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Motion Planning with Primitives: Optimization and Learning for Autonomous Driving

Motion planning problems can be efficiently solved by exploiting the symmetry property of a nonlinear dynamical system, via the concatenation of the motion primitives. These are segments of trajectories that can be sequenced according to rules described by an automaton. Then, the systems with symmetries are considered to transfer the system dynamics into a finite-state automaton. In this talk, we will focus on two aspects: the construction of this automata and the planning methods with motion primitives, both applied to autonomous driving. First, we will present a learning method to optimally extract the library of primitives based on real data. The library is designed based on primitives with highest occurrences within the data set, while Lie group symmetries from a vehicle model are analyzed in the available data to allow for structure-exploiting primitives. Second, we will show the traditional planning methods based on graph search, then close the loop with a receding horizon control approach and, lastly, discuss a recent real-time solution based on reinforcement learning, where the action space are the set of primitives.

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Zu diesem Vortrag laden wir Sie herzlich ein.

gez. Sergey Dashkovskiy