TECHNISCHE UNIVERSITÄT DARMSTADT

Thesis (B.Sc. / M.Sc.)
FPGA-based Model Predictive Control for UAVs

Fachbereich 18
Elektrotechnik und Informationstechnik
Bioinspirierte Kommunikationssysteme

Department 18
Electrical Engineering and Information Technology
Bioinspired Communication Systems

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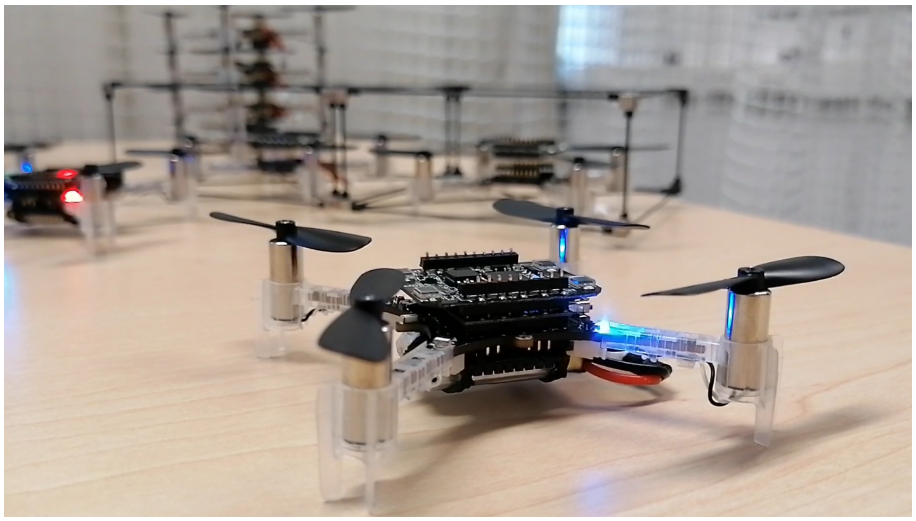
Drone swarms offer many possibilities for applications such as transportation, disaster relief operations, environmental exploration or ad-hoc communication networks. An important prerequisite to the application of drone swarms is a reliable control algorithm.

The typical approach to achieving control on dynamical systems such as drones is to first perform system identification and obtain a model of the drone dynamics that allow for precise simulation and prediction of controlled drone behavior. Afterwards, one may apply online optimization techniques in the form of model predictive control to find the optimal future behavior.

Unfortunately, model predictive control can be expensive in terms of computation. To efficiently run model predictive control on heavily resource-constrained devices such as our UAVs, one solution could be to use FPGAs for parallel processing.



At BCS Lab's Dronelab, you will have the opportunity to work with Crazyflie 2.1 drones. You will investigate how to realize model predictive control on FPGAs for the control of drones, ideally aiming at a publication in relevant venues. You are further encouraged to realize your own ideas.

Some of the following may or may not help:

- Experience with FPGAs (e.g. Lattice ice40up5k)
- Experience with embedded systems or C
- Knowledge of control

For further information, please contact Kai Cui.

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