



2SC6291 – Hierarchical management of thermal comfort

Instructors: Herve Gueguen, Romain Bourdais

Department: DOMINANTE - SYSTÈMES COMMUNICANTS ET OBJETS CONNECTÉS,
DOMINANTE - GRANDS SYSTÈMES EN INTERACTION

Language of instruction: ANGLAIS

Campus: Rennes

Workload (HEE): 40

On-site hours (HPE): 27,00

Description

The building must no longer be considered as a simple consumer but as a real energy actor perfectly integrated into its ecosystem. It must be fully integrated into a renewed vision of society, where comfort and health are in harmony with energy management. This requires rethinking the systems through new steering functions and stronger interactions with occupants. The "building" ecosystem is complex, because it consists of a heterogeneous set of systems: local production, storage, supply, sale, and the various equipment, which must be coordinated for optimized management.

The challenges facing the engineers are first the analysis of needs and the specification of intelligent control systems. This design is based on the integration of control algorithms deployed on communicating systems to achieve an optimal compromise between technology - cost - efficiency, such as closed loop performance, communication frequency and protocol, sensor autonomy and actuator life.

The objective is to define a modular system, allowing to implement hierarchical control strategies between a local regulation of comfort by zone and a supervisor managing the intermittency of the occupation, the limitation of available power in order to minimize the consumption related to thermal comfort. The challenges induced by this project are the consideration of societal issues (human, comfort and energy efficiency), technical constraints (power limitation, ease of implementation and robustness of the solution) and technologies allowing implementation. The different groups will have to work together to address the different aspects of the project and result in a proof of concept implementation.

Quarter number

ST5



Prerequisites (in terms of CS courses)

Control theory (commun course 2A)

One of the 2 courses:

- High Energy Performance Communications
- System Architecture and Modeling

Syllabus

This course is built from a simulator/emulator of the thermal behaviour of a building, whose meteorological data and conditions of use are taken from data from the city of Rennes.

The energy manager that the students will have to build will have to be implemented and validated in the simulator.

Class components (lecture, labs, etc.)

The pedagogical activity alternates between working together and working in mini-groups to arrive at a collective proposal at the end of the week. The courses are in French with specific modalities to allow the adaptation of students with a low level in French: all the materials are in English, the tutorials, the practical work as well as the integration teaching are provided in English. English support sessions are also scheduled.

Grading

The activity will be evaluated during the various daily points and during the final presentation.

Resources

A building thermal simulator is made available to the students. They will then be able to work in groups on the project, taking advantage of the supervision of 2 research professors of the school with complementary skills (system modeling and automation)

Learning outcomes covered on the course

At the end of this teaching, the students will be able to:
- implement a collaborative control strategy



- simulate the behavior of the building and evaluate the relevance of the proposed solution
- present a technological solution and valorize it from a technical-economic point of view

Description of the skills acquired at the end of the course

C4.1 : Identify and (re) formulate the customer's need to create value and the associated challenges or constraints. Identify and integrate other stakeholders, internal and external, and other dimensions not mentioned initially (technical, economic, human, etc.)

C6.2 : Design software

C7.1 : Basically: Structure ideas and arguments, be synthetic (assumptions, objectives, expected results, approach, and value created)