Graduate Student Research Seminar

Spring 2026

Making Electric Vehicles More Energy Efficient through Automation and Optimal Control

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Monday, February 2nd

3:00 pm (EST) – 132 Fluor Daniel Building

Abstract

Energy efficient cruise control has been well studied for combustion engine vehicles. This work extends these results to electric vehicles and accounts for the different efficiency map of electric motors and their regenerative capability. We employ Pontryagin's Minimum Principle (PMP) theory, which solves the energy efficient driving problem as a boundary value problem (BVP) to generate optimal acceleration and braking control sequences. The algorithm was tested on a Ford Mustang Mach-E in straight-line test track experiments designed to emulate daily human driving behavior. We measured as much as 10 percent of energy savings relative to human drivers who drove the same vehicle under the same scenarios. The study demonstrates that, despite the inherent efficiency advantages of electric vehicles over gasoline-powered vehicles, additional energy savings can be achieved through the proposed algorithms. It also highlights the benefits of incorporating regenerative efficiency into control design.

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