Universität Stuttgart
Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung

Lehrstuhl für Heiz- und Raumlufttechnik
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Open Thesis

Type:
MA/FA/BA

Model-Based Off-line Control for Cooling Tower Systems

Cooling towers play a pivotal role in removing heat from ventilation and air conditioning systems in buildings, data center cooling systems, and industrial processes. The current operational protocols for cooling towers typically involve setting fixed water flow rates and outlet temperature setpoints, and adjusting the number of towers in operation according to predefined criteria. However, this method of operation is deficient in terms of energy and cost efficiency.

The objective of this thesis is to develop a model-based algorithm focused on enhancing the efficiency of cooling tower operations through near-optimal off-line control. Compared to on-line control technologies such as Model Predictive Control, an off-line control strategy offers a simpler, faster, and sometimes more reliable alternative, albeit with a certain degree of compromise in achieving a global optimum.

The research outlined in this thesis will build upon an existing model for cooling tower systems and cover the following key tasks:

1. **Literature Review:** Conduct a comprehensive review of the current control strategies for cooling towers, identifying potential limitations and areas for improvement.

2. **Control Algorithm Development**: Develop control algorithms that systematically account for model uncertainties to ensure the effectiveness and robustness of the algorithms under different conditions.

3. **Simulation and Assessment:** Utilize simulations to evaluate the developed algorithms, ensuring their effectiveness and applicability under practical operational constraints.

Prerequisites:

- Background in thermodynamics and control theory
- Interests in theoretical problems

Beginning: now

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