



Robot Learning Workshop

October 14-15, 2019

Kyriakos Vamvoudakis

The Daniel Guggenheim School of Aerospace Engineering,
Georgia Institute of Technology

Kinodynamic Motion Planning with Q-Learning: An Online, Model-Free, and Safe Navigation Framework

This talk will present an online kinodynamic motion planning algorithmic framework using asymptotically optimal rapidly-exploring random tree (RRT*) and continuous-time Q-learning, which we term as RRT-Q*. I will formulate a model-free Q-based advantage function and I will utilize integral reinforcement learning to develop tuning laws for the online approximation of the optimal cost and the optimal policy of continuous-time linear systems. A terminal state evaluation procedure is introduced to facilitate the online implementation. I will then propose a static obstacle augmentation and a local replanning framework, which are based on topological connectedness, to locally recompute the robot's path and ensure collision-free navigation. I will finally show simulations and a qualitative comparison to evaluate the efficacy of the proposed methodology.