A Disaggregated Thermostat:

Enhancing Comfort, Energy Efficiency, and Demand Response

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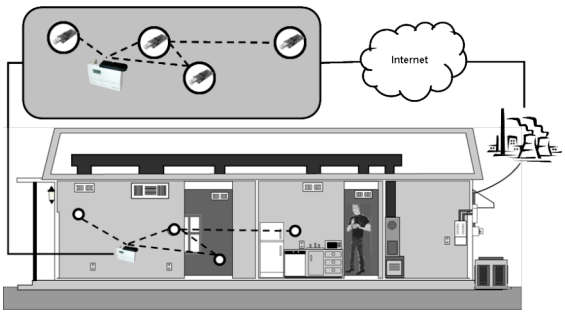
Vision

Design and implement a wireless sensor network enabled residential energy management system that reliably balances occupant satisfaction and energy savings preferences with automatic, reactive short-term load shedding and long-term energy reduction.

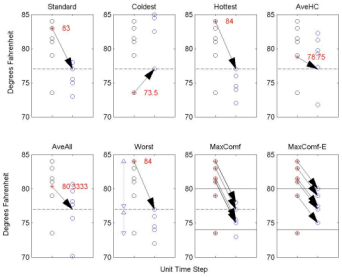
	Old Way	*New Way*
Actuates	On/Off	On/Off
Uses	Single sensor	Multiple sensors
Measures	°F	°F, RH
Controls	°F	Comfort, cost
Aware	n/a	price, weather



Research

Questions

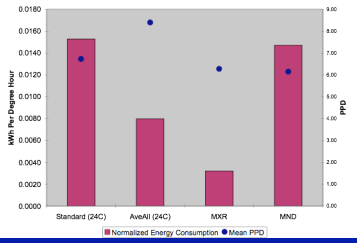
- How can an HVAC system react differently given environmental conditions from all rooms?
- How does an HVAC system tradeoff comfort and energy consumption?
- How can an HVAC system react differently given electricity price information?

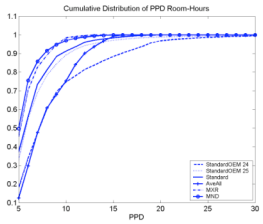


Methods

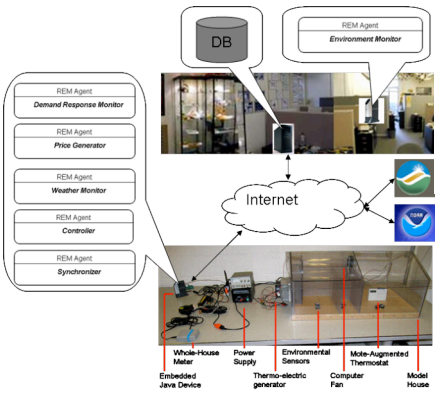
- Simulations to evaluate multi-sensor HVAC control with distributed sensing for 4 house designs, 4 comfort offsets, 2 operational modes, and 2 weather profiles.
- Wireless communication performance site surveys to characterize packet-level communication.
- Design and development of autonomous embedded agent system for in-situ system pilot tests.
- Real world and testbed deployments of HVAC control with distributed sensing.

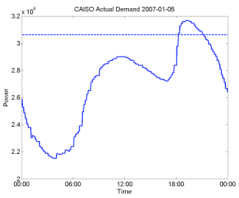
location	Pleasanton, CA
orientation (front door)	southeast
total square feet	~2500
conditioned area	~2100
foundation	slab
interior construction	wood frame, plaster on dry wall
exterior construction	stucco, wood, brick
insulation (R-values)	n/a
roofing material	shingle
window	aluminum frame
a/c size	4.0 tons (48,000 BTUH) 11.5 SEER

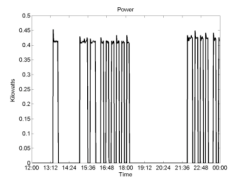




Findings







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