



7<sup>th</sup> Workshop SDF 2012, Sep 04 – 06, 2012

## Sensor Data Fusion: Trends, Solutions, Applications

### Technical Program

Prior to its technological realization or the scientific reflection on it, sensor data fusion is an omnipresent capability. In fact, all living creatures by nature or intuitively perform sensor data fusion. Each in their own way, they combine or sensations provided by different and mutually complementary sense organs with knowledge learned from previous experiences and communications from other creatures. The result is a mental model of their individual environment, the basis of behaving appropriately. As a sophisticated technology with significant economic implications, sensor data fusion aims at automating this capability in various areas.

SDF 2012, the 7th in a row of annual workshops, addresses numerous application aspects of sensor data fusion, as well as methodology oriented topics. Its 22 presentations are grouped into 6 sessions. Particular emphasis is placed on Random Finite Set methods, emitter localization and tracking, ground surveillance, resource management, and selected aspects of higher-level fusion. 15 of the papers were contributed by authors from abroad (Australia, France, South Korea, Singapore, NL, UK, USA). The contributions from industry, academia, and research institutions let us expect an exchange of ideas, lively discussions, and mutual cross-fertilization. For more detailed information see: [www.fkie.fraunhofer.de/sdf2012](http://www.fkie.fraunhofer.de/sdf2012).

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**Time, Location:** September 4-6, 2012, World Conference Center, Bonn, Germany

#### Technical Program Committee

Sten F. Andler (University of Skövde, SWE); Daniel Cremers (Technical University Munich, GER); Hans Driessen (Thales Nederlands, NED); Frank Ehlers (FWG, GER); Herve Fargeton (DGA Tn, FRA); Dietrich Fränken (Cassidian, GER); Jesus Garcia (University Carlos III, Madrid, ES); Fredrik Gustafsson (Linköping University, SWE); Uwe D. Hanebeck (Karlsruhe Institute of Technology (KIT), GER); Jörg Hurka (Atlas Elektronik, GER); Michael Kiefner (Carl Zeiss Optronics, GER); Wolfgang Konle (Cassidian, GER); Arne Kraft (Atlas Elektronik, GER); Mila Mihaylova (Lancaster University, GBR); Gee Wah Ng (DSO, SIN); Vincent Nimier (ONERA, FRA); Felix Optiz (Cassidian, GER); Umut Orguner (Linköping University, SWE); Ulrich Scheunert (Fusion-Systems, GER); Roy L. Streit (Metron Inc., USA); Jörn Thielecke (Universität Erlangen-Nürnberg, GER); Reiner Thomä (Technical University Ilmenau, GER); Martin Ulmke (Fraunhofer FKIE, GER); Anthony Weiss (Tel Aviv University, ISR); Abdelhak Zoubir (Technische Universität Darmstadt, GER).

**14:00 - 15:20**

**110: Advances in Methodology**

Chair: Wolfgang Koch (Fraunhofer FKIE & Bonn University, Germany)

**14:00 *Sensor Data Fusion: Trends, Solutions, Applications***

Wolfgang Koch (Fraunhofer FKIE & Bonn University, Germany); Felix Govaers (Fraunhofer FKIE / University of Bonn, Germany)

**14:20 *Simultaneous Localization and Mapping for Non-parametric Potential Field Environments***

James Murphy (University of Cambridge, United Kingdom); Simon Godsill (University of Cambridge, United Kingdom)

**14:40 *Track Maintenance Using the SMC-Intensity Filter***

Christoph Degen (Fraunhofer FKIE, Germany); Felix Govaers (Fraunhofer FKIE / University of Bonn, Germany); Wolfgang Koch (Fraunhofer FKIE & Bonn University, Germany)

**15:00 *A Particle Filter for Target Arrival Detection and Tracking in Track-Before-Detect***

Alexandre Lepoutre (Onera, France); Olivier Rabaste (Onera, France); François Le Gland (INRIA, France)

**16:00 - 17:40**

**120: Random Finite Set Methods**

Chair: Lyudmila Mihaylova (Lancaster University, United Kingdom)

**16:00 *On the Performance of the Box Particle Filter for Extended Object Tracking Using Laser Data***

Nikolay Petrov (Lancaster University, United Kingdom); Martin Ulmke (Fraunhofer FKIE, Germany); Lyudmila Mihaylova (Lancaster University, United Kingdom); Amadou Gning (Lancaster University, United Kingdom); Marek Schikora (Fraunhofer FKIE, Germany); Monika Wieneke (Fraunhofer FKIE, Germany); Wolfgang Koch (Fraunhofer FKIE & Bonn University, Germany)

**16:20 *Calibration of Tracking Systems Using Detections From Non-Cooperative Targets***

Branko Ristic (DSTO, Australia); Daniel Clark (Heriot Watt, United Kingdom); Neil Gordon (DSTO, Australia)

**16:40 *A Probabilistic Hypothesis Density Filter for Traffic Flow Estimation in the Presence of Clutter***

Matthieu Canaud (University of Lyon & IFSTTAR, France); Lyudmila Mihaylova (Lancaster University, United Kingdom); Nour-Eddin El Faouzi (IFSTTAR, France); Romain Billot (IFSTTAR, France); Jacques Sau (IFSTTAR, France)

**17:00 *Ground Moving Target Tracking Using Signal Strength Measurements with the GM-CPHD Filter***

Michael Mertens (Fraunhofer FKIE, Germany); Martin Ulmke (Fraunhofer FKIE, Germany)

**17:20 *Traffic Mapping Filters for Multisensor Fields***

Roy Streit (Metron Inc., USA)

**14:00 - 15:20**

**210: Selected Aspects of Multisensor Fusion**

Chair: Darko Musicki (Hanyang University, Korea)

**14:00 *Creating a Likelihood Vector for Ground Moving Targets in the Exo-Clutter Region of Airborne Radar Signals***

Dieter Nagel (Cassidian Ulm, Germany)

**14:20 *Finding Sensor Trajectories for TDOA Based Localization - Preliminary Considerations***

Regina Kaune (Fraunhofer FKIE/ University of Bonn, Germany)

**14:40 *Track Segment Association with Classification Information***

Benjamin Pannetier (Onera, France); Jean Dezert (Onera, France)

**15:00 *Towards an Online, Adaptive Algorithm for Radar Surveillance Control***

Fotios Katsilieris (Thales Nederland BV & University of Twente, The Netherlands); Alexander Charlish (Fraunhofer FKIE, Germany); Yvo Boers (Thales Nederland BV & University of Twente, The Netherlands)

**16:00 - 17:40**

**220: Emitter Localization and Tracking**

Chair: Benjamin Pannetier (Onera, France)

**16:00 *Wi-Fi Azimuth and Position Tracking Using Directional Received Signal Strength Measurements***

Jochen Seitz (Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany); Thorsten Vaupel (Fraunhofer Institute for Integrated Circuits IIS, Germany); Stephan Haimerl (Fraunhofer Institute for Integrated Circuits IIS, Germany); Javier Gutiérrez Boronat (Fraunhofer Institute for Integrated Circuits IIS, Germany); Jörn Thielecke (Universität Erlangen, Germany)

**16:20 *Distributed Time and Frequency Difference of Arrival Tracking in Clutter***

Darko Musicki (Hanyang University, Korea); Taek-Lyul Song (Hanyang University, Korea); Hyoung Won Kim (Hanyang University, Korea)

**16:40 *FDOA Determination of ADS-B Transponder Signals***

Christian Steffes (Fraunhofer Institute for Communication, Information Processing and Ergonomics FKIE, Germany); Sven Rau (Fraunhofer Institute for Communication, Information Processing and Ergonomics, Germany)

**17:00 *Multipath Detection in TDOA Localization Scenarios***

Christian Steffes (Fraunhofer Institute for Communication, Information Processing and Ergonomics FKIE, Germany); Sven Rau (Fraunhofer Institute for Communication, Information Processing and Ergonomics, Germany)

**17:20 *Target Maneuver Detection Using a Particle Filter with Spawn Model and Particle Labeling***

Julian Hoerst (Fraunhofer FKIE & Karlsruhe Institute of Technology, Germany)

**14:00 - 15:20**

**310: Aspects of Higher JDL-Level Fusion**

Chair: Adnan Bubalo (Air Force Research Laboratory, USA)

**14:00 *ISR Analytics: Architectural and Methodic Concepts***

Jennifer Sander (Fraunhofer Institute of Optronics, System Technologies and Image Exploitation, Germany); Gerd Schneider (Fraunhofer Institute of Optronics, System Technologies and Image Exploitation, Germany); Barbara Essendorfer (Fraunhofer Institute of Optronics, System Technologies and Image Exploitation, Germany); Achim Kuwertz (Karlsruhe Institute of Technology, Germany)

**14:20 *Road Network Identification by Means of the Hough Transform***

Eric Salerno (University at Buffalo, USA); Tarunraj Singh (University at Buffalo, USA); Puneet Singla (University at Buffalo, USA); Maria Scalzo (AFRL, Information Directorate, USA); Adnan Bubalo (Air Force Research Laboratory, USA); Mark Alford (Air Force Research Laboratory/RIEA, USA); Eric Jones (Air Force Research Laboratory/RIEA, USA)

**14:40 *DSO Cognitive Architecture in Mobile Surveillance***

Gee Wah Ng (DSO National Laboratories, Singapore); Yuan Sin Tan (DSO National Laboratories, Singapore); Xuhong Xiao (DSO National Laboratories, Singapore); Rui Zhong Chan (DSO National Laboratories, Singapore)

**15:00 *The JDL Model of Data Fusion Applied to Cyber-Defence - a Review Paper***

Sabine Schreiber-Ehle (Fraunhofer-Institut für Kommunikation, Informationsverarbeitung und Ergonomie FKIE, Germany)