ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Institute for Dynamic Systems and Control
IDSC
Institut für Dynamische Systeme und Regelungstechnik

Bachelor Thesis / Semester Project / Master Thesis

IDSC-RD-MMu-KX

Approximative MPC

Fast Online Model-Predictive Control

Description:

The ability to explicitly exploit the full problem structure, including the system dynamics, and input and state constraints, makes MPC one of the most promising and successful control strategies.

However, MPC is computationally very demanding: In each sampling interval, an optimization problem must be solved. In order to address the computational challenges of MPC, we propose to approximate the predicted state trajectory, rather than strictly enforcing the system dynamics.

It is conjectured that by carefully reducing the prediction accuracy, the convergeance speed of the optimization problem can be increased with limited performance degradation (particularly on a physical system, where the dynamics are only known approximately). The aim is to develop tools to analyze the implications of using approximate predictions with regards to closed-loop stability, robustness and performance.

Moreover, the methods are evaluated in experiments on the "Flying Platform", a new flying vehicle, capable of hovering.

Suitable projects regarding practical and theoretical aspects can be found for talented and motivated students. I look forward to hearing from you.

Prerequisites:

Depending on the specific project. Strong analytical skills, course in control systems and optimization preferable.

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