Tuning of model predictive controller using Bayesian optimization

TECHNISCHE UNIVERSITÄT DARMSTADT

Projektseminar (2 Personen, Homeoffice)

Control of robotic manipulators is a challenging task due to their highly complex nonlinear dynamics. Therefore, we often require advanced control techniques to achieve a desired performance.

Model predictive control (MPC) is a control strategy that is well suited for the control of robotic manipulators, since the dynamics are directly considered by the controller. Furthermore, the quantitative performance of the controller is highly depended on the cost functional defined in the MPC formulation. Typically, this cost function needs to be tuned by an expert. Alternatively, we can deploy machine learning algorithms, such as Bayesian optimization, to learn a proper set of tuning parameters.

Requirements:

- experienced with MATLAB
- basic knowledge MPC and nonlinear control

Your tasks will be:

- to inform yourself about robotic manipulators and Bayesian optimization
- to tune a MPC by hand and by using Bayesian optimization
- compare the MPC performance of both tuning approaches

M. Sc. Philipp Holzmann
M.Sc. Maik Pfefferkorn

E-Mail: philipp.holzmann@iat.tu-darmstadt.de
maik.pfefferkorn@ovgu.de
Web: http://www.rtm.tu-darmstadt.de

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