Chair of
Automatic Control

FAU

Bachelor's-, Master's-, Project-Thesis, Research Project

Different Topics in Reinforcement Learning Control in Thermal Management of Electric Vehicles

Motivation

At the interface of machine learning and optimal control, reinforcement learning (RL) agents have mastered numerous problems in various domains [3]. Among others, this is due to their capability of handling complex nonlinear systems which makes them a promising solution for control engineering problems, too [1]. Effective thermal management systems for electrified automotive applications are, in contrast to combustion engines, notably more complex [2]. Thus, RL strategies capable of managing this complexity and potentially conflicting control goals are of great interest.

Task Description

Potential topics and tasks are in the area of

- Robustness of RL approaches (disturbance rejections, modeling inaccuracies, ...)
- Effective RL training (training strategies, hyperparameter selection, ...)
- Model-based and model-free RL
- Multi-agent RL
- RL in combination with conventional control methods

Requirements

Basic skills in automatic control, basic knowledge in RL, intermediate skills in MATLAB/Simulink

References

[1] Tech Logg Ding, Stuart Norris, and Alison Subiantoro. Reinforcement Learning for Vapor Compression Cycle Control. *SSRN Electronic Journal*, 2022.

[2] Achim Kampker and Heiner Hans Heimes, editors. *Elektromobilität: Grundlagen einer Fortschrittstechnologie*. Open Access. Springer Vieweg, Berlin [Heidelberg], 3. auflage edition, 2024.

[3] Ashish Kumar Shakya, Gopinatha Pillai, and Sohom Chakrabarty. Reinforcement learning algorithms: A brief survey. *Expert Systems with Applications*, 231:120495, November 2023.

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