

The Field Robotics Center

Seminar Series

Friday, 11th November

NSH 1507 2:00 – 3:00pm

Lunch will be served



Serban Sabau

Assistant Professor

Stevens Institute of Technology

How to Platoon more than Three Cars: A Comprehensive, Practical Solution

Abstract: On highways, all vehicles (automated or not) must travel in the string (or platoon) formation. Surprisingly enough, this has been an open problem in controls for more than fifty years, dating back to the work of Levine and Athans on intelligent vehicles highway systems. The reason for which automated platooning is not a reality today is that no existing solution was deemed completely satisfactory from several engineering standpoints. We present a novel distributed control design that vastly outperforms existing methods with respect to the relevant quantitative metrics of safety and performance. Our method is also the only one (we are aware of) capable to tackle systematically with several key practical necessities: it can accommodate heterogeneous platoons by compensating the different time constants associated with the dynamics of various types of drive trains (and hydraulic actuators), it can completely compensate the vehicle to vehicle communications time delays and time-jittering, it retains optimality during merging/ exiting maneuvers, requiring only "local" reconfigurations of the control scheme. As an extra bonus, the scheme is capable of detecting in real time (while functioning on the highway) any "abnormal" behavior caused by sensors faults or sensors spoofing and by wireless communications disruptions or hacking. Our method is based on a novel type of structural constraints in distributed control, introduced by the speaker. We disprove longstanding conjectures that claimed that vehicle-to-vehicle communications with more than one preceding vehicle (beyond the direct line of sight) may be beneficial for platooning, since it provides a "preview" of disturbances. We also show how our methods can be exploited for more general, two-dimensional formations, appearing in flight control of aerial vehicles and other practical applications.

Speaker Bio: Serban Sabau received the M.S. in control engineering from "Politehnica" Bucharest in 2002 and the Ph.D. in electrical engineering from the University of Maryland in 2011. Before joining Stevens in 2013 as an Assistant Professor he was a postdoctoral fellow at the University of Pennsylvania. His interests are in numerical algorithms for distributed optimization and distributed control and in fault tolerant control methods for driverless cars.



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