, J. Lalli, NanoSonic, Inc. . . . . [6562-17]

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

SESSION 5

Room: Grand 4 . . . . . Tues. 1:30 to 2:30 pm

Signal Processing I

Chairs: **Tien Pham**, Army Research Lab.; **Graeme van Voorthuijsen**, TNO-FEL (Netherlands)

1:30 pm: **UGS video target detection and discrimination,** G. M. Roberts, Textron Systems . . . . . [6562-59]

1:50 pm: **Capon beamspace beamforming for distributed acoustic arrays,** M. R. Azimi-Sadjadi, N. J. Roseveare, Colorado State Univ. . . . . [6562-19]

2:10 pm: **Underwater source localization based on energy measurement with randomly distributed sensor array,** X. Chen, U. Tureli, Stevens Institute of Technology . . . . . [6562-21]

SESSION 6

Room: Grand 4 . . . . . Tues. 2:30 to 4:40 pm

Signal Processing II

Chairs: **Tien Pham**, Army Research Lab.; **Graeme van Voorthuijsen**, TNO-FEL (Netherlands)

2:30 pm: **Loud target suppression: an innovative approach to reduce excessive sensor collaboration in distributed UGS systems,** C. A. Stelzig, G. Lipelt, General Dynamics Advanced Information Systems; S. Minor, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6562-23]

2:50 pm: **Role of quality of service metrics in visual target acquisition and tracking in resource-constrained environments,** M. Anderson, Univ. of Minnesota; P. David, Army Research Lab. . . . . [6562-25]

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

3:40 pm: **Adaptive polarimetric sensing and processing** *(Invited Paper)***,** F. A. Sadjadi, Lockheed Martin Corp. . . . . [6562-26]

4:00 pm: **A temporal and spatial fusion-based decision support system for sparse undersea sensor network,** B. Ling, Migma Systems, Inc. . . . . [6562-27]

4:20 pm: **Layered mode selection logic control for border security,** T. E. Born, A. B. Wright, Univ. of Arkansas/Little Rock; A. Wright, G. Ferrer, Hendrix College . . . . . [6562-24]

Wednesday 11 April

SESSION 7

Room: Grand 4 . . . . . Wed. 9:00 to 11:10 am

Modeling and Simulation/Experimentation

Chairs: **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command; **Tien Pham**, Army Research Lab.

9:00 am: **Acoustic/seismic signal propagation and sensor performance modeling,** D. K. Wilson, U.S. Army Engineer Research and Development Ctr.; D. H. Marlin, Army Research Lab.; S. Mackay, Atmospheric and Environmental Research, Inc. . . . . [6562-30]

9:20 am: **ARL participation in C4ISR OTM experiment: integration and performance results,** L. Zong, B. O'Brien, Army Research Lab. . . . . [6562-31]

9:40 am: **Modeling unmanned system collaborative target engagement,** H. M. Jaenisch, dtech Systems Inc.; J. Handley, Licht Strahl Engineering Inc.; M. Hicklen, dtech Systems Inc. . . . . [6562-32]

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

10:30 am: **Geometric considerations for optimally placing sensors in a field,** T. Brown, City College/CUNY; D. Sarioz, The Graduate Ctr./CUNY; T. La Porta, The Pennsylvania State Univ.; D. C. Verma, IBM Thomas J. Watson Research Ctr.; A. Bar-Noy, M. P. Johnson, The Graduate Ctr./CUNY; H. Rowaihy, The Pennsylvania State Univ. . . . . [6562-33]

10:50 am: **Sensors that report by email: system concepts for keeping costs low,** C. J. Brown, Brown Computer Co. . . . . [6562-34]

Lunch/Exhibition Break . . . . . 11:10 am to 1:00 pm

SESSION 8

Room: Grand 4 . . . . . Wed. 1:00 to 3:10 pm

Unattended Ground Sensors (UGS)

Chairs: **Michael A. Kolodny**, Army Research Lab.; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.

1:00 pm: **Sustained unattended sensor networks: state-of-the-art challenges for future ocean and littoral systems** *(Invited Paper)***,** E. M. Carapezza, Univ. of Connecticut and DARPA . . . . . [6562-35]

1:30 pm: **Unattended ground sensors: the way ahead,** M. A. Kolodny, Army Research Lab. . . . . [6562-36]

1:50 pm: **Real-time acoustic source localization with high performance sensor nodes,** M. R. Azimi-Sadjadi, Information System Technologies, Inc.; G. Kiss, B. Fehér, Budapest Univ. of Technology and Economics (Hungary); Á. Lédeczi, Vanderbilt Univ.; S. Srinivasan, Information System Technologies, Inc.; P. Völgyesi, Vanderbilt Univ. . . . . [6562-37]

2:10 pm: **iScout™ low-cost ad hoc networked sensor enhancements,** M. A. Winston, McQ, Inc. . . . . [6562-38]

2:30 pm: **Detection of the under-soil intruder activity,** J. Cechak, Univ. of Defence (Czech Republic) . . . . . [6562-39]

2:50 pm: **Low-cost unattended ground sensors for continuous surveillance,** S. Benda, General Atomics . . . . . [6562-58]

Coffee Break . . . . . 3:10 to 4:00 pm

SESSION 9

Room: Grand 4 . . . . . Wed. 4:00 to 5:40 pm

Transients Detection

Chairs: **Myron E. Hohil**, U.S. Army Research, Development and Engineering Command; **Tien Pham**, Army Research Lab.

4:00 pm: **Sniper detection using a helmet array: first tests in urban environment,** S. Hengy, French-German Research Institute of Saint-Louis (France) . . . . . [6562-41]

4:20 pm: **Acoustic localization of mortar and rocket fires,** T. Tran-Luu, L. Solomon, S. Tenney, Army Research Lab. . . . . [6562-42]

4:40 pm: **Quality of information trade-offs in the detection of transient phenomena,** C. Bisdikian, IBM Thomas J. Watson Research Ctr. . . . . [6562-43]

5:00 pm: **Acoustic classification of battlefield transient events using wavelet subband features,** M. R. Azimi-Sadjadi, Colorado State Univ.; S. Srinivasan, Information System Technologies, Inc. . . . . [6562-44]

5:20 pm: **New seismic unattended small-size module for foot-step, and light and heavy vehicle detection and identification,** E. T. Goldburt, A. Pakhomov, General Sensing Systems LLC . . . . . [6562-04]

Thursday 12 April

SESSION 10

Room: Grand 4 . . . . . Thurs. 8:45 to 9:35 am

Keynote Session

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

Keynote Presentation

8:45 am: **DARPA NetCentric radio demonstrations** *(Invited Paper)*,
L. B. Stotts, Defense Advanced Research Projects Agency . . . . . [6562-45]

SESSION 11

Room: Grand 4 . . . . . Thurs. 9:35 to 11:25 am

Network Sensors

Chairs: **Tien Pham**, Army Research Lab.;
Graeme van Voorthuijsen, TNO-FEL (Netherlands)

9:35 am: **Self-healing routing: a study in efficiency and resiliency of data delivery in wireless sensor networks,** K. Wasilewski, J. W. Branch, M. W. Lisee, B. Szymanski, Rensselaer Polytechnic Institute . . . . . [6562-46]

9:55 am: **Simulation of sensor networks using message queue infrastructure,** D. C. Verma, IBM Thomas J. Watson Research Ctr. . . . . [6562-47]

Coffee Break . . . . . 10:15 to 10:45 am

10:45 am: **A survey of sensor selection schemes in wireless sensor networks,** H. Rowaihy, S. Eswaran, The Pennsylvania State Univ.; M. P. Johnson, A. Bar-Noy, T. Brown, City College/CUNY; D. C. Verma, IBM Thomas J. Watson Research Ctr.; T. La Porta, The Pennsylvania State Univ. . . . . [6562-48]

11:05 am: **The color blue: an update on the ARL blue radio,** R. Tobin, Army Research Lab. . . . . [6562-49]

Lunch/Exhibition Break . . . . . 11:25 am to 1:30 pm

SESSION 12

Room: Grand 4 . . . . . Thurs. 1:30 to 3:00 pm

User Programs and Requirements

Chair: **Michael A. Kolodny**, Army Research Lab.

1:30 pm: **TBD, Army** *(Presentation Only)*, , ... [6562-51]

1:45 pm: **TBD, Marines** *(Presentation Only)*, , ... [6562-52]

2:00 pm: **TBD, Navy** *(Presentation Only)*, , ... [6562-53]

2:15 pm: **TBD, INSCOM** *(Presentation Only)*, , ... [6562-54]

2:30 pm: **TBD, INSCOM** *(Presentation Only)*, , ... [6562-55]

2:45 pm: **TBD, DHS** *(Presentation Only)*, , ... [6562-56]

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

Panel Discussion

Room: Grand 4 . . . . . Thurs. 3:30 to 5:00 pm

Unattended Ground Sensors

Chair: **Michael A. Kolodny**, Army Research Lab.

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Thursday-Friday 12-13 April 2007 • Proceedings of SPIE Vol. 6563

Evolutionary and Bio-inspired Computation: Theory and Applications

Conference Chairs: **Misty Blowers**, Air Force Research Lab.; **Alex F. Sisti**, Air Force Research Lab.

Program Committee: **Teresa H. O'Donnell**, Air Force Research Lab.; **John C. Sciortino, Jr.**, Naval Research Lab

Thursday 12 April

Opening Remarks

Room: North Tower-Key Largo . . . . . Thurs. 10:40 to 10:50 am

Chair: **Misty Blowers**, Air Force Research Lab.

SESSION 1

Room: North Tower-Key Largo . . . . . Thurs. 10:50 am to 12:10 pm

Technologies for Tactical Operations and Planning

Chair: **John C. Sciortino, Jr.**, Naval Research Lab.

10:50 am: **Biologically inspired models for swarming,** E. W. Justh, V. Kowtha, Naval Research Lab. . . . . [6563-01]

11:10 am: **Evolving behaviors in search and tracking problems,** G. A. Vilches, A. S. Wu, Univ. of Central Florida; J. C. Sciortino, Jr., Naval Research Lab.; D. J. Pack, U.S. Air Force Academy; J. P. Ridder, Innovating Systems, Inc. . . . . [6563-02]

11:30 am: **Developing AEA system-of-systems mission plans with a multi-objective genetic algorithm,** J. C. Handuber, Dynamic Analytics and Test, Inc.; J. P. Ridder, Innovating Systems, Inc. . . . . [6563-03]

11:50 am: **Genetic algorithms to find solutions to the minimum Voronoi classifier coverage problem,** J. L. Overholt, G. R. Hudas, M. Skalny, G. Fiorani, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. . . . . [6563-04]

Lunch Break . . . . . 12:10 to 1:10 pm

SESSION 2

Room: North Tower-Key Largo . . . . . Thurs. 1:10 to 2:30 pm

Modeling Group Dynamics

Chair: **Mark P. Kleeman**, Air Force Institute of Technology

1:10 pm: **Evolutionary optimization of cooperative heterogeneous teams,** R. B. Heckendorn, T. Soule, Univ. of Idaho . . . . . [6563-05]

1:30 pm: **Using a multi-objective evolutionary algorithm for the airman assignment problem,** M. P. Kleeman, G. B. Lamont, Air Force Institute of Technology . . . . . [6563-06]

1:50 pm: **Modeling and predicting abstract concept or idea introduction and propagation through geopolitical groups,** H. M. Jaenisch, dtech Systems Inc.; J. Handley, Tec-Masters, Inc.; M. Hicklen, dtech Systems Inc. . . . . [6563-07]

2:10 pm: **Modeling and predicting community responses to events using cultural demographics,** H. M. Jaenisch, dtech Systems Inc.; J. Handley, M. P. Carroll, Tec-Masters, Inc. . . . . [6563-08]

SESSION 3

Room: North Tower-Key Largo . . . . . Thurs. 2:30 to 3:30 pm

Strategies for Utilizing UAVs

Chair: **Annie S. Wu**, Univ. of Central Florida

2:30 pm: **Exploring small UAV search strategies using a multi-objective genetic algorithm,** J. P. Ridder, Innovating Systems, Inc.; J. C. Sciortino, Jr., Naval Research Lab. . . . . [6563-09]

2:50 pm: **Optimizing a search strategy for multiple mobile agents,** A. S. Wu, Univ. of Central Florida; P. Lima, U.S. Air Force Academy; J. C. Sciortino, Jr., Naval Research Lab.; D. J. Pack, U.S. Air Force Academy . . . . . [6563-10]

3:10 pm: **Swarming UAVs mission design strategy,** K. Lin, Univ. of Central Florida . . . . . [6563-11]

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

Panel Discussion

Room: North Tower-Key Largo . . . . . Thurs. 4:00 to 5:00 pm

Choosing the Right Tool for the Job

Chair: **Misty Blowers**, Air Force Research Lab.

You could build a house with just a screwdriver... but why would you? Is it because you're a screwdriver expert and can make it do anything? Or is it merely because that's the only tool you own? In this session, we will discuss many of the evolutionary and bio-inspired tools, techniques and approaches being researched in the community today, their strengths and shortcomings, and the classes of problems for which they are most — and least — appropriate.

Friday 13 April

SESSION 4

Room: North Tower-Key Largo . . . . . Fri. 8:40 to 9:40 am

Keynote Session

Chair: **Teresa H. O'Donnell**, Air Force Research Lab.

Keynote Presentation

8:40 am: **Cognitive algorithms for engineering applications: dynamic logic, neural fields, and the mind,** L. I. Perlovsky, Air Force Research Lab. [6563-12]

SESSION 5

Room: North Tower-Key Largo . . . . . Fri. 9:40 to 11:30 am

System Component Design and Optimization

Chair: **Teresa H. O'Donnell**, Air Force Research Lab.

9:40 am: **Bio-inspired large cellular neural networks,** T. P. Jannson, T. C. Forrester, K. Chua, M. Reznikov, Physical Optics Corp. . . . . [6563-13]

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

10:30 am: **Genetic programming techniques for thin-wire antennas** *(Invited Paper)*, T. H. O'Donnell, Air Force Research Lab. . . . . [6563-14]

11:00 am: **Application of evolutionary algorithms and neural network concepts to the design of low-cost, wideband antenna arrays** *(Invited Paper)*, S. Santarelli, R. J. Mailloux, T. Yu, T. M. Roberts, M. H. Champion, D. E. Goldberg, Air Force Research Lab. . . . . [6563-15]

Lunch Break . . . . . 11:30 am to 1:00 pm

SESSION 6

Room: North Tower-Key Largo . . . . . Fri. 1:00 to 2:40 pm

Dealing with Complexity in Real-World Applications

Chair: **David Montana**, Bolt, Beranek & Newman, Inc.

1:00 pm: **Evolving military-grade image transforms using state-of-the-art variation operators,** M. R. Peterson, Wright State Univ.; G. B. Lamont, Air Force Institute of Technology; F. W. Moore, Univ. of Alaska Anchorage . . . . . [6563-17]

1:20 pm: **Using a multi-agent evidential reasoning network as the objective function for an evolutionary algorithm,** R. S. Woodley, C. M. Gore, E. R. Lindahl, 21st Century Systems, Inc. . . . . [6563-18]

1:40 pm: **Optimizing the usage of computer servers with a hybrid-genetic algorithm,** D. Montana, Bolt, Beranek & Newman, Inc. . . . . [6563-19]

2:00 pm: **Object classifiction with recurrent loop networks,** T. Achler, Univ. of Illinois at Urbana-Champaign . . . . . [6563-20]

2:20 pm: **Data mining approach for analysis of a co-evolutionary SASO simulation,** L. Suantak, J. W. Rozenblit, F. Momen, The Univ. of Arizona [6563-21]

Closing Remarks and Wrap-up Discussions

Room: North Tower-Key Largo . . . . . Fri. 2:40 to 2:50 pm

Chair: **Misty Blowers**, Air Force Research Lab.

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Modeling and Simulation for Military Operations II

Conference Chairs: **Kevin Schum**, Air Force Research Lab.; **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.

Tuesday 10 April

Opening Remarks

Room: North Tower-Key Largo . . . . . Tues. 8:50 to 9:00 am

Chair: **Dawn A. Trevisani**, Air Force Research Lab.

SESSION 1

Room: North Tower-Key Largo . . . . . Tues. 9:00 to 10:00 am

Sensor Modeling

Chair: **Judson McCarty**, Air Force Research Lab.

9:00 am: **Modeling stochastic phenomena in rocket exhaust signatures,** J. L. Rapanotti, R. Farinaccio, P. Gosselin, R. Pimentel, A. Schäfke, Defence R&D Canada/Valcartier (Canada) . . . . . [6564-01]

9:20 am: **Irma 5.2 multisensor signature prediction model,** J. C. Savage, C. F. Coker, Air Force Research Lab.; B. Thai, O. Aboutalib, A. Chow, N. Yamaoka, Northrop Grumman Corp. . . . . [6564-03]

9:40 am: **A conically scanning active/passive sensor simulation,** P. Laupattarakasem, W. L. Jones, Univ. of Central Florida; R. S. Roeder, Raytheon Co.; S. O. Alweiss, Univ. of Central Florida . . . . . [6564-04]

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

SESSION 2

Room: North Tower-Key Largo . . . . . Tues. 10:30 to 11:50 am

Variable Simulation Fidelity and Architectures

Chair: **Victoria R. Hahn**, Raytheon Missile Systems

10:30 am: **Autonomous selection of nonlinear inpainting techniques versus stochastic inpainting techniques for high-resolution digital elevation models,** M. D. Rahmes, J. H. Yates, J. D. Allen, Harris Corp. . . . . [6564-05]

10:50 am: **On the criticality of parameter data transfer in avionic simulations,** R. D. Teichgraeber, Lockheed Martin Corp. . . . . [6564-06]

11:10 am: **Limitations and uses of quick-turn analyses versus extensive integrated simulations,** K. Schum, G. Boyarko, J. McCarty, Air Force Research Lab. . . . . [6564-07]

11:30 am: **Using ontology comparison methods for simulation composition,** M. S. Patki, P. C. Benjamin, R. Mayer, Knowledge Based Systems, Inc. . [6564-08]

Lunch/Exhibition Break . . . . . 11:50 am to 1:20 pm

SESSION 3

Room: North Tower-Key Largo . . . . . Tues. 1:20 to 2:40 pm

Simulation Environments

Chair: **Dawn A. Trevisani**, Air Force Research Lab.

1:20 pm: **An adversary prediction environment based on DSAP capabilities,** M. E. Valinski, N. Mia, R. M. McGraw, RAM Labs. . . . . [6564-09]

1:40 pm: **An analysis of the effects of initial velocity errors on geometric pairing,** B. C. Schricker, AT&T Government Solutions, Inc.; L. Ford, Icon Systems, Inc. . . . . [6564-10]

2:00 pm: **Real-time updates to the DSAP framework to improve calibration and dynamic situational awareness,** R. M. McGraw, M. E. Valinski, RAM Labs. . . . . [6564-11]

2:20 pm: **Building and analyzing timed influence net models with internet-enabled pythia,** P. W. Pachowicz, L. W. Wagenhals, J. Pham, A. H. Levis, George Mason Univ. . . . . [6564-12]

Coffee Break . . . . . 2:40 to 3:30 pm

SESSION 4

Room: North Tower-Key Largo . . . . . Tues. 3:30 to 4:30 pm

Training Simulations

Chair: **Judson McCarty**, Air Force Research Lab.

3:30 pm: **Evolution of live training by the implementation of an electronic bullet,** D. L. Fisher, J. Mann, T. Sherrill, M. Kraus, J. Lyons, A. York, Applied Research Associates, Inc. . . . . [6564-13]

3:50 pm: **Architecture for an integrated real-time air combat and sensor network simulation,** E. A. Criswell, J. A. Rushing, H. Lin, S. J. Graves, The Univ. of Alabama/Huntsville . . . . . [6564-14]

4:10 pm: **Applied cognition and training research to address emerging military requirements,** D. M. Nicholson, L. Davis, C. M. Fidopiastis, Univ. of Central Florida . . . . . [6564-15]

Wednesday 11 April

SESSION 5

Room: North Tower-Key Largo . . . . . Wed. 9:00 to 10:00 am

Dynamic Simulation and Target Generation

Chair: **Kelly R. Feirstine**, U.S. Air Force

9:00 am: **Toward fully automated 3D scene reconstruction using decision-level fusion of remotely sensed data,** M. C. Tarnowski, D. Warnaar, Applied Research Associates, Inc. . . . . [6564-17]

9:20 am: **Experimental determination of key visibility modeling parameters for aircraft,** S. R. Murrill, Army Research Lab.; B. S. Miller, T. Maurer, U.S. Army Night Vision & Electronic Sensors Directorate; W. K. Krebs, Office of Naval Research; G. Hewitt, U.S. Dept. of Transportation; R. G. Driggers, U.S. Army Night Vision & Electronic Sensors Directorate . . . . . [6564-18]

9:40 am: **Automating ground-fixed target modeling with the smart target model generator,** D. A. Verner, Applied Research Associates, Inc.; R. C. Dukes, Air Force Research Lab. . . . . [6564-19]

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

SESSION 6

Room: North Tower-Key Largo . . . . . Wed. 10:30 to 11:50 am

Terrain Profiling and Characterization

Chair: **Michael D. Letherwood**, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.

10:30 am: **Developing Markov chain models for road surface simulation,** W. B. Israel, J. B. Ferris, Virginia Polytechnic Institute and State Univ. . . [6564-20]

10:50 am: **Development of a 3D terrain measurement system,** J. V. Kern, Virginia Polytechnic Institute and State Univ. . . . . [6564-21]

11:10 am: **Characterizing 2D road profiles using ARIMA modeling techniques,** J. V. Kern, J. B. Ferris, Virginia Polytechnic Institute and State Univ. . . . . [6564-22]

11:30 am: **Analysis and estimation of vehicle position measurement in a 3D terrain scanning system,** S. M. Wagner, J. B. Ferris, Virginia Polytechnic Institute and State Univ. . . . . [6564-23]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 7

Room: North Tower-Key Largo . . . . . Wed. 1:30 to 2:50 pm

Methods and Applications

Chair: **Michael D. Letherwood**, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.

1:30 pm: **The development of an assessment tool for predicting the mobility of lightweight autonomous vehicles on coastal terrain,** M. E. Worley, R. Ping, C. Sandu, D. W. Hong, Virginia Polytechnic Institute and State Univ. . . . [6564-24]

1:50 pm: **Using multibody simulation to evaluate armor impacts on military vehicle automotive performance,** D. D. Gunter, U.S. Army Research, Development and Engineering Command . . . . . [6564-25]

2:10 pm: **Acoustic response modeling of energetics systems in confined spaces,** D. R. Gonzalez, M. J. Sanford, Naval Surface Warfare Ctr.; W. Liou, Western Michigan Univ.; R. Hixon, Univ. of Toledo . . . . . [6564-26]

2:30 pm: **Modeling of space shuttle SRB aft ends for inherent aerodynamic bias determination,** D. R. Gonzalez, T. J. Gebhard, Naval Surface Warfare Ctr.; S. P. Stapf, U.S. Air Force . . . . . [6564-27]

Coffee Break . . . . . 2:50 to 3:20 pm

SESSION 8

Room: North Tower-Key Largo . . . . . Wed. 3:20 to 5:00 pm

Reliability and Safety

Chair: **David J. Gorsich**, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.

3:20 pm: **Modeling of microstructure evolution during LENS™ deposition,** L. Wang, H. El-Kadiri, S. Felicelli, P. T. Wang, Mississippi State Univ.; B. R. Gady, U.S. Army Tank-automotive and Armaments Command . . . . . [6564-28]

3:40 pm: **Design and modeling of prognostics and self-maintenance systems for military applications and future combat systems,** J. Lee, M. Ghaffari, H. Wang, L. Yang, R. Allemang, T. C. Lim, Univ. of Cincinnati . . . . . [6564-29]

4:00 pm: **Modeling and simulation of a VTOL UAV for landing gear performance evaluation,** B. J. Chan, C. Sandu, Virginia Polytechnic Institute and State Univ.; T. Streett, A. Ko, AVID LLC . . . . . [6564-30]

4:20 pm: **Emissive signature for HMMWV run flat insert modeling and simulation,** W. W. Gardetto, Drive Dynamics LLC; D. J. Gorsich, A. Kurec, J. R. Mabesa, Jr., D. Murray, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. . . . . [6564-31]

4:40 pm: **Survey of contemporary aircraft flight dynamics models for use in airspace simulation,** S. M. McGovern, John A. Volpe National Transportation Systems Ctr. . . . . [6564-16]

Thursday 12 April

SESSION 9

Room: North Tower-Key Largo . . . . . Thurs. 8:20 to 10:00 am

Integrated Simulation Technology

Chair: **Kelly R. Feirstine,** U.S. Air Force

8:20 am: **Modeling and simulation for small system integration of military and homeland security applications,** M. J. Bennahmias, V. Esterkin, K. Lee, R. Kogiol, A. A. Kostrzewski, T. P. Jannson, Physical Optics Corp. . . . . [6564-32]

8:40 am: **A mixed simulation and hardware-in-the-loop controller for autonomous sensing and navigation by unmanned air vehicles,** G. E. Collins, P. E. Vegdahl, Toyon Research Corp. . . . . [6564-33]

9:00 am: **Testbed for distributed scenario simulations with EW and its effects on C2,** L. Tydén, C. Wigren, Swedish Defence Research Agency (Sweden) . . . . . [6564-34]

9:20 am: **An integrated development environment for PMESII model authoring, integration, validation, and debugging,** N. J. Pioch, C. L. Lofdahl, M. Sao Pedro, B. Krikeles, L. Morley, BAE Systems Advanced Information Technologies . . . . . [6564-35]

9:40 am: **Modeling multiple communities of interest for interactive simulation and gaming: the dynamic adversarial gaming algorithm project,** Q. Zhao, E. Santos, Jr., Dartmouth College; F. Pratto, A. R. Pearson, Univ. of Connecticut; B. R. McQueary, A. Breeden, L. S. Krause, Securboration . . . . . [6564-36]

Closing Remarks and Wrap-up Discussions

Room: North Tower-Key Largo . . . . . Thurs. 10:00 to 10:10 am

Chair: **Dawn R. Trevisani**, Air Force Research Lab.

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Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XIII

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 GeoImaging, LLC; **Alan P. Schaum**, Naval Research Lab.; **Joel Susskind**, NASA Goddard Space Flight Ctr.; **Grady H. Tuell**, Optech International, Inc. (Canada); **Miguel Vélez-Reyes**, Univ. de Puerto Rico Mayagüez

Monday 9 April

SESSION 1

Room: North Tower-Sawgrass . . . . . Mon. 8:30 to 10:30 am

Detection and Identification I

Chair: **Sylvia S. Shen**, The Aerospace Corp.

8:30 am: **Hyperspectral anomaly detection beyond RX,** A. P. Schaum, Naval Research Lab. . . . . [6565-01]

8:50 am: **Beyond the adaptive matched filter: nonlinear detectors for weak signals in high-dimensional clutter,** J. Theiler, B. Foy, A. M. Fraser, Los Alamos National Lab. . . . . [6565-02]

9:10 am: **A comparative study of linear and nonlinear anomaly detectors for hyperspectral imagery,** N. M. Nasrabadi, Army Research Lab.; H. Goldberg, Univ. of Maryland/College Park . . . . . [6565-03]

9:30 am: **Adaptive constrained signal detectors for hyperspectral images,** S. E. Johnson, Lockheed Martin Coherent Technologies; M. T. Eismann, Air Force Research Lab.; S. C. Cain, Air Force Institute of Technology . . . . . [6565-04]

9:50 am: **Anomaly detection in hyperspectral imagery: a comparison of methods using diurnal and seasonal data,** P. C. Hytla, R. C. Hardie, Univ. of Dayton; M. T. Eismann, J. Meola, Air Force Research Lab. . . . . [6565-05]

10:10 am: **A theoretical framework for hyperspectral anomaly detection using spectral and spatial a priori information,** B. Yver, R. Marion, Commissariat a l'Energie Atomique (France) . . . . . [6565-06]

Coffee Break . . . . . 10:30 to 10:50 am

SESSION 2

Room: North Tower-Sawgrass . . . . . Mon. 10:50 to 11:30 am

Spectral Unmixing

Chair: **Glenn E. Healey**, Univ. of California/Irvine

10:50 am: **Hyperspectral target detection by using independent component analysis-based linear mixture model,** E. Sarigul, M. S. Alam, Univ. of South Alabama . . . . . [6565-10]

11:10 am: **The impact of initialization procedures on unsupervised unmixing of hyperspectral imagery using the constrained positive matrix factorization,** Y. Masalmah, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez . . . . . [6565-08]

Lunch Break . . . . . 11:30 am to 1:30 pm

SESSION 3

Room: North Tower-Sawgrass . . . . . Mon. 1:30 to 3:30 pm

Novel Spectral Data Representation and Performance Assessment Tools

Chair: **Paul E. Lewis**, National Geospatial-Intelligence Agency

1:30 pm: **A hyperspectral image projector for hyperspectral imagers,** J. P. Rice, E. A. Dakin, S. W. Brown, R. R. Bousquet, J. E. Neira, M. Litorja, National Institute of Standards and Technology . . . . . [6565-11]

1:50 pm: **Sonification of hyperspectral image data,** M. Bernhardt, C. E. West, Waterfall Solutions Ltd. (United Kingdom) . . . . . [6565-12]

2:10 pm: **New developments and application of the UPRM MATLAB hyperspectral image analysis toolbox,** S. Rosario-Torres, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez . . . . . [6565-13]

2:30 pm: **A hyperspectral model for target detection,** M. Bernhardt, Waterfall Solutions Ltd. (United Kingdom); P. E. Clare, Defence Science and Technology Lab. Farnborough (United Kingdom); C. E. West, M. I. Smith, Waterfall Solutions Ltd. (United Kingdom) . . . . . [6565-14]

2:50 pm: **Hyperspectral data processing algorithm comparison software (HyperPACS),** D. Runnels, C. Leflore, Radiance Technologies, Inc.; J. J. Dirbas, PAR Government Systems Corp. . . . . [6565-15]

3:10 pm: **Visualization of hyperspectral imagery,** M. A. Hogervorst, P. Bijl, A. Toet, TNO Human Factors (Netherlands) . . . . . [6565-16]

Coffee Break . . . . . 3:30 to 3:50 pm

SESSION 4

Room: North Tower-Sawgrass . . . . . Mon. 3:50 to 5:10 pm

Spectral Data Analysis Methodologies I

Chair: **Miguel Vélez-Reyes**, Univ. de Puerto Rico Mayagüez

3:50 pm: **Spectral/spatial filter selection for illumination-invariant hyperspectral texture discrimination,** N. Nejati, G. E. Healey, Univ. of California/ Irvine . . . . . [6565-17]

4:10 pm: **Applicability of ICA to hyperspectral imagery of various complexity levels,** D. C. Koestler, P. J. Diute, D. W. Messinger, Rochester Institute of Technology . . . . . [6565-18]

4:30 pm: **From PCA and MNF to ICA: ERDAS IMAGINE incorporates next-generation remote sensing technology for improved spectral unmixing and target detection,** C. A. Shah, Univ. of California/Los Angeles; I. Anderson, Z. Gou, S. Hao, A. Leason, Leica Geosystems, LLC . . . . . [6565-19]

4:50 pm: **Integration of PCA and JPEG2000 for hypespectral image compression,** Q. Du, W. Zhu, Mississippi State Univ. . . . . [6565-20]

Tuesday 10 April

SESSION 5

Room: North Tower-Sawgrass . . . . . Tues. 8:30 to 10:30 am

Sensor Design and Performance

Chair: **Eustace L. Dereniak**, College of Optical Sciences/The Univ. of Arizona

8:30 am: **New grating designs for a CTIS imaging spectrometer,** N. A. Hagen, C. J. Vandervlugt, E. L. Dereniak, The Univ. of Arizona; D. T. Sass, U.S. Army Tank-automotive and Armaments Command . . . . . [6565-21]

8:50 am: **Reconfigurable liquid-crystal dispersing element for computed tomographic imaging spectrometer,** C. J. Vandervlugt, The Univ. of Arizona; H. J. Masterson, Boulder Nonlinear Systems, Inc.; N. A. Hagen, E. L. Dereniak, The Univ. of Arizona . . . . . [6565-22]

9:10 am: **Affordable spectro-polarimetry with MANTIS-3T,** J. J. Dirbas, A. Davies, PAR Government Systems Corp.; J. S. Schoonmaker, Advanced Coherent Technologies LLC; G. R. Gilbert, U.S. Army MRMC and TATRC; V. M. Contarino, Naval Air Systems Command . . . . . [6565-23]

9:30 am: **Narrowband polarization in maritime imaging,** J. S. Schoonmaker, Advanced Coherent Technologies LLC; J. J. Dirbas, A. Davies, PAR Government Systems Corp.; Y. Podobna, I. Petrosuk, Advanced Coherent Technologies LLC; V. M. Contarino, Naval Air Systems Command; G. R. Gilbert, U.S. Army MRMC and TATRC . . . . . [6565-24]

9:50 am: **Laser-based multispectral polarimetric imaging,** Y. Wang, Y. Wang, B. Hu, H. Q. Le, Univ. of Houston . . . . . [6565-25]

10:10 am: **High-performance Sagnac interferometers using cooled and uncooled detectors for infrared hyperspectral applications,** P. G. Lucey, K. A. Horton, T. J. Williams, B. B. Wilcox, Univ. of Hawaii at Manoa . . . . [6565-26]

Coffee Break . . . . . 10:30 to 10:50 am

SESSION 6

Room: North Tower-Sawgrass . . . . . Tues. 10:50 am to 12:10 pm

Spectral Methodologies and Applications I

Chair: **Miguel Vélez-Reyes**, Univ. de Puerto Rico Mayagüez

10:50 am: **Explosives-generated plumes using AVHRR,** M. B. Tayahi, Univ. of Nevada/Reno . . . . . [6565-27]

11:10 am: **Hyperspectral image unmixing over Benthic habitats,** M. Vélez-Reyes, E. M. Alvira-Concepción, S. Rosario-Torres, Univ. de Puerto Rico Mayagüez . . . . . [6565-28]

11:30 am: **Terrain categorization using LIDAR and multispectral data,** A. M. Puetz, R. C. Olsen, M. F. Helt, Naval Postgraduate School . . . . . [6565-29]

11:50 am: **Scintillometer network for calibration and validation of energy balance and soil moisture remote sensing algorithms,** J. M. H. Hendrickx, J. Kleissl, S. Hong, J. D. Gómez-Vélez, New Mexico Institute of Mining and Technology; J. R. Fábrega-Duque, D. N. Vega, Univ. Tecnológica de Panama (Panama); H. A. Moreno-Ramírez, Escuela de Ingeniería de Antioquia (Colombia) . . . . . [6565-30]

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

SESSION 7

Room: North Tower-Sawgrass . . . . . Tues. 1:30 to 3:10 pm

Modeling and Simulation

Chair: **Gail P. Anderson**, Air Force Research Lab.

1:30 pm: **A framework for polarized radiance signature prediction for natural scenes,** C. Devaraj, S. D. Brown, D. W. Messinger, A. A. Goodenough, D. R. Pogorzala, Rochester Institute of Technology . . . . . [6565-31]

1:50 pm: **Recreation of a nominal polarimetric scene using synthetic modeling tools,** D. R. Pogorzala, S. D. Brown, D. W. Messinger, C. Devaraj, Rochester Institute of Technology . . . . . [6565-32]

2:10 pm: **Multiband texture synthesis using histogram and power spectral density matching,** S. Sarkar, G. E. Healey, Univ. of California/Irvine . . . [6565-33]

2:30 pm: **Radiometric modeling of cavernous targets to assist in the determination of absolute temperature for input to process models,** M. Montanaro, C. Salvaggio, D. W. Messinger, S. D. Brown, Rochester Institute of Technology; A. J. Garrett, Savannah River National Lab. . . . . [6565-34]

2:50 pm: **Modeling signatures from particle-laden rocket exhaust plumes and active transmission through battlefield smoke,** J. L. Rapanotti, R. Farinaccio, P. Gosselin, R. Pimentel, A. Schäfke, Defence R&D Canada/Valcartier (Canada) . . . . . [6565-35]

Coffee Break . . . . . 3:10 to 3:30 pm

SESSION 8

Room: North Tower-Sawgrass . . . . . Tues. 3:30 to 4:50 pm

Spectral Data Analysis Methodologies II

Chair: **Fred A. Kruse**, Horizon GeoImaging, LLC

3:30 pm: **Fast multiscale smoothing and segmentation of hyperspectral imagery,** J. M. Duarte-Carvajalino, Univ. de Puerto Rico Mayagüez; G. Sapiro, Univ. of Minnesota; M. Velez-Reyes, Univ. de Puerto Rico Mayagüez . . . [6565-36]

3:50 pm: **Improving multispectral mapping by spectral modeling with hyperspectral signatures,** F. A. Kruse, Horizon GeoImaging, LLC . . . . . [6565-37]

4:10 pm: **Affine invariant and T-robust image registration/conflation algorithm,** B. Kovalerchuk, Central Washington Univ. . . . . [6565-38]

4:30 pm: **Hyperspectral detection in high clutter using elliptically contoured distributions,** A. P. Schaum, E. C. Allman, Naval Research Lab. . . . . [6565-84]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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-show and their manuscript 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.

✔ **Comparison among some anomaly detection approaches for hyperspectral imagery,** S. R. Soofbaf, H. Fahimnejad, M. J. Valadan Zoej, B. Mojaradi, K.N. Toosi Univ. of Technology (Iran) . . . . . [6565-77]

✔ **Fast implementation of N-FINDR algorithm for endmember determination in hyperspectral imagery,** A. Chowdhury, M. S. Alam, Univ. of South Alabama . . . . . [6565-78]

✔ **Improved forward floating selection algorithm for detection in hyperspectral imagery,** S. Nakariyakul, D. P. Casasent, Carnegie Mellon Univ. . . . . [6565-79]

✔ **Target detection in high-dimensional space using a stochastic expectation maximization algorithm,** M. Karakaya, M. S. Alam, M. I. Elbakary, Univ. of South Alabama . . . . . [6565-80]

✔ **Change detection for hyperspectral imagery,** A. K. Shaw, K. Vongsy, S. Karimkhan, Wright State Univ.; D. Wicker, Air Force Research Lab. [6565-81]

✔ **Automated recognition and detection of dismounts and vehicles using close-in urban hyperspectral images,** A. K. Shaw, S. Karimkhan, K. Vongsy, Wright State Univ.; D. Wicker, Air Force Research Lab. . . . . [6565-82]

✔ **Evaluation of PCA dimensionality reduction techniques in imaging spectroscopy for foreign object detection,** O. M. Conde, M. Amado, P. B. Garcia-Allende, A. Cobo, J. M. López-Higuera, Univ. de Cantabria (Spain) . . . . . [6565-83]

Wednesday 11 April

SESSION 9

Room: North Tower-Sawgrass . . . . . Wed. 8:30 to 10:10 am

Spectral Data Analysis Methodologies III

Chair: **Glenn E. Healey**, Univ. of California/Irvine

8:30 am: **Comparative study of state-of-the-art algorithms for hyperspectral image analysis,** C. Rivera, S. D. Hunt, Univ. de Puerto Rico Mayagüez . [6565-41]

8:50 am: **Modeling subpixel orientation effects for hyperspectral image analysis,** K. Chandra, Univ. of California/Irvine . . . . . [6565-42]

9:10 am: **Gaussian smoothing of sparse spatial distributions as applied to spectral separation calculations by use of the informational difference,** D. Sheffer, Y. Ultchin, Institute for Advanced Research and Development (Israel) . . . . . [6565-43]

9:30 am: **An orthogonal subspace projection-based for estimation of virtual dimensionality for hyperspectral data exploitation,** W. Liu, C. Wu, C. Chang, Univ. of Maryland/Baltimore County . . . . . [6565-44]

9:50 am: **Dimensionality expansion in hyperspectral imagery using real and imaginary complex transformations,** A. Castrodad, E. H. Bosch, R. G. Resmini, National Geospatial-Intelligence Agency . . . . . [6565-45]

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

SESSION 10

Room: North Tower-Sawgrass . . . . . Wed. 10:30 am to 12:10 pm

Sensor System Characterization and Calibration

Chair: **Fred A. Kruse**, Horizon GeoImaging, LLC

10:30 am: **Wavelength calibration of hyperspectral sensors with 2D detector arrays,** E. Lo, Susquehanna Univ.; A. W. Fountain III, U.S. Army Research, Development and Engineering Command; J. Ingram, U.S. Military Academy . . . . . [6565-46]

10:50 am: **Processing misregistered hyperspectral data,** J. T. Casey, J. P. Kerekes, Rochester Institute of Technology . . . . . [6565-47]

11:10 am: **Median spectral-spatial bad pixel identification and replacement for hyperspectral SWIR sensors,** A. D. Fischer, NovaSol; T. V. Downes, R. A. Leathers, Naval Research Lab. . . . . [6565-48]

11:30 am: **Spatial misregistration detection for hyperspectral sensors using in-flight data,** F. Dell'Endice, J. Nieke, D. R. Schläpfer, K. I. Itten, Univ. of Zürich (Switzerland) . . . . . [6565-49]

11:50 am: **Coregistration of multispectral images for enhanced target recognition,** F. Khaghani, Solid State Scientific Corp. and Tufts Univ.; R. J. Nelson, Solid State Scientific Corp. . . . . [6565-50]

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

SESSION 11

Room: North Tower-Sawgrass . . . . . Wed. 1:30 to 4:10 pm

Atmospheric Instrumentation, Measurements, and Forecasting

Chair: **Joel Susskind**, NASA Goddard Space Flight Ctr.

1:30 pm: **Recent theoretical advances in analysis of AIRS/AMSU sounding data,** J. Susskind, NASA Goddard Space Flight Ctr. . . . . [6565-51]

1:50 pm: **Utility of AIRS retrievals for climate studies,** G. I. Molnar, NASA Goddard Space Flight Ctr. . . . . [6565-52]

2:10 pm: **The impact of atmospheric infrared sounder (AIRS) profiles on short-term weather forecasts,** B. T. Zavodsky, NASA Marshall Space Flight Ctr. and The Univ. of Alabama/Huntsville; S. Chou, G. J. Jedlovec, W. Lapenta, NASA Marshall Space Flight Ctr. . . . . [6565-53]

2:30 pm: **Retrieval of atmospheric sulfur dioxide and nitric acid using the atmospheric infrared sounder (AIRS),** L. L. Strow, S. Hannon, Univ. of Maryland/ Baltimore County . . . . . [6565-54]

2:50 pm: **Analysis of SO_2 point source emissions using NASA atmospheric infrared sounder data,** S. S. Shen, The Aerospace Corp.; D. P. Miller, Northrop Grumman Corp.; P. E. Lewis, National Geospatial-Intelligence Agency . . [6565-55]

3:10 pm: **Advanced remote-sensing imaging emission spectrometer (ARIES): AIRS spectral resolution with MODIS spatial resolution,** T. S. Pagano, Jet Propulsion Lab. . . . . [6565-56]

Coffee Break . . . . . 3:30 to 3:50 pm

3:50 pm: **Recent progress in neural network estimation of atmospheric profiles using microwave and hyperspectral infrared sounding data in the presence of clouds,** W. J. Blackwell, F. W. Chen, MIT Lincoln Lab. . . . . [6565-57]

SESSION 12

Room: North Tower-Sawgrass . . . . . Wed. 4:10 to 5:50 pm

Atmospheric Characterization and Correction

Chair: **Gail P. Anderson**, Air Force Research Lab.

4:10 pm: **Using the MODTRAN™5 radiative transfer algorithm for NASA satellite data analyses: AIRS and SORCE,** G. P. Anderson, Air Force Research Lab.; A. Berk, Spectral Sciences, Inc; J. W. Harder, J. M. Fontenla, Univ. of Colorado/Boulder; E. P. Shettle, Naval Reasearch Lab.; P. Pilewski, B. C. Kindel, Univ. of Colorado/Boulder; J. H. Chetwynd, Jr., J. A. Gardner, M. L. Hoke, G. W. Felde, R. B. Lockwood, Air Force Research Lab.; H. E. Snell, Atmospheric and Environmental Research, Inc.; P. K. Acharya, Spectral Sciences, Inc. . . . [6565-58]

4:30 pm: **Atmospheric correction of off-Nadir hyperspectral imagery,** S. M. Adler-Golden, L. S. Bernstein, M. W. Matthew, M. J. Fox, R. L. Sundberg, Spectral Sciences, Inc.; A. J. Ratkowski, Air Force Research Lab. . . . . [6565-59]

4:50 pm: **Error analysis for a temperature and emissivity retrieval algorithm for hyperspectral imaging data,** C. C. Borel, Ball Aerospace & Technologies Corp. . . . . [6565-60]

5:10 pm: **Modeling and estimation of adjacency effects in aerial images,** H. Chandra, Univ. of California/Irvine . . . . . [6565-61]

5:30 pm: **Correlated-k-based fast accurate bandpass radiance and transmittance (kURT) calculations for scenes,** P. K. Acharya, R. Panfili, A. Berk, S. M. Adler-Golden, Spectral Sciences, Inc.; A. Wetmore, R. C. Shirkey, Army Research Lab. . . . . [6565-62]

Thursday 12 April

SESSION 13

Room: North Tower-Sawgrass . . . . . Thurs. 8:30 to 10:10 am

Detection and Identification II

Chair: **Michael T. Eismann**, Air Force Research Lab.

8:30 am: **Analysis of hyperspectral change and target detection as affected by vegetation and illumination variations,** J. Meola, Air Force Research Lab. . . . . [6565-63]

8:50 am: **Use of spectral clustering to enhance clutter suppression,** M. T. Eismann, Air Force Research Lab. . . . . [6565-64]

9:10 am: **Resampling approach for anomalous change detection,** J. Theiler, S. J. Perkins, Los Alamos National Lab. . . . . [6565-65]

9:30 am: **An FPGA implementation of image space reconstruction algorithm for hyperspectral imaging analysis,** J. Morales, N. G. Santiago, A. Fernandez, Univ. de Puerto Rico Mayagüez . . . . . [6565-66]

9:50 am: **Maintaining CFAR operation in hyperspectral target detection,** D. G. Manolakis, D. Zhang, MIT Lincoln Lab. . . . . [6565-67]

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

SESSION 14

Room: North Tower-Sawgrass . . . . . Thurs. 10:30 to 11:30 am

Spectral Methodologies and Applications II

Chair: **Paul E. Lewis**, National Geospatial-Intelligence Agency

10:30 am: **Detecting changes in scenes using autonomous smart cameras,** H. M. Jaenisch, dtech Systems Inc.; J. Handley, Licht Strahl Engineering Inc.; M. Hicklen, dtech Systems Inc. . . . . [6565-69]

10:50 am: **PM10 retrieval in urban area from space,** H. S. Lim, M. Z. Mat Jafri, K. Abdullah, Univ. Sains Malaysia (Malaysia) . . . . . [6565-70]

11:10 am: **PM10 retrieval over the water surface of Penang Straits,** H. S. Lim, M. Z. Mat Jafri, K. Abdullah, Univ. Sains Malaysia (Malaysia) . . . . . [6565-71]

Lunch/Exhibition Break . . . . . 11:30 am to 1:10 pm

SESSION 15

Room: North Tower-Sawgrass . . . . . Thurs. 1:10 to 2:50 pm

Scene Background Characterization

Chair: **Sylvia S. Shen**, The Aerospace Corp.

1:10 pm: **Framework development for spectral libraries of natural hyperspectral backgrounds,** M. A. Glennon, J. J. Cipar, Air Force Research Lab.; D. G. Manolakis, MIT Lincoln Lab.; R. B. Lockwood, Air Force Research Lab.; P. Grisgby, J. Jacobson, NASIC/DEKA . . . . . [6565-72]

1:30 pm: **Random sampling statistical analysis for adaptive target-scale-invariant hyperspectral anomaly detection,** J. M. Romano, U.S. Army Armament Research, Development and Engineering Ctr.; D. S. Rosario, Army Research Lab. . . . . [6565-73]

1:50 pm: **A comparative study and analysis between vertex component analysis and orthogonal subspace projection for endmember extraction,** C. Wu, W. Liu, Univ. of Maryland/Baltimore County; H. Ren, National Central Univ. (Taiwan); C. Chang, Univ. of Maryland/Baltimore County . . . . . [6565-74]

2:10 pm: **Impact of missing endmembers on the performance of the OSP detector for hyperspectral images,** P. Bajorski, Rochester Institute of Technology . . . . . [6565-75]

2:30 pm: **Statistical models for LWIR hyperspectral backgrounds and their applications in chemical agent detection,** D. G. Manolakis, D. Zhang, MIT Lincoln Lab. . . . . [6565-76]

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Tuesday-Thursday 10-12 April 2007 • Proceedings of SPIE Vol. 6566

Automatic Target Recognition XVII

Conference Chair: **Firooz A. Sadjadi**, Lockheed Martin Corp.

Cochair: **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. Gaunaurd**, Army Research Lab.; **Izidor Gertner**, City College/CUNY; **Patti S. Gillespie**, Army Research Lab.; **Riad I. Hammoud**, Delphi Automotive Systems; **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; **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. Zelnio**, Air Force Research Lab.

Tuesday 10 April

SESSION 1

Room: North Tower-Vinoy . . . . . Tues. 8:30 to 11:30 am

EO/IR Processing for ATR I

Chair: **Patti S. Gillespie**, Army Research Lab.

8:30 am: **Phenomenological modeling of surface roughness for predicting reflected and emitted polarization from targets** *(Invited Paper)***,** L. B. Wolf, Equinox Corp. . . . . [6566-01]

9:00 am: **Minace IR ATR (classification and rejection) tests with aspect view, scale, depression angle, and thermal state variations,** R. Patnaik, D. P. Casasent, Carnegie Mellon Univ. . . . . [6566-02]

9:20 am: **Automatic aerial target detection and tracking system in airborne FLIR images based on efficient target trajectory filtering,** C. R. del Blanco-Adan, F. F. Jaureguizar, L. L. Salgado, N. N. García, Grupo de Tratamiento de Imagenes (Spain) . . . . . [6566-04]

9:40 am: **Ground-target detection in a virtual battlefield,** P. Gozard, DGA/DSP/Tour DGA (France) . . . . . [6566-05]

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

10:30 am: **Efficient feature selection for real-time object detection,** C. Yu, Z. Yue, P. Topiwala, FastVDO LLC . . . . . [6566-06]

10:50 am: **Low-complexity motion analysis and segmentation for target detection using portable computing platforms,** P. Topiwala, A. V. Nehemiah, FastVDO LLC . . . . . [6566-07]

11:10 am: **Wavelet-based target detection using multiscale directional analysis,** B. J. Chambers, W. Reynolds, Jr., ITT Visual Information Solutions; D. Campbell, ITT Industries; R. Ansari, Univ. of Illinois/Chicago . . . . . [6566-09]

Lunch/Exhibition Break . . . . . 11:30 am to 1:00 pm

SESSION 2

Room: North Tower-Vinoy . . . . . Tues. 1:00 to 3:00 pm

EO/IR Processing for ATR II

Chair: **Carl Holden, Jr.**, Lockheed Martin Corp.

Keynote Presentation

1:00 pm: **Three-dimensional passive sensing photon counting for object classification** *(Invited Paper)***,** B. Javidi, S. Yeom, Univ. of Connecticut; E. A. Watson, Air Force Research Lab. . . . . [6566-09]

1:40 pm: **Real-time adaptive classification environment using rules (RACER),** R. S. Eaton, M. S. Snorrason, Charles River Analytics, Inc. . . . . [6566-10]

2:00 pm: **Evaluation of the VIVID confirmatory identification module,** K. J. Erickson, Jacobs Engineering . . . . . [6566-11]

2:20 pm: **High-performance polarization-enhanced wavelet joint-transform correlation for automated multiple target recognition system,** A. M. El-Saba, M. S. Alam, H. Nalluri, Univ. of South Alabama . . . . . [6566-12]

2:40 pm: **Development of a long-wave infrared polarimetric imaging system,** F. A. Sadjadi, C. Holden, Jr., Lockheed Martin Corp.; C. S. L. Chun, Physics Innovations, Inc.; W. T. Yenisch, Lockheed Martin Corp.; R. J. Johnson, Lockheed Martin Co. . . . . [6566-13]

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

SESSION 3

Room: North Tower-Vinoy . . . . . Tues. 3:30 to 4:50 pm

Radar Processing for ATR

Chair: **Guillermo C. Gaunaurd**, Army Research Lab.

3:30 pm: **Application of interferoceiver for battleship self defense,** M. Li, Consultant . . . . . [6566-14]

3:50 pm: **Radar classification of landmines by time-frequency analysis,** D. C. Wong, L. H. Nguyen, G. C. Gaunaurd, Army Research Lab. . . . . [6566-15]

4:10 pm: **Feature extraction for classification of signals propagating in channels with dispersion and dissipation,** G. Okopal, P. J. Loughlin, Univ. of Pittsburgh . . . . . [6566-17]

4:30 pm: **Time-varying spectral moments and distributions,** L. Cohen, Hunter College/CUNY; K. L. Davidson, Office of Naval Research; P. J. Loughlin, Univ. of Pittsburgh . . . . . [6566-18]

Wednesday 11 April

SESSION 4

Room: North Tower-Vinoy . . . . . Wed. 9:00 to 10:00 am

Multi- and Hyperspectral Processing for ATR

Chair: **Alan J. Van Nevel**, Naval Air Warfare Ctr.

9:00 am: **Pattern recognition in hyperspectral imagery using one-dimensional maximum average correlation height filter and Mahalanobis distance,** M. F. Islam, M. S. Alam, Univ. of South Alabama . . . . . [6566-19]

9:20 am: **Nonlinear unmixing of hypespectral data using BDRF and maximum likelihood algorithm,** M. T. Rahman, M. S. Alam, Univ. of South Alabama . . . . . [6566-21]

9:40 am: **An automated method for pattern recognition using linear mixing model and vertex component analysis,** N. Haq, M. S. Alam, E. Sarigul, Univ. of South Alabama . . . . . [6566-22]

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

SESSION 5

Room: North Tower-Vinoy . . . . . Wed. 10:30 am to 12:00 pm

Fusion Processing for ATR

Chair: **Izidor Gertner**, City College/CUNY

10:30 am: **Probabilistic graphical models and their application in data fusion and monitoring and control** *(Invited Paper)***,** S. Bottone, C. J. Stanek, DataPath, Inc. . . . . [6566-23]

11:00 am: **Target identification using multiradar fusion,** I. I. Jouny, Lafayette College . . . . . [6566-24]

11:20 am: **Tracking moving targets in complex environment by fusing active and passive sensors,** B. G. Fitzpatrick, Z. Cheng, L. Liu, Y. Wang, Tempest Technologies LLC . . . . . [6566-25]

11:40 am: **An ensemble approach to data fusion and its application to ATR,** C. Barbu, Tulane Univ.; J. Peng, Montclair State Univ.; S. R. F. Sims, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. . . . . [6566-26]

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

SESSION 6

Room: North Tower-Vinoy . . . . . Wed. 1:00 to 3:10 pm

Advanced Algorithms for ATR

Chair: **Timothy J. Klausutis**, Air Force Research Lab.

1:00 pm: **Sense and avoid technology for unmanned aircraft systems** *(Invited Paper)*, J. F. McCalmont, M. J. Taylor, Air Force Research Lab.; J. M. Utt, M. A. Deschenes, Defense Research Associates Inc. . . . . [6566-27]

1:30 pm: **Signal-to-noise behavior of gradient direction models for corner detection in images,** D. W. Paglieroni, Lawrence Livermore National Lab. . . . . [6566-28]

1:50 pm: **Multiple target vehicles detection and classification based on low-rank decomposition,** T. Viangteeravat, A. H. Shirkhodaie, H. Rababaah, Tennessee State Univ. . . . . [6566-29]

2:10 pm: **Shape prior active contour model based on curve similarity,** P. Cheng, H. Cao, Huazhong Univ. of Science and Technology (China) . . [6566-31]

2:30 pm: **Toward a sensor-based threat warning system for patrols in MOUT scenarios,** J. Metzler, D. N. Willersinn, Fraunhofer Institute for Information and Dataprocessing (Germany) . . . . . [6566-32]

2:50 pm: **Point target detection using superresolution reconstruction,** J. Dijk, K. Schutte, D. J. de Lange, TNO-FEL (Netherlands) . . . . . [6566-48]

Coffee Break . . . . . 3:10 to 3:50 pm

SESSION 7

Room: North Tower-Vinoy . . . . . Wed. 3:50 to 5:30 pm

Composite-Filter Techniques for ATR

Chair: **Abhijit Mahalanobis**, Lockheed Martin Missiles and Fire Control

3:50 pm: **Vehicle ATR with separable correlation filters cued by pose estimates,** F. E. McFadden, General Dynamics Advanced Information Systems . . . . . [6566-33]

4:10 pm: **An efficient quadratic correlation filter for automatic target recognition,** W. Mikhael, P. Ragothaman, Univ. of Central Florida; R. R. Muise, A. Mahalanobis, Lockheed Martin Missiles and Fire Control . . . . . [6566-34]

4:30 pm: **Data driven training image set selection for composite correlation filter banks,** D. W. Carlson, A. Ramirez, Raytheon Missile Systems . . . . [6566-35]

4:50 pm: **Efficient directional filter bank structures for image decomposition,** R. Ansari, Univ. of Illinois/Chicago; D. Fennell, ITT Space Systems LLC; A. M. Bagci, Univ. of Illinois/Chicago; B. J. Chambers, W. Reynolds, Jr., ITT Visual Information Solutions . . . . . [6566-36]

5:10 pm: **Autonomous spacecraft docking using optical correlation techniques,** G. J. Outerbridge II, D. A. Gregory, The Univ. of Alabama/ Huntsville . . . . . [6566-37]

Thursday 12 April

SESSION 8

Room: North Tower-Vinoy . . . . . Thurs. 8:30 to 10:30 am

Performance Evaluation for ATR

Chair: **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

8:30 am: **A novel ROC approach for performance evaluation of target detection algorithms,** P. Ganapathy, J. A. Skipper, Wright State Univ. . [6566-38]

8:50 am: **Evaluation testbed for ATD performance prediction (ETAPP),** S. K. Ralph, Charles River Analytics, Inc.; J. M. Irvine, Science Applications International Corp.; M. S. Snorrason, Charles River Analytics, Inc. . . . . [6566-39]

9:10 am: **EO ATR performance modeling to support fusion experimentation,** E. P. Blasch, Air Force Research Lab.; B. Kahler, Veridian Inc.; D. Pikas, Univ. of Dayton . . . . . [6566-40]

9:30 am: **Phenomenological fireball model for remote identification of high explosives,** K. C. Gross, Air Force Institute of Technology; J. A. Wayman II, The Ohio State Univ.; G. P. Perram, Air Force Institute of Technology . . . . . [6566-41]

9:50 am: **Evaluation of object level change detection techniques,** J. M. Irvine, S. M. Bergeron, Science Applications International Corp.; D. W. Hugo, M. A. O'Brien, National Geospatial-Intelligence Agency . . . . . [6566-42]

10:10 am: **Construction and correction of probability densities,** L. Cohen, Hunter College/CUNY . . . . . [6566-43]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 9

Room: North Tower-Vinoy . . . . . Thurs. 11:00 am to 12:20 pm

Motion Exploitation for ATR

Chair: **Mubarak A. Shah**, Univ. of Central Florida

11:00 am: **Human motion tracking using mean shift clustering and discrete cosine transform,** M. F. Islam, M. S. Alam, Univ. of South Alabama . . . [6566-44]

11:20 am: **Vision-based vehicle tracking using image alignment with symmetrical function,** L. Cheung, Y. Moon, The Chinese Univ. of Hong Kong (Hong Kong China) . . . . . [6566-45]

11:40 am: **Facial feature tracking with the super image vector inner product,** L. G. Hassebrook, W. Su, B. Hao, D. L. Lau, Univ. of Kentucky . . . . . [6566-46]

12:00 pm: **Rapid automatic target recognition using generic 3D sensor and shape-from-motion data,** C. E. English, M. Labrie, G. Bouchette, P. Iles, B. Powaschuk, P. M. Church, Neptec Design Group Ltd. (Canada); J. Maheux, Defence Research and Development Canada (Canada) . . . . . [6566-47]

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

ATR Technical Event

Room: North Tower-Vinoy . . . . . Thurs. 1:30 to 5:30 pm

Chair: **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

Introductory Remarks . . . . . 1:30 to 1:45 pm

Infrared Data and Overview . . . . . 1:45 to 5:15 pm

Three ATR method tutorials and results on common infrared imaging training and test data.

Presentations

Statistical Models for Target Detection in Infrared Imagery
Presenter: **Michael D. DeVore,** Univ of Virginia

Decision Trees, Regularized Least Square and Their Applications to ATR
Presenters: **Peng Zhang, Kun Zhang, Jing Peng,** Tulane Univ.

Composite Filter Functions for ATR
Presenter: **Mohammad Alam,** Univ. of South Alabama

Feedback plans for next year . . . . . 5:15 to 5:30 pm

Monday-Wednesday 9-11 April 2007 • Proceedings of SPIE Vol. 6567

Signal Processing, Sensor Fusion, and Target Recognition XVI

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

Program Committee: **Mark G. Alford**, Air Force Research Lab.; **Erik P. 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**, The MITRE Corp.; **Perry C. Lindberg**, Teledyne Brown Engineering; **James Llinas**, SUNY/Univ. at Buffalo; **Ronald P. S. 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. Thomopoulos**, National Ctr. for Scientific Research (Greece); **Wiley E. Thompson**, New Mexico State Univ.

Monday 9 April

SESSION 1

Room: North Tower- Marco Island . . . . . Mon. 8:15 to 10:15 am

Multisensor Fusion, Multitarget Tracking, and Resource Management I

Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Mohammad Farooq**, Royal Military College of Canada (Canada)

8:15 am: **Impact and point prediction using a neural extended Kalman filter with multiple sensors,** S. C. Stubberud, Anzus, Inc.; K. A. Kramer, Univ. of San Diego . . . . . [6567-01]

8:35 am: **Markov chains for the prediction of tracking performance,** P. O. Arambel, M. Antone, BAE Systems Advanced Information Technologies . . . . . [6567-02]

8:55 am: **Two solutions to the localization using time difference of arrival problem,** T. Sathyan, T. Kirubarajan, McMaster Univ. (Canada) . . . . . [6567-03]

9:15 am: **Acoustic signature analysis and data fusion of vehicles based on acoustic sensor arrays,** T. Viangteeravat, A. H. Shirkhodaie, H. Rababaah, Tennessee State Univ. . . . . [6567-04]

9:35 am: **Structural and metric correlation of electro-optical and radar generated tracks,** B. Kovalerchuk, Central Washington Univ. . . . . [6567-05]

9:55 am: **Tracking partially occluded objects in moving cameras by extended recursive least-squares filtering with forgetting factor,** C. Li, B. Li, J. Si, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems . [6567-06]

Coffee Break . . . . . 10:15 to 10:40 am

SESSION 2

Room: North Tower- Marco Island . . . . . Mon. 10:40 am to 12:40 pm

Multisensor Fusion, Multitarget Tracking, and Resource Management II

Chairs: **Kenneth J. Hintz**, George Mason Univ.; **Mohammad Farooq**, Royal Military College of Canada (Canada); **Ivan Kadar**, Interlink Systems Sciences, Inc.

10:40 am: **Fuzzy decision trees for planning and autonomous control of a coordinated team of UAVs,** J. F. Smith III, Naval Research Lab. . . . . [6567-07]

11:00 am: **Random set tracking and entropy based control applied to distributed sensor networks,** D. W. J. Stein, J. Witkoskie, S. Theophanis, W. S. Kuklinski, The MITRE Corp. . . . . [6567-08]

11:20 am: **Adaptive sensor tasking using genetic algorithms,** P. J. Shea, J. Kirk, D. Welchons, Black River Systems Co. . . . . [6567-09]

11:40 am: **Distributed sensor resource management and planning,** D. Khosla, J. Guillochon, HRL Labs., LLC . . . . . [6567-10]

12:00 pm: **Integrated tracking and sensor management based on expected information gain,** K. A. B. White, Defence Science and Technology Organisation (Australia) . . . . . [6567-11]

12:20 pm: **Distributed simulation of an information-based sensor management system,** J. P. Malachowski, K. J. Hintz, George Mason Univ. . . . . [6567-12]

Lunch Break . . . . . 12:40 to 1:30 pm

SESSION 3

Room: North Tower- Marco Island . . . . . Mon. 1:30 to 2:50 pm

Assisted Target Recognition (ATR) I

Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Kenneth J. Hintz**, George Mason Univ.

1:30 pm: **UAV-based distributed ATR under realistic simulated environmental effects,** X. Chen, N. A. Schmid, S. Gong, M. Valenti, West Virginia Univ. [6567-13]

1:50 pm: **Real-time vehicle detection in infrared and visible images,** C. Yu, Z. Yue, P. N. Topiwala, FastVDO LLC . . . . . [6567-14]

2:10 pm: **Information theoretic partitioning and confidence-based weight assignment for multiclassifier decision level fusion in hyperspectral target recognition applications,** S. Prasad, L. M. Bruce, Mississippi State Univ. . . . . [6567-15]

2:30 pm: **Applying target shadow models for SAR ATR,** S. Papson, R. M. Narayanan, The Pennsylvania State Univ. . . . . [6567-16]

Coffee Break . . . . . 2:50 to 3:20 pm

SESSION 4

Room: North Tower- Marco Island . . . . . Mon. 3:20 to 4:20 pm

Assisted Target Recognition (ATR) II

Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Kenneth J. Hintz**, George Mason Univ.

3:20 pm: **Detection and identification of human targets in radar data,** S. Z. Gurbuz, Georgia Institute of Technology; W. L. Melvin, Georgia Tech Research Institute; D. B. Williams, Georgia Institute of Technology . . . . . [6567-17]

3:40 pm: **Improving throughput for temporal target nomination using existing infrastructure,** P. G. Raeth, Ball Aerospace & Technologies Corp. . . . . [6567-18]

4:00 pm: **Time-frequency transform techniques for seabed and buried target classification,** M. Barbu, E. Kaminsky, R. E. Trahan, Jr., Univ. of New Orleans . . . . . [6567-19]

Invited Panel Discussion

Room: North Tower- Marco Island . . . . . Mon. 7:00 to 9:40 pm

Issues and Challenges in Uncertainty Representation and Management with Applications to Real-World Problems

Organizers: **Ivan Kadar,** Interlink Systems Sciences, Inc., **Ronald P. Mahler,** Lockheed Martin Tactical Systems

Moderators: **Ivan Kadar,** Interlink Systems Sciences, Inc., **Thiagalingam Kirubarajan,** McMaster Univ. (Canada)

Panelists: **Chee-Yee Chong,** BAE Systems Advanced Information Technologies; **Mohamad Farooq,** Royal Military College of Canada; **Anne-Laure Jouselme,** Defense Research Establishment Valcartier (Canada); **Ivan Kadar,** Interlink Systems Sciences, Inc., **Thiagalingam Kirubarajan,** McMaster Univ. (Canada); **Ronald P. Mahler,** Lockheed Martin Tactical Systems; **Joseph Peri,** Johns Hopkins Univ./Applied Physics Lab.; **Enrique Ruspini,** SRI; **Pierre Valin,** Defense Research Establishment Valcartier (Canada)

Tuesday 10 April

SESSION 5

Room: North Tower- Marco Island . . . . . Tues. 8:00 to 9:40 am

Multisensor Fusion Methodologies and Applications I

Chair: **Ronald P. S. Mahler**, Lockheed Martin Co.

8:00 am: **A survey of PHD filter related research,** R. P. S. Mahler, Lockheed Martin Co. . . . . [6567-21]

8:20 am: **A unified Bayesian theory of measurements,** R. P. S. Mahler, Lockheed Martin Co. . . . . [6567-22]

8:40 am: **Mission-based situational awareness sensor management and information fusion,** A. I. El-Fallah, A. Zatezalo, Scientific Systems Co., Inc.; R. P. S. Mahler, Lockheed Martin Co.; R. K. Mehra, Scientific Systems Co., Inc.; M. G. Alford, Air Force Research Lab. . . . . [6567-23]

9:00 am: **Space-based sensor management and geostationary satellites tracking,** A. I. El-Fallah, A. Zatezalo, R. K. Mehra, Scientific Systems Co., Inc.; R. P. S. Mahler, Lockheed Martin Co.; D. Donatelli, Air Force Research Lab. . . . . [6567-24]

9:20 am: **PFLib: an object-oriented MATLAB toolbox for particle filtering,** L. Chen, Scientific Systems Co., Inc.; C. Lee, A. Budhiraja, The Univ. of North Carolina at Chapel Hill; R. K. Mehra, Scientific Systems Co., Inc. . . . . [6567-25]

Coffee Break . . . . . 9:40 to 10:30 am

SESSION 6

Room: North Tower- Marco Island . . . . . Tues. 10:30 to 11:50 am

Multisensor Fusion Methodologies and Applications II

Chairs: **Martin E. Liggins II**, MITRE Corp.; **Chee-Yee Chong**, BAE Systems Advanced Information Technologies; **Michael L. Hinman**, Air Force Research Lab.

10:30 am: **Analytical performance evaluation for autonomous sensor fusion,** K. C. Chang, George Mason Univ.; M. E. Liggins II, The MITRE Corp. . . [6567-26]

10:50 am: **A testbed for architecture and fidelity trade studies in the Bayesian decision-level fusion of ATR products,** K. J. Erickson, Jacobs Engineering . . . . . [6567-27]

11:10 am: **Survey of approaches and experiments in decision-level fusion of automatic target recognition (ATR) products,** T. D. Ross, Air Force Research Lab. . . . . [6567-28]

11:30 am: **ROC curve formulas for fused correlated classification systems,** C. M. Schubert, Virginia Commonwealth Univ.; S. N. Thorsen, M. E. Oxley, Air Force Institute of Technology . . . . . [6567-29]

Lunch/Exhibition Break . . . . . 11:50 am to 1:30 pm

SESSION 7

Room: North Tower- Marco Island . . . . . Tues. 1:30 to 2:30 pm

Multisensor Fusion Methodologies and Applications III

Chairs: **Martin E. Liggins II**, MITRE Corp.; **Chee-Yee Chong**, BAE Systems Advanced Information Technologies; **Michael L. Hinman**, Air Force Research Lab.

1:30 pm: **Aerial video and ladar imagery fusion for persistent urban vehicle tracking,** P. L. Cho, D. Greisokh, R. C. Knowlton, MIT Lincoln Lab. . . . . [6567-30]

1:50 pm: **Advanced activity reporting in a multilayered unattended ground sensor network,** T. Joslin, Harris Corp. . . . . [6567-31]

2:10 pm: **The use of optical RF network for target detection and tracking,** M. Li, Consultant . . . . . [6567-32]

SESSION 8

Room: North Tower- Marco Island . . . . . Tues. 2:30 to 3:50 pm

Multisensor Fusion Methodologies and Applications IV

Chairs: **Michael L. Hinman**, Air Force Research Lab.; **Ivan Kadar**, Interlink Systems Sciences, Inc.

2:30 pm: **Issues and challenges in resource management and its interaction with levels 2/3 fusion with applications to real-world problems: an annotated perspective,** E. P. Blasch, Air Force Research Lab.; I. Kadar, Interlink Systems Sciences, Inc.; K. J. Hintz, George Mason Univ.; C. Chong, BAE Systems Advanced Information Technologies; J. J. Salerno, Jr., Air Force Research Lab.; J. Biermann, FGAN-FKIE (Germany); S. Das, Charles River Analytics, Inc. . . . . [6567-33]

2:50 pm: **Game theoretic behavior features change prediction in hostile environments,** M. Wei, G. Chen, Intelligent Automation Inc.; J. B. Cruz, Jr., The Ohio State Univ. . . . . [6567-34]

3:10 pm: **Statistical comparison of the hybrid approach with pure and exact inference models for fusion 2+,** K. D. Lee, E. Wiesenfeld, A. Gelfand, Decisive Analytics Corp. . . . . [6567-35]

3:30 pm: **Hybrid methodology for situation assessment model development within an air operations center domain,** P. G. Gonsalves, C. D. Call, S. Ho, Charles River Analytics, Inc. . . . . [6567-36]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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-show and their manuscript 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.

Poster/Oral Standby

✔ **Exact message passing algorithms for Bayesian network with loops,** W. Sun, K. C. Chang, George Mason Univ. . . . . [6567-64]

Posters

✔ **Signal filtering based on wavelet transform and its application in ground-penetrating radar,** C. Xu, South China Normal Univ. (China); J. Li, Shanghai Jiao Tong Univ. (China) . . . . . [6567-55]

✔ **Dwi-detector optical sensor for measuring the measuring the concentration of total suspended solids,** H. S. Lim, M. Z. Mat Jafri, K. Abdullah, Univ. Sains Malaysia (Malaysia) . . . . . [6567-57]

✔ **An improved DS acoustic-seismic modality fusion algorithm based on a new cascaded fuzzy classifier for ground-moving targets classification in wireless sensor networks,** Q. Pan, J. Wei, H. Cao, N. Li, H. Liu, Shanghai Institute of Microsystem and Information Technology (China) . . . . . [6567-58]

✔ **Effective improvement on traditional filter to reduce envelope delay,** Z. Liang, Sr., B. Li, Sr., J. Wei, Y. Liu, Sr., H. Liu, Shanghai Institute of Microsystem and Information Technology (China) . . . . . [6567-59]

✔ **Adaptive target segmentation using runtime-weighted features,** J. Jung, H. Lee, D. Park, Korea Advanced Institute of Science and Technology (South Korea); C. Park, J. Lee, Samsung Thales Co., Ltd. (South Korea) . . . . [6567-60]

✔ **Real-time color transfer system for low-level light visible and infrared images in YUV color space,** L. Wang, W. Jin, Beijing Institute of Technology (China) . . . . . [6567-61]

✔ **Radar detection using sparsely distributed apertures in urban environment,** I. Son, T. K. Varslot, C. Yarman, Rensselaer Polytechnic Institute; A. Pezeshki, Princeton Univ.; B. Yazici, M. Cheney, Rensselaer Polytechnic Institute . . . . . [6567-62]

✔ **Face and automatic target recognition based on class-specific superresolution subspace,** W. Asdornwised, Chulalongkorn Univ. (Thailand) . . . . . [6567-63]

Wednesday 11 April

SESSION 9

Room: North Tower- Marco Island . . . . . Wed. 8:00 to 11:30 am

Signal and Image Processing I

Chairs: **Lynne L. Grewe**, California State Univ./East Bay; **Alastair D. McAulay**, Lehigh Univ.; **Mark G. Alford**, Air Force Research Lab.

8:00 am: **Automatic building detection and 3D shape recovery from single monocular electro-optic imagery,** D. A. Lavigne, Defence R&D Canada/ Valcartier (Canada); A. Dlugan, N. Goldstein, P. Saeedi, H. H. Zwick, MacDonald, Dettwiler & Associates Ltd. (Canada) . . . . . [6567-38]

8:20 am: **Application of a dynamic feature selection algorithm to multisensor image registration,** S. P. DelMarco, H. F. Webb, V. T. Tom, D. Lefebvre, BAE Systems Advanced Information Technologies . . . . . [6567-39]

8:40 am: **A verification metric for multisensor image registration,** S. P. DelMarco, V. T. Tom, H. F. Webb, D. Lefebvre, BAE Systems Advanced Information Technologies . . . . . [6567-40]

9:00 am: **Detecting small changes in images with parallax,** M. J. Carlotto, General Dynamics Corp. . . . . [6567-41]

9:20 am: **A feature-based approach for detecting anomalies in space, time, and spectrum,** M. J. Carlotto, General Dynamics Corp. . . . . [6567-42]

9:40 am: **Target detection based on multiresolution singularity analysis,** D. Charalampidis, G. W. Stein, Univ. of New Orleans . . . . . [6567-43]

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

10:30 am: **Morphological component analysis and STAP filters,** H. C. Morris, Modal Research; M. De Pass, Claremont Graduate Univ. . . . . [6567-44]

10:50 am: **High-dimensional feature space partitioning using classification catch cover digraphs,** M. A. Ordaz, A. J. Patterson, D. E. Waagen, N. N. Shah, E. Whittenberger, Raytheon Missile Systems . . . . . [6567-45]

11:10 am: **A spectral independent morphological adaptive classifier,** J. B. Montgomery, C. Montgomery, M&M Aviation; R. Sanderson, Air Force Research Lab. . . . . [6567-46]

Lunch/Exhibition Break . . . . . 11:30 am to 1:30 pm

SESSION 10

Room: North Tower- Marco Island . . . . . Wed. 1:30 to 3:50 pm

Signal and Image Processing II

Chairs: **Alastair D. McAulay**, Lehigh Univ.; **Lynne L. Grewe**, California State Univ./East Bay; **Mark G. Alford**, Air Force Research Lab.

1:30 pm: **A fuzzy rule base system for object-based feature extraction and classification,** X. Jin, S. Paswaters, ITT Visual Information Solutions . . . [6567-47]

1:50 pm: **Novel lock-in amplifier for identification of luminescent materials for authentication,** A. D. McAulay, Lehigh Univ. . . . . [6567-48]

2:10 pm: **Robust modulation classification techniques based on hierarchical neural networks,** J. DeClouet, M. Naraghi-Pour, Louisiana State Univ. . [6567-49]

2:30 pm: **Real-time 3D target tracking and localization for arbitrary camera geometries,** A. P. Kulkarni, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems; J. Si, Arizona State Univ. . . . . [6567-50]

2:50 pm: **NIR polarization camera,** G. S. Baker, MilSys Technologies LLC . . . . . [6567-51]

3:10 pm: **MTF model for color Bayer detectors,** Y. Elor, RAFAEL Armament Development Authority Ltd. (Israel) . . . . . [6567-52]

3:30 pm: **Signal processing techniques for heterodyne differential absorption lidar,** J. Y. Beyon, California State Univ./Los Angeles; G. J. Koch, S. Ismail, NASA Langley Research Ctr. . . . . [6567-53]

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Tuesday-Wednesday 10-11 April 2007 • Proceedings of SPIE Vol. 6568

Algorithms for Synthetic Aperture Radar Imagery XIV

Conference Chairs: **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**, Defense Advanced Research Projects Agency; **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.

Tuesday 10 April

PROLOG

Room: North Tower-Key West . . . . . Tues. 8:10 to 8:15 am

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

Session Introduction

Room: North Tower-Key West . . . . . Tues. 8:15 to 8:20 am

Chair: **Gerard W. Titi**, BAE Systems Advanced Information Technologies

SESSION 1

Room: North Tower-Key West . . . . . Tues. 8:20 to 10:10 am

Advanced Radar Imaging

Chair: **Gerard W. Titi**, BAE Systems Advanced Information Technologies

8:20 am: **GOTCHA experience report: three-dimensional SAR imaging with complete circular apertures,** E. Ertin, C. Austin, R. L. Moses, L. C. Potter, The Ohio State Univ. . . . . [6568-01]

8:30 am: **Three-dimensional point spread function characterization of a radially displaced scatterer,** M. A. Temple, Air Force Institute of Technology . . . . . [6568-02]

8:40 am: **Three-dimensional resolution for circular synthetic aperture radar,** L. J. Moore, L. C. Potter, The Ohio State Univ. . . . . [6568-03]

8:50 am: **Exploitation of UAV trajectories with perturbation for intelligent circular SAR applications,** A. K. Mitra, T. L. Lewis, L. Willemsen, Air Force Research Lab. . . . . [6568-04]

9:00 am: **Synthetic aperture imaging using sources of opportunity,** C. E. Yarman, Drexel Univ.; B. Yazici, M. Cheney, Rensselaer Polytechnic Institute . . . . . [6568-05]

9:10 am: **Bistatic synthetic aperture inversion for arbitrary flight trajectories,** C. E. Yarman, Drexel Univ. . . . . [6568-06]

9:20 am: **Shadow detectors for moving target focusing,** F. A. Lee-Elkin, R. L. Dilsavor, SET Corp.; M. McClure, DARPA . . . . . [6568-07]

9:30 am: **Characterizing geolocation ambiguity responses in SAR-GMTI,** M. E. Holston, Air Force Institute of Technology; M. J. Minardi, Air Force Research Lab.; M. A. Temple, M. A. Saville, Air Force Institute of Technology . . . . [6568-35]

9:40 am: **A comparison of nonquadratic regularization implementations on the backhoe data set,** A. S. Kondrath, B. D. Rigling, Wright State Univ. [6568-08]

9:50 am: **Joint enhancement of multichannel SAR data,** N. Ramakrishnan, E. Ertin, R. L. Moses, The Ohio State Univ. . . . . [6568-09]

10:00 am: **Resolution analysis for wide-angle SAR imaging,** S. He, National Univ. of Defense Technology (China) . . . . . [6568-10]

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

Session Introduction

Room: North Tower-Key West . . . . . Tues. 10:40 to 10:45 am

Chair: **Charles V. Jakowatz, Jr.**, Sandia National Labs.

SESSION 2

Room: North Tower-Key West . . . . . Tues. 10:45 am to 12:15 pm

Radar Modeling and Measurement

Chair: **Charles V. Jakowatz, Jr.**, Sandia National Labs.

10:45 am: **A challenge problem for 2D/3D imaging of targets from a volumetic data set in an urban environment,** C. H. Casteel, Jr., L. A. Gorham, M. J. Minardi, S. Scarborough, K. D. Naidu, Air Force Research Lab. . . . [6568-36]

10:55 am: **Raider Tracer: a MATLAB-based electromagnetic scattering simulator,** B. D. Rigling, Wright State Univ. . . . . [6568-11]

11:05 am: **Indoor range for spatially resolved radar signature acquisition of targets,** U. Aulenbacher, M. John, C. T. Inaebnit, Armasuisse (Switzerland) . . . . . [6568-12]

11:15 am: **Three-dimensional characterization of radar targets by means of ISAR/SAR near-field imaging techniques,** M. John, U. Aulenbacher, C. T. Inaebnit, Armasuisse (Switzerland) . . . . . [6568-13]

11:25 am: **An end-to-end simulator for high-resolution spaceborne SAR systems,** R. H. Speck, P. Turchi, H. Suess, DLR Standort Oberpfaffenhofen (Germany) . . . . . [6568-14]

11:35 am: **Efficient algorithms for target validation using 3D scattering features,** A. M. Raynal, The Univ. of Texas/Austin; R. Bhalla, Science Applications International Corp.; H. Ling, The Univ. of Texas/Austin; V. Velten, Air Force Research Lab. . . . . [6568-15]

11:45 am: **Image exploitation for MiSAR,** N. F. Heinze, Fraunhofer Institut für Informations-und Datenverarbeitung (Germany); M. Edrich, EADS Deutschland GmbH (Germany); G. M. Saur, W. Krüger, Fraunhofer Institut für Informations-und Datenverarbeitung (Germany) . . . . . [6568-16]

11:55 am: **A comparison between imaging radar and medical imaging polar format algorithm implementations,** L. A. Gorham, Air Force Research Lab.; B. D. Rigling, Wright State Univ.; E. G. Zelnio, Air Force Research Lab. . [6568-34]

12:05 pm: **SAR data exploitation: present and future computational technology for enabling algorithm development,** U. K. Majumder, Air Force Research Lab.; J. W. Nehrbass, Ohio Supercomputer Ctr.; P. Buxa, E. G. Zelnio, M. J. Minardi, C. H. Casteel, Jr., Air Force Research Lab. . . . . [6568-18]

Lunch/Exhibition Break . . . . . 12:15 to 1:30 pm

Poster Session . . . . . Tues. 1:30 to 3:00 pm

✔ **A comparison of SAR images from a full 360-degree aperture using backprojection and the least mean squares algorithms,** J. E. Minardi II, Carroll High School; M. J. Minardi, Air Force Research Lab. . . . . [6568-37]

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

Panel Discussion/Workshop . . . . . Tues. 3:30 to 4:30 pm

Wednesday 11 April

Session Introduction

Room: North Tower-Key West . . . . . Wed. 9:00 to 9:05 am

Chair: **Stephen P. Welby**, DARPA

SESSION 3

Room: North Tower-Key West . . . . . Wed. 9:05 to 9:55 am

Detection Techniques

Chair: **Stephen P. Welby**, DARPA

9:05 am: **An improved multichannel clutter suppression algorithm,** B. Kahler, B. L. Keaffaber, Veridian Inc. . . . . [6568-19]

9:15 am: **Waveform preconditioning for clutter rejection,** T. K. Varslot, B. Yazici, C. Yarman, M. Cheney, Rensselaer Polytechnic Institute; L. L. Scharf, Colorado State Univ. . . . . [6568-20]

9:25 am: **Multifrequency space time orthogonal projection (MF-STOP): radar signal processing algorithm for detecting and discriminating targets in heavy clutter,** Y. Tamrat, C. J. Hatleberg, Apogen Technologies . . . . . [6568-21]

9:35 am: **Single-pass detection and classification in LF FOPEN SAR,** D. Blacknell, QinetiQ Ltd. (United Kingdom) . . . . . [6568-22]

9:45 am: **Motion-segmentation based change detection,** W. Ye, D. Wu, W. L. Roberts, J. Li, Univ. of Florida . . . . . [6568-23]

Coffee Break . . . . . 9:55 to 10:35 am

Session Introduction

Room: North Tower-Key West . . . . . Wed. 10:35 to 10:40 am

Chair: **Eric R. Keydel**, Science Applications International Corp.

SESSION 4

Room: North Tower-Key West . . . . . Wed. 10:40 am to 12:10 pm

Classification Techniques

Chair: **Eric R. Keydel**, Science Applications International Corp.

10:40 am: **Extraction of 3D attributed scattering center features from sparse apertures,** J. A. Jackson, R. L. Moses, The Ohio State Univ. . . . . [6568-25]

10:50 am: **Improve ATR performance through distance metric learning,** Y. Sun, M. Xue, J. Li, Univ. of Florida; S. R. Stanfill, Lockheed Martin Co. [6568-26]

11:00 am: **Preprocessing of SAR interferometric data using anisotropic diffusion filter,** K. Sartor, J. D. Allen, E. Ganthier, Harris Corp.; G. B. Tenali, Florida Institute of Technology . . . . . [6568-28]

11:10 am: **A real-time robust feature-based object tracking algorithm,** B. Han, D. Wu, J. Li, Univ. of Florida . . . . . [6568-29]

11:20 am: **Multinomial pattern matching for high-range resolution profiles,** M. L. Koudelka, J. A. Richards, M. W. Koch, Sandia National Labs. . . . . [6568-30]

11:30 am: **Sparse manifold learning applied to building synthetic aperture radar ATR templates,** P. L. Busarow, N. N. Shah, D. E. Waagen, Raytheon Missile Systems; V. S. Berisha, Arizona State Univ. . . . . [6568-31]

11:40 am: **Diffusion distances and radar data analysis,** D. G. Arnold, S. Bhat, Air Force Research Lab. . . . . [6568-38]

11:50 pm: **Object-image metric: properties and applications,** D. G. Arnold, O. L. Mendoza, Air Force Research Lab. . . . . [6568-32]

12:00 pm: **Score-based SAR ATR performance models,** E. M. Lavely, V. Kaufman, BAE Systems Advanced Information Technologies; T. D. Ross, E. Blasch, Air Force Research Lab. . . . . [6568-33]

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

Poster Session . . . . . Wed. 1:30 to 3:00 pm

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

Panel Discussion/Workshop . . . . . Wed. 3:30 to 4:30 pm

Monday-Wednesday 9-11 April 2007 • Proceedings of SPIE Vol. 6569

Acquisition, Tracking, Pointing, and Laser Systems Technologies XXI

DEDICATION TO LARRY A. STOCKUM

The 2007 SPIE Acquisition, Tracking, and Pointing Conference is dedicated to Larry A. Stockum, who served as co-chair for this conference for 16 years (1991-2006). Dr. Stockum passed on August 9, 2006. Larry was a Technical Fellow in the Boeing Space and Communications Group and an expert in all aspects of electro-optical sensors applied to target acquisition and tracking. He contributed numerous technical articles to SPIE as well as other venues. Dr. Stockum also co-taught the SPIE Short Course, "Precision Stabilization and Laser Pointing Systems" for many years.

Conference Chairs: **Steven L. Chodos**, Boeing-SVS, Inc.; **William E. Thompson**, Air Force Research Lab.

Cochairs: **Ali T. Alouani**, Tennessee Technological Univ.; **Jim F. Riker**, Air Force Research Lab.; **James E. Kimbrell**, L-3 Communications/Brashear

Program Committee: **Kenneth W. Billman**, Lockheed Martin Corp.; **William D. Blair**, Georgia Tech Research Institute; **John E. Gray**, Naval Surface Warfare Ctr.; **Gillian K. Groves**, Raytheon Co.; **James M. Hilkert**, Alpha-Theta Technologies; **Henry R. Sebesta**, Applied Technology Associates; **Glenn A. Tyler**, The Optical Sciences Co.; **Juan R. Vasquez**, Air Force Institute of Technology

Monday 9 April

Opening Remarks and Tribute to Larry A. Stockum

Room: North Tower-Key Biscayne . . . . . Mon. 1:00 to 1:10 pm

Chairs: **Steven L. Chodos**, Boeing-SVS, Inc.; **William E. Thompson**, Air Force Research Lab.

SESSION 1

Room: North Tower-Key Biscayne . . . . . Mon. 1:10 to 2:30 pm

Signal Processing

Chair: **Ali T. Alouani**, Tennessee Technological Univ.

1:10 pm: **Effects of cartesian to polar transformation on target track quality,** J. E. Gray, Naval Surface Warfare Ctr.; A. T. Alouani, Tennessee Technological Univ. . . . . [6569-01]

1:30 pm: **Asynchronous track fusion using constant gain filter,** A. T. Alouani, Tennessee Technological Univ.; J. E. Gray, Naval Surface Warfare Ctr. . . [6569-02]

1:50 pm: **Alternative switching logic designs for multiple model filters,** A. S. Smith-Carroll, D. H. McCabe, Naval Surface Warfare Ctr. . . . . [6569-03]

2:10 pm: **Launch point estimation and impact point prediction of small ballistic munitions with an interacting multiple model estimator,** D. F. Hardiman, U.S. Army Research, Development and Engineering Command . . . . . [6569-05]

Coffee Break . . . . . 2:50 to 3:30 pm

SESSION 2

Room: North Tower-Key Biscayne . . . . . Mon. 3:30 to 4:10 pm

Stabilization and Line-of-Sight Control

Chair: **James E. Kimbrell**, L-3 Brashear

3:30 pm: **Acquisition, tracking, and pointing technology development for bifocal relay mirror spacecraft,** J. J. Kim, T. A. Sands, B. N. Agrawal, Naval Postgraduate School . . . . . [6569-07]

3:50 pm: **Friction effects on large, gimbaled E-O directors,** C. A. Lagunowich, R. Sobek, M. McEver, G. D. Danyo, L-3 Brashear . . . . . [6569-08]

Tuesday 10 April

SESSION 3

Room: North Tower-Key Biscayne . . . . . Tues. 8:00 to 11:30 am

Image Processing for Tracking

Chairs: **Jim F. Riker**, Air Force Research Lab.; **Steven L. Chodos**, Boeing-SVS, Inc.

8:00 am: **Tunable wavelet target extraction preprocessor,** D. Yonovitz, Complex Data Systems . . . . . [6569-12]

8:20 am: **Target tracking based on spatio-temporal fractal error,** B. S. Allen, L-3 Communications Cincinnati Electronics, Inc. . . . . [6569-13]

8:40 am: **Bayesian tracking in actively illuminated laser tracking through deep turbulence,** B. G. Fitzpatrick, Y. Wang, Tempest Technologies LLC [6569-14]

9:00 am: **A novel segmentation method for object tracking and recognition,** C. Witte, W. Armbruster, M. Hebel, K. Jäger, Forschungsfesellschaft für Angewandte Naturwissenschaften e.V. (Germany) . . . . . [6569-16]

9:20 am: **Video surveillance of pedestrians and vehicles,** M. S. Snorrason, D. Gutchess, Charles River Analytics, Inc.; V. Ablavsky, Boston Univ. and Charles River Analytics, Inc.; A. Thangali, S. Sclaroff, Boston Univ. . . . . [6569-17]

9:40 am: **Zoom techniques for achieving scale invariant object tracking in real-time active vision systems,** E. D. Nelson, J. C. Cockburn, Rochester Institute of Technology . . . . . [6569-18]

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

10:30 am: **Passive ranging of boost-phase missiles,** M. Hawks, G. P. Perram, Air Force Institute of Technology . . . . . [6569-19]

10:50 am: **Results from precision tracking tests against distant objects,** J. F. Riker, Air Force Research Lab. . . . . [6569-20]

11:10 am: **Optimization of the tomographic scanning (TOSCA) imager,** H. Hovland, Forsvarets Forsknings Institute (Norway) . . . . . [6569-21]

Lunch/Exhibition Break . . . . . 11:30 am to 1:30 pm

SESSION 4

Room: North Tower-Key Biscayne . . . . . Tues. 1:30 to 3:10 pm

System Level Applications

Chairs: **William E. Thompson**, Air Force Research Lab.; **Steven L. Chodos**, Boeing-SVS, Inc.

1:30 pm: **Angel Fire: a real-time open-source video tracking system,** B. R. Secrest, J. R. Vasquez, Air Force Institute of Technology . . . . . [6569-23]

1:50 pm: **Comprehensive evaluation of tracking systems by non-photorealistic simulation,** C. Dubreu, Cedip Infrared Systems (France); A. Manzanera, École Nationale Supérieure de Techniques Avancées (France); E. Bohain, Cedip Infrared Systems (France) . . . . . [6569-25]

2:10 pm: **A method for tuning a standard Linux kernel to be used in signal processing systems,** R. Herbel, Raytheon Co. . . . . [6569-26]

2:30 pm: **IRLooK: an advanced mobile infrared signature measurement, data reduction, and analysis system,** T. Cukur, Y. Altug, C. Uzunoglu, ASELSAN Inc. (Turkey) . . . . . [6569-27]

2:50 pm: **Practical to tactical: an evolution of the dual line-of-sight experiment,** D. J. Riedle, Boeing-SVS, Inc. . . . . [6569-28]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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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✔ **Collaborative multimodel Rao-Blackwellised particle filter for target tracking in acoustic sensor networks,** Z. Yu, J. Wei, J. Zhao, H. Liu, Shanghai Institute of Microsystem and Information Technology (China) . . . . . [6569-06]

✔ **IR and CCD-based object tracking using active shape model,** J. Lee, Samsung Thales Ltd. (South Korea) . . . . . [6569-22]

✔ **Laser-beam director system monitoring the alignment state with a null reflector,** Y. Kim, H. Kim, Y. Park, E. Kang, Agency for Defense Development (South Korea); S. Lee, J. Kim, H. Eom, Doosan Infracore Co., Ltd. (South Korea) . . . . . [6569-35]

✔ **Image seeker simulation for short-range surface-to-surface missile,** S. Jin, H. Kang, Nex1 Future Co., Ltd. (South Korea) . . . . . [6569-36]

Wednesday 11 April

SESSION 5

Room: North Tower-Key Biscayne . . . . . Wed. 8:00 am to 11:50 am

Joint session with conference 6542

Chairs: **Alexander M. Veprik**, Ricor-Cryogenic & Vacuum Systems (Israel); **Dan C. Herrick**, Air Force Research Lab. Directed Energy Directorate

8:00 am: **Adaptive filtering and feed-forward control for suppression of vibration and jitter,** E. H. Anderson, R. Blankinship, L. P. Fowler, R. Glaese, P. Janzen, CSA Engineering, Inc. . . . . [6569-29]

8:20 am: **Real-time optimal sensing strategies for active control of optical systems,** S. Moon, Adaptive Technologies, Inc.; L. P. Fowler, CSA Engineering, Inc.; R. L. Clark, Jr., Duke Univ.; E. H. Anderson, CSA Engineering, Inc. . [6569-30]

8:40 am: **Jitter control in actively illuminated laser tracking,** Y. Wang, L. Liu, B. G. Fitzpatrick, Tempest Technologies LLC . . . . . [6569-31]

9:00 am: **Real-time, low-latency stabilization for micro-autonomous unmanned vehicles,** S. D. Martinez, Honeywell, Inc. . . . . [6569-32]

9:20 am: **Vibration evaluation of a precision inertial reference unit,** P. H. Merritt, J. Friel, B. Spanbauer, Air Force Research Lab.; J. Donaldson, R. E. Walter, Boeing-SVS, Inc. . . . . [6569-33]

9:40 am: **Adaptive suppression of optical jitter with a new liquid crystal beam steereing device,** P. Orzechowski, S. Gibson, T. Tsao, Univ. of California/ Los Angeles; D. C. Herrick, Air Force Research Lab.; M. Mahajan, B. Wen, Teledyne Scientific Co. . . . . [6569-34]

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

10:30 am: **IR detector dewar and cooler assemblies for stringent environmental conditions,** X. Breniere, M. Molina, A. Kessler, P. M. Tribolet, Sofradir (France) . . . . . [6542-85]

10:50 am: **Optimal snubbers for the system of vibration protection of sensitive electronic and electro-optic instrumentation,** A. M. Veprik, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel); S. Djerassi, RAFAEL Armament Development Authority Ltd. (Israel) . . . . . [6542-86]

11:10 am: **Portable cryogenically cooled infrared imager: how silent it might be?,** A. M. Veprik, H. Vilenchik, R. Broyde, N. Pundak, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel); A. Struckhoff, Kollsman, Inc. . . . . [6542-88]

11:30 am:**Identification of vibration sources in pulse tube cryogenic refrigerator,** S. V. Riabzev, A. M. Veprik, H. Vilenchik, N. Pundak, Ricor-Cryogenic & Vacuum Systems Ltd. (Israel) . . . . . [6542-90]

Tuesday 10 April 2007 • Proceedings of SPIE Vol. 6570 *(On-site Proceedings)*

Data Mining, Intrusion Detection, Information Assurance, and Data Networks Security 2007

Conference Chair: **Belur V. Dasarathy**, Consultant, Information Fusion Technologies

Program Committee: **Thomas G. L. Allen**, Air Force Research Lab.; **Sheila B. Banks**, Calculated Insight; **Jonathan A. Gloster**, The Van Dyke Technology Group, Inc.; **Robert S. Lynch, Jr.**, Naval Undersea Warfare Ctr.; **Martin R. Stytz**, Institute for Defense Analyses; **Shusaku Tsumoto**, Shimane Univ. (Japan); **JingTao Yao**, Univ. of Regina (Canada)

Tuesday 10 April

SESSION 1

Room: North Tower-Aruba . . . . . Tues. 8:30 to 10:30 am

Intrusion/Intruder Detection

Chairs: **Jonathan A. Gloster**, The Van Dyke Technology Group, Inc.; **Belur V. Dasarathy**, Consultant

8:30 am: **BOT armies as threats to network security,** S. B. Banks, Calculated Insight; M. R. Stytz, Institute for Defense Analyses . . . . . [6570-29]

8:50 am: **Defending against Internet worms using a phase space method from chaos theory,** J. Hu, J. Gao, Univ. of Florida . . . . . [6570-01]

9:10 am: **Information fusion and visualization of large complex attack graphs for networks security,** H. Chen, G. Chen, Intelligent Automation Inc.; M. Kruger, Office of Naval Research; E. Blasch, Air Force Research Lab.; D. Penwell, Alion Science and Technology Corp. . . . . [6570-02]

9:30 am: **Summary of results on optimal camera placement for boundary monitoring,** R. J. Holt, Queensborough Community College/CUNY; H. Man, J. Wang, I. Mukherjee, R. Martini, R. Netravali, Stevens Institute of Technology . . . . . [6570-03]

9:50 am: **Evaluation of data mining techniques for suspicious network activity classification using honeynets data,** A. Grégio, R. Santos, Instituto Nacional de Pesquisas Espaciais (Brazil); A. Montes, Ctr. de Pesquisas Renato Archer (Brazil) . . . . . [6570-04]

10:10 am: **Selection of intrusion detection system threshold bounds for effective sensor fusion,** C. Thomas, N. Balakrishnan, Indian Institute of Science (India) . . . . . [6570-05]

Coffee Break . . . . . 10:30 to 11:00 am

SESSION 2

Room: North Tower-Aruba . . . . . Tues. 11:00 am to 12:00 pm

Data Mining

Chairs: **Robert S. Lynch, Jr.**, Naval Undersea Warfare Ctr.; **Thomas G. L. Allen**, Air Force Research Lab.

11:00 am: **Mining unknown patterns in data when the features are correlated,** R. S. Lynch, Jr., Naval Undersea Warfare Ctr.; P. K. Willett, Univ. of Connecticut . . . . . [6570-07]

11:20 am: **Image information mining from geospatial archives based on combination of the wavelet transform and Fourier phase descriptor,** V. P. Shah, N. H. Younan, S. S. Durbha, R. L. King, Mississippi State Univ. and GeoResources Institute . . . . . [6570-08]

11:40 am: **Genetic program-based data mining of fuzzy decision trees and methods of improving convergence and reducing bloat,** J. F. Smith III, Naval Research Lab. . . . . [6570-10]

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

SESSION 3

Room: North Tower-Aruba . . . . . Tues. 1:00 to 3:00 pm

Applications

Chairs: **Jonathan A. Gloster**, The Van Dyke Technology Group, Inc.; **John J. Salerno, Jr.**, Air Force Research Lab.

1:00 pm: **Enabling distributed simulation multi-level security using virtual machine and virtual private network technology,** M. R. Stytz, Institute for Defense Analyses; S. B. Banks, Calculated Insight . . . . . [6570-27]

1:20 pm: **Maximizing information recovery from rank-order codes,** B. B. Sen, S. Furber, The Univ. of Manchester (United Kingdom) . . . . . [6570-13]

1:40 pm: **Impact of information assurance on the performance of secure messaging systems,** S. V. Belur, J. A. Gloster, The Van Dyke Technology Group, Inc. . . . . [6570-14]

2:00 pm: **Cluster analysis of temporal trajectories of hospital laboratory examinations,** S. Tsumoto, S. Hirano, Shimane Univ. (Japan) . . . . . [6570-15]

2:20 pm: **Discovery of exacerbating cases in chronic hepatitis based on cluster analysis of time-series platelet count data,** S. Tsumoto, S. Hirano, Shimane Univ. (Japan) . . . . . [6570-16]

2:40 pm: **Support online learning with games,** J. Yao, Univ. of Regina (Canada) . . . . . [6570-23]

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

SESSION 4

Room: North Tower-Aruba . . . . . Tues. 3:30 to 5:30 pm

Miscellaneous Topics

Chairs: **Martin R. Stytz**, Institute for Defense Analyses; **Shusaku Tsumoto**, Shimane Univ. (Japan)

3:30 pm: **AutoCorrel II: A neural network event correlation approach,** M. G. Dondo, P. Mason, Defence Research and Development Canada (Canada); N. Japkowicz, R. D. Smith, Univ. of Ottawa (Canada) . . . . . [6570-17]

3:50 pm: **New metrics for blog mining,** B. Ulicny, Versatile Information Systems, Inc. . . . . [6570-18]

4:10 pm: **Adaptive Grahm-Schmidt orthogonalization for the projection-slice synthetic discriminant function filter,** V. R. Riasati, Boeing Satellite Systems; D. Grishin, Univ. of California/Davis . . . . . [6570-19]

4:30 pm: **Semantic search via concept annealing,** K. A. Dunkelberger, Northrop Grumman Corp. . . . . [6570-20]

4:50 pm: **Three-way aspect model (TWAPM) and co-training for image retrieval,** A. Doloc-Mihu, V. V. Raghavan, Univ. of Louisiana at Lafayette [6570-21]

5:10 pm: **A flexible self-learning model based on granular computing,** W. Ting, W. Yu, Y. Li, Chongqing Univ. of Posts and Telecommunications (China) [6570-22]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . Tues. 6:00 to 7:30 pm

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✔ **The solution of solving materialized views selection using random algorithm,** L. Zhou, Z. Hao, Harbin Institute of Technology (China); C. Liu, Capital Normal Univ. (China) . . . . . [6570-25]

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Wednesday-Thursday 11-12 April 2007 • Proceedings of SPIE Vol. 6571 *(On-site Proceedings)*

Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2007

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); **Mieczyslaw M. Kokar**, Northeastern Univ.; **Damian M. Lyons**, Fordham Univ.; **Vahid R. Riasati**, Science Applications International Corp.; **Firooz A. Sadjadi**, Lockheed Martin Corp.; **John J. Salerno, Jr.**, Air Force Research Lab.; **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Shanchieh J. Yang**, Rochester Institute of Technology

Wednesday 11 April

SESSION 1

Room: North Tower-Harbor Beach . . . . . Wed. 9:00 to 10:00 am

Image Registration and Related Issues

Chairs: **Jerome J. Braun**, MIT Lincoln Lab.; **Sheela V. Belur**, The Van Dyke Technology Group, Inc.

9:00 am: **A novel method to evaluate the performance of pan-sharpening algorithms,** V. P. Shah, N. H. Younan, R. L. King, Mississippi State Univ. and GeoResources Institute . . . . . [6571-01]

9:20 am: **Real-time object-based image registration using improved MRAN,** Z. Yue, P. Narasimha, FastVDO LLC; K. Subbarao, M. T. Manry, The Univ. of Texas/Arlington; P. N. Topiwala, FastVDO LLC . . . . . [6571-03]

9:40 am: **Convergence rate improvement in NMI-based multisensor image registration,** J. H. Lee, J. B. Ra, Korea Advanced Institute of Science and Technology (South Korea) . . . . . [6571-04]

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

SESSION 2

Room: North Tower-Harbor Beach . . . . . Wed. 10:30 to 11:50 am

Image Fusion

Chairs: **Nour-Eddin El Faouzi**, Institut National de Recherche sur les Transports (France); **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

10:30 am: **Cross-sensor fusion approach for visible and infrared imagery,** M. Ouendeno, S. P. Kozaitis, Florida Institute of Technology . . . . . [6571-06]

10:50 am: **Real-time EO/IR sensor fusion on a portable computer and head-mounted display,** Z. Yue, P. Topiwala, FastVDO LLC . . . . . [6571-07]

11:10 am: **Fusion and kernel type selection in adaptive image retrieval,** A. Doloc-Mihu, V. V. Raghavan, Univ. of Louisiana at Lafayette . . . . . [6571-08]

11:30 am: **Merging infrared and color visible images with an contrast enhanced fusion method,** G. Li, K. Wang, Jilin Univ. (China) . . . . . [6571-09]

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

SESSION 3

Room: North Tower-Harbor Beach . . . . . Wed. 1:00 to 2:40 pm

Detection, Classification, and ATR

Chairs: **S. Richard F. Sims**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Shanchieh J. Yang**, Rochester Institute of Technology

1:00 pm: **Multisensor detection and fusion technique,** A. Bhargave, B. E. Ambrose, F. S. Lin, M. I. Kazantzidis, Broadata Communications, Inc . . . . . [6571-10]

1:20 pm: **A novel classification fusion technique for improved performance,** T. Liu, G. A. Lampropoulos, G. Gigli, A.U.G. Signals Ltd. (Canada) . . . . . [6571-11]

1:40 pm: **Classifier combination and feature selection methods for polarimetric SAR classification,** G. Gigli, A.U.G. Signals Ltd. (Canada); R. Sabry, Defence Research and Development Canada (Canada); G. A. Lampropoulos, A.U.G. Signals Ltd. (Canada) . . . . . [6571-12]

2:00 pm: **Bayesian framework for ATR decision-level fusion experiments,** D. R. Morgan, BAE Systems Advanced Information Technologies; T. D. Ross, Air Force Research Lab. . . . . [6571-13]

2:20 pm: **Operating condition modeling for ATR fusion assessment,** B. Kahler, General Dynamics; L. Goodwon, Air Force Research Lab. . . . . [6571-14]

Coffee Break . . . . . 2:40 to 3:10 pm

SESSION 4

Room: North Tower-Harbor Beach . . . . . Wed. 3:10 to 4:50 pm

Higher Level Fusion and Fusion System Architecture

Chairs: **John J. Salerno, Jr.**, Air Force Research Lab.; **Mieczyslaw M. Kokar**, Northeastern Univ.

3:10 pm: **A full-scale prototype multisensor system for fire detection and situational awareness,** C. Minor, Nova Research, Inc.; K. Johnson, S. Rose-Pehrsson, J. Owrutsky, S. Wales, U.S. Naval Research Lab.; D. Steinhurst, Nova Research, Inc.; D. Gottuk, Hughes Associates, Inc. . . . . [6571-15]

3:30 pm: **A Markov game theoretic approach for cyber situational awareness,** D. Shen, G. Chen, Intelligent Automation Inc.; J. B. Cruz, Jr., The Ohio State Univ.; L. S. Haynes, Intelligent Automation Inc.; M. Kruger, Office of Naval Research; E. Blasch, Air Force Research Lab. . . . . [6571-16]

3:50 pm: **Hierarchical high-level information fusion technologies for detection of weapons of mass destruction in a Naval environment,** A. L. Crassidis, Rochester Institute of Technology . . . . . [6571-17]

4:10 pm: **Fusion of disparate information sources in a hybrid decision-support architecture,** J. J. Braun, Y. Glina, L. Brattain, MIT Lincoln Lab. [6571-18]

4:30 pm: **Collective agents interpolative integral (CAII) for asymmetric threat detection,** Q. Zhu, Univ. of Nebraska/Omaha; S. O'Hara, M. Simon, E. R. Lindahl, 21st Century Systems, Inc. . . . . [6571-19]

Thursday 12 April

SESSION 5

Room: North Tower-Harbor Beach . . . . . Thurs. 8:30 to 9:30 am

Applications

Chairs: **Shanchieh J. Yang**, Rochester Institute of Technology; **Jerome J. Braun**, MIT Lincoln Lab.

8:30 am: **Real time data fusion of road traffic and ETC data for road network monitoring,** N. El Faouzi, O. De Mouzon, Institut National de Recherche sur les Transports (France) . . . . . [6571-20]

8:50 am: **Real-time target tracking simulations in large disparate sensor networks,** H. Lin, J. A. Rushing, S. J. Graves, E. A. Criswell, S. Tanner, The Univ. of Alabama/Huntsville . . . . . [6571-21]

9:10 am: **Prospects for dynamic ISR tasking and interpretation based on standing orders to sensor networks,** A. V. Pantaleev, J. Josephson, The Ohio State Univ. . . . . [6571-23]

SESSION 6

Room: North Tower-Harbor Beach . . . . . Thurs. 9:30 am to 12:20 pm

Miscellaneous Topics I

Chairs: **Mieczyslaw M. Kokar**, Northeastern Univ.; **Damian M. Lyons**, Fordham Univ.

9:30 am: **Evaluating rank-score diversity to select fusion operations for SLAM,** D. M. Lyons, D. F. Hsu, Fordham Univ. . . . . [6571-25]

9:50 am: **Maximum likelihood ensemble filter applied to multisensor systems,** A. Albayrak, M. Zupanski, D. Zupanski, Colorado State Univ. . . . . [6571-26]

10:10 am: **Assessing the value of information in a fuzzy cognitive map,** K. A. Perusich, Purdue Univ. . . . . [6571-29]

Coffee Break . . . . . 10:30 to 11:00 am

11:00 am: **Sensitivity analysis of OWA operator with respect to the optimism degree,** M. Zarghaami, R. Ardakanian, Sharif Univ. of Technology (Iran); F. Szidarovszky, The Univ. of Arizona . . . . . [6571-30]

11:20 am: **Application of a static and dynamic united decoupling method for non-gyro inertial measurement unit,** M. Ding, Q. L. Wang, C. Wang, Harbin Institute of Technology (China) . . . . . [6571-31]

11:40 am: **Distributed fusion and tracking in multisensor systems,** D. Khosla, J. Guillochon, HRL Labs., LLC . . . . . [6571-22]

12:00 pm: **Digital terrain mapping from multispectral and high-resolution satellite data for defense studies,** S. Pandey, Indian Agricultural Research Institute (India) . . . . . [6571-27]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 6:00 to 7:30 pm

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✔ **Multisensor fusion of images for target identification,** A. Muthukumar, G. Anitha, J. Shanmugam, Madras Institute of Technology (India) . . . [6571-33]

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Monday-Tuesday 9-10 April 2007 • Proceedings of SPIE Vol. 6572

Enabling Photonic Technologies for Defense, Security, and Aerospace Applications III

Conference Chairs: **Michael J. Hayduk**, Air Force Research Lab.; **Andrew R. Pirich**, Air Force Research Lab.-RET.; **Peter J. Delfyett, Jr.**, College of Optics and Photonics/Univ. of Central Florida; **Eric J. Donkor**, Univ. of Connecticut

Cochairs: **Guifang Li**, College of Optics and Photonics/Univ. of Central Florida; **John P. Barrios**, Air Force Research Lab.; **Rebecca J. Bussjaeger**, Air Force Research Lab.; **Michael L. Fanto**, Air Force Research Lab.; **Robert L. Kaminski**, Air Force Research Lab.; **Edward W. Taylor**, International Photonics Consultants, Inc.; **Hooman Mohseni**, Northwestern Univ.

Program Committee: **Henry J. Caulfield**, Diversified Research Corp.; **Bahram Javidi**, Univ. of Connecticut; **Fazio Nash**, Air Force Research Lab.; **Henry Zmuda**, Univ. of Florida

Monday 9 April

SESSION 1

Room: North Tower-Bahamas . . . . . Mon. 1:30 to 3:20 pm

Coherent Optical Communications

Chairs: **Michael J. Hayduk**, Air Force Research Lab.; **Andrew R. Pirich**, Air Force Research Lab-RET

1:30 pm: **DSP-enabled coherent optical communications** *(Invited Paper)*, G. Goldfarb, G. Li, College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-01]

2:00 pm: **All-optical carrier phase and polarization recovery for coherent optical communications,** I. Kim, K. A. Croussore, X. Li, G. Li, College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-02]

2:20 pm: **Coherent optical receiver with widely tunable local oscillator laser,** C. Wree, D. Mohr, D. A. Becker, A. M. Joshi, Discovery Semiconductors, Inc. . . . . [6572-03]

2:40 pm: **All-optical phase and amplitude regeneration of phase-shift keyed signals,** K. A. Croussore, G. Li, College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-04]

3:00 pm: **1310 nm WDM transmission of differential phase-shift keying (DPSK) signals using semiconductor optical amplifiers,** X. Li, G. Li, College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-05]

Coffee Break . . . . . 3:20 to 3:50 pm

SESSION 2

Room: North Tower-Bahamas . . . . . Mon. 3:50 to 5:00 pm

RF Photonics

Chairs: **Michael L. Fanto**, Air Force Research Lab.; **Hooman Mohseni**, Northwestern Univ.

3:50 pm: **40GHz optoelectronics polyphase analog to digital converter,** C. Villa, Univ. of Connecticut; M. J. Hayduk, R. J. Bussjaeger, Air Force Research Lab.; E. J. Donkor, Univ. of Connecticut . . . . . [6572-06]

4:10 pm: **Programmable microwave transversal filter using acousto-optic tunable filtering,** F. N. Ghauri, N. A. Riza, College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-07]

4:30 pm: **Control of an adaptive, ultra wideband arrays using time reversal** *(Invited Paper)*, H. Zmuda, Univ. of Florida; R. J. Bussjaeger, AFRL; R. K. Erdmann, M. L. Fanto, M. J. Hayduk, J. E. Malowicki, Air Force Research Lab. . . . . [6572-08]

Tuesday 10 April

SESSION 3

Room: North Tower-Bahamas . . . . . Tues. 8:30 to 10:00 am

Mode-locked Lasers and Optical Sources

Chair: **Guifang Li**, College of Optics & Photonics/Univ. of Central Florida

8:30 am: **Chirp control via differential pumping of a monolithic passively mode locked quantum dot laser,** K. C. Brown, B. Wysocki, M. L. Fanto, J. E. Malowicki, Air Force Research Lab. . . . . [6572-09]

8:50 am: **Low noise, optical frequency stabilized, semiconductor-based frequency comb source for coherent communication and signal processing** *(Invited Paper)*, F. J. Quinlan, S. Gee, S. Ozharar, P. J. Delfyett, Jr., College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-10]

9:20 am: **Ultrastable harmonically mode-locked erbium-doped waveguide laser,** M. L. Fanto, J. E. Malowicki, R. K. Erdmann, B. Wysocki, T. McEwen, Air Force Research Lab. . . . . [6572-11]

9:40 am: **High stability, PLC-based broadband Er-ASE sources for integrated inertial navigation devices,** S. V. Frolov, J. Shmulovich, A. J. Bruce, Inplane Photonics, Inc. . . . . [6572-12]

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

SESSION 4

Room: North Tower-Bahamas . . . . . Tues. 10:30 am to 12:20 pm

Optical Detectors and Arrays

Chair: **Peter J. Delfyett, Jr.**, College of Optics & Photonics/ Univ. of Central Florida

10:30 am: **Multimode fibered photodetectors for high-power high-speed applications beyond 10 Gb/s,** R. L. Howard, 7th Edge, LLC; A. M. Joshi, D. A. Becker, Discovery Semiconductors, Inc. . . . . [6572-13]

10:50 am: **FOCUS: toward a high-gain and high-speed single photon detector** *(Invited Paper)*, H. Mohseni, O. G. Memis, S. Kong, A. Katsnelson, Northwestern Univ.; S. Zhang, N. Jin, I. Adesida, Univ. of Illinois at Urbana-Champaign . . . . . [6572-14]

11:20 am: **InGaAsP avalanche photodetectors for non-gated 1.06 μm photon-counting receivers,** M. A. Itzler, X. Jiang, R. Ben-Michael, K. Slomkowski, Princeton Lightwave Inc.; M. A. Krainak, S. Wu, X. Sun, NASA Goddard Space Flight Ctr. . . . . [6572-15]

11:40 am: **Linear-mode single photon counting APD arrays with subnanosecond, afterpulse free performance for ladar, spectroscopy & QKD applications,** L. A. Aina, A. M. Fathimulla, H. S. Hier, M. Lecates, R. Dwarkin, D. Johnson, Epitaxial Technologies, LLC; S. Babu, NASA Goddard Space Flight Ctr.; J. J. Foshee, Air Force Research Lab. . . . . [6572-16]

12:00 pm: **Multipurpose sensor fusing near infrared, visible, and communications wavelengths in a single camera,** J. E. Nichter, Air Force Research Lab.; B. M. Onat, Goodrich Corp. . . . . [6572-17]

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

SESSION 5

Room: North Tower-Bahamas . . . . . Tues. 1:30 to 2:30 pm

Laser Technology and Applications

Chairs: **Robert L. Kaminski**, Air Force Research Lab.; **John P. Barrios**, Air Force Research Lab.

Keynote Presentation

1:30 pm: **MIT/LL development of broadband linear frequency chirp for high-resolution ladar,** K. W. Holman, Massachusetts Institute of Technology . . . . . [6572-18]

2:10 pm: **Frequency shifted optical pulses for range detection,** S. Ozharar, S. Gee, F. J. Quinlan, P. J. Delfyett, Jr., College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-19]

SESSION 6

Room: North Tower-Bahamas . . . . . Tues. 2:30 to 3:40 pm

Airborne Networks

Chairs: **Robert L. Kaminski**, Air Force Research Lab.; **John P. Barrios**, Air Force Research Lab.

2:30 pm: **Fabrication and testing of laser communication terminals for aircraft,** J. A. Cunningham, D. Foulke, T. Goode, D. Baber, M. E. Gangl, M. Fletcher, D. Hopf, D. S. Fisher, D. S. Grinch, D. Jeri, ITT Industries . . [6572-21]

2:50 pm: **Advances in PLC technology for highly integrated photonic components in avionic and space network** *(Invited Paper)*, J. Shmulovich, S. V. Frolov, A. J. Bruce, Inplane Photonics, Inc. . . . . [6572-20]

3:20 pm: **Highly-integrated, VCSEL-based optoelectronics for fault-tolerant, self-routing optical networks,** P. S. Guilfoyle, D. A. Louderback, K. Yang, K. M. Patel, X. Jin, J. Cheng, OptiComp Corp. . . . . [6572-22]

Coffee Break . . . . . 3:40 to 4:00 pm

SESSION 7

Room: North Tower-Bahamas . . . . . Tues. 4:00 to 5:20 pm

Enabling Photonic Technology

Chair: **Eric J. Donkor**, Univ. of Connecticut

4:00 pm: **A 1x3 optical switch by carrier induced beam-steering on InP,** D. May-Arrioja, N. Bickel, P. LiKamWa, College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-23]

4:20 pm: **Programmable fiber-optic splitters using distributed optical MEMS,** N. A. Riza, S. A. Reza, College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-24]

4:40 pm: **Non-contact no-moving parts surface height measurement sensor using liquid crystal optics,** N. A. Riza, M. A. Sheikh, College of Optics & Photonics/Univ. of Central Florida . . . . . [6572-25]

5:00 pm: **Simulation and analysis of ultrafast laser pulse induced plasma generation in dielectric materials,** J. R. Gulley, S. W. Winkler, W. M. Dennis, The Univ. of Georgia . . . . . [6572-26]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . Tues. 6:00 to 7:30 pm

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✔ **Pulse shape effects on the measurement of temperature using a Brillouin-based optical fiber sensor,** C. A. Galindez, A. Cobo, O. M. Conde, F. J. Madruga, J. M. López-Higuera, Univ. of Cantabria (Spain) . . . . . [6572-27]

✔ **Characterization of new thermo-responsive hydrogels for optical sensing applications,** J. Rueda, K. Contreras, R. Coello, Pontificia Univ. Catolica del Peru (Peru); M. Lomer, Univ. de Cantabria (Spain); H. Komber, S. Zschoche, B. Voit, Leibniz-Institut für Polymerforschung Dresdene e.V. (Germany) . . . . . [6572-28]

✔ **Singlemode photonic crystal fiber for the middle infrared,** L. N. Butvina, O. V. Sereda, E. M. Dianov, General Physics Institute (Russia); N. V. Lichkova, V. N. Zagorodnev, Institute of Microelectronics Technology (Russia) . [6572-29]

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Wednesday-Thursday 11-12 April 2007 • Proceedings of SPIE Vol. 6573

Quantum Information and Computation V

Conference Chairs: **Eric J. Donkor**, Univ. of Connecticut; **Andrew R. Pirich**, Air Force Research Lab.-Ret.; **Howard E. Brandt**, Army Research Lab.

Program Committee: **Chip B. Elliott**, BBN Technologies; **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.; **Horace P. Yuen**, Northwestern Univ.

Tuesday 10 April

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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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✔ **Quantum properties that are extended in time,** J. Tollaksen, George Mason Univ. . . . . [6573-35]

Wednesday 11 April

Signal Image and Neural Net Processing Plenary Presentation
Room: North Tower-Aruba . . . . . Wed. 9:00 to 10:00 am

Speaking of sensing in the language of quantum mechanics [6573-38]
J. M. Myers, Harvard Univ.
For details see p. 6

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

SESSION 1

Room: North Tower-Aruba . . . . . Wed. 10:30 am to 12:00 pm

Quantum Gates and Quantum Quantum Computation I

Chair: **Howard E. Brandt**, Army Research Lab.

10:30 am: **Coherence and entanglement in two-qubit dynamics: Interplay of the induced exchange interaction and quantum noise due to thermal bosonic environment** *(Invited Paper)***,** V. Privman, D. Solenov, Clarkson Univ. . . . [6573-01]

11:00 am: **Recent advances in quantum computing,** G. N. Gilbert, M. Hamrick, Y. Weinstein, J. Thayer, The MITRE Corp. . . . . [6573-02]

11:20 am: **Spatial optimization of the classically controlled ion-motion interface in a multiplexed ion-trap quantum computer,** T. S. Metodi, Univ. of California/Davis; N. Isailovic, Univ. of California/Berkeley; D. D. Thaker, Univ. of California/Davis; M. Whitney, Y. Patel, J. D. Kubiatowicz, Univ. of California/Berkeley; F. T. Chong, Univ. of California/Santa Barbara . . . . . [6573-03]

11:40 am: **Scattering theory in relation to quantum computing,** J. M. Myers, T. T. Wu, Harvard Univ. . . . . [6573-04]

Lunch/Exhibition Break . . . . . 12:00 to 1:20 pm

SESSION 2

Room: North Tower-Aruba . . . . . Wed. 1:20 to 3:00 pm

Quantum Gates and Quantum Quantum Computation II

Chairs: **Eric J. Donkor**, Univ. of Connecticut;
Vladimir E. Korepin, Stony Brook Univ.

1:20 pm: **Quantum computing in control and optimization,** V. A. Yatsenko III, Institute of Space Research (Ukraine); P. M. Pardalos, D. Vassiloyannis, Univ. of Florida . . . . . [6573-05]

1:40 pm: **Topological quantum scheme based on quantum walk,** A. C. Kwan, The Graduate Ctr./CUNY; X. Li, City Univ. of New York/Technology College; L. W. Leung, The City Univ. of New York . . . . . [6573-06]

2:00 pm: **Optimization of algorithmic cooling for NMR quantum computers,** A. Kaltchenko, Wilfrid Laurier Univ. (Canada) . . . . . [6573-07]

2:20 pm: **Quantum lattice-gas simulation of Bose-Einstein condensates governed by the Gross-Pitaevskii equation,** J. Yepez, Air Force Research Lab. . . . . [6573-08]

2:40 pm: **Finite temperature quantum entanglement,** D. Ghoshal, R. B. Gomez, George Mason Univ.; M. O. Lanzagorta, Naval Research Lab.; J. K. Uhlmann, Univ. of Missouri/Columbia . . . . . [6573-09]

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

SESSION 3

Room: North Tower-Aruba . . . . . Wed. 3:30 to 5:10 pm

Quantum Algorithms

Chair: **Vladimir Privman**, Clarkson Univ.

3:30 pm: **Quantum algorithm for partial search,** V. E. Korepin, Stony Brook Univ. . . . . [6573-10]

3:50 pm: **Quantum algorithms for optimal graph traversals problems,** S. Doern, Univ. Ulm (Germany) . . . . . [6573-12]

4:10 pm: **Two-way quantum finite automata with improved state complexity,** F. M. Atak, C. Say, Bogaziçi Univ. (Turkey) . . . . . [6573-13]

4:30 pm: **Quantum query algorithms for certain functions and general algorithm construction techniques,** A. Dubrovska, Latvijas Univ. (Latvia) . . . . . [6573-14]

4:50 pm: **Information theoretic analysis of the Grover algorithm using generalized statistics,** R. C. Venkatesan, Systems Research Corp. (India) . . . . . [6573-15]

Thursday 12 April

SESSION 4

Room: North Tower-Aruba . . . . . Thurs. 9:00 to 10:20 am

Quantum Networks, Memory, & Sensors

Chair: **Samuel J. Lomonaco, Jr.**, Univ. of Maryland/Baltimore County

9:00 am: **Non-statistical weak measurements,** J. Tollaksen, George Mason Univ. . . . . [6573-33]

9:20 am: **Quantum simulator review,** E. M. Bednar, Air Force Research Lab. . . . . [6573-16]

9:40 am: **Multiscale quantum optical networks,** G. A. Jaroszkiewicz, The Univ. of Nottingham (United Kingdom) . . . . . [6573-17]

10:00 am: **Recent MITRE research in quantum sensors,** G. N. Gilbert, M. Hamrick, Y. Weinstein, The MITRE Corp. . . . . [6573-19]

Coffee Break . . . . . 10:20 to 10:50 am

SESSION 5

Room: North Tower-Aruba . . . . . Thurs. 10:50 am to 12:40 pm

Quantum Key Distribution, Secure Communication I

Chair: **John M. Myers**, Harvard Univ.

10:50 am: **On the security of the Y-00 or alpha-eta protocol** *(Invited Paper)***,** H. P. Yuen, R. Nair, Northwestern Univ. . . . . [6573-20]

11:20 am: **POVM and PV measurement in QKD,** H. E. Brandt, Army Research Lab. . . . . [6573-21]

11:40 am: **Rényi-entropy-independent privacy amplification,** A. Nakassis, National Institute of Standards and Technology . . . . . [6573-22]

12:00 pm: **The security and efficiency of continuous variable quantum communication,** K. Tang, X. Zhang, The Graduate Ctr./CUNY . . . . . [6573-23]

12:20 pm: **Fisher-Schrödinger models for statistical encryption of covert information,** R. C. Venkatesan, Systems Research Corp. (India) . . . . . [6573-24]

Lunch Break . . . . . 12:40 to 1:40 pm

SESSION 6

Room: North Tower-Aruba . . . . . Thurs. 1:40 to 3:00 pm

Quantum Key Distribution, Secure Communication II

Chairs: **Horace P. Yuen**, Northwestern Univ.;
Eric J. Donkor, Univ. of Connecticut

1:40 pm: **Quantum technology and cryptology for information security,** S. Naqvi, Ctr. of Excellence in Information and Communication Technologies (Belgium); M. Riguidel, École Nationale Supérieure des Télécommunications (France) . . . . . [6573-25]

2:00 pm: **Demonstration of a six-user quantum key distribution network on a bus architecture,** P. D. Kumavor, A. C. Beal, L. Lu, E. J. Donkor, B. C. Wang, Univ. of Connecticut . . . . . [6573-26]

2:20 pm: **A simple secure quantum authorization scheme,** X. Zhang, X. Xu, K. Tang, A. C. Kwan, The Graduate Ctr./CUNY; X. Li, City Univ. of New York/ Technology College; M. M. Anshel, City College/CUNY . . . . . [6573-27]

2:40 pm: **Quantum entanglement assisted key distribution,** K. Tang, The Graduate Ctr./CUNY; P. Ji, John Jay College; X. Zhang, The Graduate Ctr./ CUNY . . . . . [6573-28]

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

SESSION 7

Room: North Tower-Aruba . . . . . Thurs. 3:30 to 5:00 pm

Quantum Information Theory

Chairs: **Andrew R. Pirich**, Air Force Research Lab-RET.;
Howard E. Brandt, Army Research Lab.

3:30 pm: **Quantum algorithms for topological quantum computing** *(Invited Paper)***,** S. J. Lomonaco, Jr., Univ. of Maryland/Baltimore County; L. H. Kauffman, Univ. of Illinois/Chicago . . . . . [6573-29]

4:00 pm: **Spin networks, knots, and quantum algorithms,** L. H. Kauffman, Univ. of Illinois/Chicago; S. J. Lomonaco, Jr., Univ. of Maryland/Baltimore County . . . . . [6573-30]

4:20 pm: **Two qutrits universal quantum gates from nine dimensional solutions of Yang-Baxter equation,** J. F. Ospina, Univ. EAFIT (Colombia) . . . . . [6573-31]

4:40 pm: **A quantum state discrimination martingale,** M. R. Frey, Bucknell Univ. . . . . [6573-32]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 6:00 to 7:30 pm

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✔ **Quantum repeaters: fundamental and future,** Y. Li, Y. Liu, J. Ye, Huazhong Univ. of Science and Technology (China); Q. Zhou, China Aerospace Science & Industry Corp. (China) . . . . . [6573-34]

✔ **Quantum entanglement, weak measurements and weak values,** D. Ghoshal, George Mason Univ. . . . . [6573-36]

✔ **Properties and application of nondeterministic quantum query algorithms,** A. Dubrovska, Latvijas Univ. (Latvia) . . . . . [6573-37]

Monday-Tuesday 9-10 April 2007 • Proceedings of SPIE Vol. 6574 *(On-site Proceedings)*

Optical Pattern Recognition XVIII

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 (United Kingdom)

Monday 9 April

SESSION 1

Room: North Tower-Puerto Rico . . . . . Mon. 8:30 to 10:00 am

Data Processing *(Invited papers)*

Chair: **David Casasent**, Carnegie Mellon Univ.

8:30 am: **SAR classification and confuser and clutter rejection tests on MSTAR ten-class data using Minace filters** *(Invited Paper)***,** R. Patnaik, D. P. Casasent, Carnegie Mellon Univ. . . . . [6574-01]

9:00 am: **Track and trap in 3D** *(Invited Paper)***,** J. Glückstad, Risø National Lab. (Denmark) . . . . . [6574-02]

9:30 am: **Recent results of integrated sensing and processing with hyperspectral imager** *(Invited Paper)***,** R. R. Muise, A. Mahalanobis, Lockheed Martin Missiles and Fire Control . . . . . [6574-03]

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

SESSION 2

Room: North Tower-Puerto Rico . . . . . Mon. 10:30 am to 12:00 pm

Optical Processing *(Invited papers)*

Chairs: **David Casasent**, Carnegie Mellon Univ.; **Tien-Hsin Chao**, Jet Propulsion Lab.

10:30 am: **System issues of developing grayscale optical correlator for ATR applications** *(Invited Paper)***,** T.-H. Chao, T. T. Lu, Jet Propulsion Lab. . . [6574-04]

11:00 am: **A hybrid digital-optical correlator for automatic target recognition** *(Invited Paper)***,** A. K. Gupta, Instruments Research and Development Establishment (India) . . . . . [6574-05]

11:30 am: **Pattern recognition in hyperspectral imagery using Gaussian filter with post-processing** *(Invited Paper)***,** M. S. Alam, Univ. of South Alabama; M. N. Islam, Univ. of West Florida; A. Bal, Istanbul Univ. (Turkey) . . . . . [6574-06]

Lunch/Exhibition Break . . . . . 12:00 to 1:40 pm

SESSION 3

Room: North Tower-Puerto Rico . . . . . Mon. 1:40 to 3:00 pm

Tracking and Distortion—Invariant Recognition Methods

Chair: **Rupert C. D. Young**, Univ. of Sussex (United Kingdom)

1:40 pm: **A new SVM for distorted IR object tracking and recognition,** Y. F. Wang, D. Casasent, Carnegie Mellon Univ. . . . . [6574-07]

2:00 pm: **Building robust appearance models using on-line feature selection,** R. B. Porter, R. C. Loveland, E. Rosten, Los Alamos National Lab. . . . . [6574-08]

2:20 pm: **Fully invariant multiple object recognition and tracking using MACH and Kalman filters,** P. Bone, Univ. of Sussex at Brighton (United Kingdom) . . . . . [6574-09]

2:40 pm: **Advanced correlation filter methods for SHARP ATR,** P. Topiwala, FastVDO LLC; D. P. Casasent, Carnegie Mellon Univ.; A. V. Nehemiah, FastVDO LLC . . . . . [6574-11]

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

SESSION 4

Room: North Tower-Puerto Rico . . . . . Mon. 3:30 to 5:10 pm

Pattern Recognition and Processing

Chairs: **Mohammad S. Alam**, Univ. of South Alabama; **Tien-Hsin Chao**, Jet Propulsion Lab.

3:30 pm: **Super-resolution reconstruction of hyperspectral images,** M. I. Elbakary, M. S. Alam, Univ. of South Alabama . . . . . [6574-12]

3:50 pm: **Dynamic range compression deconvolution using A-law and μ-law algorithms,** B. Haji-saeed, S. K. Sengupta, W. D. Goodhue, Univ. of Massachusetts/Lowell; J. Khoury, C. L. Woods, Air Force Research Lab.; J. Kierstead, Solid State Scientific Corp. . . . . [6574-13]

4:10 pm: **A neural network identification system for space-borne GCMS pattern recognition,** T. T. Lu, T.-H. Chao, J. Macaskill, M. Girard, M. R. Darrach, Jet Propulsion Lab. . . . . [6574-14]

4:30 pm: **Machine intelligence-based decision-support (Mind) for automatic anomaly detection,** N. R. Prasad, New Mexico State Univ.; T. T. Lu, Jet Propulsion Lab. . . . . [6574-15]

4:50 pm: **Distributed sensor network control for power and bandwidth allocation in large sensor networks,** A. Talukder, A. Panangadan, Univ. of Southern California . . . . . [6574-16]

Tuesday 10 April

✔ Posters-Tuesday

Room: Spa Terrace . . . . . Tues. 6:00 to 7:30 pm

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Tracking and Distortion—Invariant Recognition Methods

✔ **IR classification and rejection tests on Comanche data using Minace filters,** D. P. Casasent, R. Patnaik, Carnegie Mellon Univ. . . . . [6574-17]

✔ **Real-time multisensor-based vehicle detection using MINACE filters,** A. V. Nehemiah, P. Topiwala, FastVDO LLC . . . . . [6574-18]

✔ **Input scene restoration in pattern recognition correlator based on digital photo camera,** S. N. Starikov, N. N. Balan, M. V. Konnik, V. G. Rodin, I. V. Solyakin, E. A. Shapkarina, Moscow Engineering Physics Institute (Russia) . . . . . [6574-20]

✔ **Position estimation and driving of an autonomous vehicle by monocular vision,** J. C. Hanan, P. Kayathi, Oklahoma State Univ.; C. L. Hughlett, Zion Labs. Inc. . . . . [6574-25]

Pattern Recognition and Processing

✔ **Face recognition for building access control** *(Presentation Only)*, C. L. Woods, J. Khoury, P. Crabtree, Air Force Research Lab. . . . . [6574-21]

✔ **Object detection in hyperspectral imagery using K-means clustering algorithm with pre-processing,** M. S. Aslan, M. S. Alam, M. I. Elbakary, Univ. of South Alabama . . . . . [6574-22]

✔ **Experimental estimation of the recognition reliability in the optical pattern recognition systems,** V. L. Perju, Technical Univ. of Moldova (Moldova) . . . . . [6574-23]

✔ **The intellectual processor on basis of 2nd order objects in restoration of images,** I. A. Mardare, Technical Univ. of Moldova (Moldova) . . . . . [6574-24]

Wednesday 11 April

Signal Image and Neural Net Processing Plenary Presentation
Room: North Tower-Aruba . . . . . Wed. 9:00 to 10:00 am

Speaking of sensing in the language of quantum mechanics [6573-38]
J. M. Myers, Harvard Univ.
For details see p. 6

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Tuesday 10 April 2007 • Proceedings of SPIE Vol. 6575

Visual Information Processing XVI

Conference Chairs: **Zia-ur Rahman**, Old Dominion Univ.; **Stephen E. Reichenbach**, Univ. of Nebraska/Lincoln; **Mark A. Neifeld**, The Univ. of Arizona

Program Committee: **Gary W. Euliss**, The MITRE Corp.; **Richard D. Juday**, NASA Johnson Space Ctr.; **Ram M. 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 10 April

SESSION 1

Room: North Tower-Puerto Rico . . . . . Tues. 8:50 to 10:10 am

Applications of Image Processing

Chair: **Zia-ur Rahman**, Old Dominion Univ.

8:50 am: **A system to automatically track humans and vehicles with a PTZ camera,** M. Lalonde, S. Foucher, L. Gagnon, CRIM (Canada); A. Janelle, VideoStream Technologies Inc. (Canada) . . . . . [6575-01]

9:10 am: **Visual signal processing using fly-eye-based algorithm to detect the road edge,** N. Truong, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.; W. Agassounon, Physical Sciences Inc. . . . . [6575-02]

9:30 am: **A progressive de-skewing technique for document image analysis,** D. Charalampidis, Univ. of New Orleans; J. Haralambides, Barry Univ. . . [6575-03]

9:50 am: **Applications of adaptive feature-specific imaging,** J. Ke, P. K. Baheti, M. A. Neifeld, The Univ. of Arizona . . . . . [6575-04]

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

SESSION 2

Room: North Tower-Puerto Rico . . . . . Tues. 10:40 am to 12:20 pm

Image Processing Methods I

Chair: **Stephen E. Reichenbach**, Univ. of Nebraska/Lincoln

10:40 am: **Steganalysis feature improvement using expectation maximization,** B. M. Rodriguez II, G. L. Peterson, Air Force Institute of Technology; S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6575-30]

11:00 am: **Power spectrum weighted edge analysis for target detection in images,** H. V. Karvir, J. A. Skipper, Wright State Univ. . . . . [6575-07]

11:20 am: **A local variance-based filtering method for enhancement in super-resolution image reconstruction,** N. Unaldi, V. K. Asari, Old Dominion Univ. . . . . [6575-08]

11:40 am: **All source adaptive fusion for aided navigation in non-GPS environment,** O. Aboutalib, B. Awalt, A. Fung, B. Thai, Northrop Grumman Corp.; T. J. Klausutis, Air Force Research Lab.; R. Wehling, M. C. Iames, Eglin Air Force Base . . . . . [6575-29]

12:00 pm: **Local adaptive contrast enhancement for color images,** J. Dijk, J. G. M. Schavemaker, K. Schutte, TNO-FEL (Netherlands) . . . . . [6575-10]

Lunch/Exhibition Break . . . . . 12:20 to 1:20 pm

SESSION 3

Room: North Tower-Puerto Rico . . . . . Tues. 1:20 to 3:00 pm

Image Processing Methods II

Chair: **Mark A. Neifeld**, The Univ. of Arizona

1:20 pm: **Image data representation for efficient optimization of objective criterion,** R. Sundaram, Gannon Univ. . . . . [6575-11]

1:40 pm: **Fast orthogonal heap transforms: theory and application in cryptography,** A. M. Grigoryan, R. N. Raghunath, The Univ. of Texas at San Antonio . . . . . [6575-13]

2:00 pm: **Wavelet priors for multiframe image restoration,** P. M. Shankar, M. A. Neifeld, The Univ. of Arizona . . . . . [6575-14]

2:20 pm: **Elastic image registration using subspace constraints,** A. S. Elsafi, R. Zewail, N. Durdle, Univ. of Alberta (Canada) . . . . . [6575-15]

2:40 pm: **Data mining within digital images,** T. P. Donovan, Midwestern State Univ. . . . . [6575-27]

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

SESSION 4

Room: North Tower-Puerto Rico . . . . . Tues. 3:30 to 5:10 pm

Image Processing Tools

Chair: **Zia-ur Rahman**, Old Dominion Univ.

3:30 pm: **Task-specific information: an imaging system analysis tool,** A. Ashok, P. K. Baheti, M. A. Neifeld, The Univ. of Arizona . . . . . [6575-16]

3:50 pm: **Application of particle analysis to transmission electron microscopy (TEM),** J. S. DaPonte, T. J. Sadowski, C. Broadbridge, A. Lehman, D. Krishna, L. Marinella, P. Munhutu, M. Sawicki, Southern Connecticut State Univ. [6575-17]

4:10 pm: **An architecture for the efficient implementation of compressive sampling reconstruction algorithms in reconfigurable hardware,** F. E. Ortiz, E. J. Kelmelis, EM Photonics, Inc. . . . . [6575-18]

4:30 pm: **Median predictor-based lossless video compression algorithm for IR image sequences,** R. Saran, H. B. Srivastava, A. Kumar, Instruments Research and Development Establishment (India) . . . . . [6575-19]

4:50 pm: **BTC-based object tracking,** V. K. Mittal, C. R. Patil, Bharat Electronics Ltd. (India) . . . . . [6575-20]

✔ Posters-Tuesday

Room: Spa Terrace . . . . . 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. Each evening will represent a different set of conferences to promote opportunities 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-show and their manuscript 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.

✔ **Comparison of thresholding techniques on nanoparticle images,** J. S. DaPonte, T. J. Sadowski, C. Broadbridge, D. Day, A. Lehman, D. Krishna, L. Marinella, P. Munhutu, M. Sawicki, Southern Connecticut State Univ. . . . . [6575-21]

✔ **Visualized measurement instrument based on electrical capacitance tomography technique,** D. Chen, Harbin Univ. of Science and Technology (China) . . . . . [6575-23]

✔ **An approach of key frame extraction based on rough set,** T. Wang, W. Yu, L. Chen, Chongqing Univ. of Posts and Telecommunications (China) . [6575-25]

✔ **Linear restoration methods for wavefront coded imaging system based on digital photo camera,** S. N. Starikov, M. V. Konnik, E. A. Manykin, V. G. Rodin, Moscow Engineering Physics Institute (Russia) . . . . . [6575-26]

✔ **Image denoising based on a mixture of bivariate laplacian distributions with local parameters in complex wavelet domain,** H. Rabbani, M. Vafadust, Amirkabir Univ. of Technology (Iran) . . . . . [6575-28]

✔ **Objectively assessing underwater image quality for the purpose of automated restoration,** W. Hou, A. D. Weidemann, Naval Research Lab. . . . . [6575-06]

✔ **Image quality measure using a quadtree homogeneity analysis,** E. P. Lam, ThalesRaytheonSystems . . . . . [6575-12]

Tuesday-Friday 10-13 April 2007 • Proceedings of SPIE Vol. 6576 *(On-site Proceedings)*

Independent Component Analyses, Wavelets, Unsupervised Nano-Biomimetic Sensors and Neural Networks V

Conference Chairs: **Harold H. Szu**, Office of Naval Research; **Jack Agee**, Rice Univ.

Cochairs: **Shoji Makino**, Nippon Telegraph and Telephone Corp. (Japan) and Hokkaido Univ. (Japan); **C. Sidney Burrus**, Rice Univ.

Program Committee: **Shun-ichi Amari**, The Institute of Physical and Chemical Research (RIKEN) (Japan); **David G. Brown**, U.S. Food and Drug Administration; **Chang Wen Chen**, Florida Institute of Technology; **Danny W. Chung**, Chung Yuan Christian Univ. (Taiwan); **Andrzej S. Cichocki**, The Institute of Physical and Chemical Research (RIKEN) (Japan); **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); **William Liou**, Western Michigan Univ.; **Anke Meyer-Bäse**, Florida State Univ.; **Uwe H. Meyer-Bäse**, Florida State Univ.; **Francesco C. 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 V. 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)

Tuesday 10 April

SESSION 1

Room: North Tower-St. Thomas . . . . . Tues. 8:00 to 8:40 am

2007 Unsupervised ICA Award

Chairs: **Shoji Makino**, Nippon Telegraph and Telephone Corp. (Japan); **Harold H. Szu**, Office of Naval Research

Presented to:
Te-Won Lee, Univ. of California/San Diego

Independent vector analysis for real world speech processing *(Invited Paper)***,** T. Lee, Univ. of California/San Diego . . . . . [6576-36]

Panel Discussion

Room: North Tower-St. Thomas . . . . . Wed. 11:10 to 11:50 am

Future of ICA

Chairs: **Te-Won Lee**, Univ. of California/San Diego; **Harold H. Szu**, Office of Naval Research

Panelists: **Carl E. Halford,** The Univ. of Memphis; **John Gray,** Naval Surface Warfare Ctr.; **Lidan Miao,** The Univ. of Tennessee; **Shoji Makino,** Nippon Telegraph and Telephone Corp.

SESSION 2

Room: North Tower-St. Thomas . . . . . Tues. 9:20 am to 12:10 pm

Unsupervised Applications in Medicine

Chairs: **Te-Won Lee**, Univ. of California/San Diego; **Harold H. Szu**, Office of Naval Research

9:20 am: **Improved denoising approach using higher-order statistics,** S. P. Kozaitis, Florida Institute of Technology . . . . . [6576-09]

9:40 am: **Design and implementation of a support vector machine using an optoelectronic matrix-vector multiplier,** J. Gimeno Sarciada, H. Lamela, M. González, M. Jiménez, M. Ruiz-Llata, Univ. Carlos III de Madrid (Spain) . . . . . [6576-29]

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

10:30 am: **Unsupervised learning with mini free energy** *(Invited Paper)***,** L. Miao, H. Qi, The Univ. of Tennessee; H. H. Szu, Office of Naval Research . . . . [6576-42]

11:10 am: **Learning, entropy, free energy underlying commonality** *(Invited Paper)***,** J. E. Gray, Naval Surface Warfare Ctr.; H. H. Szu, Office of Naval Research . . . . . [6576-48]

11:50 am: **Design of a cylindrical fiber-optic lens focusing passive dual-color irspectra and readout,** K. A. Byrd, Howard Univ.; H. H. Szu, Office of Naval Research and Howard Univ. . . . . [6576-53]

Lunch/Exhibition Break . . . . . 12:10 to 1:00 pm

SESSION 3

Room: North Tower-St. Thomas . . . . . Tues. 1:00 to 2:40 pm

Unsupervised Applications in Medicine II

Chairs: **Te-Won Lee**, Univ. of California/San Diego; **Harold H. Szu**, Office of Naval Research

1:00 pm: **Exploratory analysis of functional MRI analysis using HSOM and HTMP,** A. Saalbach, Univ. Bielefeld (Germany); O. Lange, A. Meyer-Bäse, Florida State Univ. . . . . [6576-23]

1:20 pm: **Singular value decomposition (SVD)-based segmentation of multicomponent signals,** S. Rajan, Defence Research and Development Canada (Canada); R. Doraiswami, Univ. of New Brunswick (Canada) . . . . . [6576-14]

1:40 pm: **Analysis of breast MRI data dased on (topographic) independent and tree-dependent component analysis,** A. Saalbach, Univ. Bielefeld (Germany); O. Lange, Florida State Univ.; T. Nattkemper, Univ. Bielefeld (Germany); A. Meyer-Bäse, Florida State Univ. . . . . [6576-22]

2:00 pm: **Multispectral MWIR image feature extraction using filters derived from independent component analysis** *(Invited Paper)***,** S. K. Chari, C. E. Halford, A. L. Robinson, E. L. Jacobs, Univ. of Memphis . . . . . [6576-120]

SESSION 4

Room: North Tower-St. Thomas . . . . . Tues. 2:40 to 3:20 pm

2007 Wavelets Pioneer Award

Chairs: **C. Sidney Burrus**, Rice Univ.; **Harold H. Szu**, Office of Naval Research

Presented to:
Ronald A. DeVore, Univ. of South Carolina

A taste of compressed sensing *(Invited Paper)***,** R. A. DeVore, Univ. of South Carolina . . . . . [6576-37]

Coffee Break . . . . . 3:20 to 3:40 pm

Panel Discussion

Room: North Tower-St. Thomas . . . . . Tues. 3:40 to 4:20 pm

Future of Wavelets

Chairs: **Ronald A. DeVore**, Univ. of South Carolina; **C. Sidney Burrus**, Rice Univ.

Panelists: **Harold H. Szu,** Office of Naval Research; **Patricia H. Carter,** Naval Surface Warfare Ctr.; **Glenn Easley,** System Planning Corp.

SESSION 5

Room: North Tower-St. Thomas . . . . . Tues. 4:20 to 6:40 pm

Wavelet Applications

Chair: **Samuel P. Kozaitis**, Florida Institute of Technology

4:20 pm: **Next gen wavelets down-sampling preserving statistics,** H. H. Szu, Office of Naval Research; L. Miao, The Univ. of Tennessee; P. Chanyagon, The World Bank (Thailand); M. Cader, The World Bank . . . . . [6576-44]

4:40 pm: **Video watermarking capacity in the DWT hierarchy,** M. P. Mitrea, O. Dumitru, F. Prêteux, Institut National des Télécommunications (France) . . . . . [6576-07]

5:00 pm: **Adaptive Rochio text classifier using wavelets,** P. H. Carter, Naval Surface Warfare Ctr. . . . . [6576-47]

5:20 pm: **Wavelet-based fusion approach using unique reconstruction approach,** S. P. Kozaitis, M. Ouendeno, Florida Institute of Technology . [6576-08]

5:40 pm: **Wavelet analysis applied to smart structure carbon composite material: past achievements and future challenges,** K. J. Jones, Rice Univ. . . . . [6576-04]

6:00 pm: **Wavelet-based texture image classification using vector quantization,** E. P. Lam, ThalesRaytheonSystems . . . . . [6576-15]

6:20 pm: **Improved total variation algorithms for wavelet-based denoising,** G. R. Easley, System Planning Corp. and Univ. of Maryland/College Park; F. Colonna, George Mason Univ. . . . . [6576-02]

Wednesday 11 April

Signal Image and Neural Net Processing Plenary Presentation

Room: North Tower-Aruba . . . . . Wed. 9:00 to 10:00 am

Speaking of sensing in the language of quantum mechanics [6573-38]

J. M. Myers, Harvard Univ.

For details see p. 6

SESSION 6

Room: North Tower-St. Thomas . . . . . Wed. 10:30 to 11:10 am

Nanoengineering Awards

Chairs: **Francisco Santiago**, Naval Surface Warfare Ctr.; **Kevin W. Lyons**, National Institute of Standards and Technology

Presented to
Ning Xi, Michigan State Univ.;
Harold H. Szu, Office of Naval Research

Nanorobot assembly carbon nanotubes for mid-IR sensor *(Invited Paper)*, N. Xi, Michigan State Univ. . . . . [6576-34]

Panel Discussion

Room: North Tower-St. Thomas . . . . . Wed. 11:10 to 11:50 am

Nanosensor Manufacture

Chairs: **Francisco Santiago**, Naval Surface Warefare Ctr.; **Jack Agee, Ph.D.**, Rice Univ.

Panelists: **Kitt C. Reinhardt,** Air Force Office of Scientific Research; **Vittal S. Rao,** National Science Foundation; **Kevin W. Lyons,** National Institute of Standards and Technology; **Donggun Park,** Univ. of California/Berkeley; **Mau-Kuen Wu,** Academia Sinica; **Ning Xi,** Michigan State Univ.

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

SESSION 7

Room: North Tower-St. Thomas . . . . . Wed. 1:00 to 3:00 pm

Nanoscience and Nanotechnology

Chairs: **Francisco Santiago**, Naval Surface Warfare Ctr.; **Kevin W. Lyons**, National Institute of Standards and Technology

1:00 pm: **Future direction of nanometrology and nanomanufacture** *(Invited Paper)*, K. W. Lyons, National Institute of Standards and Technology . . . . . [6576-46]

1:40 pm: **Nanotechnology at NSWC** *(Invited Paper)*, F. Santiago, Naval Surface Warfare Ctr. . . . . [6576-45]

2:20 pm: **Taiwan nanotechnology** *(Invited Paper)*, M. Wu, Academia Sinica (Taiwan) . . . . . [6576-50]

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

Thursday 12 April

SESSION 8

Room: North Tower-St. Thomas . . . . . Thurs. 8:00 to 8:40 am

Wellness Engineering Award

Chairs: **Wen-Lee Cheng**, Chung Yuan Christian Univ. (Taiwan); **Shia-Chung Chen**, Chung Yuan Christian Univ. (Taiwan)

Presented to
Harold H. Szu, Office of Naval Research

Award Committee: **Dr. Norden E. Huang**, NASA & National Central Univ, (Taiwan); **Dr. Hanseok Brian Ko**, VP of Korea Univ. (Korea); **Dr. Hyunsook Yoon, MD**, VP of Hallym Univ. (Korea); **Dr. G. Moon**, Prof. of Hallym Univ.(Korea)

Wellness engineering and wellness doctors as gate keepers of aging baby boomers *(Invited Paper)*, H. H. Szu, Office of Naval Research . . . . . [6576-35]

Panel Discussion

Room: North Tower-St. Thomas . . . . . Thurs. 8:40 to 9:20 am

Financial Crisis of Aging Baby Boomers

Chairs: **Shia-Chung Chen**, Chung Yuan Christian Univ. (Taiwan); **Danny Wen-Yaw Chung,** Chung Yuan Christian Univ.;

Panelists: **Norden E. Huang,** NASA Goddard Space Flight Ctr.; **Ming-Sin Hsu,** Ming-Shen Hospitals; **Hanseok Brian Ko,** Korea Univ.; **Hyunsook Yoon,** Hallym Univ.

SESSION 9

Room: North Tower-St. Thomas . . . . . Thurs. 9:20 am to 12:00 pm

Real World Data Analysis

Chairs: **Norden E. Huang**, NASA Goddard Space Flight Ctr.; **Gyu Moon**, Hallym Univ. (South Korea)

9:20 am: **Noninvasive methodology for wellness baseline profiling** *(Invited Paper)*, D. W. Chung, Chung Yuan Christian Univ. (Taiwan); Y. S. Tasi, National Huwei Institute of Technology (Taiwan); S. Miaou, W. H. Chang, Chung Yuan Christian Univ. (Taiwan); Y. Chang, Chung Yuan Christian Univ.; S. Chen, Y. Hong, C. S. Chyang, Q. Chang, Chung Yuan Christian Univ. (Taiwan); H. Hsu, J. Hsu, W. Yao, M. Hsu, Ming-Shen Hospital (Taiwan); M. Chen, S. Lee, National Taiwan Univ. (Taiwan); C. Hsu, Consultant; L. Miao, The Univ. of Tennessee; K. A. Byrd, M. F. Chouikha, X. Gu, Howard Univ.; P. C. Wang, Howard Univ. Hospital; H. H. Szu, The George Washington Univ. . . . . [6576-33]

10:00 am: **EMD of real world data analysis** *(Invited Paper)*, N. E. Huang, NASA Goddard Space Flight Ctr. . . . . [6576-43]

Coffee Break . . . . . 10:40 to 11:00 am

11:00 am: **Pavement crack evaluation with bidimensional empirical mode decomposition,** A. Y. Ayenu-Prah, Jr., N. Attoh-Okine, Univ. of Delaware; S. Bhuiyan, The Univ. of Alabama/Huntsville . . . . . [6576-13]

11:20 am: **Passive unattended sensors** *(Invited Paper)*, R. W. Van Dine, DKL International, Inc. . . . . [6576-31]

Lunch Break . . . . . 12:00 to 1:10 pm

SESSION 10

Room: North Tower-St. Thomas . . . . . Thurs. 1:10 to 3:30 pm

Autonomous UAV and Sensors

Chairs: **Rabinder N. Madan**, Office of Naval Research; **Shubha L. Kadambe**, Office of Naval Research

1:10 pm: **Neural dynamic optimization for unmanned aerial vehicle trajectory design,** P. Xu, A. Verma, Knowledge Based Systems, Inc. . . . . [6576-17]

1:30 pm: **Smart Altera firmware for DSP with FPGAs** *(Invited Paper)***,** U. H. Meyer-Bäse, R. Perry, A. Meyer-Bäse, Florida State Univ.; A. Vera, M. Pattichis, The Univ. of New Mexico . . . . . [6576-10]

2:10 pm: **FPGA wavelet processor design using language for instruction-set architectures (LISA),** U. H. Meyer-Bäse, Florida State Univ.; M. Witte, RWTH Aachen (Germany); S. Rao, K. Lenk, Florida State Univ.; H. Meyr, RWTH Aachen (Germany) . . . . . [6576-11]

2:30 pm: **Analog smart sensors,** D. W. Chung, Chung-Yuan Christian Univ. (Taiwan) . . . . . [6576-40]

2:50 pm: **3D map generation for biomimetic applications using a net work of multi-static radar sensors** *(Invited Paper)***,** S. L. Kadambe, Office of Naval Research . . . . . [6576-30]

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

SESSION 11

Room: North Tower-St. Thomas . . . . . Thurs. 4:00 to 5:40 pm

Smart Sensors

Chairs: **Shia-Chung Chen**, Chung Yuan Christian Univ. (Taiwan); **Danny W. Chung**, Chung Yuan Christian Univ. (Taiwan)

4:00 pm: **Hardware implementation of a neural vision system based on a neural network using integrated and fire neurons,** M. González, H. Lamela, M. Jiménez, J. A. Gimeno, M. Ruiz-Llata, Univ. Carlos III de Madrid (Spain) . . . . . [6576-28]

4:20 pm: **Design of hybrid neuron elements for spatio-temporal algebraic integration and nonlinear transformation of time-pulse encoded optical signals,** V. G. Krasilenko, Open International Univ. of Human Development (Ukraine); V. F. Bardachenko, Institute of Cybernetics (Ukraine); A. I. Nikolsky, A. A. Lazarev, Vinnitsa National Technical Univ. (Ukraine) . . . . . [6576-19]

4:40 pm: **Programmed relational optoelectronic time-pulse coded processors as element basis for sorting neuron networks,** V. G. Krasilenko, Open International Univ. of Human Development (Ukraine); V. F. Bardachenko, Institute of Cybernetics (Ukraine); A. I. Nikolsky, A. A. Lazarev, Vinnitsa National Technical Univ. (Ukraine) . . . . . [6576-20]

5:00 pm: **A weighted quadratic asymptotic analysis of classifier design with extensions to finite-size training sets,** G. J. Dobeck, Naval Surface Warfare Ctr. . . . . [6576-21]

5:20 pm: **Fault tolerant adaptive routing for heterogeneous networked embedded systems,** X. Huang, C. Liang, Worcester Polytechnic Institute; J. Ma, AirSprite Technologies, Inc. . . . . [6576-25]

Friday 13 April

SESSION 12

Room: North Tower-St. Thomas . . . . . Fri. 8:00 to 9:20 am

System of ATR

Chairs: **Miao Liden**, TSU; **Amy S. Smith-Carroll**, Naval Surface Warfare Ctr.

8:00 am: **Automatic target recognition on unidentified explosive ordnance** *(Invited Paper)***,** R. N. Madan, Office of Naval Research . . . . . [6576-32]

8:40 am: **Autonomous UAV techniques,** M. Hsu, The George Washington Univ.; H. H. Szu, Office of Naval Research . . . . . [6576-27]

9:00 am: **An FPGA-based rapid prototyping platform for wavelet-based coprocessors,** G. A. Vera, The Univ. of New Mexico; U. H. Meyer-Bäse, Florida State Univ.; M. Pattichis, The Univ. of New Mexico . . . . . [6576-18]

SESSION 13

Room: North Tower-St. Thomas . . . . . Fri. 9:20 am to 12:10 pm

Vision and ATR

Chairs: **Frank E. McFadden**, General Dynamics Advanced Information Systems; **Shengping Xia**, National Univ. of Defense Technology (China)

9:20 am: **Arrogance analysis of several typical pattern recognition classifiers,** J. Chen, S. Xia, W. Hu, National Univ. of Defense Technology (China) . . . [6576-06]

9:40 am: **Implicit differential analysis for cortical models,** F. E. McFadden, General Dynamics Advanced Information Systems; H. H. Szu, Howard Univ. . . . . [6576-49]

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

10:30 am: **Automatic target recognition method for phased antenna arrays with no passive training mode information,** A. Bhargave, F. S. Lin, M. I. Kazantzidis, Broadata Communications, Inc. . . . . [6576-16]

10:50 am: **Intellectual property protection of IP cores through high-level watermarking,** E. Castillo, Univ. de Granada (Spain); U. H. Meyer-Bäse, Florida State Univ.; A. García, L. Parrilla, A. Lloris, Univ. de Granada (Spain) . . . [6576-12]

11:10 am: **Carrier signal design using constrained iterative spectral deconvolution,** A. M. Amini, Southern Univ. . . . . [6576-01]

11:30 am: **Technique of information hiding based on neural network,** L. Xu, G. Tao, North China Institute of Science and Technology (China) . . . . . [6576-03]

11:50 am: **Research on the technique of public watermarking system based on wavelet transform and neural network,** L. Xu, G. Tao, North China Institute of Science and Technology (China) . . . . . [6576-05]

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Wireless Sensing and Processing II

Conference Chairs: **Raghuveer M. Rao**, Rochester Institute of Technology; **Sohail A. Dianat**, Rochester Institute of Technology; **Michael D. Zoltowski**, Purdue Univ.

Program Committee: **Moeness G. Amin**, Villanova Univ.; **Braham Himed**, Air Force Research Lab.; **Sirisha R. Medidi**, Washington State Univ.; **John W. Nieto**, Harris Corp.; **Pramod K. Varshney**, Syracuse Univ.

Monday 9 April

SESSION 1

Room: North Tower-Aruba . . . . . Mon. 8:30 to 10:10 am

Wireless networks

Chair: **John W. Nieto**, Harris Corp.

8:30 am: **A hybrid 802.16/802.11 network architecture for a United States coastal area network,** J. L. Burbank, W. Kasch, J. Andrusenko, B. Haberman, Johns Hopkins Applied Physics Lab. . . . . [6577-01]

8:50 am: **Indoor location sensing using ZigBee tag,** S. Shih, Cheng-Shiu Univ. (Taiwan); K. Hsieh, Rightsym International Company (Taiwan) . . . . . [6577-02]

9:10 am: **Adaptive binary signature design of code division controlled-MAC in wireless sensor network,** L. Wei, S. N. Batalama, D. A. Pados, Univ. at Buffalo; B. W. Suter, Air Force Research Lab. . . . . [6577-03]

9:30 am: **Location-based route self-recovery for mobile ad hoc networks,** S. R. Medidi, J. Wang, Washington State Univ. . . . . [6577-04]

9:50 am: **Enhancing ad hoc routing with history-based route selection,** S. R. Medidi, P. M. Cappetto, Washington State Univ. . . . . [6577-05]

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

SESSION 2

Room: North Tower-Aruba . . . . . Mon. 10:40 to 11:40 am

Smart Antennas

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

10:40 am: **Approximate MLE algorithm for source localization based on TDOA measurements,** G. Gu, Louisiana State Univ. . . . . [6577-07]

11:00 am: **The constrained Kalman filtering and its application to tracking of ground moving target,** G. Gu, Louisiana State Univ. . . . . [6577-08]

11:20 am: **Direction finding of GPS receiver interference based on a hybrid RF-DSP approach,** J. Wang, M. G. Amin, Villanova Univ. . . . . [6577-09]

Lunch Break . . . . . 11:40 am to 1:20 pm

SESSION 3

Room: North Tower-Aruba . . . . . Mon. 1:20 to 2:20 pm

Multipath

Chair: **Sohail A. Dianat**, Rochester Institute of Technology

1:20 pm: **A fast algorithm for direction of arrival estimation in a multipath environment,** M. Naraghi-Pour, N. Tayem, Louisiana State Univ. . . . . [6577-11]

1:40 pm: **Decoder-aided multidata detection of OFDM-CDMA waveforms on HF multipath/fading channels,** J. W. Nieto, Harris Corp. . . . . [6577-12]

2:00 pm: **Utilizing space frequency COFDM on multipath fading channels,** F. C. Kellerman, Harris Corp. . . . . [6577-13]

SESSION 4

Room: North Tower-Aruba . . . . . Mon. 2:20 to 4:50 pm

Emerging Systems

Chair: **Sirisha R. Medidi**, Washington State Univ.

2:20 pm: **A review of scale factors, fixed-point precision, soft decisions and hard decisions on the performance of the UMTS (3GPP) turbo codes,** J. W. Nieto, Harris Corp. . . . . [6577-16]

2:40 pm: **UMTS-based data link and data network for telemetry and time space position information (TSPI) applications,** R. Sivasankaran, W. Ferzali, G. S. Rajappan, Mayflower Communications Company, Inc.; A. Khosrowabadi, Edwards Air Force Base . . . . . [6577-17]

3:00 pm: **Comparison of ultrawideband channel models estimated by model selection techniques and hypothesis testing,** D. Choudhary, A. L. Robinson, Univ. of Memphis . . . . . [6577-18]

Coffee Break . . . . . 3:20 to 3:50 pm

3:50 pm: **Performance of chirp slope keying with joint time-frequency detectors,** E. J. Kaminsky Bourgeois, I. X. Incer, Univ. of New Orleans . [6577-19]

4:10 pm: **Anti-collusion fingerprinting scheme based on error correction ability of nonlinear combinatorial code,** W. Huang, I. M. Panahi, The Univ. of Texas at Dallas . . . . . [6577-20]

4:30 pm: **RFID electronic seal and system using the RFID electronic seal,** S. Shih, Cheng-Shiu Univ. (Taiwan) . . . . . [6577-21]

SESSION 5

Room: North Tower-Aruba . . . . . Mon. 4:50 to 5:30 pm

Sensor networks

Chair: **Fred C. Kellerman**, Harris Corp.

4:50 pm: **A simple hill-climbing technique to place sensors in a polygonal area for increased intrution detection in the presence of a cognizant intruder,** S. U. Khan, The Univ. of Texas/Arlington . . . . . [6577-15]

5:10 pm: **Sensor networks and network sensibility,** M. Li, Univ. of Waterloo (Canada); H. Lin, J. A. Rushing, S. J. Graves, The Univ. of Alabama/ Huntsville . . . . . [6577-14]

Monday-Thursday 9-12 April 2007 • Proceedings of SPIE Vol. 6578

Defense Transformation and Net-Centric Systems 2007

Conference Chair: **Raja Suresh**, General Dynamics Advanced Information Systems

Program Committee: **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.; **John M. Pellegrino**, Army Research Lab.; **Brian M. Sadler**, Army Research Lab.; **Larry B. Stotts**, Defense Advanced Research Projects Agency; **Guy Vézina**, Defence R&D Canada/Valcartier (Canada); **James Wood**, Defence Science and Technology Lab. (United Kingdom)

Monday 9 April

SESSION 1

Room: North Tower-Grand Cayman . . . . . Mon. 8:30 to 11:40 am

Net-Centric Systems, Architectures and Services

Chairs: **Paul S. Gaertner**, Embassy of Australia; **Guy Vézina**, Defence R&D Canada/Valcartier (Canada)

8:30 am: **Tactical service oriented architecture (TSOA) over wireless communications,** J. Gohde, P. Griffin, B. Rickenbach, General Dynamics Advanced Information Systems . . . . . [6578-01]

8:50 am: **Testbed for large volume surveillance through distributed fusion and resource management,** P. Valin, A. Guitouni, E. Bosse, Defence R&D Canada/ Valcartier (Canada); H. Wehn, R. Yates, H. H. Zwick, MacDonald, Dettwiler & Associates Ltd. (Canada) . . . . . [6578-02]

9:10 am: **An evaluation of case-based classification to support automated web service discovery and brokering,** E. G. Warner, R. V. Ladner, F. Petry, Naval Research Lab. . . . . [6578-03]

9:30 am: **Enabling dynamic interoperability with multiple COI systems,** E. J. Martens, A. Armbruster, D. E. Corman, Boeing Military Aircraft and Missile Systems Group . . . . . [6578-04]

9:50 am: **An investigative analysis of information assurance issues associated with the GIG's P&P architecture,** B. S. Farroha, R. Cole, Johns Hopkins Applied Physics Lab.; D. Farroha, Defense Intelligence Agency [6578-05]

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

10:40 am: **Embedded instrumentation systems architecture,** N. A. Visnevski, P. C. Sanza, GE Global Research . . . . . [6578-06]

11:00 am: **Widely distributed C4ISR,** D. A. Goughnour, M. J. Salonish, S. D. Allen, ElanTech, Inc. . . . . [6578-07]

11:20 am: **Methodology for assessing technologies to improve or compress the kill chain,** D. K. Bowley, C. Standford, S. James, Defence Science and Technology Organisation (Australia) . . . . . [6578-08]

Lunch . . . . . 11:40 am to 1:00 pm

SESSION 2

Room: North Tower-Grand Cayman . . . . . Mon. 1:00 to 4:30 pm

Information Management Architectures and Experimentation

Chair: **Robert G. Hillman**, Air Force Research Lab.

1:00 pm: **Evaluating technologies for tactical information management in net-centric systems,** D. C. Schmidt, Vanderbilt Univ. . . . . [6578-09]

1:20 pm: **Dynamic policy enforcement in JBI information management services with the KAoS policy and domain services,** J. Donnelly, J. Madden, ISX Corp.; J. M. Bradshaw, A. Uszok, Institute for Human and Machine Cognition . . . . . [6578-10]

1:40 pm: **A QoS management system for dynamically interoperating net-centric systems,** J. P. Loyall, J. Ye, P. Sharma, R. E. Schantz, BBN Technologies . . . . . [6578-11]

2:00 pm: **AIMS taking on roles to support information dominance,** P. J. Ceccio, Northrop Grumman Corp. . . . . [6578-12]

2:20 pm: **Managing information sharing in tactical environments,** J. P. Hanna, V. T. Combs, Air Force Research Lab. . . . . [6578-13]

2:40 pm: **iFUSE: a development environment for composable, easy-to-assemble information transforms,** R. A. Joyce, Architecture Technology Corp.-New York . . . . . [6578-14]

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

3:30 pm: **Semantic mediation and transformation services,** J. R. Milligan, Air Force Research Lab. . . . . [6578-15]

3:50 pm: **Pedigree management and assessment in a net-centric information management environment,** M. M. Gioioso, D. McCullough, C. Marceau, R. A. Joyce, Architecture Technology Corp.-New York . . . . . [6578-16]

4:10 pm: **Composition modeling framework (CMF),** G. R. Staskevich, J. R. Milligan, Air Force Research Lab. . . . . [6578-17]

Tuesday 10 April

SESSION 3

Room: North Tower-Grand Cayman . . . . . Tues. 8:50 to 9:50 am

Sensor Networks

Chairs: **Raja Suresh**, General Dynamics Advanced Information Systems; **Michael A. Kolodny**, Army Research Lab.

8:50 am: **CUGSS communications** *(Invited Paper)***,** G. L. Duckworth, Defense Advanced Research Projects Agency . . . . . [6578-18]

9:10 am: **Methods for calculating the probability of detection and target location error of unattended ground sensors,** K. W. Brendley, Artis LLC; G. A. Klager, U.S. Army Night Vision & Electronic Sensors Directorate . . [6578-19]

9:30 am: **A novel framework for command and control of networked sensor systems,** G. Chen, Intelligent Automation Inc.; J. B. Cruz, Jr., The Ohio State Univ.; Z. Tian, Michigan Technological Univ.; D. Shen, Intelligent Automation Inc.; E. P. Blasch, P. Khanh, Air Force Research Lab. . . . . [6578-20]

Coffee Break . . . . . 9:50 to 10: 30 am

SESSION 4

Room: North Tower-Grand Cayman . . . . . Tues. 10:30 am to 4:00 pm

Communications and Networks

Chairs: **John W. Gowens II**, Army Research Lab.; **Gayle D. Grant**, U.S. Army Communications-Electronics Command; **Brian M. Sadler**, Army Research Lab.

10:30 am: **Interference division multiple access communications** *(Invited Paper)***,** L. R. Brothers, Defense Advanced Research Projects Agency . . . . . [6578-22]

11:00 am: **Paradigm shifts in wireless networking** *(Invited Paper)***,** J. C. Ramming, Defense Advanced Research Projects Agency . . . . . [6578-23]

11:30 am: **Throughput of 802.11g wireless devices in ad hoc mode,** B. B. Luu, R. L. Hardy, Army Research Lab. . . . . [6578-24]

11:50 am: **The airborne network definition project: a network architecture effort for future battlefield networks that enable network-centric warfare,** B. Ganguly, S. Finn, J. McLamb, W. Bynoe, L. Veytser, I. Pedan, S. A. Davidson, MIT Lincoln Lab. . . . . [6578-25]

Lunch break . . . . . 12:10 to 1:10 pm

1:10 pm: **Live-flight demonstration of agent technology for connecting the tactical edge to the global information grid,** E. J. Martens, D. E. Corman, Boeing Military Aircraft and Missile Systems Group . . . . . [6578-26]

1:30 pm: **Demonstration of high-data-rate wavelength division multiplexed transmission over a 150 km free space optical link,** D. W. Young, J. E. Sluz, J. C. Juarez, M. B. Airola, R. M. Sova, H. Hurt III, Johns Hopkins Applied Physics Lab.; M. J. Northcott, J. Phillips, A. McClaren, D. Driver, J. E. Graves, D. D. Abelson, AOptix Technologies, Inc.; J. J. Foshee, Air Force Research Lab. . . . . [6578-27]

1:50 pm: **Hawaii 150km FSO 40 Gbps communications link demonstration,** M. J. Northcott, AOptix Technologies, Inc.; J. J. Foshee, Air Force Research Lab.; D. D. Abelson, J. E. Graves, J. Phillips, A. McClaren, AOptix Technologies, Inc.; D. W. Young, R. M. Sova, J. E. Sluz, J. C. Juarez, M. B. Airola, Johns Hopkins Applied Physics Lab. . . . . [6578-28]

2:10 pm: **A framework for assessing and predicting network loads and performance for network centric operations and warfare,** E. E. Santos, Virginia Polytechnic Institute and State Univ. . . . . [6578-29]

2:30 pm: **Synchronization techniques for wireless multi-radar covert communication networks,** S. C. Surender, R. M. Narayanan, The Pennsylvania State Univ. . . . . [6578-30]

Coffee break . . . . . 2:50 to 3:20 pm

3:20 pm: **A network-centric robust resource allocation strategy for unmanned systems: stability analysis,** K. Khorasani, Concordia Univ. (Canada) . . . . . [6578-32]

3:40 pm: **Node compromise attacks and network connectivity,** K. S. Chan, F. Fekri, Georgia Institute of Technology . . . . . [6578-33]

Wednesday 11 April

Introduction to Joint Session

Room: Grand 3 . . . . . Wed. 8:00 to 8:10 am

SESSION 5

Room: Grand 3 . . . . . Wed. 8:10 am to 12:10 pm

Joint Session with Conference 6561

Self-organizing Collaborative ISR Robotic Teams I

Chairs: **Venkatarama Sundareswaran**, Teledyne Scientific Co.; **George Vachtsevanos**, Georgia Institute of Technology

8:10 am: **The DARPA urban challenge** *(Invited Paper)***,** N. A. Whitaker, Defense Advanced Research Projects Agency . . . . . [6578-34]

8:40 am: **Multiplatform information-based sensor management: an inverted UAV demonstration,** C. M. Kreucher, J. W. Wegrzyn, M. Beauvais, R. Conti, General Dynamics Advanced Information Systems . . . . . [6578-35]

9:00 am: **Collaborative unmanned vehicle engagement in adversarial missions,** J. Reimann, G. Vachtsevanos, Georgia Institute of Technology; J. Ge, L. Tang, A. Liberson, Impact Technologies; H. Chang, U.S. Army Research Office . . . . . [6578-36]

9:20 am: **Agent-based multiplatform control, collaboration, and target hand-off,** N. P. Coleman, U.S. Army Armament Research, Development and Engineering Ctr.; J. Robbins, B. Tirabassi, Technical Solutions, Inc. . . . . [6578-37]

9:40 am: **Formation control in multiplayer pursuit evasion game with superior evaders,** X. Wang, The Ohio State Univ.; G. Chen, Intelligent Automation Inc.; J. B. Cruz, Jr., The Ohio State Univ.; H. Chang, U.S. Army Research Office; E. Blasch, Air Force Research Lab. . . . . [6578-38]

10:00 am: **Collaborative multitarget tracking using networked robotic vehicles,** S. Biswas, S. Gupta, F. Yu, Michigan State Univ. . . . . [6578-39]

Coffee break . . . . . 10:20 to 10:50 am

10:50 am: **Hunter standoff killer team (HSKT) ground and flight results,** B. M. Moreland, U.S. Army Research, Development and Engineering Command . . . . . [6578-40]

11:10 am: **A man portable hybrid UAV/UGV system,** P. Rudakevych, B. M. Yamauchi, iRobot Corp. . . . . [6561-48]

11:30 am: **Multi-UAV autonomous collaborative behaviors for convoy protection,** Y. Chen, M. A. Peot, J. Lee, V. Sundareswaran, T. W. Altshuler, Teledyne Scientific Co. . . . . [6561-49]

11:50 am: **Development of a GPS/INS/MAG navigation system and waypoint navigator for a VTOL UAV,** O. Meister, R. Mönikes, J. Wendel, N. M. Frietsch, C. Schlaile, G. F. Trommer, Univ. Karlsruhe (Germany) . . . . . [6561-50]

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

SESSION 6

Room: Grand 3 . . . . . Wed. 1:30 to 4:20 pm

Joint Session with Conference 6561

Self-organizing Collaborative ISR Robotic Teams II

Chairs: **Venkatarama Sundareswaran**, Teledyne Scientific Co.; **George Vachtsevanos**, Georgia Institute of Technology

1:30 pm: **Deployable reconnaissance from a VTOL UAS in urban environments,** S. Barnett, A. Culhane, A. Sharkasi, J. Bird, C. F. Reinholtz, Virginia Polytechnic Institute and State Univ. . . . . [6561-51]

1:50 pm: **Macro-fiber composites for wing morphing micro-air vehicles,** O. Bilgen, D. J. Inman, A. J. Kurdila, Virginia Polytechnic Institute and State Univ. . . . . [6561-52]

2:10 pm: **Toward distributed ATR using subjective logic combination rules with networked UAVs,** S. O'Hara, 21st Century Systems, Inc. and Univ. of Nebraska/Omaha; M. Simon, 21st Century Systems, Inc.; Q. Zhu, Univ. of Nebraska/Omaha . . . . . [6561-53]

2:30 pm: **Detection and tracking of objects in an image sequence captured by a VTOL-UAV,** N. M. Frietsch, O. Meister, C. Schlaile, J. Wendel, G. F. Trommer, Univ. Karlsruhe (Germany) . . . . . [6561-54]

Coffee Break . . . . . 2:50 to 3:20 pm

3:20 pm: **An intelligent algorithm for unmanned aerial vehicle surveillance,** A. Bhargave, B. E. Ambrose, F. S. Lin, Broadata Communications, Inc. . [6561-55]

3:40 pm: **Cooperative control architectures for a team of UAVs subject to communications failures,** K. Khorasani, Concordia Univ. (Canada) . . . [6561-56]

4:00 pm: **Vision-based sensing for autonomous in-flight refueling,** D. A. Scott, M. Toal, J. L. Dale, Octec Ltd. (United Kingdom) . . . . . [6561-57]

Thursday 12 April

SESSION 7

Room: North Tower-Grand Cayman . . . . . Thurs. 8:00 to 10:20 am

GeoInt Systems

Chairs: **Larry B. Stotts**, Defense Advanced Research Projects Agency; **Beth H. Driver**, National Geospatial-Intelligence Agency

8:00 am: **UrbanScape** *(Invited Paper)***,** B. S. Leininger, Defense Advanced Research Projects Agency . . . . . [6578-41]

8:30 am: **Leveraging neuroscience for geospatial intelligence** *(Invited Paper)***,** A. A. Kruse, Defense Advanced Research Projects Agency . . . . . [6578-42]

9:00 am: **Geospatial challenges in a net centric environment: actionable information technology, design, and implementation,** M. R. Hieb, M. J. Pullen, George Mason Univ.; M. W. Powers, H. Yu, U.S. Army Engineer Research and Development Ctr. . . . . [6578-43]

9:20 am: **Airborne data to actionable intelligence in minutes,** M. Phipps, P. P. Hed, M. Meister, General Dynamics Advanced Information Systems . . . . . [6578-44]

9:40 am: **Orchestrating and optimizing multisource ISR,** M. Limcaco, General Dynamics Advanced Information Systems . . . . . [6578-45]

10:00 am: **Spatio-temporalreasoning of urban environs for C2 planning and execution,** M. L. Collins, U.S. Army . . . . . [6578-46]

Coffee break . . . . . 10:20 to 10:50 am

SESSION 8

Room: North Tower-Grand Cayman . . . . . Thurs. 10:50 am to 12:10 pm

Predictive Analytic Modeling

Chair: **Beth H. Driver**, National Geospatial-Intelligence Agency

10:50 am: **GIS approaches for geographic dynamics understanding and event prediction,** M. Yuan, Univ. of Oklahoma . . . . . [6578-47]

11:10 am: **Incorporating uncertainty with geospatial forecasts for terror events,** J. Goffeney, Naval Research Lab. and ITT Corp. and Univ. of Missouri/ Columbia; G. Schmidt, R. Willis, Naval Research Lab.; R. Heimann, Naval Research Lab. and ITT Corp. . . . . [6578-48]

11:30 am: **EcoSentinel: a spatially explicit model for prediction of outbreaks of the Siberian moth in Siberia and the Russian Far East,** M. C. Saunders, B. J. Miller, M. McFadden, The Heron Group LLC . . . . . [6578-49]

11:50 am: **Detecting space-time cancer clusters using residential histories,** J. R. Meliker, BioMedware, Inc.; G. M. Jacquez, BioMedware, Inc. and Univ. of Michigan . . . . . [6578-50]

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

SESSION 9

Room: North Tower-Grand Cayman . . . . . Thurs. 1:30 to 5:10 pm

MDA Session

Chairs: **Chung-Hye Read**, National Geospatial-Intelligence Agency; **Michael Limcaco**, General Dynamics Advanced Information Systems

1:30 pm: **GEOINT for MDA** *(Invited Paper)***,** C. Andreasen, C. Read, National Geospatial-Intelligence Agency . . . . . [6578-52]

2:00 pm: **Challenges of maritime domain awareness and global maritime intelligence integration,** T. Breidenstein, National Intelligence Agency . [6578-53]

2:20 pm: **Maritime domain awareness network** *(Presentation Only)***,** M. Andress, Office of Naval Intelligence . . . . . [6578-54]

2:40 pm: **Determinants for global cargo analysis tools,** M. Wilmoth, W. Kay, Office of Naval Intelligence; M. Hancock, C. Sessions, Essex Corp. . . . . [6578-62]

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

3:30 pm: **Comprehensive maritime awareness (CMA),** C. Dwyer, Naval Research Lab. . . . . [6578-56]

3:50 pm: **Software solutions for ship tracking and harbor surveillance,** U. C. Benz, Definiens Imaging GmbH (Germany); A. Hsu, D. W. Hugo, National Geospatial-Intelligence Agency . . . . . [6578-57]

4:10 pm: **Automated detection of objects inside scanning sonar data,** J. M. Irvine, S. A. Israel, S. M. Bergeron, Science Applications International Corp. . . . . [6578-58]

4:30 pm: **Change detection and intelligence preparation of the environment in support of maritime domain awareness,** R. E. Betsch, Naval Oceanographic Office . . . . . [6578-59]

4:50 pm: **SeeCoast: persistent surveillance and automated scene understanding for ports and coastal areas,** B. Rhodes, A. M. Waxman, M. Seibert, N. A. Bomberger, T. M. Freyman, W. Kreamer, L. Kirschner, A. C. L'talien, W. Mungovan, C. Stauffer, L. Stolzar, BAE Systems Advanced Information Technologies . . . . . [6578-60]

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Mobile Multimedia/Image Processing For Military And Security Applications 2007

Conference Chairs: **Sos S. Agaian**, The Univ. of Texas at San Antonio; **Sabah A. Jassim**, Univ. of Buckingham (United Kingdom)

Program Committee: **Christopher R. Adams**, Univ. of Buckingham (United Kingdom); **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); **Erlan H. Feria**, College of Staten Island/CUNY; **Phalguni Gupta**, Indian Institute of Technology Kanpur (India); **Jacques Koreman**, Norwegian Univ. of Science and Technology (Norway); **Maryline Maknavicius**, Institut National des Télécommunications (France); **Alessandro Neri**, Univ. degli Studi di Roma Tre (Italy); **Gilbert L. Peterson**, Air Force Institute of Technology; **Sonia Salicetti**, GET/INT (France); **Xiyu Shi**, Univ. of Surrey (United Kingdom); **Pedro Soria-Rodriguez**, CISSP (Spain); **Gregory B. White**, Ctr for Infrastructure Assurance and Security

Wednesday 11 April

SESSION 1

Room: North Tower-Key Biscayne . . . . . Wed. 1:30 to 3:10 pm

Image/Video Compression

Chair: **Erlan H. Feria**, College of Staten Island/CUNY

1:30 pm: **Recent advances in multiview distributed video coding,** F. Dufaux, M. Ouaret, T. Ebrahimi, École Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [6579-01]

1:50 pm: **Memory-efficient contour-based region-of-interest coding of arbitrarily large images,** N. G. Sadaka, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems; L. J. Karam, Arizona State Univ. . . . . [6579-02]

2:10 pm: **Real-time super-resolution-enhanced ultra-low-bit-rate video coding,** W. Chien, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems; L. J. Karam, Arizona State Univ. . . . . [6579-03]

2:30 pm: **Signal compression via coordinate logic transforms,** E. E. Danahy, K. A. Panetta, Tufts Univ.; S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6579-04]

2:50 pm: **A predictive-transform (PT) sidelobe canceller for adaptive radar systems,** E. H. Feria, College of Staten Island/CUNY . . . . . [6579-05]

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

SESSION 2

Room: North Tower-Key Biscayne . . . . . Wed. 3:40 to 5:20 pm

Network Issues

Chair: **Sabah A. Jassim**, Univ. of Buckingham (United Kingdom)

3:40 pm: **A prompt information retrieval system on handheld devices,** Y. Huang, W. Yen, S. Lin, Tatung Univ. (Taiwan) . . . . . [6579-06]

4:00 pm: **Enhanced network management method for random IMS application servers,** S. Kim, SAMSUNG Electronics Co., Ltd. (South Korea) . . . . . [6579-07]

4:20 pm: **Detecting and isolating malicious nodes in wireless ad hoc networks,** F. Li, S. A. Jassim, Univ. of Buckingham (United Kingdom) . . [6579-08]

4:40 pm: **Impact on routers performance to classify and condition real-time interactive multimedia traffic based on its PHB,** S. Alsharif, Univ. of South Alabama . . . . . [6579-34]

5:00 pm: **A sobering look at topology constraints in network sensor systems,** G. J. Lenihan, Endevco Corp. . . . . [6579-10]

Thursday 12 April

SESSION 3

Room: North Tower-Key Biscayne . . . . . Thurs. 9:00 to 10:20 am

Security of Media Objects

Chair: **Frederic Dufaux**, École Polytechnique Fédérale de Lausanne (Switzerland)

9:00 am: **Switching theory-based steganographic system for JPEG images,** R. C. Cherukuri, S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6579-11]

9:20 am: **New quantization matrices-based JPEG steganography,** Y. O. Yildiz, K. A. Panetta, Tufts Univ.; S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6579-12]

9:40 am: **Steganography anomaly detection using simple one-class classification,** B. M. Rodriguez II, G. L. Peterson, Air Force Institute of Technology; S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6579-15]

10:00 am: **A mesh-based robust digital watermarking technique against geometric attacks,** Y. Huang, W. Yen, Y. Chen, Tatung Univ. (Taiwan) . . [6579-14]

Coffee Break . . . . . 10:20 to 11:00 am

SESSION 4

Room: North Tower-Key Biscayne . . . . . Thurs. 11:00 am to 12:00 pm

Data Hiding

Chair: **Yo-Ping Huang**, Tatung Univ. (Taiwan)

11:00 am: **Data hiding based on Fibonacci-Haar transform,** F. Battisti, Univ. degli Studi di Roma Tre (Italy); K. O. Egiazarian, Tampere Univ. of Technology (Finland); M. Carli, A. Neri, Univ. degli Studi di Roma Tre (Italy) . . . . . [6579-16]

11:20 am: **A chaotic cipher Mmohocc and its security analysis,** X. Zhang, The Graduate Ctr./CUNY; L. Shu, Sichuan Univ. (China); K. Tang, The Graduate Ctr./CUNY . . . . . [6579-17]

11:40 am: **Reversible data hiding by exploiting structure information in block transform domain,** H. Cai, S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6579-19]

Lunch/Exhibition Break . . . . . 12:00 to 1:20 pm

SESSION 5

Room: North Tower-Key Biscayne . . . . . Thurs. 1:20 to 3:00 pm

Identification Systems and Applications

Chair: **Yingzi Du**, Indiana Univ.-Purdue Univ. Indianapolis

1:20 pm: **Biometric authentication system with watermarking-based signatures protection,** P. Campisi, E. Maiorana, A. Neri, Univ. degli Studi Roma Tre (Italy) . . . . . [6579-20]

1:40 pm: **The problems of using ROC curve as the sole criteria in positive biometrics identification,** Y. Du, C. S. Belcher, Indiana Univ.-Purdue Univ. Indianapolis; C. Chang, Univ. of Maryland/Baltimore County . . . . . [6579-21]

2:00 pm: **Wavelet-based face detection for face recognition,** N. Al-Jawad, S. A. Jassim, Univ. of Buckingham (United Kingdom) . . . . . [6579-22]

2:20 pm: **Secure access control to hidden data by biometric features,** M. Cancellaro, M. Carli, Univ. degli Studi di Roma Tre (Italy); K. O. Egiazarian, Tampere Univ. of Technology (Finland); A. Neri, Univ. degli Studi di Roma Tre (Italy) . . . . . [6579-23]

2:40 pm: **Log-polar-based framework for mobile vehicle tracking with road follower,** P. Melnyk, R. A. Messner, Univ. of New Hampshire . . . . . [6579-24]

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

SESSION 6

Room: North Tower-Key Biscayne . . . . . Thurs. 3:30 to 4:50 pm

Image/Video Processing and Retrieval

Chair: **Sos S. Agaian**, The Univ. of Texas at San Antonio

3:30 pm: **Human visual-system-based image enhancement,** E. J. Wharton, K. A. Panetta, Tufts Univ.; S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6579-25]

3:50 pm: **Wavelet library for constrained devices,** J. H. Ehlers, S. A. Jassim, Univ. of Buckingham (United Kingdom) . . . . . [6579-26]

4:10 pm: **Efficient ROI recognition-based CBIR for large database with parallel distributed RSOM,** S. Xia, X. Lv, J. Liu, W. Hu, National Univ. of Defense Technology (China) . . . . . [6579-27]

4:30 pm: **Interactive and adaptive image segmentation algorithm for CBIR,** X. Lv, S. Xia, National Univ. of Defense Technology (China) . . . . . [6579-28]

✔ Posters-Thursday

Room: Spa Terrace . . . . . Thurs. 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. Each evening will represent a different set of conferences to promote opportunities 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 Thursday. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-show and their manuscript 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 robust digital watermarking scheme by use of integral imaging technique,** D. C. Hwang, D. Shin, E. S. Kim, Kwangwoon Univ. (South Korea) . . . . . [6579-30]

✔ **OFDM securitization by phase carrier random offset,** D. Blasi, P. Campisi, A. Neri, Univ. degli Studi di Roma Tre (Italy) . . . . . [6579-31]

✔ **Quantify similarity with measurement of enhancement by entropy,** E. A. Silva, K. A. Panetta, Tufts Univ.; S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6579-32]

✔ **The evolution of ambient learning and ambient learning in a mobile world,** R. Creutzburg, Fachhochschule Brandenburg (Germany) . . . . . [6579-33]

✔ **Fourier phase domain steganography: phase bin encoding via interpolation,** E. L. Rivas, S. S. Agaian, The Univ. of Texas at San Antonio . . . . . [6579-13]

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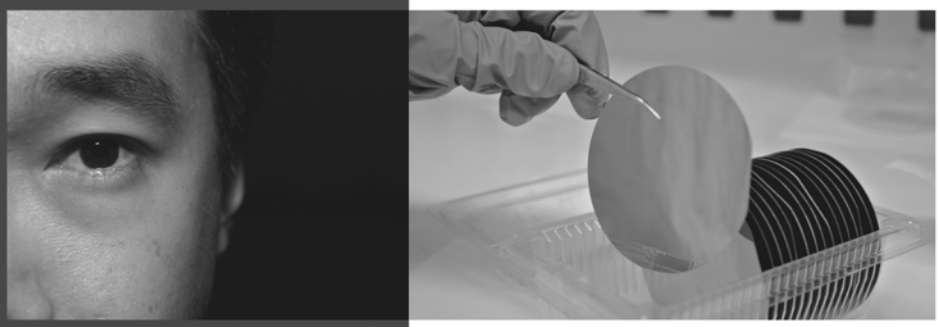

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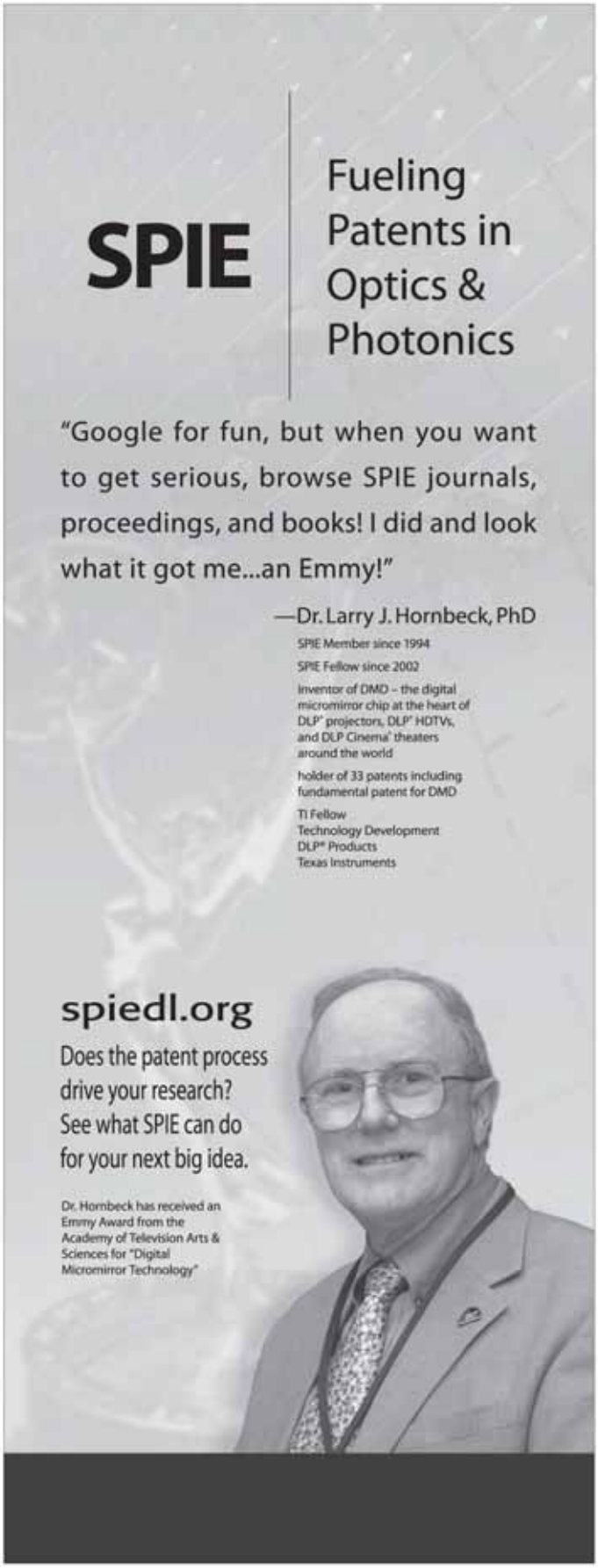

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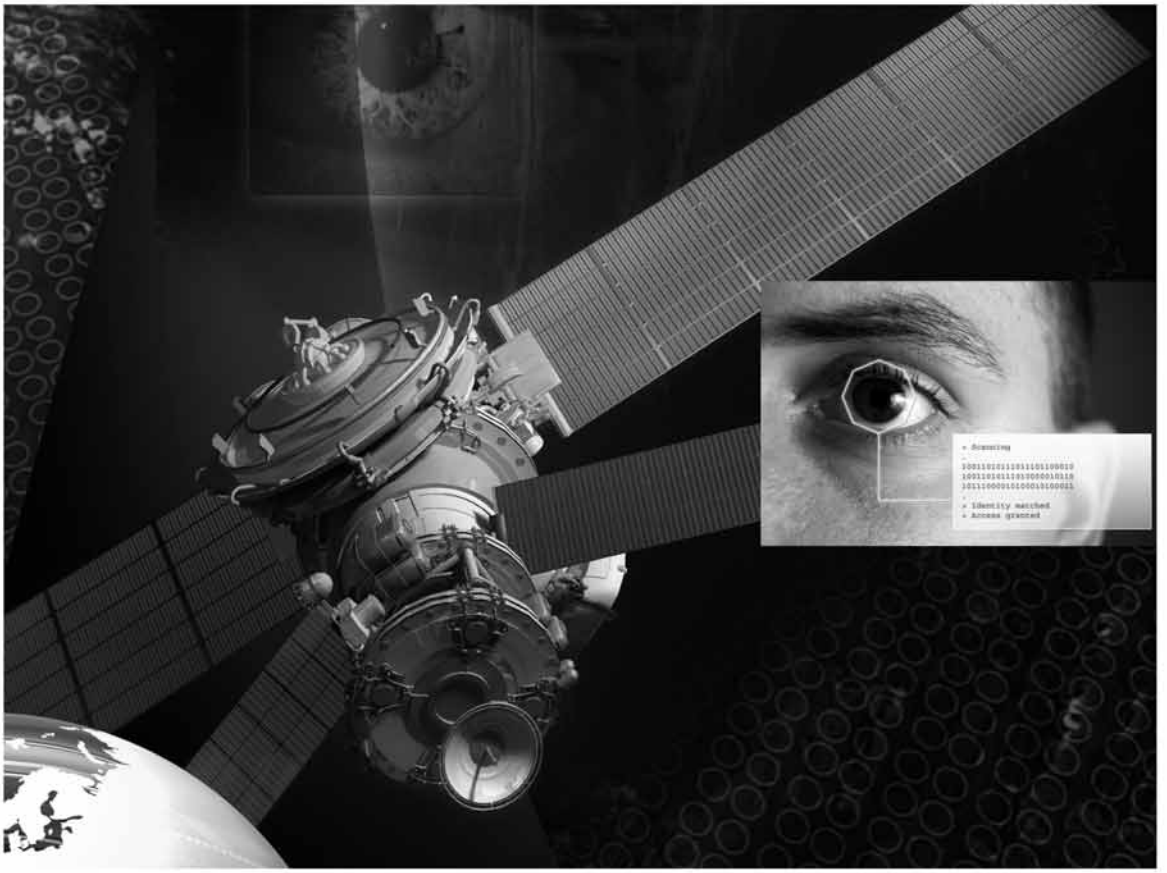

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SPIE
DEFENSE & SECURITY
SYMPOSIUM

9–13 April 2007
Orlando World Center Marriott Resort & Convention Center
8701 World Center Drive
Orlando, FL 32821

Onsite Registration Hours

Orlando World Center Marriott Resort & Convention Center

Grand Registration Area

Sunday 8 April . . . . . 5:00 pm to 8:00 pm
Monday 9 April . . . . . 7:00 am to 4:00 pm (see note below)
Tuesday 10 April . . . . . 7:15 am to 5:00 pm
Wednesday 11 April . . . . . 7:30 am to 5:00 pm
Thursday 12 April . . . . . 7:30 am to 4:00 pm
Friday 13 April . . . . . 7:30 am to 11:30 am

For Safety and Security reasons, please be prepared to show a picture ID at registration to receive your event badge!

Note: Those registrants not attending a Monday morning conference or short course are requested to wait until after 9:30 am on Monday to register. This will allow us to promptly process registrants who are attending conferences or short courses occurring Monday morning.

Exhibition Hours

Orlando World Center Marriott Resort & Convention Center

Crystal and Palms Ballrooms and Palms Foyer

Tuesday 10 April . . . . . 10:00 am to 5:00 pm
Wednesday 11 April . . . . . 10:00 am to 5:00 pm
Thursday 12 April . . . . . 10:00 am to 2:00 pm

Course Materials Desk

Located near the SPIE Registration Area

Open during registration hours

If you have registered to attend a short course, please stop by the Course Materials Desk to pick up your course notes and to find out where the class will be located AFTER you have picked up your badge.

Message Center

Located near the SPIE Registration Area

Messages will be taken during registration hours Monday through Friday by calling: **(407) 238-4050**

Internet Access

Multiple workstations will be available allowing attendees to access their internet e-mail during the conference and several Ethernet connections to use with your personal laptop. There will be a 10-minute time limit per each person's internet session.

Monday . . . . . 7:00 am to 4:00 pm
Tuesday . . . . . 7:15 am to 5:00 pm
Wednesday . . . . . 7:30 am to 5:00 pm
Thursday . . . . . 7:30 am to 4:00 pm

Complimentary Internet Wireless Access

Grand Salon 7A

SPIE is pleased to provide complimentary wireless access to the Internet for all conference attendees bringing 802.11b wireless-enabled laptops or PDAs.

Properly secure your computer before accessing the public wireless network. Failure to do so may allow unauthorized access to your laptop.

Connection settings will be posted in WiFi area.

SPIE Copy Center

Located near registration

Monday through Thursday

During registration hours San Diego Copy will provide a copy service during the week for symposium attendees. The discounted rates are:
5 cents/copy and $1 per transparency
Other services are available.

SPIE Marketplace

The SPIE Marketplace is your source for the latest SPIE Press books, Proceedings, and Education and Professional Development materials. You can become a member of SPIE, explore the Digital Library, and take home a souvenir.

Media Center

The on-site Media Center provides press conference facilities, refreshments, and convenient one-stop-shopping for press releases. Credentialed media are invited to communicate news via the provided phone, and computer hook-up. Registration and exhibition fees are waived for media representatives. You are encouraged to pre-register by e-mailing: name, organization, title, address, e-mail, and phone number to **media@spie.org**. For more information about SPIE media services, see **spie.org/info/media**

Audio/Video/Digital Recording Policy

Due to copyright restrictions, strictly no recordings of any kind are permitted without prior written consent of the presenter in any conference session, short course or posters. Consent forms are available at the SPIE Audiovisual Desk and anyone wishing to record must have a written consent form signed and filed for each presenter being recorded. Individuals not complying with this policy will be asked to leave a given session and asked to surrender their film or recording media.

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 exhibition hall.

Underage Persons on Show 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.

Photography

Personal photographs and video taping of individual booths (and their displays) is not allowed without the explicit permission from the company representative on-site. Failure to obtain consent could result in losing your film and being asked to leave the Exhibition Hall.

For Authors & Presenters

Speakers Check In Desk

Orlando World Center Marriott Resort & Convention Center, Los Angeles Room

Monday through Friday . . . . . 7:30 am to 5:00 pm

All conference rooms will have a computer, LCD projector, screen, lapel microphone, and laser pointer. All Presenters are requested to come to the speaker audiovisual desk to confirm display settings of their presentations from their memory devices or laptops with the audiovisual equipment being used at this symposium.

Interactive Poster Sessions Set-Up Instructions

Setup

Poster presenters may set up between 10:00 am and 5:00 pm on their scheduled presentation day. Posters that are not set-up by the 5:00 pm cut-off time will be considered no-show and their manuscript will not be published.

Removal

Presenters must remove their posters immediately after their respective 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 a poster session.

Display Hours

Tuesday & Thursday . . . . . 6:00 to 7:30 pm

Important 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 Audiovisual 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. In California, it is a criminal misdemeanor to shine a laser pointer at individuals "who perceive they are at risk."

Meals and Refreshments

Breakfast Breads

North Tower Lobby and Crystal Atrium Lobby

Breakfast breads and coffee will be served from 7:30 to 8:30 am Monday through Friday for Symposium attendees.

Coffee Breaks

Coffee will be served in the North Tower Lobby and Crystal Atrium Lobby at the following times:

Monday though Friday . . . . . 10:00 to 11:00 am, 3:00 to 4:00 pm

Check individual conference listings for actual break times.

Desserts

Dessert snacks will be served in the Exhibition Hall, (Palms and Crystal Ballrooms) Tuesday & Wednesday from 3:00 to 3:30 pm during the coffee break. Complimentary dessert tickets will be included in attendee registration packets.

Lunch Locations

The Marriott has added several grab-and-go sandwich stations near the Food Court. Champions and the Poolside Grill will also be open.

Visitor Information Desk

Guests can visit the Concierge desk in the main lobby for guest services, restaurant reservations, Disney transportation, etc.

Child Care

All About Kids Professional Child Care, (407) 812-9300, www.All-About-Kids.com, or email 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.

Guest Hospitality Suite

Guests of attendees are invited to meet, relax, and enjoy a cup of coffee and breakfast breads in SPIE's Guest Hospitality Suite at the Marriott World Center. The Suite will be open Tuesday through Thursday from 8:30 to 10:00 am. This event is for guests of Defense and Security Symposium attendees only. This hospitality suite is sponsored by SPIE.

Hertz Car Rental has been selected as 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# 029B0010.**

In the United States call 1-800-654-2240.

Shuttles & Taxis, etc.

Mears Motor Shuttle

If you are not in need of a rental car, SPIE recommends you take advantage of discounted rates on the Mears Motor Shuttle transportation between the airport and the hotel. SPIE has negotiated a discounted rate for use of this transportation mode. 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. Shuttles depart from the airport approximately every 30 minutes. To arrange your 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 your vehicle. 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 **www.spie.org/events/dssadvance** under Travel/General. Please plan to allow three hours prior to your flight time for your transfer to the airport.

Taxi

Yellow Cab Company is the oldest and largest ground transportation company, in business since 1939. Yellow Cab **sedans** will accommodate up to FIVE (5) passengers and Yellow Cab **vans** will accommodate up to SEVEN (7) passengers. Rates are not per person, but per vehicle, in fact **5 passengers or 7, 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 $42 one way from the airport to the Orlando World Center Marriott. Prices are subject to change. 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 under insured or not insured at all. For more information requesting Taxi Service while in Orlando, call (407) 422-2222, or email **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. Gratuity is extra. Two or more flights will not be combined in one transfer. 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 Diner's), traveler's checks or cash are accepted (no personal checks). Call toll free 1-877-248-9965, local phone (407) 854-3999.

Parking and Shuttles

The Premium Outlet Mall will not be able to support a shuttle service to the Orlando World Center Marriott (OWC Marriott) as previously published. We apologize in advance for any inconvenience this may cause. SPIE has worked with the OWC Marriott to provide complimentary parking and shuttles from the Disney Wide World of Sports parking lot.

Those arriving after 8:30am are unlikely to find parking available at the OWC Marriott. SPIE and the OWC Marriott recommend parking at the Disney Wide World of Sports. Primary shuttle hours will be 7am to 8pm. The daily schedule will be posted onsite. If you are staying at the Caribe Royale or the Marriott Village-Springhill Suites shuttles are available as published. Please check with the front desk.

Disney Wide World of Sports

700 Victory Way
Kissimmee, FL 34747

Directions to parking lot:
Traveling Eastbound on I-4 (from Tampa):

1. Take Exit 65 (Osceola Parkway) toward Animal Kingdom/Wide World of Sports.
2. After exit loop, remain in right-hand lane and proceed northbound toward Disney.
3. Proceed on Osceola Parkway approximately one mile and prepare to turn left at traffic signal.
4. Turn left at Victory Way following signs to Disney's Wide World of Sports.
5. Victory Way will turn to the right into Sports Complex.
6. Proceed into parking lot for the Sports Complex.

Traveling Westbound on I-4 (from Orlando):

1. Take Exit 65 (Osceola Parkway) toward Animal Kingdom/Wide World of Sports.
2. Upon exiting remain in right-hand lane and proceed northbound toward Disney.
3. Proceed on Osceola Parkway approximately one-half mile and prepare to turn left at traffic signal.
4. Turn left at Victory Way following signs to Disney's Wide World of Sports.
5. Victory Way will turn to the right into Sports Complex.
6. Proceed into parking lot for the Sports Complex.

Driving to the Meeting

Toll roads consist of cash lanes and pass lanes. Some cash lanes make change, some require exact change. Driving directions below include those specifics. Each toll pass lane will accept O-Pass, E-Pass and Sun Pass, which are prepaid passes popular with daily commuters. **Cash toll rates are subject to change at any time**.

Driving Directions from Orlando International Airport to Orlando World Center Marriott

Take Route 417 (Central Florida Greenway) south to Exit 6. There are 2 tolls along 417 ($1.00 each). Proceed through the cash lanes; change can be made. Take Exit 6 (536 East). Drive through two lights and the hotel is on the right.

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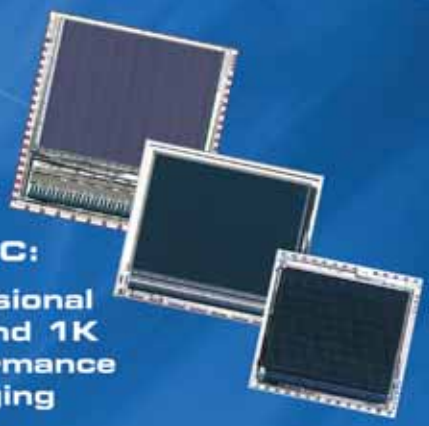

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