DEPARTMENT OF MECHANICAL & AEROSPACE ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

"Game-Theoretic, Set-Theoretic and Optimal Control for Safe and Energy-Efficient Mobility"

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Abstract:

Advances in mobility technology are expected to bring significant societal impacts. Many challenges remain to be addressed in achieving safe and energy-efficient mobility. This talk introduces some recent advances in control strategies to highlight several solutions. Firstly, for safety-critical applications, it is important to guarantee that the systems can operate safely anytime even with the occurrence of failures. Meanwhile, the system's availability should be maximized. I will present a set-theoretic and reference governor-centric fault-tolerant control strategy that exploits nesting between sets to satisfy constraints in all phases of failure detection, isolation, and reconfiguration. In the second part of the talk, I will focus on motion planning and control for autonomous driving applications. In the foreseeable future, autonomous vehicles are expected to operate together with human-driven vehicles in traffic. Thus, the cognitive behaviors of human drivers should be considered during the autonomous driving control development. I will present an energy-efficient autonomous driving policy trained by reinforcement learning using a battery electric vehicle powertrain model and a level-k game-theoretic interactive traffic model. To conclude the talk, I will highlight some results of the most recent development for a strategy that increases the chance of successful overtaking on two-lane rural highways and guarantees collision-free trajectory tracking using set-theoretic and optimal control methods.

Speaker Bio:

Huayi Li received her Ph.D. degree in Aerospace Engineering from the University of Michigan, Ann Arbor in 2022. She was a postdoctoral researcher at Texas A&M University from 2022 to 2023. She joined the Department of Mechanical and Aerospace Engineering and the Paducah Extended Campus Program at the University of Kentucky in August 2023 as an Assistant Professor. Her research and teaching interests include constrained and optimal control, fault-tolerant control, and control for safe, clean and energy-efficient mobility systems.

Date: Friday, October 6, 2023
Place: Whitehall Classroom Building 110

Time: 3:00 PM EST
Contact: Dr. Jonathan Wenk

Attendance open to all interested persons

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