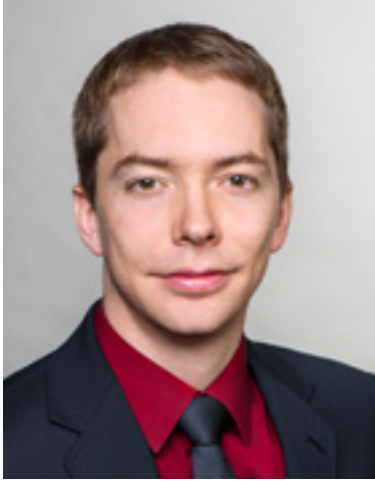


The Field Robotics Center

Seminar Series

Friday, 11th May

NSH 1305 11:30 AM – 12:30 PM



Lunch will be served

Matthias Althoff

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Cyber Physical Systems
Technische Universität München
(TUM)

Composable Benchmarks for Safe Motion Planning on Roads

Abstract: Numerical experiments for motion planning of road vehicles require numerous components: vehicle dynamics, a road network, static obstacles, dynamic obstacles and their movement over time, goal regions, a cost function, etc. Providing a description of the numerical experiment precise enough to reproduce it might require several pages of information. Thus, only key aspects are typically described in scientific publications, making it impossible to reproduce results—yet, reproducibility is an important asset of good science. Composable benchmarks for motion planning on roads (CommonRoad) are presented so that numerical experiments are fully defined by a unique ID. Each benchmark is composed by a vehicle model, a cost function, and a scenario (including goals and constraints). The scenarios are partly recorded from real traffic and partly hand-crafted to create dangerous situations.

The second part of the talk presents techniques to ensure safe planning in CommonRoad benchmarks. Since each traffic situation is unique, we propose to verify the safety of autonomous vehicles online, i.e., during their operation, to account for any possible traffic situation. We use reachability analysis to bound possible behaviors of other traffic participants and plan fail-safe trajectories that ensure that reachable sets are avoided when the fail-safe maneuver is activated. This makes it possible to safeguard non-verifiable techniques, such as machine learning.

Speaker Bio: Matthias Althoff received the diploma in Mechatronics and Information Technology from the department of mechanical engineering at the Technische Universität München, Germany, in 2005. He received his PhD degree (summa cum laude) in electrical engineering from the same university under the supervision of Univ.-Prof. Dr.-Ing./Univ. Tokio Martin Buss in 2010. From 2010 - 2012 he was a postdoctoral researcher at Carnegie Mellon University, USA, with a joint appointment in electrical engineering and the Robotics Institute. He joined the computer science department at Ilmenau University of Technology, Germany, in 2012 as assistant professor for automation systems. Since 2013 Matthias Althoff is assistant professor in computer science at the Technische Universität München.

His research interests include the design and analysis of cyber-physical systems, formal verification of continuous and hybrid systems, reachability analysis, planning algorithms, robust and fault-tolerant control. Main applications of his research are automated vehicles, robotics, power systems, and analog and mixed-signal circuits.



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