

# **Proceedings of the IEEE 2010 National Aerospace and Electronics Conference**

**(NAECON 2010)**

**Dayton, Ohio, USA  
14-16 July 2010**



**IEEE Catalog Number: CFP10NAE-PRT  
ISBN: 978-1-4244-6576-7**

# TABLE OF CONTENTS

---

---

## Collaborative & Cognitive Processing

CC01

<b>Trust Model for Semantic Sensor and Social Networks: A Preliminary Report</b> .....	1
Pramod Anantharam, Wright State University	
Cory A. Henson, Wright State University	
Krishnaprasad Thirunarayan, Wright State University	
Amit P. Sheth, Wright State University	

CC02

<b>A Concept for Reducing Workload in a High-Volume Layered Sensing Collaborative Environment by Employing Sensor Web Enablement and Reasoning Systems</b> .....	6
John Hudson, SAIC	

CC03

<b>Biomimetic Learning, Not Learning Biomimetics: A Survey of Developmental Learning</b> .....	11
Alan L. Jennings, University of Dayton	
Raúl Ordóñez, University of Dayton	

CC05

<b>Review of Trust Research from an Interdisciplinary Perspective – Psychology, Sociology, Economics, and Cyberspace</b> .....	18
Simin Hall, Virginia Tech	
William McQuay, Air Force Research Laboratory	

CC06

<b>Teaching an Undergraduate Electromechanical Course</b> .....	26
Max Rabiee, University of Cincinnati	

CC08

<b>Graphical and Statistical Communication Patterns of Automated Conversational Agents in Collaborative Computer-Mediated Communication Systems</b> .....	34
John McIntire, Air Force Research Laboratory	
Paul Havig, Air Force Research Laboratory	
Katheryn Farris, Air Force Research Laboratory	
Lindsey McIntire, Infoscitex Corporation	

CC09

<b>Formal Verification of Layered Sensing Architectures</b> .....	41
Benjamin Tyler, Edaptive Computing, Inc.	
Adam Langdon, Edaptive Computing, Inc.	
Praveen Chawla, Edaptive Computing, Inc.	

## Radar Signal & Image Processing

RI01

<b>Automated Image Segmentation for Synthetic Aperture Radar Feature Extraction</b> .....	45
Julie Ann Jackson, AFIT	

<b>RI02</b>	<b>Effects of Polarization on Wide-Angle SAR Classification Performance .....</b>	50
	Kerry E. Dungan, Ohio State University	
	Lee C. Potter, Ohio State university	
<b>RI03</b>	<b>WiMAX Ambiguity Function for PCL Systems .....</b>	54
	José R. Gutiérrez del Arroyo, AFIT	
	Julie Jackson, AFIT	
	Michael Temple, AFIT	
<b>RI04</b>	<b>Robust Wideband Beamforming .....</b>	60
	Zhen Hu, Tennessee Tech University	
	Nan Guo, Tennessee Tech University	
	Robert Qiu, Tennessee Tech University	
	Jason Bonior, Tennessee Tech University	
	Lihyeh Liou, Air Force Research Laboratory	
	David Lin, Air Force Research Laboratory	
	Matthew Longbrake, Air Force Research Laboratory	
	Peter Buxa, Air Force Research Laboratory	
	Thomas Dalrymple, Air Force Research Laboratory	
	Stephen Hary, Air Force Research Laboratory	
	James Tsui, Air Force Research Laboratory	
<b>RI05</b>	<b>The Effect of the Number of Modes and Feed Locations in Angle-of-Arrival Estimation using a Multimode Antenna .....</b>	65
	Geoffrey A. Akers, AFIT	
	Clair F. Corbin, AFIT	
<b>RI06</b>	<b>A Faster and Accurate Method for Spectral Testing Applicable to Noncoherent Data .....</b>	70
	Minshun Wu, Xi'an Jiaotong University and Iowa State University	
	Degang Chen, Iowa State University	
	Guican Chen, Xi'an Jiaotong University	
<b>RI07</b>	<b>Ground-UAV Platform Geometries for Radar Imaging .....</b>	76
	Atindra K. Mitra, Air Force Research Laboratory	
<b>RI08</b>	<b>Collision-Avoidance Radar for Bicyclist and Runners .....</b>	84
	April Johnson, Wright State University	
	Cara Rupp, Wright State University	
	Brad Wolf, Wright State University	
	Lang Hong, Wright State University	
	Atindra Mitra, Air Force Research Laboratory	
<b>RI09</b>	<b>GPU-Enabled High Performance Feature Modeling for ATR Applications .....</b>	92
	Michael P. Dessauer, Louisiana Tech University	
	Joshua Hitchens, Louisiana Tech University	
	Sumeet Dua, Louisiana Tech University	

<b>RI10</b>		
<b>SUMATRA: Supervised Modeling of ATR Algorithms .....</b>		99
Ranga Narayanaswami, Scientific Systems Company, Inc.		
Avinash Gandhe, Scientific Systems Company, Inc.		
Raman K. Mehra, Scientific Systems Company, Inc.		
<b>RI11</b>		
<b>Multitarget Tracking Performance Analysis using the Non-Credibility Index in the Nonlinear Estimation Framework (NEF) Toolbox .....</b>		107
Erik P. Blasch, Defence R&D Canada-Valcartier		
Ondřej Straka, University of West Bohemia		
Jindřich Duník, University of West Bohemia		
Miroslav Šimandl, University of West Bohemia		
<b>RI12</b>		
<b>Optimization of Image Fusion using Genetic Algorithms and the Discrete Wavelet Transform .....</b>		116
Chaunté W. Lacewell, North Carolina Agricultural and Technical State University		
Mohamed Gebril, North Carolina Agricultural and Technical State University		
Ruben Buaba, North Carolina Agricultural and Technical State University		
Abdollah Homaifar, North Carolina Agricultural and Technical State University		
<b>RI13</b>		
<b>Salient Frame Extraction using Support Vector Regression and Motion Features .....</b>		122
Xian Du, Louisiana Tech University		
Sumeet Dua, Louisiana Tech University		
<b>RI14</b>		
<b>Multi-Resolution Unmanned Aerial Vehicle Video Stabilization .....</b>		126
Stephen Hong, Stanford University		
Tracey Hong, Vanderbilt University		
Wu Yang, Wright State University		
<b>RI15</b>		
<b>Precise Image Registration and Occlusion Labeling .....</b>		132
Vinod Khare, Ohio State University		
Alper Yilmaz, Ohio State University		
Olga Mendoza-Schrok, Air Force Research Laboratory		
<b>RI16</b>		
<b>In-Flight Camera Platform Geometric Calibration of the Aerial Multi-Head Camera System .....</b>		136
Young-Jin Lee, Ohio State University		
Alper Yilmaz, Ohio State University		
Olga Mendoza-Schrok, Air Force Research Laboratory		
<b>RI17</b>		
<b>Ontology Alignment using Relative Entropy for Semantic Uncertainty Analysis .....</b>		140
Erik P. Blasch, Defence R&D Canada-Valcartier		
Éric Dorion, Defence R&D Canada-Valcartier		
Pierre Valin, Defence R&D Canada-Valcartier		
Eloi Bossé, Defence R&D Canada-Valcartier		
<b>RI18</b>		
<b>A Limited Comparative Study of Dimension Reduction Techniques on CAESAR .....</b>		149
James Patrick, Air Force Research Laboratory		
Hamilton Scott Clouse, North Carolina State University		
Olga Mendoza-Schrok, Air Force Research Laboratory		
Gregory Arnold, Air Force Research Laboratory		

<b>RI19</b>	<b>Ground Target Track Bias Estimation using Opportunistic Road Information .....</b>	156
	Chun Yang, Sigtem Technology, Inc	
	Erik Blasch, Air Force Research Laboratory	
	Jim Patrick, Air Force Research Laboratory	
	Di Qiu, Sigtem Technology, Inc	
<b>RI20</b>	<b>RF Emitter Localization with Position-Adaptive MAV Platforms .....</b>	164
	Raul Ordonez, University of Dayton Research Institute	
	Miguel Gates, Louisiana Tech University	
	Kasongo Moma, Tennessee State University	
	Atindra Mitra, Air Force Research Laboratory	
	Rastko Selmic, Louisiana Tech University	
	Phil Detweiler, University of Dayton Research Institute	
	Craig Cox, Air Force Research Laboratory	
	Greg Parker, Air Force Research Laboratory	
	Zach Goff, Air Force Research Laboratory	
<b>RI21</b>	<b>Design of Mismatched Filters for Oversampled Signals .....</b>	173
	Rao Nuthalapati, Lockheed Martin	
<b>RI22</b>	<b>GPU Accelerated Real Time Polarimetric Image Processing through the use of CUDA .....</b>	177
	Hiren Patel, Air Force Research Laboratory	
<b>RI23</b>	<b>Atmospheric Turbulence Effects on Radar Systems .....</b>	181
	R.W. McMillan, US Army Space and Missile Defense Command	
<b>Compressive Sensing</b>		
<b>CS01</b>	<b>Wavelet-Modulated Pulse for Compressive Sensing in SAR .....</b>	197
	Da Xu, Ohio State University	
	Ryan Tongret, Ohio State University	
	Yuan F. Zheng, Ohio State University	
	Robert L. Ewing, Air Force Research Laboratory	
<b>CS02</b>	<b>BYPASS and PARALLEL Modes for JPEG2000 Compression of Natural Imagery .....</b>	203
	Eric J. Balster, University of Dayton	
	David L. Lucking, Air Force Research Laboratory	
<b>CS03</b>	<b>Sensorless Temperature Measurement based on ADC Input Noise Measurement .....</b>	208
	Jingbo Duan, Iowa State University	
	Degang Chen, Iowa State University	
	Randall Geiger, Iowa State University	

## **Computational Modeling**

### **CM02**

- Application of Newton Method to Natural Frequency Estimation .....** 212  
Joon-Ho Lee, Sejong University  
Hyo-Tae Kim, Pohang University

### **CM03**

- Directional Wide Band Time Reversal Digital Beam Forming FIR Filter Design  
using Bore-Sight Calibration Data .....** 215  
David M. Lin, Air Force Research Laboratory  
Lihyeh L. Liou, Air Force Research Laboratory  
James B.Y. Tsui, Independent Consultant

### **CM04**

- On Approximate Message Passing for Reconstruction of Non-Uniformly Sparse Signals .....** 223  
Subhojit Som, Ohio State University  
Lee C. Potter, Ohio State University  
Philip Schniter, Ohio State University

### **CM05**

- Fast Algebraic Methods in Computational Electromagnetics .....** 230  
Tri Van, BerrieHill Research Corporation  
Laura R.C. Suzuki, BerrieHill Research Corporation  
Damir Latypov, BerrieHill Research Corporation  
Joy Von Holle, BerrieHill Research Corporation  
Tom Voss, BerrieHill Research Corporation  
Ton Van, BerrieHill Research Corporation  
Greg Wilson, BerrieHill Research Corporation  
George Antilla, Northrup Grumman Corporation  
Matt Warren, Northrup Grumman Corporation

### **CM06**

- Effects of Radio Frequency Interference on an 802.11a Wireless Ad-Hoc Network .....** 237  
Joseph Natarian, Air Force Research Laboratory

### **CM07**

- A Graphical Framework for Constructing and Executing Computational Networks .....** 240  
Christopher L. Hall, Consortium Research Fellows Program  
Vincent A. Schmidt, Air Force Research Laboratory

## **Smart Antennas**

### **SA01**

- Improvement of Exhaustive Search based Maximum-Likelihood DOA Estimation .....** 246  
Joon-Ho Lee, Sejong University  
Sangho Jo, Sejong University

### **SA02**

- Smart Electronic Phase Control for Phased Array Antennas .....** 250  
Altan M. Ferendeci, University of Cincinnati

### **SA03**

- MEMS Applications for Reconfigurable Antennas for Wireless Data Sensing .....** 253  
Abdelnasser Eldek, Jackson State University  
Abubaker Abdallah, Jackson State University  
Mahmoud Manzoul, Jackson State University

## **SA04**

<b>Closed-Loop Smart Antenna Systems with Controllable Metamaterial Lattice Interactions .....</b>	257
Atindra Mitra, Air Force Research Laboratory	
Colin Hu, Air Force Research Laboratory	
Connor Johnson, Louisiana Tech University	

## **Biomedical Sensing**

### **BS01**

<b>Monitoring and Surveillance: Design of a Formal Language for Representing Body Positions .....</b>	266
N. Bourbakis, Wright State University	
A. Tsitsoulis, Wright State University	

### **BS03**

<b>Network Calibration of Embedded Sensors .....</b>	269
Chris Papachristou, Case Western Reserve University	
Swarup Bhunia, Case Western Reserve University	
Frank Wolff, Case Western Reserve University	

## **Adaptive RF & Space based Communications**

### **AS02**

<b>A 3.1-10.6 GHz CMOS Mixer with a 1.6 GHz IF Bandwidth for Frequency Hopping OFDM Applications .....</b>	275
Fei Gong, Ohio State University	
Joanne DeGroat, Ohio State University	
Chaojiang Li, Clemson University	

### **AS03**

<b>Interference Avoidance via Adaptive Wavelet Packet Modulation in Wireless Communication Systems .....</b>	279
Hui-Ling Lu, Optimal Synthesis Inc.	
P.K. Menon, Optimal Synthesis Inc.	

### **AS04**

<b>Formalization of Confidence Levels in Verification Efforts .....</b>	283
Ramsundar Radhakrishnan, Ohio State University	
Fei Gong, Ohio State University	
Joanne DeGroat, Ohio State University	

### **AS06**

<b>Wakeup Receiver-Aided Communication Terminals .....</b>	287
Jianlei Shi, University of Washington	
Brian Otis, University of Washington	

## **Reconfigurable Computing**

### **RC01**

<b>An Integer-Based Unsharp Mask Algorithm for Infrared Imagery .....</b>	291
Benjamin T. Fortener, University of Dayton	

**RC02**

<b>Image Compression Emphasizing Pixel Size Objects in Midwave Infrared Persistent Surveillance Systems .....</b>	296
---	-----

Patrick C. Hytla, University of Dayton  
Joseph C. French, University of Dayton  
Nicholas P. Vicen, University of Dayton  
Russell C. Hardie, University of Dayton  
Eric J. Balster, University of Dayton  
Frank O. Baxley, General Dynamic Advanced Information Systems  
Kenneth J. Barnard, Air Force Research Laboratory  
Mark A. Bicknell, Air Force Research Laboratory

**RC03**

<b>A Model for Flash Analog-to-Digital Converters with Bit-Extended Error Table Linearization .....</b>	302
---	-----

Christopher D. McGuinness, University of Dayton  
Eric J. Balster, University of Dayton  
Frank A. Scarpino, University of Dayton

**RC04**

<b>Automatic VHDL Generation Software Tool for Parameterized FPGA based FFT Architectures .....</b>	306
---	-----

Todd E. Schmuland, University of Toledo  
Matthew B. Longbrake, Air Force Research Laboratory  
Peter E. Buxa, Air Force Research Laboratory  
Mohsin M. Jamali, University of Toledo

## Aerodynamic Control Systems, Power & Smart Materials

**APS01**

<b>Chip-Scale DC/DC Power Converter .....</b>	310
---	-----

Krishna Shenai, University of Toledo  
Gary H. Bernstein, University of Notre Dame  
Huili Grace Xing, University of Notre Dame  
Jie Jayne Wu, University of Tennessee

**APS02**

<b>Performance Evaluation of Silicon and Gallium Nitride Power FETs for DC/DC Power Converter Applications .....</b>	317
--	-----

Krishna Shenai, University of Toledo  
Krushal Shah, University of Toledo  
Huili Grace Xing, University of Notre Dame

**APS03**

<b>Reliability of Wide Bandgap Semiconductor Power Switching Devices .....</b>	322
--	-----

Krishna Shenai, University of Toledo

**APS04**

<b>Effect of Voltage Scaling on Soft Error Protection Methods for SRAMs .....</b>	328
---	-----

Yuriy Shiyanovskii, Case Western Reserve University  
Aravind Rajendran, Case Western Reserve University  
Frank Wolff, Case Western Reserve University  
Chris Papachristou, Case Western Reserve University

**APS05**

<b>Linearity Testing of Analog-to-Digital Converters using Imprecise Sinusoidal Excitations .....</b>	334
---	-----

Bharath K. Vasan, Iowa State University  
Degang J. Chen, Iowa State University  
Randall L. Geiger, Iowa State University

<b>APS06</b>		
<b>Metamaterials for Microwave Frequencies .....</b>		338
Mark Patterson, University of Dayton		
<b>APS07</b>		
<b>Automatic Loop Shaping of QFT Robust Controllers with Multi-Objective Specifications via Nonlinear Quadratic Inequalities .....</b>		348
M. Garcia-Sanz, Case Western Reserve University		
C. Molins, Case Western Reserve University		
<b>APS08</b>		
<b>High-Level Control Methods for Autonomous Systems .....</b>		354
Zhesheng Jiang, University of Dayton		
Raúl Ordóñez, University of Dayton		
Jian Zhu, University of Dayton		
<b>APS09</b>		
<b>Radar Target Discrimination using Neural Networks .....</b>		358
Joon-Ho Lee, Sejong University		
Hyo-Tae Kim, Pohang University		
<b>Bio-Inspired UAVs</b>		
<b>BIU02</b>		
<b>Sensor-Based Allocation for Path Planning and Area Coverage using UGSs .....</b>		361
Erik P. Blasch, Defence R&D Canada-Valcartier		
Patrick Maupin, Defence R&D Canada-Valcartier		
Anne-Laure Jousselme, Defence R&D Canada-Valcartier		
<b>BIU03</b>		
<b>A GMTI Method via Comparing Two Consecutive Phase Difference Maps of the Same Target Area for Small UAVs .....</b>		369
Zhonghai Wang, DCM Research Resources		
Erik P. Blasch, Air Force Research Laboratory		
Khanh Pham, Air Force Research Laboratory		
Genshe Chen, DCM Research Resources		
<b>Bio-Inspired Systems &amp; Biomedical Applications</b>		
<b>BIB01</b>		
<b>Spiking Neural Network E-NOSE Classifier Chip .....</b>		374
Hoda S. Abdel-Aty-Zohdy, Oakland University		
Jacob N. Allen, Oakland University		
Robert L. Ewing, Air Force Research Laboratory		
<b>BIB02</b>		
<b>Towards Biomimetic Stereo Vision .....</b>		379
Benjamin L. Raskob, University of Southern California		
Alice C. Parker, University of Southern California		
<b>BIB03</b>		
<b>Differential Elasticity for Network Resilience .....</b>		383
Nancy Alrajei, Oakland University		
Fatma Mili, Oakland University		
Gurpreet Khatra, Oakland University		

**BIB05**

- Hyper-Fuzzy Modeling and Control for Bio-Inspired Radar Processing .....** 392  
Omar M. Salim, Benha University  
Hoda S. Abdel-Aty-Zohdy, Oakland University  
Mohamad A. Zohdy, Oakland University

**BIB07**

- An Inexpensive Accelerometer-Based Sleep-Apnea Screening Technique .....** 396  
Christie L. Bucklin, Oakland University  
Manobar Das, Oakland University  
Sam L. Luo, Johns Hopkins University

**BIB09**

- XML Defined Custom Microprocessors using Rapid Hardware Definition Language .....** 400  
Jacob N. Allen, Oakland University  
Hoda S. Abdel-Aty-Zohdy, Oakland University  
Robert L. Ewing, Air Force Research Laboratory

**2009 Grand Challenge Winner****GC**

- Predicted Radar/Optical Feature Fusion Gains for Target Identification .....** 405  
Bart Kahler, General Dynamics  
Erik Blasch, Air Force Research Laboratory

**Poster**

- Academic Leadership Pipeline Scholarship Computing and Analysis Project .....** 413  
Matthew Pickett, Wright State University  
Neal Eikenberry, Wright State University  
Rhonda J. Vickery, High Performance Technologies, Inc  
Sameer Naboulsi, High Performance Technologies, Inc