

# **NAECON 2018 – IEEE National Aerospace and Electronics Conference**

**Dayton, Ohio, USA  
23 – 26 July 2018**



**IEEE Catalog Number: CFP18NAE-POD  
ISBN: 978-1-5386-6558-9**

**Copyright © 2018 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP18NAE-POD
ISBN (Print-On-Demand):	978-1-5386-6558-9
ISBN (Online):	978-1-5386-6557-2
ISSN:	0547-3578

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# Table of Contents

---

---

## Plenary

<b>Autonomy in use for Information Fusion Systems</b> .....	1
Erik Blasch Air Force Office of Scientific Research	

## Aerospace Power Systems and Power Electronics

<b>A Bilevel Equalizer for Lithium Ion Batteries</b> .....	9
Ngalula Sandrine Mubenga, Thomas A. Stuart University of Toledo, University of Toledo	

<b>Holistic Control of Three-Phase Bidirectional Rectifiers</b> .....	13
Alexei V. Nikitin Nonlinear LLC	

<b>Quantifying Temperature Dependence of qd Parameters in Aerospace Synchronous Machines</b> .....	21
Brett Robbins <sup>1</sup> , Will Perdikakis <sup>2</sup> , Chase Kitzmiller <sup>3</sup> , Nate Peck <sup>4</sup> , Kevin Yost <sup>4</sup> <sup>1</sup> PC Krause & Associates, <sup>2</sup> The Ohio State University, <sup>3</sup> UES, Inc., <sup>4</sup> Air Force Research Laboratory	

<b>Model-Based Design and Real-Time Testing of Commercial More-Electric Aircraft Power Systems</b> .....	28
Zhenhua Jiang <sup>1</sup> , Hao Huang <sup>2</sup> , Xiaochuan Jia <sup>2</sup> , Jinhui Zhang <sup>2</sup> <sup>1</sup> University of Dayton, <sup>2</sup> GE Aviation Systems	

<b>A Model-Based Multi-Objective Optimization for High Efficiency and High Power Density Motor Drive Inverters for Aircraft Applications</b> .....	36
Yingzhuo Chen <sup>1</sup> , Zhao Yuan <sup>2</sup> , Fang Luo <sup>2</sup> <sup>1</sup> The Ohio State University, <sup>2</sup> University of Arkansas	

## Cooperative Autonomous Systems and Technologies (CAST) Grand Challenge

<b>Design and Implementation of a Centralized System for Autonomous Unmanned Aerial Vehicle Trajectory Conflict Resolution</b> .....	43
Max Z. Li <sup>1</sup> , William R. Tam <sup>2</sup> , Sahithya M. Prakash <sup>2</sup> , John F. Kennedy <sup>2</sup> , Megan S. Ryerson <sup>2</sup> , Daewon Lee <sup>2</sup> , Yash V. Pant <sup>2</sup> <sup>1</sup> Massachusetts Institute of Technology, <sup>2</sup> University of Pennsylvania	

<b>Accommodating Plan Revisions with Multiple Agents for Local Search in Road Networks</b> .....	52
DeVanye Moore <sup>1</sup> , Trevor J. Bihl <sup>2</sup> , Todd A. Jenkins <sup>2</sup> , Christopher Archibald <sup>1</sup> <sup>1</sup> Mississippi State University, <sup>2</sup> Air Force Research Laboratory	

<b>Connected Car Networking</b> .....	60
Teng Yang, Frank Wolff, Chris Papachristou Case Western Reserve University	

<b>Accelerating Probabilistic Optimization Solution to Autonomous Vehicles under Uncertain and Dynamic Environments</b> .....	65
Zhenhua Jiang <sup>1</sup> , Seyed Ata Raziei <sup>2</sup>	
<sup>1</sup> University of Dayton Research Institute, <sup>2</sup> University of Dayton	

## **Cybersecurity and Trusted Systems**

<b>Combination of Traditional and Deep Learning based Architectures to Overcome Class Imbalance and its Application to Malware Classification</b> .....	73
Temesguen Messay-Kebede, Barath Narayanan Narayanan, Ouboti Djaneye-Boundjou	
University of Dayton	

<b>Use of Topological Vulnerability Analysis for Cyber-physical Systems</b> .....	78
Ronald Fernandes <sup>1</sup> , Perakath Benjamin <sup>1</sup> , Biyan Li <sup>1</sup> , Andrew Stephenson <sup>1</sup> , Mayank Patel <sup>2</sup> , Jong Hwang <sup>3</sup>	
<sup>1</sup> Knowledge Based Systems, Inc., <sup>2</sup> Air Force Life Cycle Management Center, <sup>3</sup> Air Force Research Laboratory	

<b>Detecting Malicious Assembly with Deep Learning</b> .....	82
M. Santacroce <sup>1</sup> , Daniel Koranek <sup>2</sup> , David Kapp <sup>2</sup> , Anca Ralescu <sup>1</sup> , R. Jha <sup>1</sup>	
<sup>1</sup> University of Cincinnati, <sup>2</sup> Air Force Research Laboratory	

<b>Hardware Trojan Detection using Xilinx Vivado</b> .....	86
Ryan Marlow, Scott Harper, Whitney Batchelor, Jonathan Graf	
Graf Research	

<b>Guiding Software Evolution with Binary Diversity</b> .....	92
Jeremiah Greer <sup>1</sup> , Samuel Toth <sup>1</sup> , Rashmi Jha <sup>1</sup> , Anca Ralescu <sup>1</sup> , Nan Niu <sup>1</sup> , Mitchell Hirschfeld <sup>2</sup> , David Kapp <sup>2</sup>	
<sup>1</sup> University of Cincinnati, <sup>2</sup> Air Force Research Laboratory	

<b>A Novel FPGA-based LFSR PUF Design for IoT and Smart Applications</b> .....	99
Fathi Amsaad <sup>1</sup> , Ahmed Sherif <sup>1</sup> , Amer Dawoud <sup>1</sup> , Mohammed Niamat <sup>2</sup> , Selck Kose <sup>3</sup>	
<sup>1</sup> University of Southern Mississippi, <sup>2</sup> University of Toledo, <sup>3</sup> University of South Florida	

<b>FPGA IP Obfuscation using Ring Oscillator Physical Unclonable Function</b> .....	105
Noor Ahmad Hazari, Faris Alsulami, Mohammed Niamat	
University of Toledo	

<b>Toward Rapid Integration in High Assurance Mission Systems</b> .....	109
Vahid Rajabian-Schwartz <sup>1</sup> , Nicholas S. Kovach <sup>1</sup> , Matthew Maupin <sup>2</sup> , Kenneth Littlejohn <sup>1</sup>	
<sup>1</sup> Air Force Research Laboratory, <sup>2</sup> Air Force Sustainment Center	

<b>Big Data Analytics of Network Traffic and Attacks</b> .....	117
Lidong Wang, Randy Jones	
Mississippi State University	

<b>Cross-domain Autonomous Communication Protocol for Delay Tolerant Networks</b> .....	124
Mehmet Adalier <sup>1</sup> , Scott Burleigh <sup>2</sup>	
<sup>1</sup> Antara Teknik LLC, <sup>2</sup> Jet Propulsion Laboratory	

<b>A Framework for Aviation Cybersecurity</b> .....	132
Jon C. Haass, J. Philip Craiger, Gary C. Kessler	
Embry-Riddle Aeronautical University	

<b>A Signal Verification Approach to Cognitive Radio Network Security</b> .....	137
Md Tanzin Farhat <sup>1</sup> , Ahmad Y. Javaid <sup>1</sup> , Vijay Devabhaktuni <sup>1</sup> , Zhiqiang Wu <sup>2</sup>	
<sup>1</sup> University of Toledo, <sup>2</sup> Wright State University	

<b>Spectrum Sensing Falsification Detection in Dense Cognitive Radio Networks using a Greedy Method</b> .....	144
John Kelly, Jonathan Ashdown Air Force Research Laboratory	
<b>Ransomware Detection using Limited Precision Deep Learning Structure in FPGA</b> .....	152
Khaled Alrawashdeh, Carla Purdy University of Cincinnati	
<b>Unauthentic IC Countermeasures for Future Integrity of the Semiconductor Supply Chain</b> .....	158
Pallavi Ebenezer, Degang Chen, Randall Geiger Iowa State University	
<b>Protecting Embedded Systems from Zero-Day Attacks</b> .....	165
Stephen Taylor Dartmouth College	
 <b>Deep Learning and Artificial Intelligence</b>	
<b>Machine Learning based Modeling Attacks on a Configurable PUF</b> .....	169
Sharad Kumar, Mohammed Niamat University of Toledo	
<b>A Comparative Study of Different Curve Fitting Algorithms in Artificial Neural Network using Housing Dataset</b> .....	174
Ali Al Bataineh, Devinder Kaur University of Toledo	
<b>Machine Learning Applied to an RF Communication Channel</b> .....	179
Mathew McCaskey <sup>1</sup> , Emily Kukura <sup>1</sup> , Robert Corrigan <sup>1</sup> , Kul Bhasin <sup>1</sup> , David Chelmins <sup>2</sup> <sup>1</sup> Comsat Architects, <sup>2</sup> NASA Glenn Research Center	
<b>Convolutional Neural Networks for Aerial Vehicle Detection and Recognition</b> .....	186
Amir Soleimani <sup>1</sup> , Nasser M. Nasrabadi <sup>1</sup> , Elias Griffith <sup>2</sup> , Jason Ralph <sup>2</sup> , Simon Maskell <sup>2</sup> <sup>1</sup> West Virginia University, <sup>2</sup> University of Liverpool	
<b>Enhancing the Parallelization of Backpropagation Neural Network Algorithm for Implementation on FPGA Platform</b> .....	192
Ali Al Bataineh <sup>1</sup> , Devinder Kaur <sup>1</sup> , Amin Jarrah <sup>2</sup> <sup>1</sup> University of Toledo, <sup>2</sup> Yarmouk University	
<b>Improving Inertial Sensor by Reducing Errors using Deep Learning Methodology</b> .....	197
Hua Chen <sup>1</sup> , Priyanka Aggarwal <sup>2</sup> , Tarek M. Taha <sup>1</sup> , Vamsy P. Chodavarapu <sup>1</sup> <sup>1</sup> University of Dayton, <sup>2</sup> Prixarc LLC	
<b>A Multi-Modular Sensor Fusion and Decision-Making Approach for Human-Machine Teaming</b> .....	203
Mohammed I. Thanoon, Charles D. McCurry, M. Saleh Zein-Sabatto Tennessee State University	
<b>Knowledge Acquisition in the Cockpit using One-Shot Learning</b> .....	208
Evana Gizzi <sup>1</sup> , Lisa Le Vie <sup>2</sup> , Mattias Scheutz <sup>1</sup> , Vasanth Sarathy <sup>1</sup> , Jivko Sinapov <sup>1</sup> <sup>1</sup> Tufts University, <sup>2</sup> NASA Langley Research Center	
<b>Designed Complex Adaptive Systems Exhibiting Weak Emergence</b> .....	214
Kerrin S. Neace, Mary Beth A. Chipkevich Johns Hopkins University Applied Physics Laboratory	

<b>Microscopic Blood Cell Classification using Inception Recurrent Residual Convolutional Neural Networks</b> .....	222
Md Zahangir Alom, Chris Yakopcic, Tarek M. Taha, Vijayan K. Asari University of Dayton	
<b>Nuclei Segmentation with Recurrent Residual Convolutional Neural Network based U-Net (R2U-Net)</b> .....	228
Md Zahangir Alom, Chris Yakopcic, Tarek M. Taha, Vijayan K. Asari University of Dayton	
<b>Onboard Image Processing for Small Satellites</b> .....	234
Austin P. Arechiga, Alan J. Michaels, Jonathan T. Black Virginia Polytechnic Institute and State University	
<b>High Speed Approximate Cognitive Domain Ontologies for Asset Allocation based on Isolated Spiking Neurons</b> .....	241
Chris Yakopcic <sup>1</sup> , Tanvir Atahary <sup>1</sup> , Tarek M. Taha <sup>1</sup> , Alex Beigh <sup>2</sup> , Scott Douglass <sup>3</sup> <sup>1</sup> University of Dayton, <sup>2</sup> University of Dayton Research Institute, <sup>3</sup> Air Force Research Laboratory	
<b>Task Allocation Performance Comparison for Low Power Devices</b> .....	247
Nayim Rahman <sup>1</sup> , Tanvir Atahary <sup>1</sup> , Chris Yakopcic <sup>1</sup> , Tarek M. Taha <sup>1</sup> , Scott Douglass <sup>2</sup> <sup>1</sup> University of Dayton, <sup>2</sup> Air Force Research Laboratory	
<b>Deep Learning Measures of Effectiveness</b> .....	254
Erik Blasch <sup>1</sup> , Shuo Liu <sup>2</sup> , Zheng Liu <sup>2</sup> , Yufeng Zheng <sup>3</sup> <sup>1</sup> Air Force Office of Scientific Research, <sup>2</sup> University of British Columbia, <sup>3</sup> Alcorn State University	
<b>Digital Signal and Image Processing</b>	
<b>Performance Analysis of Feature Selection Techniques for Support Vector Machine and its Application for Lung Nodule Detection</b> .....	262
Barath Narayanan Narayanan, Russell C. Hardie, Temesguen M. Kebede University of Dayton	
<b>Demonstration of Thermo-optical Infrared Image Defocus and Correction</b> .....	267
Woo-Yong Jang <sup>1</sup> , James Park <sup>2</sup> , Robert Schueler <sup>3</sup> , Gregory Phillips <sup>4</sup> , Michael Noyola <sup>2</sup> , Augustine Urbas <sup>2</sup> <sup>1</sup> University of Dayton Research Institute, <sup>2</sup> Air Force Research Laboratory, <sup>3</sup> Riverside Research, <sup>4</sup> Defense Engineering Corporation	
<b>Multiple Objects Detection using HSV</b> .....	270
Kayla Cameron, Md Shafiul Islam Florida State University	
<b>Harmonic Distortion Estimate for Damage Detection</b> .....	274
Pietro Burrascano <sup>1</sup> , Stefano Laureti <sup>1</sup> , Marco Ricci <sup>2</sup> <sup>1</sup> Università degli Studi di Perugia, <sup>2</sup> University of Calabria	
<b>Real-time 3D Scene Reconstruction and Localization with Surface Optimization</b> .....	280
Ruixu Liu, Tao Peng, Vijayan K. Asari, John S. Loomis University of Dayton	
<b>Parallelized Interactive Machine Learning on Autonomous Vehicles</b> .....	286
Xi Chen, Caylin Hickey University of Kentucky	
<b>Road Pothole Detection System based on Stereo Vision</b> .....	292
Yaqi Li, Christos Papachristou, Daniel Weyer Case Western Reserve University	

<b>Improved Image Processing in Quaternary Logic</b> .....	298
Supriya Karmakar <sup>1</sup> , Sayantani Karmakar <sup>2</sup>	
<sup>1</sup> Farmingdale State College-SUNY, <sup>2</sup> Portland State University	

<b>Target Tracking using Friendship Paradox</b> .....	303
Sujay Bhatt <sup>1</sup> , Vikram Krishnamurthy <sup>1</sup> , Muralidhar Rangaswamy <sup>2</sup>	
<sup>1</sup> Cornell University, <sup>2</sup> Air Force Research Laboratory	

## **Electronic Warfare**

<b>Analysis of Kinematic Model Effects on SAR ECM</b> .....	309
David Pyles <sup>1</sup> , Michael A. Saville <sup>2</sup>	
<sup>1</sup> MacAulay-Brown, Inc., <sup>2</sup> Wright State University	

<b>Quantifying Error Estimates as Functions of Signal-to-Noise Ratio in a Multi-Tier Weak Radio Signal Detection Process with N Simultaneous Signals</b> .....	318
M.Y. Lanzerotti <sup>1</sup> , C.L. Cerny <sup>2</sup> , M. Current <sup>3</sup> , R.K. Martin <sup>4</sup>	
<sup>1</sup> United States Military Academy, <sup>2</sup> Air Force Research Laboratory, <sup>3</sup> Augsburg College, <sup>4</sup> Air Force Institute of Technology	

## **Emerging Electronics and Microsystems**

<b>Ultrasensitive Label-Free Tobramycin Detection with Aptamer-Functionalized ZnO TFT Biosensor</b> .....	331
Abhijeet Barua, Thinh H. Nguyen, Yao Wu, Vishal M. Jain, Ryan J. White, Rashmi Jha	
University of Cincinnati	

<b>Effects of Control-FET Gate Resistance on False Turn-on in GaN based Point of Load Converter</b> .....	339
Naga Babu Koganti, Shankar Dhakal, Roshan L. Kini, Michael R. Hontz, Raghav Khanna	
University of Toledo	

<b>A Real-Time Automatic Stability Optimization Loop (SOL) for MEMS-Referenced Oscillators</b> .....	344
Mohammad S. Islam, Soumyajit Mandal	
Case Western Reserve University	

<b>Reliability Analysis of Nano-CMOS Logic Gates under Process Induced Variations</b> .....	350
Srinivasa Vemuru, Sandeep Vittala	
Ohio Northern University	

<b>A Generalized 1-Dimensional Temperature Model for Mass Via Arrays (MVA)</b> .....	356
Devin A. Smarra, Michael C. Wicks, Vamsy P. Chodavarapu	
University of Dayton	

<b>A Stencil Printed Textile-based Silver-Zinc Battery for Powering Sensors</b> .....	362
Akash Kota, Nilan Mani, Amy T. Neidhard-Doll, Vamsy P. Chodavarapu	
University of Dayton	

<b>A Clip-on Shoe-Mounted Wearable System for Gait Analysis</b> .....	366
Pooya Merat <sup>1</sup> , Edward J. Harvey <sup>1</sup> , Georgios D. Mitsis <sup>1</sup> , Vamsy P. Chodavarapu <sup>2</sup>	
<sup>1</sup> McGill University, <sup>2</sup> University of Dayton	

<b>Experimental Study of Memristors for use in Neuromorphic Computing</b> .....	370
Ayesha Zaman, Eunsung Shin, Chris Yakopcic, Tarek M. Taha, Guru Subramanyam	
University of Dayton	

## Low SWaP Sensor Processing

- Investigation of Multicore SoCs for On-Board Feature Detection and Segmentation of Images** ..... 375  
Barath Ramesh, Eric Shea, Alan D. George  
University of Pittsburgh
- Accelerating Inference in Long Short-Term Memory Neural Networks** ..... 382  
Thomas Mealey<sup>1</sup>, Tarek M. Taha<sup>2</sup>  
<sup>1</sup>The MathWorks, Inc., <sup>2</sup>University of Dayton
- Generalized Power Modeling for Deep Learning** ..... 391  
William Mitchell<sup>1</sup>, Stefan Westberg<sup>1</sup>, Anthony Reiling<sup>1</sup>, Tarek Taha<sup>1</sup>, Eric Balster<sup>1</sup>, Kerry Hill<sup>2</sup>  
<sup>1</sup>University of Dayton, <sup>2</sup>Air Force Research Laboratory

## Machine Learning, Guidance and Control

- Design of a Stochastic Basis Function Artificial Neural Network Controller for Quadrotors Flight in the Presence of Model and Aerodynamic Uncertainties** ..... 395  
Ahmed Mekky, Thomas E. Alberts  
Old Dominion University
- Access Point Selection using Particle Swarm Optimization in Indoor Positioning Systems** ..... 403  
Ahmed K. Abed<sup>1</sup>, Ikhlas Abdel-Qader<sup>2</sup>  
<sup>1</sup>Thi-Qat University, <sup>2</sup>Western Michigan University
- Verification of Random Number Generators for Embedded Machine Learning** ..... 411  
Jonathan Lockhart, Khaled Al Rawashdeh, Carla Purdy  
University of Cincinnati
- A Rapid Situational Awareness Development Framework for Heterogeneous Manned-Unmanned Teams** ..... 417  
Aditya Das, Patrik Kolaric, Cody Lundberg, Kris Doelling, Hakki Erhan Sevil, Frank Lewis  
University of Texas at Arlington
- 3-D Graphical Representation for Indoor Objects based on a Bayesian Model** ..... 425  
Tarek Elderini<sup>1,2</sup>, Naima Kaabouch<sup>1</sup>, Jeremiah Neubert<sup>1</sup>  
<sup>1</sup>University of North Dakota, <sup>2</sup>Arab Academy for Science, Technology & Maritime Transport
- A Leaf Recognition Approach to Plant Classification using Machine Learning** ..... 431  
Redha Ali<sup>1</sup>, Russell Hardie<sup>1</sup>, Almabrok Essa<sup>2</sup>  
<sup>1</sup>University of Dayton, <sup>2</sup>Cleveland State University
- Design and Implementation of Linear/Nonlinear Control Methods on 3-DOF Helicopter** ..... 435  
Ajith Kumar Veeraboina, Raúl Ordóñez  
University of Dayton
- Nonlinear Model Predictive Motion Control of Differential Wheeled Robots** ..... 443  
Seyed Ata Raziei<sup>1</sup>, Zhenhua Jiang<sup>2</sup>  
<sup>1</sup>University of Dayton, <sup>2</sup>University of Dayton Research Institute
- Interaction of Fractional Order Adaptive Law and Fractional Order PID Controller for The Ball and Beam Control System** ..... 451  
Mohamed Aburakhis, Raúl Ordóñez  
University of Dayton
- Two-Pursuer, One-Evader Pursuit Evasion Differential Game** ..... 457  
Zachariah E. Fuchs<sup>1</sup>, Eloy Garcia<sup>2</sup>, David W. Casbeer<sup>2</sup>  
<sup>1</sup>Wright State University, <sup>2</sup>Air Force Research Laboratory



## Photonics Devices and Systems

- Double-Pointed Optical Antenna in the Longwave Infrared (LWIR) Spectral Regime** ..... 465  
Ainaz GhafaryAghdam<sup>1</sup>, Boyang Xiang<sup>1</sup>, Lin Li<sup>1</sup>, Thitikorn Kemsri<sup>1</sup>, Guiru Gu<sup>2</sup>, Xuejun Lu<sup>1</sup>  
<sup>1</sup>University of Massachusetts Lowell, <sup>2</sup>Stonehill College
- Optimal Sphere-Sensor Ratio Determination for Sapphire Microsphere-Enhanced SLS-lattice-II Sensors in Reflecting and Refracting Telescopes & Cameras** ..... 470  
P. Mack<sup>1</sup>, D.B. Megherbi<sup>1</sup>, J. DiZoglio<sup>1</sup>, M.I. Vakil<sup>2</sup>, N. Limberopoulos<sup>2</sup>, A. Urbas<sup>2</sup>  
<sup>1</sup>University of Massachusetts Lowell, <sup>2</sup>Air Force Research Laboratory
- Electromagnetic Propagation across an Achiral/Chiral (Dispersive) Boundary using Phasor Approach to Fresnel Coefficients** ..... 475  
Rajab Y. Ataa, Monish R. Chatterjee  
University of Dayton
- Impact of Dielectric and Magnetic Losses on the Negative Index Characteristics of a Chiral Material with First-Order Sideband Dispersion** ..... 481  
Monish R. Chatterjee, Salaheddeen G. Bugoffa  
University of Dayton
- Free Space Optical System Performance using Non-Kolmogrov Spectrum over Gamma-Gamma Turbulent Atmosphere** ..... 487  
Elforjani Jera, Sichao Zhou  
University of Dayton
- Rigorous Approach to Simulate Electromagnetic Interactions in Biological Systems** ..... 491  
Kenneth W. Allen<sup>1</sup>, William D. Hunt<sup>2</sup>, Jonathan D. Andreassen<sup>1</sup>, John D. Farnum<sup>1</sup>, Alex Saad-Falcon<sup>1</sup>, Ryan S. Westafer<sup>1</sup>, Douglas R. Denison<sup>1</sup>  
<sup>1</sup>Georgia Tech Research Institute, <sup>2</sup>Georgia Institute of Technology
- Microconical Arrays as Novel Light-Concentrating Structures for Enhancing Sensitivity, Angle-of-View, and Reducing Dark Current of mid-IR FPAs** ..... 496  
Aaron Brettin<sup>1</sup>, Nicholas I. Limberopoulos<sup>2</sup>, Igor Anisimov<sup>2</sup>, Augustine M. Urbas<sup>2</sup>, Vasily N. Astratov<sup>1,2</sup>  
<sup>1</sup>University of North Carolina at Charlotte, <sup>2</sup>Air Force Research Laboratory
- The Art of the Impossible: Sorting Dielectric Microspheres by using Light** ..... 499  
Luiz Poffo<sup>1,2</sup>, Farzaneh Abolmaali<sup>1</sup>, Aaron Brettin<sup>1</sup>, Boya Jin<sup>1</sup>, James Page<sup>1</sup>, Nicholas I. Limberopoulos<sup>3</sup>, Igor Anisimov<sup>3</sup>, Ilya Vitebskiy<sup>3</sup>, Augustine M. Urbas<sup>3</sup>, Alexey V. Maslov<sup>4</sup>, Vasily N. Astratov<sup>1,3</sup>  
<sup>1</sup>University of North Carolina at Charlotte, <sup>2</sup>Université de Rennes, <sup>3</sup>Air Force Research Laboratory, <sup>4</sup>University of Nizhny Novgorod

## Poster

- An Adaptive Technique for Automatic Region Detection and Extraction of FTIR Spectral Material Absorption for Mid-Wave Infrared Microsphere-Lens-Enhanced Type II Strained Layer Super-Lattice Photodetectors** ..... 503  
J. DiZoglio<sup>1</sup>, D.B. Megherbi<sup>1</sup>, P. Mack<sup>1</sup>, M.I. Vakil<sup>2</sup>, N. Limberopoulos<sup>2</sup>, A. Urbas<sup>2</sup>  
<sup>1</sup>University of Massachusetts Lowell, <sup>2</sup>Air Force Research Laboratory
- Safe Design of Controller for Smart Communicating Vehicles** ..... 508  
Salam Hajjar  
Marshall University
- Plasma Treatment Effects on Nanocrystalline ZnO Thin-Film Transistors** ..... 513  
Blaine Z. Underwood  
Air Force Institute of Technology

<b>Frequency Diverse Array Antenna for Tracking Low Earth Orbit Satellites</b> .....	516
Issa M. Elbelazi, Michael C. Wicks University of Dayton	
<b>Deep Reinforcement Learning for Autonomous Search and Rescue</b> .....	521
Juan Gonzalo Cárcamo Zuluaga, Jonathan P. Leidig, Christian Trefftz, Greg Wolffe Grand Valley State University	
<b>Optimal Threshold Selection and Efficacy Evaluation for a Generic dc Series Arc Detection Algorithm</b> .....	525
Eric Bauer <sup>1</sup> , Martin Troth <sup>1</sup> , Jin Wang <sup>1</sup> , Daniel Schweickart <sup>2</sup> , Dennis Grosjean <sup>3</sup> <sup>1</sup> The Ohio State University, <sup>2</sup> Air Force Research Laboratory, <sup>3</sup> Innovative Scientific Solutions, Inc.	
<b>Visualization and Prediction of Aircraft Trajectory using ADS-B</b> .....	529
Sai Teja Kanneganti, Phillip B. Chilson, Robert Huck University of Oklahoma	
<b>Towards Fabrication of mid-IR FPAs with Enhanced Sensitivity and Reduced Dark Current by using Integration with Microspherical Arrays</b> .....	533
Aaron Brettin <sup>1</sup> , Farzaneh Abolmaali <sup>1</sup> , Nicholas I. Limberopoulos <sup>2</sup> , Andrew Green <sup>2</sup> , Igor Anisimov <sup>2</sup> , Augustine M. Urbas <sup>2</sup> , Vasily N. Astratov <sup>1,2</sup> <sup>1</sup> University of North Carolina at Charlotte, <sup>2</sup> Air Force Research Laboratory	
<b>Superresolution Imaging of Fluorescent Nanospheres by using High Index Microspheres Embedded in Slabs with Illumination Provided by Plasmonic Array</b> .....	536
Aaron Brettin <sup>1</sup> , Cobey L. McGinnis <sup>1</sup> , Farzaneh Abolmaali <sup>1</sup> , Nicholas I. Limberopoulos <sup>2</sup> , Dennis Walker <sup>2</sup> , Augustine M. Urbas <sup>2</sup> , Luiz Poffo <sup>3</sup> , Alexey V. Maslov <sup>4</sup> , Vasily N. Astratov <sup>1,2</sup> <sup>1</sup> University of North Carolina at Charlotte, <sup>2</sup> Air Force Research Laboratory, <sup>3</sup> Université de Rennes, <sup>4</sup> University of Nizhny Novgorod	
<b>Observation of the Resonantly Enhanced Resolution of Imaging of Fluorescent Nanospheres due to their Coupling to the Metallic Nanoplasmonic Arrays</b> .....	540
Farzaneh Abolmaali <sup>1</sup> , Luiz Poffo <sup>2</sup> , Aaron Brettin <sup>1,3</sup> , Dennis E. Walker <sup>3</sup> , Nicholas I. Limberopoulos <sup>3</sup> , Igor Anisimov <sup>3</sup> , Augustine M. Urbas <sup>3</sup> , Alexey V. Maslov <sup>4</sup> , Vasily N. Astratov <sup>1,3</sup> <sup>1</sup> University of North Carolina at Charlotte, <sup>2</sup> Université de Rennes, <sup>3</sup> Air Force Research Laboratory, <sup>4</sup> University of Nizhny Novgorod	
<b>Radar, Tomography and RF Sensing</b>	
<b>Improving Below Ground Radar Imagery of Targets Obscured by Metal Plates</b> .....	544
Abdunaser Abdusamad, Muftah Akrousch, Michael C. Wicks University of Dayton	
<b>Tracking a Moving Object for Tomographic Below Ground Imaging</b> .....	550
Abdulhakim A. Daluom, Michael C. Wicks University of Dayton	
<b>Analysis of Damage in Unidirectional CFRP Circuit Analog Absorbers</b> .....	555
Joseph C. O'Donnell, Ram M. Narayanan, Erik H. Lenzing The Pennsylvania State University	
<b>Operational Reliability of Radar Systems</b> .....	561
Tyler D. Ridder, Ram M. Narayanan The Pennsylvania State University	
<b>Multifunctional Radar and Communications Waveform using Chaos</b> .....	568
Caden J. Pici, Ram M. Narayanan The Pennsylvania State University	

<b>Suppression of Strong Sidelobes Masking Weak Targets using Multiplicative Algebraic Reconstruction Techniques (MART)</b> .....	573
Muftah Akroush, Michael C. Wicks, Abdunaser Abdusamad University of Dayton	
<b>Radio Frequency Tomographic Reconstruction based on Convolutional Neural Networks</b> .....	578
Jia Li <sup>1</sup> , Robert L. Ewing <sup>2</sup> , Xiaopang Shen <sup>3</sup> <sup>1</sup> Oakland University, <sup>2</sup> Air Force Research Laboratory, <sup>3</sup> Ohio University	
<b>Practical Design Considerations for Broadband Cognitive Radio Systems: Co-existence</b> .....	583
Jian Shao <sup>1</sup> , Junning Jiang <sup>1</sup> , Aydin Karsilayan <sup>1</sup> , Jose Silva-Martinez <sup>1</sup> , Christopher Rodenbeck <sup>2</sup> <sup>1</sup> Texas A&M University, <sup>2</sup> US Naval Research Laboratory	
<b>Radar Jamming Suppression using Clipping based Pulse Integration</b> .....	587
Sohail Ahmed <sup>1</sup> , Furqan Abbasi <sup>1</sup> , Usman Iqbal Ahmed <sup>2</sup> <sup>1</sup> Air University, <sup>2</sup> College of Aeronautical Engineering	
<b>A Low-Complexity Nonparametric STAP Detector</b> .....	592
Ahmed A. Abouelfadl, Ioannis Psaromiligkos, Benoit Champagne McGill University	
<b>Integrating Vanadium Dioxide Switch Technology in Reconfigurable Antenna Array Feed Networks</b> .....	597
Joshua M. Kovitz, Kenneth W. Allen Georgia Tech Research Institute	
<b>Wideband Phased Array Antenna Design with Fragmented Combiner Technology</b> .....	602
David W. Landgren <sup>1</sup> , Theresa Brunasso <sup>2</sup> , James B. Dee <sup>1</sup> , Jonathan Perez <sup>1</sup> , Daniel J.P. Dykes <sup>1</sup> , Jeramy M. Marsh <sup>1</sup> , Charles P. Hunter <sup>1</sup> , Kenneth W. Allen <sup>1</sup> <sup>1</sup> Georgia Tech Research Institute, <sup>2</sup> D&S Microwave, Inc.	
<b>Practical Considerations for Broadband Cognitive Radio Systems: On-chip Spectrum Sensing</b> .....	607
Junning Jiang <sup>1</sup> , Jian Shao <sup>1</sup> , Tanwei Yan <sup>1</sup> , Aydin Karsilayan <sup>1</sup> , Jose Silva-Martinez <sup>1</sup> , Christopher T. Rodenbeck <sup>2</sup> <sup>1</sup> Texas A&M University, <sup>2</sup> U.S. Naval Research Laboratories	
<b>AoA Estimation using an Array of Diversely Polarized Microstrip Antenna</b> .....	611
Faraj Abdelhafeid, Robert Penno University of Dayton	
<b>Reconstruction of Reflector Surface Deformations using Back-Projection</b> .....	618
Karthik Devarajan Raghunathan, Shakthi Priya Gowri University of Texas at Dallas	
 <b>Terahertz and Millimeter Wave Devices</b>	
<b>Indium Tin Oxide/Barium Strontium Titanate THz Sensor Antenna</b> .....	622
Sai Dittakavi, Ibrahim Abdel-Motaleb Northern Illinois University	