PennState College of Engineering

**Systems, Controls, and Robotics Seminar Series**

# Logic of Autonomous Dynamical Systems


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**Zoom Link: https://bit.ly/3eH6iF6**


## ABSTRACT

This talk highlights some of the most fascinating aspects of the logic of dynamical systems which constitute the foundation for developing cyber-physical systems (CPS) such as robots, cars and aircraft with the mathematical rigor that their safety-critical nature demands. Differential dynamic logic (dL) provides an integrated specification and verification language for dynamical systems, such as hybrid systems that combine discrete transitions and continuous evolution along differential equations. In dL, properties of the global behavior of a dynamical system can be analyzed solely from the logic of their local change without having to solve the dynamics.

In addition to providing a strong theoretical foundation for CPS, differential dynamic logics as implemented in the KeYmaera X prover have been instrumental in verifying many applications, including the Airborne Collision Avoidance System ACAS X, the European Train Control System ETCS, automotive systems, mobile robot navigation, and a surgical robotic system for skull-base surgery. dL is the foundation to provable safety transfer from models to CPS implementations and is also the key ingredient behind autonomous dynamical systems for Safe AI in CPS.



- André Platzer. Logical Foundations of Cyber-Physical Systems. Springer, 2018. DOI:10.1007/978-3-319-63588-0
- André Platzer. Logics of dynamical systems LICS, 2012: 13-24. DOI:10.1109/LICS.2012.13


## BIOGRAPHY

André Platzer is the Alexander von Humboldt Professor at Karlsruhe Institute of Technology and a Professor of Computer Science at Carnegie Mellon University. He develops logics for dynamical systems to characterize the logical foundations of cyber-physical systems and to answer the question how we can trust a computer to control physical processes. The solution to this challenge is the key to enabling computer assistance that we can bet our lives on. Prof. Platzer pursues this challenge with the principled design of programming languages with logics that can provide proofs as correctness guarantees. André Platzer has a Ph.D. from the University of Oldenburg, Germany, received an ACM Doctoral Dissertation Honorable Mention and NSF CAREER Award, was named one of the Brilliant 10 Young Scientists by the Popular Science magazine and one of the AI's 10 to Watch by the IEEE Intelligent Systems Magazine, and received the Alexander von Humboldt Professorship for AI 2023.