

Smart Building Control

Project Proposal

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This project is in collaboration with the Department of Civil Engineering, Aalborg University. The AAU building for Civil Engineering BUILD Figure 1 is equipped with large number of sensors for light, temperature, CO₂ levels, room occupancy, etc. The building is highly automatized and provides interfaces for automatic controlling e.g. control of blinds, control of heaters, and ventilation. In spite of the buildings high level of automation, current controllers are simple and do not collaborate with each other. The current controllers are challenged by the weather conditions, the heat produced by light and people, and interactions among the controllers. Finally, BUILD provides interfaces where automated controllers can be deployed and tested.



Figure 1: AAU Build

This Project

There is relevant work in producing smart controllers including: smart controllers for floor heating [1], smart controllers for heat-pumps [2], etc. We are interested in developing advanced controllers which collaborate and integrate sensor information such as weather forecast, room occupancy distributions, CO₂ levels, etc. The project could include elements such as modeling the thermo-dynamics of the system, performing simulations and learning, implementing and testing the controllers in the physical building, etc.

References

- [1] Kim G. Larsen, Marius Mikučionis, Marco Muñiz, Jiří Srba, and Jakob Haahr Taankvist. Online and compositional learning of controllers with application to floor heating. In Marsha Chechik and Jean-François Raskin, editors, *Tools and Algorithms for the Construction and Analysis of Systems*, pages 244–259, Berlin, Heidelberg, 2016. Springer Berlin Heidelberg.
- [2] Imran Riaz Hasrat, Peter Gjørl Jensen, Kim Guldstrand Larsen, and Jiří Srba. End-to-end heat-pump control using continuous time stochastic modelling and uppaal stratego. In Yamine Aït-Ameur and Florin Crăciun, editors, *Theoretical Aspects of Software Engineering*, pages 363–380, Cham, 2022. Springer International Publishing.