Aerospace Seminar

Zachary Sunberg

Postdoctoral Scholar, University of California, Berkeley

Safety and Efficiency for Autonomous Vehicles through Online Learning

Monday, Feb. 18, 2019 | DLC | 12:00 P.M.

Abstract: Autonomous systems have the potential to help humans in a variety of ways, from traveling to inhospitable destinations and performing tasks that are impossible for humans, to working directly alongside us. To be effective, these systems must accomplish tasks *efficiently* in terms of time and other resources and do so *safely*. Though these two goals are often opposed to one another, online learning and reasoning about uncertainty in the state of the world can result in simultaneous improvement of both safety and efficiency. The partially observable Markov decision process (POMDP) is an optimization framework that automatically incentivizes the online learning necessary to accomplish an objective. This talk will discuss formulating autonomous vehicle control problems as POMDPs and solving them approximately online. First, it will present an autonomous driving scenario that quantitatively demonstrates the safety and efficiency advantages of a POMDP approach, along with several other aerospace problems that can be naturally formulated as POMDPs. Next, it will introduce a new algorithm, POMCPOW, that is capable of finding approximate solutions to POMDPs with continuous state and observation spaces. Finally it will give a brief introduction to the POMDPs.jl software interface, which provides first-class speed and unprecedented flexibility for easily formulating and solving POMDPs in teaching and research contexts.

Bio: Zachary Sunberg is a Postdoctoral Scholar with Claire Tomlin at the University of California, Berkeley. He completed his PhD in Aeronautics and Astronautics with Mykel Kochenderfer at Stanford University in 2018, with a focus on planning under uncertainty for autonomous vehicles. He earned his BS and MS degrees in Aerospace Engineering from Texas A&M University, with research focused on helicopter autorotation and orbital object tracking. He received an NSF Graduate Research Fellowship in 2012, serves as the lead maintainer of the POMDPs.jl Julia package, and is a native Coloradan and avid skier.

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