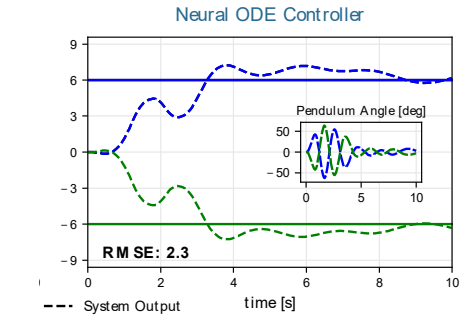
Masterthesis

Institut für Mechatronische Systeme
Leibniz Universität Hannover

Iterative Neural ODE Control

Description

Many application domains require controlling the output of a system despite unknown, nonlinear dynamics such that it tracks a desired reference signal for a finite duration of time. In prior work (https://youtu.be/tttkFFD81Qw), we have developed a method named Automatic Neural ODE Control (ANODEC) that can efficiently design neural ODE feedback controllers from input-output data. However, ANODEC has a single data collecting phase and the amount of required data must be known a-priori. In this thesis, we aim to overcome this limitation by developing an iterative version of ANODEC. This further poses two new challenges: Firstly, the explore-exploit tradeoff must be balanced, secondly, safe operation of the intermediate controllers must be guaranteed.



Tasks

- Literature research for similar problem formulations
- Formalization as a precise problem statement
- Understanding of existing software
- Method development and validation in simulation

Requirements

- Self-dependent student with high intrinsic motivation
- Excellent Python Programming Skills
- Basic understanding of Machine Learning and Reinforcement Learning
- First experience with a deep-learning framework (such as TF, PyTorch, JAX)

Supervisors

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Start

As of now