Next Generation Optimization Tools for Real-Time Energy Management in Buildings

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This project concerned the development of novel algorithms and software to optimize, in real-time, the energy consumption in buildings caused by heating, ventilation, and air-conditioning (HVAC) systems.

The new methods are capable of an accelerated resolution of the nonlinear optimization problems that emerge during the on-line optimal control of dynamic systems such as HVAC systems.

Two specific algorithms were developed. The first exploits hot-starts to generate approximate solutions to quadratic subproblems quickly. The second uses these solutions to address the general nonlinear optimization problems that arise during the model-predictive control procedure.

The new approaches will be able to work with more detailed models of the building dynamics and provide a faster turn-around time than current control systems, ultimately leading to improved energy saving and energy costs.