Thesis or project in the realm of building automation

- Modeling and Simulation of Building's Energy Demand -

Job description

Motivated by the ambitious aims of the European Union to achieve net-zero emissions by 2050, greenhouse gas emissions related to building operation must be lowered. According to the International Energy Agency, building operations account for approximately 30% of global final energy consumption. In particular, heating, ventilation and air conditioning (HVAC) is very energy intense. To abandon anachronistic fossil fuel-based or purely electricity driven HVAC technology, research and industry present a wide range of new, environmentally friendly concepts. To design and improve adequate environmentally friendly HVAC technology, extended simulations of building's energy demand are needed.

The thesis or project aims for testing the modeling and simulation of building's energy demand with IDEAS Modelica [1] library. Modelica is an object-oriented modeling language for component-oriented modeling of complex systems. Nowadays, the Modelica language is widely applied in different engineering disciplines. For instance, the energy demand of the building, where the group is located (Maschinenbaugebäude II), could be examined based on its construction and past weather data. The work begins with a literature review about the thermal dynamics of buildings and its simulation. Optionally, the comparison of real data from TU Dortmund's facility management with simulative gathered results can be added to the project.

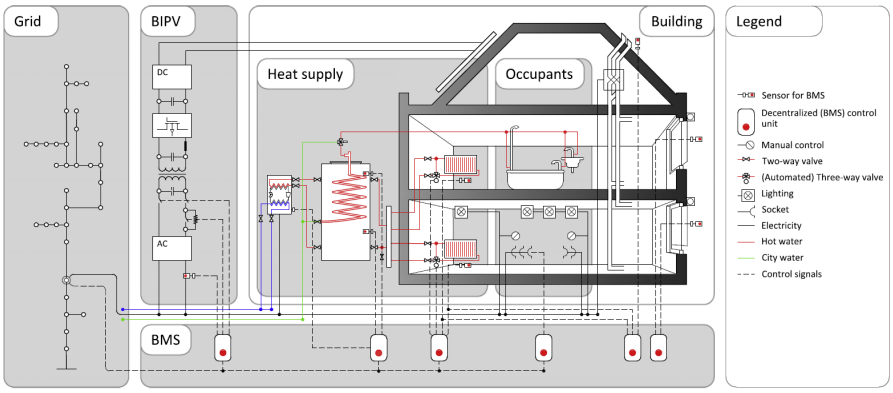

Figure 1: Simulation with IDEAS library in Modelica [2].

Your profile

Ideally but not necessary you already have some knowledge of

- Building automation
- Thermodynamics
- Simulation, object-oriented programming (arbitrary language or Modelica language)

Interested?

Got your interest? Visit us on campus or write an email to johannes.vanrandenborgh@tu-dortmund.de. Supervision and written report can be in **English or German**.

Literature

[1] F. Jorissen, G. Reynders, R. Baetens, D. Picard, D. Saelens, and L. Helsen, "Implementation and Verification of the IDEAS Building Energy Simulation Library," Journal of Building Performance Simulation, vol. 11, no. 6, 2018.
[2] R. Baetens et al., "Assessing electrical bottlenecks at feeder level for residential net zero-energy buildings by integrated system simulation," Applied Energy, vol. 96, 2012.