AutoRally

Scale Autonomous Racing at Georgia Tech

Matthew Barulic

September 23, 2019

Outline

The Platform

The Research

My Involvement

The AutoRally Platform

The Chassis

The Compute Box

The Compute Box

The Tracks

The Tracks

The Challenge

The Challenge

The Challenge

Publications Using the AutoRally Platform

- Ensemble Bayesian Decision Making with Redundant Deep Perceptual Control Policies. Keuntaek Lee, Ziyi Wang, Bogdan Vlahov, Harleen Brar, Evangelos A Theodorou. To be appear, ICMLA, 2019.
- Perceptual Attention-based Predictive Control. Keuntaek Lee, Gabriel Nakajima An, Viacheslav Zakharov, Evangelos A Theodorou. To be appear, CoRL, 2019.
- Locally Weighted Regression Pseudo-Rehearsal for Online Learning of Vehicle Dynamics. Grady Williams, Brian Goldfain, James M Rehg, Evangelos A Theodorou. To be appear, CoRL, 2019.
- An Online Learning Approach to Model Predictive Control. Nolan Wagener, Ching-An Cheng, Jacob Sacks, Byron Boots. IEEE Robotics and Automation Letters (RA-L), 2019.
- Early Failure Detection of Deep End-to-End Control Policy by Reinforcement Learning. Keuntaek Lee, Kamil Saigol, Evangelos A Theodorou. IEEE International Conference on Robotics and Automation (ICRA), 2019.
- Vision-Based High-Speed Driving With a Deep Dynamic Observer. Paul Drews, Grady Williams, Brian Goldfain, Evangelos A Theodorou, James M Rehg. IEEE Robotics and Automation Letters (RA-L), 2019.
- Robust Sampling Based Model Predictive Control with Sparse Objective Information. Grady Williams, Brian Goldfain, Paul Drews, Kamil Saigol, James M Rehg, Evangelos Theodorou. Robotics: Science and Systems (RSS), 2018.
- Agile autonomous driving using end-to-end deep imitation learning. Yunpeng Pan, Ching-An Cheng, Kamil Saigol, Keuntaek Lee, Xinyan Yan, Evangelos Theodorou, Byron Boots. Robotics: Science and Systems (RSS), 2018.
- Best Response Model Predictive Control for Agile Interactions Between Autonomous Ground Vehicles. Grady Williams, Brian Goldfain, Paul Drews, James M Rehg, Evangelos A Theodorou. IEEE International Conference on Robotics and Automation (ICRA), 2018.
- Information-Theoretic Model Predictive Control: Theory and Applications to Autonomous Driving. Grady Williams, Paul Drews, Brian Goldfain, James M Rehg, Evangelos A Theodorou. IEEE Transactions on Robotics (T-RO), 2018.
- Aggressive Deep Driving: Model Predictive Control with a CNN Cost Model. Paul Drews, Grady Williams, Brian Goldfain, Evangelos A. Theodorou, James M. Rehg. Conference on Robotic Learning (CoRL), 2017.
- Information theoretic MPC for model-based reinforcement learning. Grady Williams, Paul Drews, Brian Goldfain, James M Rehg, Evangelos A Theodorou. IEEE International Conference on Robotics and Automation (ICRA), 2017.
- Vehicle Modeling and Parameter Estimation Using Adaptive Limited Memory Joint-State UKF. Changxi You, Panagiotis Tsiotras. American Control Conference (ACC), 2017.
- Aggressive driving with model predictive path integral control. Grady Williams, Paul Drews, Brian Goldfain, James M Rehg, Evangelos A Theodorou. IEEE International Conference on Robotics and Automation (ICRA), 2016.

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MPPI

Model Predictive Path Integral

Vision-Based Track Driving

My Involvement

- Hardware Design
- Infrastructure Software Development and Maintenance
- Early (Non-ML) Work on Visual Track Detection