GP Based MPC of Drones in Critical Missions under Extreme Weather Conditions

Project Summary

The goal of this project is to develop control algorithms that yield safe, mission-critical, high-performance drones under extreme weather conditions.

Project Type

- BA Thesis (3 months)
- MA Thesis (6 months)
- Internship (3-6 months)

Required Qualifications

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

Contact

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Detailed Description

In this project, model predictive control (MPC) is adopted to control a drone under severe wind conditions. Furthermore, Gaussian Processes (GPs) are utilized to learn turbulence affecting the drone due to wind and its information is incorporated into the MPC to counteract the wind effects on the drone and enhance its performance yielding safe and high-performance operation. To evaluate the developed GPMPC, a suitable model for the MPC needs to be identified. Subsequently, the performance of the GPMPC under strong wind conditions is compared with a commercial control algorithm. The algorithms will be implemented using the jMAVSim simulation environment.

References

- N. Schmid, J. Gruner, H. S. Abbas and P. Rostalski , A real-time GP based MPC for quadcopters with unknown disturbances, ACC 2022, Atlanta, USA.