

Bonn, October 9 – 11, 2018



12th Symposium *Sensor Data Fusion:* *Trends, Solutions, and Applications*

Technical Program

Prior to its technological realization or the scientific reflection on it, sensor data fusion, a branch of Artificial Intelligence, is an omnipresent capability. Fusion algorithms provide informational elements for situation pictures, the basis of appropriate action. SDF 2018, the 12th consecutive annual symposium, addresses numerous application aspects of sensor data fusion, as well as methodologically oriented topics. Its 22 presentations are grouped into 7 sessions. Particular emphasis is placed on advances in estimation and tracking theory, emitter localization, ground surveillance, resource management, selected aspects of higher-level fusion, and even ethical aspects of data fusion. 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/sdf2018.

Location: Universitätsclub Bonn e.V., Konviktstr. 9, 53113 Bonn, Germany.
www.uniclub-bonn.de

Organisation

Executive Chairs:

Wolfgang Koch, Fraunhofer FKIE and University of Bonn.

Peter Willett, University of Connecticut, USA.

Stefano Coraluppi, Systems and Technology Research (STR), USA.

Technical Program Chair:

Felix Govaers, Fraunhofer FKIE, Germany.

Technical Program Committee

Marcus BAUM, University of Göttingen, GER; Jürgen BEYERER, Fraunhofer IOSB, GER; Chee CHONG, Consultant, CA, USA; Stefano CORALUPPI, STO, MA, USA; Daniel CREMERS, Technical University Munich, GER; Klaus DIETMAYER, University of Ulm, GER; Darin DUNHAM, Lockheed Martin, USA; Bharanidhar DURAISAMY, Daimler, GER; Murat EFE, Ankara University, TK; Frank EHLERS, FWG, GER; Dietrich FRÄNKEN, Airbus Defence and Space, GER; Jesus GARCIA, University Carlos III, Madrid, ES; Fredrik GUSTAFSSON, Linköping University, SW; Uwe D. HANEBECK, Karlsruhe Institute of Technology KIT, GER; Dann LANEUVILLE, DCNS, FR; Henry LEUNG, University of Calgary, CA; Lyudmila MIHAYLOVA, University of Sheffield, UK; Gee Wah NG, DSO, SGP; Umut ORGUNER, University of Ankara, TR; Stefan REUTER, Robert Bosch GmbH, GER; Eicke RUTHOTTO, Atlas, GER; Lauro SNIDARO, University of Udine, IT; Roy L. STREIT, Metron Inc., USA; Jörn THIELECKE, Universität Erlangen, GER; Reiner THOMÄ, Technical University Ilmenau, GER; Martin ULMKE, Fraunhofer FKIE, GER; Anthony WEISS, Tel Aviv University, IS; Alexander YAROVY, TU Delft, NL.



Day 1: Tuesday October 9th

Start of SDF Symposium

09⁰⁰ - 10⁰⁰ Registration

10⁰⁰ - 12⁰⁰ **Tutorial: Wolfgang Koch**
A Tutorial Introduction to Sensor Data Fusion and AI Applications

Session #1 – Estimation Theory and Target Tracking I

13³⁰ - 14⁰⁰ **Thomas Kropfreiter and Franz Hlawatsch**
Multiobject Tracking with Track Continuity: An Efficient Random Finite Set Based Algorithm

14⁰⁰ - 14³⁰ **Kristian A. Ruud, Edmund F. Brekke, and Jo Eidsvik**
LIDAR Extended Object Tracking of a Maritime Vessel Using an Ellipsoidal Contour Model

14³⁰ - 15⁰⁰ **Rui Liu, Klaus Greve, and Nan Jiang, and Ming Xu**
Task-Oriented Path Planning Algorithm Considering POIs and Dynamic Collaborative Targets Distribution

Session #2 – Automotive Applications I

15³⁰ - 16⁰⁰ **Markus Horn, Ole Schumann, Markus Hahn, Jürgen Dickmann, and Klaus Dietmayer**
Motion Classification and Height Estimation of Pedestrians Using Sparse Radar Data

16⁰⁰ - 16³⁰ **Andreas Tollkühn, Florian Particke, and Jörn Thielecke**
Gaussian State Estimation with Non-Gaussian Measurement Noise

16³⁰ - 17⁰⁰ **Stefan Haag, Bharanidhar Duraisamy, Wolfgang Koch, and Jürgen Dickmann**
Classification Assisted Tracking for Autonomous Driving Domain

17³⁰ **Guided Tour**
Guided tour through the city of Bonn to the icebreaker reception at Brewery Machold at Heerstraße 52.

18³⁰ **Icebreaker Reception**
Brewery Machold



Day 2: Wednesday October 10th

Keynote Talk: Chee Y. Chong

09⁰⁰ – 10³⁰

Integrating Learning and Knowledge for Robust Sensor Data Fusion

Session #3 – Navigation and Localization

Kailai Li, Daniel Frisch, Susanne Radtke, Benjamin Noack, and Uwe D. Hanebeck

11⁰⁰ - 11³⁰

Wavefront Orientation Estimation Based on Progressive Bingham Filtering

Dietrich Fränken

11³⁰ - 12⁰⁰

An Approximate Maximum-Likelihood Estimator for Localisation using Bistatic Measurements

Christian Steffes, Clemens Allmann, and Marc Oispuu

12⁰⁰ - 12³⁰

Fused Single Sensor Emitter Localization Using Time-Multiplex AOA and S⁴TDOA Measurements

Session #4 – Deep Learning and Tensor based Data Fusion

Youngjoo Kim, Peng Wang, Yifei Zhu, and Lyudmila Mihaylova

13³⁰ - 14⁰⁰

A Capsule Network for Traffic Speed Prediction in Complex Road Networks

Kaeye Dästner, Susie Brunessaux, Elke Schmid, Bastian von Haßler zu Roseneckh-Köhler, and Felix Opitz

14⁰⁰ - 14³⁰

Classification of Military Aircraft in Real-time Radar Systems based on Supervised Machine Learning with Labelled ADS-B Data

Fahrretin Gökgöz, Piro Lena

14³⁰ - 15⁰⁰

Anomaly Detection using GANs in OpenSky Network

Felix Govaers

15⁰⁰ - 15³⁰

On a Multivariate Gaussian CPD Decomposition

Session #5 – Navigation and Localization II

Marcus Baum and Kolja Thormann

16⁰⁰ - 16³⁰

On Kalman Filter-based Approaches for Elliptic Extended Target Tracking: RHM-EKF vs. MEM-EKF

Peng Wang, Youngjoo Kim, Lubos Vaci, Hoaze Yang, and Lyudmila Mihaylova

16³⁰ - 17⁰⁰

Short-Term Traffic Prediction with Vicinity Gaussian Process in the Presence of Missing Data

Get together

17⁰⁰

Piano Recital and Dinner

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Day 3: Thursday October 11th

Session #6 – *Automotive Applications II*

- 09⁰⁰ - 10⁰⁰ **Invited Talk: Daniel Svensson, and Altamash M. Khan**
Sensor Fusion Challenges Within Advanced Driver-Assistance Systems and Autonomous Driving
- 10³⁰ - 11⁰⁰ **Hosam Alqaderi and Raymond Schulz**
Enhancement of LIDAR Data Association and Fusion using Imaging Radar Grid-Maps for Advanced Automotive Environment Perception
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Session #7 – *Advanced Methodology and Ethical Aspects*

- 11⁰⁰ - 11³⁰ **Martin Ulmke**
Quantum Field Theory and Tracking of Indistinguishable Targets
- 11³⁰ - 12⁰⁰ **Martin Ulmke**
Sequential Quantum Monte-Carlo for Tracking of Indistinguishable Targets
- 12⁰⁰ - 12³⁰ **Wolfgang Koch**
On Ethics in Sensor Data Fusion
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- 12³⁰ **End of SDF Symposium 2018**