Chair of Automatic Control

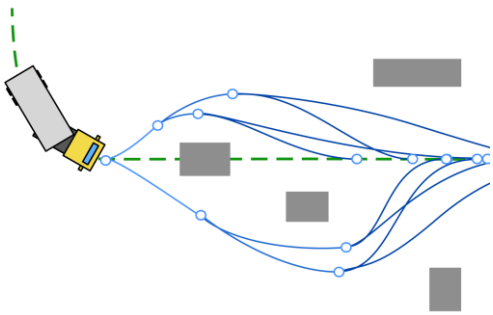
FAU

Announcement for Research Project

Local Predictive Trajectory Optimization for Truck-Trailer Systems

Motivation

Autonomous vehicles require reliable path or trajectory planners. While many Graph-based planners are complete and enable to plan paths globally, they may result in suboptimal solutions due to simplifications made to reduce the computational complexity. In contrast, local planners are generally not complete but allow to find locally optimal results [1]. This research project aims to combine both approaches by optimizing an initially planned suboptimal trajectory using a model predictive controller (MPC).



Task description

In a prior literature review, MPC-based planning and control algorithms for truck-trailer systems are to be investigated. Following, the MPC is to be implemented using the framework GRAMPC [2]. The developed algorithm will be tested through simulations.

Requirements

- Experience in Matlab programming
- The lecture Numerical Optimization and Model Predictive Control is beneficial
- The lecture Robotics 2 is beneficial

References

[1] Dahlmann, J., Völz, A., Lukassek, M., & Graichen, K. (2023). Local predictive optimization of globally planned motions for truck-trailer systems. IEEE Transactions on Control Systems Technology, 32(5), 1555-1568.

[2] Englert, T., Völz, A., Mesmer, F., Rhein, S., & Graichen, K. (2019). A software framework for embedded nonlinear model predictive control using a gradient-based augmented Lagrangian approach (GRAMPC). Optimization and Engineering, 20(3), 769-809.

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