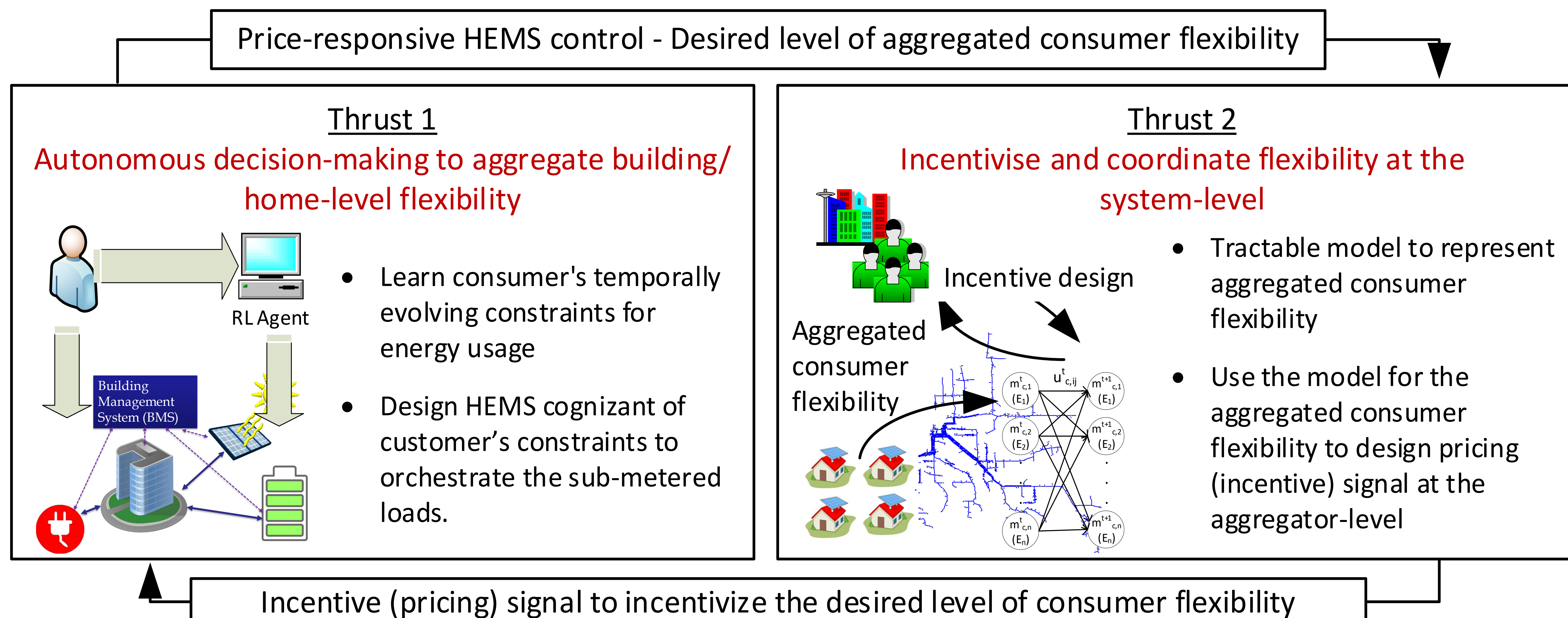


Collaborative Research: CPS: Medium: Adaptive, Human-centric Demand-side Flexibility Coordination At-scale in Electric Power Networks

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Project goal - Aggregation and coordination of demand-side flexibility at many small consumers in power grid by adequately representing the user constraints regarding electricity usage and their interactions with the system and the energy provider.



Technical Accomplishments:

- Model prosumers' demand flexibility: data-driven models to estimate and predict building-level thermal load demand for residential and commercial grid-interactive efficient buildings.
- Dynamic electricity pricing: incentive design in principal agent game with incomplete information for the agent's private payoff function
- Policy gradient-based learning algorithm for general sum stochastic Stackelberg games with theoretical guarantees for its convergence

Evaluation/Experimentation Plan

High-fidelity Simulators

- Prototype the algorithms in MATLAB/python.
- Evaluate the algorithms using a high-fidelity model of the system via extensive simulations.
- Evaluate the algorithms on real-world data obtained with the help of industry partners.

Broader Impacts:

- Provided solutions to adaptive and smart infrastructure systems with active participants, methods broadly applicable to other CPS
- Undergraduate research, recruit and train women students and other underrepresented minority students.