

# 13<sup>th</sup> Symposium Sensor Data Fusion: Trends, Solutions, and Applications

#### Technical Program

Prior to i ts technological realization or the scientific reflection on i t, sensor data f usion i s an omnip resent capability. The result i s a mental model of their i ndividual environment, the basis of behaving appropriately. SDF Symposium 2019, the  $13^{th}$  i n a row of annual conferences, addresses numerous application aspects of sensor data f usion, as well as methodology oriented topics. I ts 23 presentations are grouped i nto 7 sessions. Particular emphasis i s placed on advances i n the theory of estimation and tracking, emitter I ocalization, ground surveillance, resource management, and selected aspects of higher—level f usion. The contributions from i ndustry, academia, and research i nstitutions I et us expect an exchange of i deas, lively discussions, and mutual cross—fertilization. For more detailed i nformation see: www.fkie.fraunhofer.de/sdf2019.

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

#### Organisation

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#### **Technical Program Committee**

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# Day 1 – Tuesday October 15<sup>th</sup> Start of SDF Symposium 2019

12:30 – 13:30 Registration

### **Session #1:** Autmotive Applications

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	Daniel Svensson
13:30 - 14:00	Derivation of the Discrete-Time Constant Turn Rate and Acceleration Motion Model
	Muhammad A. Khan
14:00 - 14:30	Comparison of Track to Track Fusion Methods for Nonlinear Process and Measure- ment Models
14:30 - 15:00	Stefan Haag, Bharanidhar Duraisamy, Felix Govaers, Wolfgang Koch, Martin Fritzsche, and Jürgen Dickmann
	Extended Object Tracking Assisted Adaptive Clustering for Radar in Autonomous Driving Applications

#### **Session #2:** Anomaly Detection and Traffic Estimation

15:30 - 16:00	Kennedy J. Offor, Peng Wang, and Lyudmila Mihaylova  Multi-Model Bayesian Kriging for Urban Traffic State Prediction
16:00 - 16:30	Martina Brötje, Giulia Batistello, and Martin Ulmke Verification of Sensor Data in a Maritime Multi-Sensor Network
16:30 - 17:00	<b>Yifan Zhou, James Wright, and Simon Maskell</b> A Generic Anomaly Detection Approach Applied to Mixture-of-Unigrams and Maritime Surveillance Data
	Guided Tour
17:30	Guided tour through the city of Bonn to the icebreaker reception at Brewery Machold at Heerstr. 52.
10.20	Icebreaker Reception
18:30	Brewery Machold



## Day 2 - Wednesday October 16th

## **Session #3:** Extended Target Tracking

09:00 - 09:30	Julian Böhler, Tim Baur, Stefan Wirtensohn, and Johannes Reuter Stochastic Partitioning for Extended Object Probability Hypothesis Density Filters
09:30 - 10:00	Hosam Alqaderi, Felix Govaers, and Raymond Schulz  Spacial Elliptical Model for Extended Target Tracking Using Laser Measurements
10:00 - 10:30	Felix Govaers On Independent Axes Estimation for Extended Target Tracking

## Session #4: Localization Methods and Robust Navigation

11:00 – 11:30	Luisa Still, Macarena Varela, Wulf-Dieter Wirth, and Marc Oispuu Shooter Localization with a Microphone Array Based on a Linearly Modeled Bullet Speed
11:30 - 12:00	Josef Steinbaeck, Norbert Druml, Thomas Herndl, Stefan Loigge, Nadja Marko, Markus Postl, Georg Kail, Reinhard Hladik, Gerhard Hechenberger, Herbert Fuereder, Christian Steger, Eugen Brenner, and Christian Schwarzl ACTIVE – Autonomous Car to Infrastructure Communication Mastering Adverse Environments
12:00 – 12:30	Markus Krestel, Folker Hoffmann, Hans Schily, Alexander Charlish, and Sven Rau  Passive Emitter Direction Finding Using a Single Antenna and Compressed Sensing

## **Session #5:** Deep Learning for Data Fusion

	Mahed Javed and Lyudmila Mihaylova
13:30 - 14:00	Leveraging Uncertainty in Adversarial Learning to Improve Deep Learning Based Segmentation
	Karsten Schwalbe, Alexander Groh, Frank Hertwig, and Ullrich Scheunert
14:00 - 14:30	Data Fusion Strategy to Improve the Realiability of Machine Learning Based Classifications
14:30 - 15:00	Florian Particke, Jiaren Zhou, Markus Hiller, Christian Hofmann, and Jörn Thielecke
	Neural Network Aided Potential Field Approach for Pedestrian Prediction
15:00 - 15:30	Felix Nobis, Maximilian Geisslinger, Markus Weber, Johannes Betz, and Markus Lienkamp
15:00 - 15:30	A Deep Learning-Based Radar and Camera Sensor Fusion Architecture for Object Detection









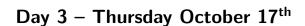




# **Session #6:** E/O Sensors and Video Processing

16:00 - 16:30	Mark Campbell and Daniel E. Clark  Joint Stereo Camera Calibration and Multi-Target Tracking Using the Linear- Complexity Factorial Cumulant Filter
16:30 - 17:00	Peng Wang, Yueda Lin, and Lyudmila Mihaylova  Computer Vision Methods for Automating High Temperature Steel Section Sizing in Thermal Images
17:30	Get Together Piano recital and Dinner





#### **Keynote Talk**

09:00 - 10:30

#### Fredrik Gustafsson

Fusion Theory for Positive Noise

There is a variety of sensors for distance measurements such as radar, sonar, lidar, UWB and various radio measurements such as round trip times and signal strength decay. They all suffer from multi-path, that causes the signal propagation to get a stochastic delay. In other words, the distance measurement suffers from positive noise. We will overview elementary results from estimation theory for how order statistics improve multiple distance measurements from the same sensor one order of magnitude, compared to classical moment (mean, variance, etc) matching techniques. These results are then applied to sensor data fusion algorithms for localisation and target tracking.

#### **Session #7:** Estimation Theory and Target Tracking

11:00 - 11:30	Stefano Coraluppi and Craig Carthel Track-Oriented MHT with Unresolved Measurements
11:30 - 12:00	Sebastian Thomas Handke and Joshua Gehlen Randomized Evolution Model for Multihypothesis Kalman Filter
12:00 - 12:30	André Fischer and Wolfgang Konle Trajectory Generation from Radar Data
12:30 - 13:00 13:00	Roy Streit Future Directions for Analytic Combinatorics in Tracking and High Level Fusion End of SDF Symposium 2019