GRADUATE STUDENT RESEARCH SEMINAR SERIES (2018)

PREDICTION AND OPTIMAL CONTROL FOR ANTICIPATIVE AUTOMATED DRIVING

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With rapid advancements in machine learning and sensing technology, automated driving is quickly moving beyond its beginnings in advanced driver assistance systems (ADAS) and into full autonomy. Replacement of human drivers with automated control systems could result in super-human energy efficiency and safety if properly implemented. With such benefits in mind, this seminar will concern the design of automated driving systems that anticipate the future traffic situation using vehicle-to-everything (V2X) connectivity and/or data-driven prediction models. The resulting preview together with the driving task's constraints and objectives are formulated as a mathematical program, which the controller repeatedly solves to obtain the optimal control input over a receding horizon. A car-following algorithm designed around this philosophy showed a simulated fuel economy benefit of at least 4.5% at a penetration rate of 30% connected and automated vehicles. To demonstrate the feasibility of anticipation in experimental unconnected environments, data-driven prediction of bus trajectories using Markov chains and shallow neural networks will be discussed. In its conclusion, the talk will explore prediction and control possibilities for complex multi-lane traffic scenes.

MONDAY, MARCH 12 AT 3:00 PM

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