Sparse Identification of Nonlinear Dynamics for Model Predictive Control

TECHNISCHE UNIVERSITÄT DARMSTADT

Master's Thesis

Model predictive control (MPC) is a powerful tool to control systems with nonlinear dynamics and constraints. Nonlinear systems are frequently encountered in control-related areas, such as control of bioreactors or robotic arms. These nonlinear systems usually lack computationally tractable models, making it difficult for application in real-time control. Hence, system identification techniques are necessary to obtain precise and efficient models for MPC.

Here, we focus on sparse identification of nonlinear dynamics (SINDy).[1]

Your tasks will be:

1. Literature review on SINDy with control
2. Implementation of SINDy algorithm in HILO-MPC[2]
3. Performance comparison against other data-driven MPC implementations

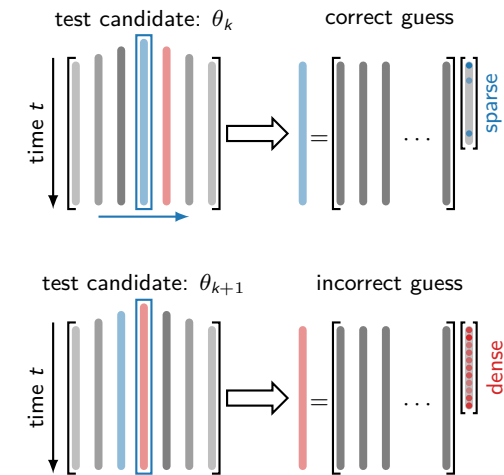| Experience with / knowledge about:	Model predictive control, data-driven modeling, system identification
Programming skills:	Python (good to very good skills required)
Language:	English (thesis and presentation), German

Figure adapted from https://doi.org/10.1098/rspa.2020.0279

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1 https://doi.org/10.1109/CDC45484.2021.9683120
2 https://www.ccps.tu-darmstadt.de/research_ccps/hilo_mpc/index.en.jsp

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