2009 12th International Conference on Information Fusion

(FUSION 2009)

Seattle, Washington, USA
6 – 9 July 2009

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Glover, Charles Oak Ridge National Lab.
Shankar, Mallikarjun Oak Ridge National Lab.
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Jamieson, Kevin Univ. of Washington
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Jilkov, Vesselin Univ. of New Orleans
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Chair: Salerno, John RIEA
Co-Chair: Kadar, Ivan Interlink Systems Sciences Inc.
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Issues and Challenges in Higher Level Fusion: Threat/Impact Assessment*
Kadar, Ivan Interlink Systems Sciences Inc.
Salerno, John RIEA

WePL
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Urmson, Chris Carnegie Mellon Univ.

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Braca, Paolo Univ. of Salerno
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**WeA3**

**Fusion Evaluation Over Dynamic Data and Intelligent Targets I (Special Session)**

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Chair: Mahler, Ronald  
Lockheed Martin MS2 Tactical Systems

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Vo, Ba-Ngu  
Univ. of Melbourne

Vo, Ba-Tuong  
Univ. of Western Australia

Pham, Nam Trung  
IRISA/INRIA

Suter, David  
Univ. of Adelaide

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**Forward-Backward Sequential Monte Carlo Smoothing for Joint Target Detection and Tracking (I)**, pp. 899-906.

Clark, Daniel  
Heriot-Watt Univ.

Vo, Ba-Ngu  
Univ. of Melbourne

Vo, Ba-Tuong  
Univ. of Western Australia

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Pollard, Evangeline  
ONERA

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ONERA

Rombaut, Michèle  
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**PHD Filters for Nonstandard Targets, I: Extended Targets (I)**, pp. 915-921.

Mahler, Ronald  
Lockheed Martin MS2 Tactical Systems

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Mahler, Ronald  
Lockheed Martin MS2 Tactical Systems

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Chair: Stone, Lawrence  
Metron Inc

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Ferry, Jim  
Metron, Inc.

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**Non-Classical Markov Logic and Network Analysis (I)**, pp. 938-947.

Wojtowicz, Ralph  
Metron, Inc.

#### 11:10-11:30

**Likelihood-Based Optimization of Threat Operation Timeline Estimation (I)**, pp. 948-953.

Godfrey, Greg  
Metron, Inc.

Mifflin, Tom  
Metron, Inc.

#### 11:30-11:50

**Detection Theory on Random Graphs (I)**, pp. 954-959.

Mifflin, Tom  
Metron, Inc.

#### 11:50-12:10

**Distributed Terrain Estimation Using a Mixture-Model Based Algorithm**, pp. 960-967.

Schoenberg, Jonathan  
Cornell Univ.

Campbell, Mark E.  
Cornell Univ.

### WeA6

**Hybrid Techniques for Adaptation of Data Fusion Systems (Special Session)**

Chair: Garcia Herrero, Jesus  
Univ. Carlos III de Madrid

Co-Chair: Molina, Jose  
Univ. Carlos III de Madrid

#### 10:30-10:50

**Organization Based System for Oceanographic Monitoring (I)**, pp. 968-975.

Mata, Aitor  
Univ. of Salamanca

Pérez-Lancho, Belén  
Univ. of Salamanca

Corchado, Emilio  
Univ. de Burgos

Bajo, Javier  
Univ. of Salamanca

#### 10:50-11:10

**Agent/Source Characterization for Exploitation of Human-Generated Intelligence**, pp. 976-983.
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<td>Steinberg, Alan N., Independent Consultant</td>
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<td>Garagic, Denis, BAE Systems</td>
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Wei, Chuanming (Lehigh Univ.)
Kaplan, Lance (ARL)
Burks, Stephen (Night Vision and Electronic Sensors Directorate)
Blum, Rick (Lehigh Univ.)

WeB2
Target Tracking V (Regular Session)
Chair: Koch, Wolfgang (German Defence Res. Establishment)

13:10-13:30

Carthel, Craig (NATO Undersea Res. Centre)
Coraluppi, Stefano (NRC)
Willett, Peter (Univ. of Connecticut)
Maratea, Marco (Univ. degli Studi di Genova)
Maguer, Alain (NRC)

13:30-13:50
Performance Analysis of Data Fusion for Ground Target Tracking Using GSM Networks, pp. 1092-1099.

Zhang, Miao (Univ. of Siegen)
Kriedik, Stefan (Univ. of Siegen)
Loffeld, Otmar (Univ. of Siegen)

13:50-14:10
A New Performance Metric for Search and Track Missions, pp. 1100-1107.

Li, X. Rong (Univ. of New Orleans)
Pitre, Ryan (Univ. of New Orleans)
Jilkov, Vesselin (Univ. of New Orleans)
Chen, Huimin (Univ. of New Orleans)

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A New Performance Metric for Search and Track Missions 2: Design and Application to UAV Search, pp. 1108-1114.

Pitre, Ryan (Univ. of New Orleans)
Li, X. Rong (Univ. of New Orleans)
DeBalzo, Donald (Planning Systems Inc.)

14:30-14:50
Information Analysis in Passive Radar Networks for Target Tracking, pp. 1115-1122.

Soysal, Gokhan (Ankara Univ.)
Bozdogun, Ali Onder (Ankara Univ.)
Efe, Murat (Ankara Univ.)

WeB3
Fusion Evaluation Over Dynamic Data and Intelligent Targets II (Special Session)
Chair: Blasch, Erik (AFRL/RYAA)
Co-Chair: Chen, Genshe (DCM Res. Res. LLC)

13:10-13:30

Carvalho, Rommel (George Mason Univ.)
Chang, KuoChu (George Mason Univ.)

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Sensor Attack Avoidance: Linear Quadratic Game Approach (I), pp. 1131-1138.

Li, Dongxu (Ohio State Univ.)
Chen, Genshe (DCM Res. Res. LLC)
Blasch, Erik (AFRL/RYAA)
Pham, Khanh (THE UNITED STATES AIR FORCE Res. Lab.)

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Kovalerchuk, Boris (Central Washington Univ.)

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Track-Centric Metrics for Track Fusion Systems, pp. 1147-1154.

Canavan, Robert (Univ. of Tennessee at Chattanooga)
McCullough, Claire (Univ. of Tennessee at Chattanooga)
Farrell, William (Adaptive Methods, Inc.)

14:30-14:50
A Geometric Feature-Aided Game Theoretic Approach to Sensor Management (I), pp. 1155-1162.

Li, Xiaokun (DCM Res. Res. LLC)
Chen, Genshe (DCM Res. Res. LLC)
Blasch, Erik (AFRL/RYAA)
Patrick, James (AFRL)
Yang, Chun (Sigtem Tech. Inc.)
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Finite Set Statistics (FISST): Theory and Applications II (Special Session)

Chair: Mahler, Ronald
Lockheed Martin MS2 Tactical Systems

13:10-13:30

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Francesco, Papi
Univ. di Firenze
Battistelli, Giorgio
Univ. of Firenze
Chisci, Luigi
Univ. di Firenze
Morrocchi, Stefano
Univ. di Firenze
Farina, Alfonso
Univ. di Firenze
Graziano, Antonio
Selex - Sistemi Integrati

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GM-PHD Filters for Multi-Object Tracking in Uncalibrated Aerial Videos (I), pp. 1171-1178.
Pollard, Evangeline
ONERA
Plyer, Aurelien
ONERA
Pannetier, Benjamin
ONERA
Champagnat, Frederic
ONERA
Le Besnerais, Guy
ONERA

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The Gaussian Mixture MCMC Particle Algorithm for Dynamic Cluster Tracking (I), pp. 1179-1186.
Carmi, Avishy
Cambridge Univ.
Septier, Francois
Cambridge Univ.
Godsill, Simon
Cambridge Univ.

14:10-14:30

Set JPDA Algorithm for Tracking Unordered Sets of Targets (I), pp. 1187-1194.
Svensson, Lennart
Chalmers Univ. of Tech.
Svensson, Daniel
Chalmers Univ. of Tech.
Willett, Peter
Univ. of Connecticut

14:30-14:50

Juang, Radford
Burlina, Philippe

WeB5

Advances and Applications of DSmT for Information Fusion (Special Session)

Chair: Dezert, Jean
ONERA - The French Aerospace Lab.
Co-Chair: Smarandache, Florentin
Univ. of New Mexico

13:10-13:30

Smarandache, Florentin
Univ. of New Mexico
Dezert, Jean
ONERA - The French Aerospace Lab.
Li, Xinde
Southeast Univ.

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DSm Theory for Fusing Highly Conflicting ESM Reports (I), pp. 1211-1217.
Valin, Pierre
Defence R&D Canada
Djiknavortan, Pascal
Laval Univ.
Grenier, Dominic
Univ. of Laval

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An Application of DSmT in Ontology-Based Fusion Systems (I), pp. 1218-1225.
Krenc, Ksawery
OBR Centrum Tech. Morskiej S.A.
Kawalec, Adam
MILITARY Univ. Of Tech.

14:10-14:30

Dambreville, Frederic
Delegation Generale pour L Armement

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Evidence Based Evaluation Method for Grid Based Environmental Representation, pp. 1234-1240.
Grabe, Baerbel
Univ. of Applied Sciences and Arts Hannover
Ike, Thorsten
Univ. of Applied Sciences and Arts Hannover
Hoetter, Michael
Univ. of Applied Sciences and Arts Hannover

WeB6

Integrating the Human Analyst into Hybrid Sensing (Special Session)

Chair: Hall, David
Penn State Univ.
Co-Chair: van Laere, Joeri
Univ. of Skive

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Monitoring of Reliability in Bayesian Identification (I), pp. 1241-1248.
Krueger, Max IABG Industrieanlagen-Betriebsgesellschaft mbH
Kratzke, Nane IABG
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Using Humans As Sensors in Robotic Search (I), pp. 1249-1256.
Lewis, Michael Univ. of Pittsburgh
Wang, Huadong Univ. of Pittsburgh
Velagapudi, Prassana Carnegie Mellon Univ.
Scher, Paul Carnegie Mellon Univ.
Sycara, Katia Carnegie Mellon Univ.
13:50-14:10 WeB6.3

A Cyber Infrastructure for Evaluating the Performance of Human Centered Fusion (I), pp. 1257-1264.
Hall, David Penn State Univ.
McNeese, Michael Penn State Univ.
Hellar, Ben The Pennsylvania State Univ.
Panulla, Brian Pennsylvania State Univ.
Shumaker, Wade Pennsylvania State Univ.
14:10-14:30 WeB6.4

Jone, Rashaad SA Tech. Inc.
Connors, Erik SA Tech. Inc.
Endsley, Mica SA Tech. Inc.
14:30-14:50 WeB6.5

Blaesch, Erik AFRL/RYAA
Valin, Pierre Defence R&D Canada
Bosse, Eloi Defence R&D Canada-Valcartier
Nilsson, Maria Univ. of Skövde
van Laere, Joeri Univ. of Skövde
Shahbaziain, Elisa OODA Tech.
14:30-14:50 WeB7.1

Extended Object and Group Tracking II (Special Session)
Chair: Hanebeck, Uwe Univ. Karlsruhe
Co-Chair: Baum, Marcus Univ. Karlsruhe (TH)
13:10-13:30 WeB7.1

Tracking of Multiple Contaminant Clouds (I), pp. 1280-1287.
Septier, François Cambridge Univ.
Carmi, Avishy Cambridge Univ.
Godsill, Simon Cambridge Univ.
13:30-13:50 WeB7.2

Extended Object Tracking Based on Combined Set-Theoretic and Stochastic Fusion (I), pp. 1288-1295.
Baum, Marcus Univ. Karlsruhe (TH)
Hanebeck, Uwe Univ. Karlsruhe
13:50-14:10 WeB7.3

Permutation Invariance in Bayesian Estimation of Two Targets That Maneuver in and Out Formation Flight (I), pp. 1296-1303.
Blom, Henk A.P. National Aerospace Lab. NLR
Bloem, Edwin A. National Aerospace Lab. NLR
14:10-14:30 WeB7.4

Image Processing/Fusion II (Regular Session)
Chair: Leung, Henry Univ. of Calgary
15:20-15:40 WeC1.1

Hawe, Simon Univ.
Kirchmaier, Ulrich Tech. Univ. München
Diepold, Klaus Univ.
15:40-16:00 WeC1.2

Noise Reduction for Tiny Contours in Image Sequence, pp. 1310-1316.
Ming, Zhai Shanghai Jiao Tong Univ. Shanghai, P.R.China
Shan, Fu Shanghai Jiao Tong Univ.
16:00-16:20 WeC1.3

Sonar Image Registration Based on Conflict from Belief Function Theory, pp. 1317-1324.
Rominger, Cedric ENSIETA
Martin, Arnaud Ensita
Khenchaf, Ali ENSIETA
16:20-16:40 WeC1.4

Chen, Siyue
Leung, Henry
Univ. of Calgary
Univ. of Calgary

WeC2
Intelligent Transportation (Regular Session)

Chair: Mihaylova, Lyudmila
Lancaster Univ.

15:20-15:40
Freeway Travel Time Forecast Using Artificial Neural Networks with Cluster Method, pp. 1331-1338.
Lee, Ying
MingDao Univ.

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Multi Sensor Mapping of Rail Networks, pp. 1339-1346.
Hensel, Stefan
Hasberg, Carsten
Univ. of Karlsruhe
Univ. of Karlsruhe

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Jerhot, Jiri
Meinecke, Marc-Michael
Form, Thomas
Nguyen, Thi-Nghia
Stanek, Ganymed
Knaup, Jörn
Volkswagen AG
Volkswagen AG
Volkswagen AG
Univ. of Magdeburg
Volkswagen of America
Volkswagen AG

16:20-16:40
Wang, Alex
Araujo, Jose
Krishnamurthy, Vikram
Univ. of British Columbia
Royal Inst. of Tech.
Univ. of British Columbia

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Multi-Hypothesis Based Map-Matching Algorithm for Precise Train Positioning, pp. 1363-1369.
Gerlach, Katrin
Rahmig, Christian
German Aerospace Center
German Aerospace Center

WeC3
Fusion & Policy Issues and Capabilities for Coalition Operations (Special Session)

Chair: Pham, Tien
Co-Chair: Kaplan, Lance
US Army Res. Lab.
ARL

15:20-15:40
Thomley, David
Kaplan, Lance
Bisdikian, Chatschik
Srivastava, Mani
Young, Robert
IBM Corp.
UCLA
MOD
IBM TJ Watson Res. Center

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An End to End Life Cycle for ISR in Coalition Networks (I), pp. 1378-1384.
Cirincione, Gregory
Verma, Dinesh
Pham, Tien
Pearson, Gavin
U.S. Army Res. Lab.
IBM TJ Watson Res. Center
US Army Res. Lab.
DSTL

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Technologies for Federation and Interoperation of Coalition Networks (I), pp. 1385-1392.
Calo, Seraphin
Wood, David
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Vvyyan, David
Dantressangle, Patrick
Bent, Graham
IBM T.J. Watson Res. Center
IBM T.J. Watson Res. Center
IBM T.J. Watson Res. Center
IBM United Kingdom Limited
IBM United Kingdom Limited
IBM United Kingdom Limited

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A Dynamic Infrastructure for Interconnecting Disparate ISR/ISTAR Assets (the ITA Sensor Fabric) (I), pp. 1393-1400.
Bergamaschi, Flavio
Gibson, Christopher
Wright, Joel James
Whipps, Gene
IBM UK Limited
IBM UK Limited
IBM UK
US Army Res. Lab.

Vincen, Daniel
Stampouli, Dafni
Powell, Gavin

16:40-17:00

WeC3.5

Color in Image and Information Fusion (Special Session)

Chair: Toet, Alexander  Co-Chair: Nikolov, Stavri  TNO Defense, Security and Safety  Attentive Displays Ltd
15:20-15:40  WeC4.1
Klonus, Sascha  Ehlers, Manfred  Univ. of Osnabrueck  Univ. of Osnabrueck
15:40-16:00  WeC4.2
Toet, Alexander  Hogervorst, Maarten Andreas  TNO Defense & Security  TNO Defense & Security
16:00-16:20  WeC4.3
Schikora, Marek  Häge, Miriam  Ruthotto, Eicke  Wild, Klaus  FGAN Res. Inst. for Communication, Information Processing  FGAN-FKIE  FGAN-FKIE
16:20-16:40  WeC4.4
Evaluation of a Color Fused Dual-Band NVG (I), pp. 1432-1438.
Hogervorst, Maarten Andreas  Toet, Alexander  TNO Defense & Security  TNO Defense & Security
16:40-17:00  WeC4.5
Fused EO/IR Detection & Tracking of Surface Targets: Flight Demonstrations (I), pp. 1439-1443.
Waxman, Allen  DARPA
17:00-17:20

WeC5

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Chair: Lien, Steven  Co-Chair: Wang, Changzhou  The Boeing Company
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Boeing Fusion Performance Analysis (FPA) Tool (I), pp. 1444-1450.
Jackson, Paul, R  Musiak, Jeffery  The Boeing Company  The Boeing Company
15:40-16:00  WeC5.2
CMAP: A Flexible and Efficient Framework for Constraint-Based Mining of Activity Patterns (I), pp. 1451-1458.
Wang, Changzhou  Choi, Jai  Kao, Anne  Tjoelker, Rodney  Boeing  Boeing Res. & Tech.  Boeing  Boeing  The Boeing Company
16:00-16:20  WeC5.3
Dynamic Resource Allocation and Management for Level 4 Fusion (I), pp. 1459-1466.
Bradley, Thomas  Boeing Co.
16:20-16:40  WeC5.4
Boeing Phantom Works Fusion Architecture: A Flexible Approach for Multiple Projects and Domains (I), pp. 1467-1472.
King, Jeffrey  Hartman, Brett  Boeing Co.  Boeing
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Characterizing the Tradeoffs between Different Sensor Allocation and Management Algorithms (I), pp. 1473-1480.
Thunemann, Zack  Mattikalli, Raju  Arroyo, Sharon  Frank, Paul  The Boeing Company  The Boeing Company  The Boeing Company  The Boeing Company
17:00-17:20

WeC6

Applications I (Regular Session)

Chair: Chong, Chee-Yee  BAE Systems
15:20-15:40  Portland
15:20-15:40
Lana Roldao da Silva, Julio Brancalion, Jose Fernandes, David
Embraer Inst. Tecnologico de Aeronautica

15:40-16:00
Fusion for Modeling Wake Effects on Wind Turbines, pp. 1489-1496.
Yan, Yanjun Kanath, Ganapathi Osadciw, Lisa Benson, Glen Legac, Paul Johnson, Peter White, Eric
Syracuse Univ. Syracuse Univ. Syracuse Univ. AWS Truewind, LLC AWS Truewind, LLC AWS Truewind, LLC

16:00-16:20
Unsupervised Learning and Fusion for Failure Detection in Wind Turbines, pp. 1497-1503.
Ye, Xiang Veeramachaneni, Kalyan Yan, Yanjun Osadciw, Lisa
Syracuse Univ. Syracuse Univ. Syracuse Univ. Syracuse Univ.

16:20-16:40
Fusing Correlated Data from Multiple Classifiers for Improved Biometric Verification, pp. 1504-1511.
Srinivas, Nisha Veeramachaneni, Kalyan Osadciw, Lisa
Syracuse Univ. L.C Smith Coll. of Engineering Syracuse Univ. Syracuse Univ.

16:40-17:00
Simultaneous Estimation of Vehicle Dynamics and Lane Features for Road Safety Applications, pp. 1512-1519.
Weigel, Hendrik Wanieilk, Gerd
Chemnitz Univ. of Tech. Chemnitz Univ. of Tech.

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WeC6.4

WeC6.5

WeC7

Directions for Higher-Level Fusion Research: Needs and Capabilities (Panel Discussion)
Chair: Toth, Gary ONR Co-Chair: Kokar, Mieczyslaw Northeastern Univ.
14:20-17:00
WeC7.1

Directions for Higher-Level Fusion Research: Needs and Capabilities*. Toth, Gary Kokar, Mieczyslaw Liggins, Marty
ONR Northeastern Univ. MITRE

ThPL

Likelihood Ratio Detection and Tracking, by Lawrence Stone, Metron Inc. (Plenary Session)
09:00-10:00
ThPL.1
Likelihood Ratio Detection and Tracking*. Stone, Lawrence
Metron Inc

ThA1

Nonlinear Filtering I (Regular Session)
Chair: Challa, Subhash National ICT Australia
10:30-10:50
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Optimal Robust H infinity Fusion Filters for Time-Delayed Systems with Multiple Saturation Nonlinear Sensors, pp. 1520-1527.
Liu, Meiqin Li, X. Rong
Coll. of Electrical Engineering, Zhejiang Univ. Univ. of New Orleans
10:50-11:10
ThA1.2

Zuo, Long Niu, Ruixin Varshney, Pramod
Syracuse Univ. Syracuse Univ. Syracuse Univ.
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Gaussian Mixture Reduction Via Clustering, pp. 1536-1543.
Schieferdecker, Dennis Huber, Marco F.
Inst. for Theoretical Computer Science, Univ. of Karls Intelligent Sensor-Actuator-Systems Lab. Univ. Karls
11:30-11:50
ThA1.4

Madankan, Reza Singla, Puneet Singh, Tarunraj
Univ. at Buffalo Univ. at Buffalo State Univ. of New York at Buffalo
### ThA2

**Multistatic Tracking I (Special Session)**

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<td>SPECSweb Multistatic Tracking on a Truth-Blind Simulated Scenario of the MSTWG (I), pp. 1568-1575.</td>
<td>Lang, Thomas Dunne, Darcy Mellema, Garfield</td>
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### ThA3

**Methods and Tools for Automated Support of Model and Context-Based Information Fusion in Intelligence (Special Session)**

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<td>Andersson, Maria Dalberg, Eva Grahn, Per Gundmark, Thomas</td>
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<td>The FOI C4ISR Demonstration 2008 (I), pp. 1604-1612.</td>
<td>Lantz, Fredrik Kylesten, Birgitta Linder, Sara Lindgren, David Pih, Jürgen Sjöberg, Eric Svensson, Pontus</td>
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**Data Association (Special Session)**

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<td>Stone, Lawrence</td>
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Mori, Shozo
Chong, Chee-Yee
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**Exact Bias Removal for the Track-To-Track Association Problem (I),** pp. 1642-1649.

Ferry, Jim

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**Target Tracking in Multipath Environments - an Algorithm Inspired by Data Association,** pp. 1650-1657.

Sathyan, Thuraiappah
Humphrey, David
Hedley, Mark

11:50-12:10

**A Robust Method for Computing Truth-To-Track Assignments,** pp. 1658-1664.

Silbert, Mark

**Command and Control through Sensor Management and Picture Compilation (Special Session)**

Chair: Bolderheij, Fok
Co-Chair: van Leijen, Vincent

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**Applying the PCR6 Rule of Combination in Real Time Classification Systems (I),** pp. 1665-1672.

Scholte, Krispijn
Norden, Wilbert van

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**Unification of Radar and Sonar Coverage Modeling (I),** pp. 1673-1678.

van Leijen, Vincent
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**Colour As an Attribute for Automated Detection in Maritime Environments (I),** pp. 1679-1686.

van Valkenburg-van Haarst, Tanja Y.C.
van Leijen, Vincent
Groen, Frans C.A.

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**Performance-Based Sensor Selection for Optimal Target Tracking (I),** pp. 1687-1694.

Ramdaras, Umesh
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Reece, Steven
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Claxton, Christopher
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