Next generation predictive home energy management system

Houses are commonly equipped with PV panels, electric batteries, variable power heat pump and electric vehicles. This means that even at the scale of a single home, we are faced with a complex energy hub which requires an efficient energy management system (EMS) that can be configured in a simple way while satisfying complex needs such as improving self-consumption and reducing cost.

The energy systems group at CSEM is actively developing a next-generation energy management system that is based on Model Predictive Control and which can be easily reconfigured through an efficient configuration and automated controller synthesis process. In this context, we are offering an internship to improve the operation of this EMS by extending its functionalities, focusing on three key aspects:

- The automated design of filters in order to accommodate different sensor availability configurations.
- The refinement of the predictive control algorithm with specification of complex objective such as peak shaving in the EMS algorithm.
- The automated design of forecasters for the EMS.

While the objective of the work is clearly industrial, its nature means there will be scope to present the results in scientific journals or at conferences. The student will be part of a team of twelve experienced engineers and researchers.

Requirements:

- Basic control and estimation/filtering knowledge, especially Kalman filtering, knowledge of MPC is a plus.
- Good programming experience, preferably with exposure to Python; and an interest in good coding practices (object-oriented programming, unit testing, version tracking with Git).
- Familiarity with machine learning, energy systems and energy management is a plus.

Type of project: Master in industry or internship, minimum 4 months. Location: Neuchatel

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