

Mercedes-Benz

16th Symposium *Sensor Data Fusion: Trends, Solutions, and Applications*

Technical Program

To a degree never known before, human decision makers or decision making systems have access to a vast amount of data. While sensor data fusion constitutes a challenging exploitation technology having a large potential for future security and ISR systems in defence and civilian applications, the data streams must not overwhelm the actors involved. For this reason, AI-based methods are increasingly being used to process this data. Their development, evaluation, and discussion will take up a significant amount of space alongside traditional methodology and applications at the 16th SDF Symposium 2024. Accordingly, the symposium with its 24 paper presentations, four industry talks, and the plenary of Daniel Cremers will have a strong focus on advances in the theory of target tracking and fusion, AI-based estimation, sensor modelling, and selected applications. 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/sdf2024`.

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

Organisation

Executive Chairs:
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Day 1 – Monday November 25th
Start of SDF Symposium 2024

12:00 – 13:15	Registration
13:15 – 13:30	Welcome & Opening

Session #1: *Extended Target Tracking*
Chair: Patrick Hoher

13:30 – 14:00	**Kolja Thormann, Simon Steuernagel, and Marcus Baum** *Modeling Contour Measurements of Elliptical Extended Objects via Gaussian Spatial Distributions*
14:00 – 14:30	**Jiayi Gu, Jiaqi Shi, Kun Shi, Chaoqun Yang, and Xianghui Cao** *IMM-based PMBM Filter for Maneuvering Extended Target Tracking*

Industry Talk #1:
Chair: Martin Herrmann

14.30 – 15:00	**Stephan Reuter, Bosch** *Multi Sensor Fusion for Automated and Assisted Driving - Robustness and Scalability*

Coffee

Session #2: *AI-based Estimation & Sensor Modeling*
Chair: Wolfgang Koch

15:30 – 16:00	**Tarik Sahin, Daniel Wolff, Max von Danwitz, and Alexander Popp** *Towards a Hybrid Digital Twin: Fusing Sensor Information and Physics in Surrogate Modeling of a Reinforced Concrete Beam*



16:00 – 16:30	**Francesco Blangiardi, Raul Beltrán, Zhicheng Zhao; Reinhard Streiter, Marko Rößler, Jan Langer, Ulrich Heinkel, and Harald Kuhn** *Exploring Data Fusion for AI-based People Counting in a Static Public Transport Vehicle using Multiple IR-UWB Transceivers*
	Coffee
16:45 – 17:15	**Arian Mehrfard, Bharanidhar Duraisamy, Stefan Haag, Wolfram Burgard, and Florian Geiss** *Performance Evaluation of Deep Learning-Based State Estimation: A Comparative Study of KalmanNet*
17:15 – 17:45	**Kabeh Mohsenzadegan, Vahid Tavakkoli, Witesyavwirwa Vianney WV Kambale; Kyandoghere Kyamakya** *A Hybrid AI Framework Integrating Ontology Learning, Knowledge Graphs, and Large Language Models for Improved Data Model Translation in Smart Manufacturing and Transportation*

Industry Talk #2:
Chair: Martin Ulmke

17.45 – 18.15	**Bharanidhar Duraisamy, Mercedes-Benz** *Sensor Fusion over Generations for Intelligent Automotive Applications: Safety. Assisted and Autonomous Driving.*
19:00	**Icebreaker Reception** *Sion im Carré, In der Sürst 1, 53111 Bonn*



Day 2 – Tuesday November 26th

Session #3: *Optimization*
Chair: Toni Fetzer

09:00 – 09:30	**Christoph Vollweiter and Folker Hoffmann** *Multi-Sensor Extension of Radar Resource Management Approach Q-RAM*
09:30 – 09:00	**Sebastian T. Handke, Christian Steffes, and Wolfgang Koch** *Evaluation of a Semantic Search Approach based on AMR for Information Retrieval in Image Exploitation*
10:00 – 10:30	**Clemens Allmann, Jannik Springer, Marc Oispuu, and Wolfgang Koch** *Optimized Array Geometry for 2D-DOA Estimation using a Time-Multiplexed Co-Array Approach*

Coffee

Keynote Talk

11:00 – 12:30	**Daniel Cremers** *3D Computer Vision for Dynamic Scene Understanding*

Lunch

Session #4: *AI-based Fusion for Next Generation Applications*
Chair: Michael Hubner

13:30 – 14:00	**Ali Hussain** *Foundation Models for Enhancing the Performance of AI model: Applications, Risks, Challenges, Opportunities, and Future Directions*
14:00 – 14:30	**Alexey Serdyuk** *Improving Online Handwriting Trajectory Reconstruction Based on Temporal Convolutional Networks*



14:30 – 15:00	**Xiangpeng Xu, Wee Kiat Chan; Panithan Rithburi, and Sutthiphong Srigrarom** *Detection and Tracking of UAV by Spatial, Temporal and Distance Contour Hybrid Architectures with Fuzzy Information Fusion*

Industry Talk #3:
Chair: Fabian Ulreich

15:00 – 15:30	**Julian Otto, Airbus** *Optimization of Mission Tasking and Decision Processes with Support of AI*

Coffee

Session #5: *Navigation and Localization*
Chair: Felix Govaers

16:00 – 16:30	**Philipp Mikus, Matthias Ospel, Marc Oispuu, and Wolfgang Koch** *On Localization Accuracy in Urban Environments Using TDOA Measurements*
16:30 – 17:00	**Daniele Giovanni Gioia, Jacopo Bonari, Daniel Lichte, Alexander Popp** *Sequential Drone Routing for Data Assimilation on a 2D Airborne Contaminant Dispersion Problem*

Industry Talk #4:
Chair: Thomas Griebel

17:00 – 17:30	**Jörg Kushauer, Diel Defence** *Information Fusion and Software Defined Defense in Embedded Systems*

Gala Dinner

18:15 – 18:25	*Awards Ceremony*
18:25 – 19:15	*Piano recital (Julia Rinderle)*
19:15	Gala Dinner



Day 3 – Wednesday November 27th

Session #6: *Sensor Data Fusion*
Chair: Clemens Allmann

09:00 – 09:30	**Michael Hubner, Jan Nausner, and Kilian Wohlleben** *Advanced Sensor Fusion for Railway Security - A Hierarchical Graph-Based Approach*
09:30 – 10:00	**Shuqi Zhang, Wenqi Cao, Krishanth Krishnan, Kuo-Chu Chang, and Ting Yuan** *Multi-sensor Track-to-Track Fusion using Dynamic Consensus*
10:00 – 10:30	**Florian Grabner** *Multi-sensor Simulation from Target Tracking to a Recognized Air Picture*
10:30 – 11:00	**Luigi Podda, Fotios Katsilieris, and Stefan Neumeier** *Computational Complexity Reduction for the Track-to-Track Association Problem*

Coffee

Industry Talk #5:
Chair: Christoph Vollweiter

11:30 – 12:00	**Hosam Alqaderi, Dedrone** *Multi-Sensor Fusion in Drone Defense: Innovations and Insights*

Session #7: *Uncertainty Quantification*
Chair: Markus Walker

12:00 – 12:30	**Fabian Ulreich, Martin Ebert, and André Kaup** *Uncertainty Quantification for Adaptive Measurement Noise in Kalman Filter based Object Tracking*
12:30 – 13:00	**Markus Walker, Philipp Bien, and Uwe Hanebeck** *Voronoi Trust Regions for Local Calibration Testing in Supervised Machine Learning Models*

End of SDF Symposium 2024