Universität Stuttgart
Institut für Systemtheorie und Regelungstechnik
Prof. Dr.–Ing. Frank Allgöwer

Open Thesis (MA)

Adaptive MPC for nonlinear systems via recursive linear system identification

Description:

Model predictive control (MPC) is a powerful modern control technique which relies on repeatedly solving an open-loop optimal control problem. The implementation of MPC requires an accurate prediction model, which is often not available. In recent years, adaptive MPC has received increasing attention, which uses online measurements to refine an initially coarse prediction model to reduce conservatism. For nonlinear systems, most adaptive MPC approaches make restrictive assumptions on knowledge of basis functions leading to a linear parametrization of the dynamics. The goal of this thesis is to develop an adaptive MPC approach for nonlinear systems based on recursive linear system identification. As a first step, a finite window of past measurements can be used online to identify a linear prediction model for MPC, exploiting that any smooth nonlinear system can be approximated locally by linear dynamics. Theoretical properties of the resulting adaptive MPC scheme should be analyzed and the method should be applied in simulation and compared to existing methods. This thesis will be co-supervised by Johannes Köhler from ETH Zürich.

Prerequisites:

- Strong background in control theory and mathematics
- Interest in theoretical problems
- Lectures: *Konzepte der Regelungstechnik*, *Model Predictive Control*

Supervisor:

Julian Berberich
Room 2.236

Area:

MPC
System identification
Adaptive control

Properties:

Type: **MA**

20% literature
60% theory
20% simulation

Beginning:

now

Weitere Informationen: www.ist.uni-stuttgart.de/lehre/bama

Aushang vom 8. März 2023