Lehrstuhl Steuerung,
Regelung und Systemdynamik

Master thesis

Programming

Data-driven model identification of a hydraulic differential cylinder system using optimization approaches

Conditions

Duration:	6 Months
Requirements:	Experience of control theory and Matlab programming
Language:	German or English
Target groups:	Master students

Content

In practice, the internal structure or mathematical relationship between inputs and outputs of nonlinear systems is hard to be achieved and the classical control and observer methods for the nonlinear system cannot easily work. Under this condition, black box models (e.g. Neural Networks) have been applied successfully in the identification and control of nonlinear dynamical systems. Unlike the well-known system identification approaches, in this work a data-driven approach is taking into consideration.
The purpose of this thesis is to model a nonlinear hydraulic differential cylinder system using experimental data and considering the mathematical simple model structure based on the preliminary and known dynamics of the system. The unknown parameters and dynamics will be identified using an optimization algorithm like NSGA II. The obtained adapted model should be validated using experimental test data.

The steps of this project are as follows:

- A brief literature review of data-driven system identification approaches
- Understanding the basic system model (hydraulic cylinder model) and the details of experimental data
- Investigating and elaborating the advanced system model considering the missing dynamics and parameters
- Optimization of the new model using experimental measurements
- Validation of the new model
- Analysis and improvement of results
- Complete and detailed documentation/presentation of the research results

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