

Announcement for Research Project

Moving Horizon Estimation for Truck-Trailer Systems

Motivation

Autonomous driving of truck-trailer systems requires a precise estimation of the vehicle states. Particularly critical are the hitching angles, which are not only difficult to measure with sensors and but are also crucial for the safety and stability of the vehicle. This problem becomes even more pronounced in off-road environments, where slipping can cause discrepancies between the vehicle orientation and its direction of motion. This project will explore how moving horizon estimation (MHE) can be applied to address this problem.



Task description

In a prior literature review, related works regarding the state estimation of truck-trailer systems are studied. A suitable model and set of sensors is determined. The MHE algorithm is implemented using the framework GRAMPC [1]. The estimator is evaluated in the simulation environment TruckMaker.

Requirements

- Experience in Matlab and C programming
- Experience with state estimation (e.g. Regelungstechnik B or Schätzverfahren in der Regelungstechnik)
- The lecture Numerical Optimization and Model Predictive Control is beneficial

References

[1] 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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