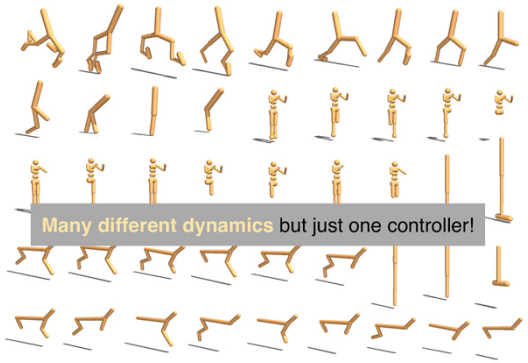
Masterthesis

Institut für Mechatronische Systeme
Leibniz Universität Hannover

One Policy to Control Them All: End-to-End Deep (Reinforcement) Learning

Description

This thesis aims to develop a machine-learning based method that can, fully autonomously, learn to control an arbitrary plant with unknown, linear dynamics such that its output follows a given reference signal quickly and accurately. The control policy must be trained on a large amount of simulated dynamics to achieve generalization across a class of system. Guided only by reward, the neural-network based control policy must learn to implicitly perform system identification and controller synthesis in real-time, i.e. while it is unrolled in time and iteration domain. By providing additional features that quantify concepts such as, e.g. an interaction time budget, we enable the control policy to learn to balance the inherent explore-exploit problem. This problem statement can be formalized as a Reinforcement Learning problem, however, alternative approaches may also be considered.



[1]

Tasks

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

Supervisors

Tim-Lukas Habich
tim-lukas.habich@imes.uni-hannover.de
0511-762-4121
Simon Bachhuber
simon.bachhuber@fau.de

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)

Start

As of now

[1] https://arxiv.org/abs/2007.04976