Karlsruhe Institute of Technology

ENERGY LAB 2.0

ESA

Institute for Automation and Applied Informatics (IAI)

Master Thesis

Control design for the reduction of buildings' energy consumption

Significant opportunities for energy savings in the building sector exist in the efficient control of heating, ventilation, and cooling (HVAC) systems.

One of the most commonly researched HVAC control strategies is model predictive control (MPC), which lacks robustness and greatly depends on the building models. On the other hand fuzzy logic is more robust to the different building types but it doesn't guarantee an optimal solution. This thesis should explore the possibility of combination of fuzzy logic and MPC considering the occupant comfort and electricity prices in order to improve the controller design.

Tasks:

- Comparison of the state of the art in controller designs for HVAC applications
- Implementing of RC building model as a plant
- Analysis and design of a controller
- Evaluation of the design improvement compared to MPC and/or Fuzzy

Qualification:

- Solid knowledge of building energy systems
- Willingness to explore and learn new control designs
- Desirable knowledge of MPC or fuzzy logic
- Knowledge in Matlab and/or Python
- Thesis can be carried out in German or English

We offer:

- Excellent support from the ESA group and experts at the EnergyLab
- Use of the HW and SW in the EGSAL Lab at the EnergyLab of KIT-CN

If you are interested in the topic, please contact Jovana Kovacevic or Anne-Christin Süß

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