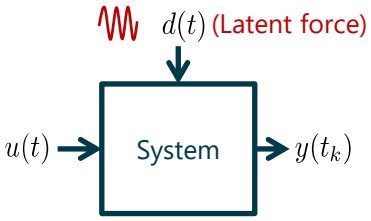
MPC Based on Latent Force Models

Project Summary

Combining Gaussian Process (GP) priors for modelling disturbances acting on a system with the model of the system results in a so-called latent force model (LFM), which can be employed as a predictor in model predictive control (MPC). Recently the LFM-MPC scheme shows promising potentials in suppressing disturbances affects. The goal of this project is to develop recursively feasible control algorithms using the LFM-MPC scheme with high fidelity simulation.

Project Type

- MA Thesis (6 months)



Required Qualifications

- Knowledge of MPC
- Programming skills in Matlab/Python/C++

Contact

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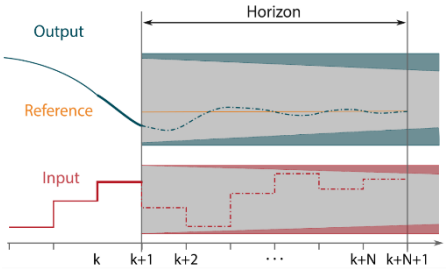
Detailed Description



Due to the unbounded support of the underlying GP models, it cannot be guaranteed that there will be always a feasible solution to the online optimization problem of the LFM-MPC. To avoid such infeasibility, an initialization strategy will be caried out in this project by considering the initial conditions as decision variables of the LFM-MPC optimization problem.

References

- S. Muntwiler, etal., LQG for Constrained Linear Systems: Indirect Feedback Stochastic MPC with Kalman Filtering, 2022
- H. Schlüter and F. Allgöwer, Stochastic MPC using Initial State and Variance Interpolation, 2023
- J. Gruner, etal., Recursively Feasible MPC using LFMs Applied to Disturbed Quadcopters, CDC 2022