Chair of Automatic Control

FAU

Announcement for Bachelor/Master Thesis/Research project

Reinforcement Learning for controlling Building Energy Systems

Motivation

The building sector is responsible for around 35% of the energy consumption in Germany. The state of the art of controlling the heating, ventilation and air conditioning (HVAC) equipment are rule-based (RB) controllers. They utilize simple schedules and heuristics to manage the HVAC equipment and therefore the temperature inside the building. The downside of RB controllers are that they don't utilize the thermal dynamics of the building and can't adequately react to disturbances like occupancy or solar radiation.

Learning the optimal control strategy with Reinforcement Learning (RL) is a promising approach for building energy systems and current subject of research. RL consists out of an agent and an environment. The agent interacts with the environment, which outputs the next state and reward for the current action. The agent uses this reward to find an optimal policy to maximize the reward return.

Task description

First, suitable RL architectures are to be examined, both model-based and model-free. Then, the training environment for a simple building simulation model shall be constructed to train a RL architecture. In the end, the performance of RL compared to a rule-based controller and model-predictive controller shall be analyzed.

Requirements

Basic knowledge with Python is required. Experience with Reinforcement Learning and Neural Networks is advantageous but not mandatory. The thesis can be written in either English or German.

Contact

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