Model Predictive Control for Platoon Coordination with Guaranteed Feasibility and Stability Properties

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Abstract:

Connected and autonomous vehicles (CAVs) have the potential to disrupt mobility, extending what is possible with driving automation and connectivity. One promising application of CAV technology is vehicle platooning, which can also be extended to drones and unmanned air traffic systems. The coordination of a platoon can be viewed as a distributed consensus problem, through inter-vehicle communication, cooperative and distributed controllers enable CAVs to travel at the same speed, maintaining a small distance between vehicles to form a platoon. This arrangement simplifies operation and improves energy efficiency and safety. In this talk, we will explore various platooning challenges using model predictive control (MPC) techniques. We will start by examining an isolated platoon and then progress to scenarios where the platoon interacts with other traffic, allowing for scalable platoon formation. This will be done by paying particular attention to MPC and distributed MPC design for guaranteed recursive feasibility, which in turn provides provable safety and stability.