Disaggregated Thermostat

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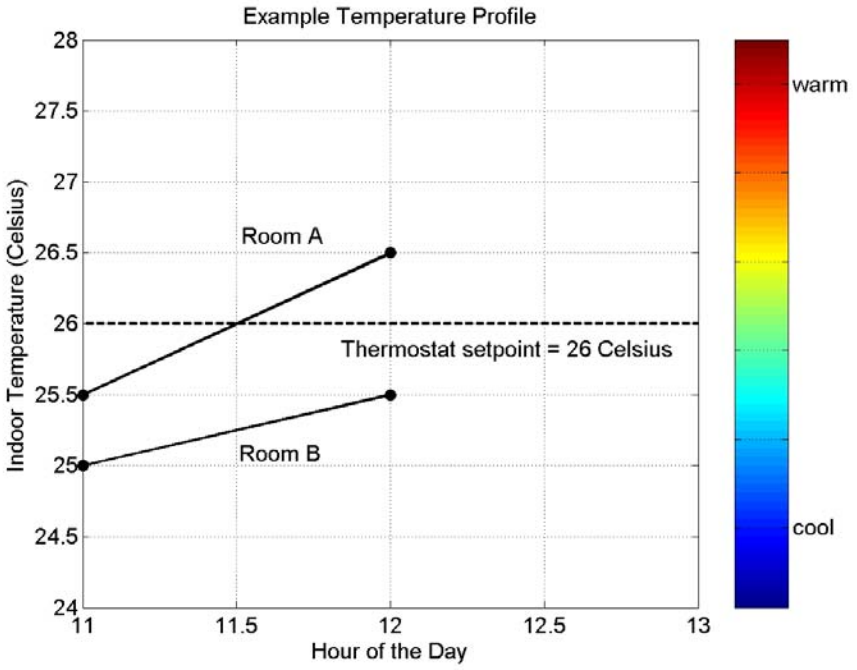
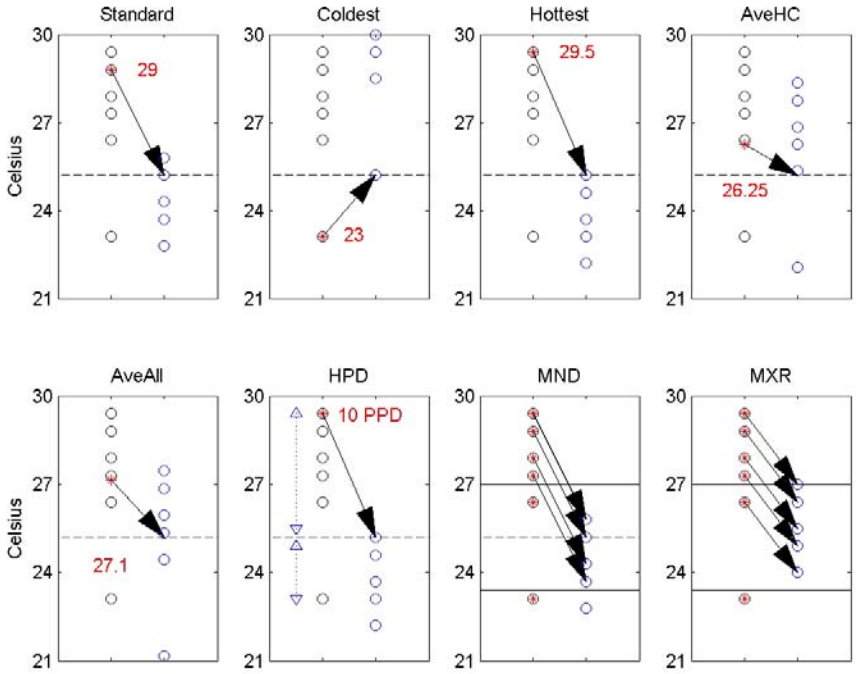
Disaggregated Thermostat

- Distributed Sensing
- Comfort-Centric Control
- Connected to Internet

Multi-Sensor Thermal Control Strategies

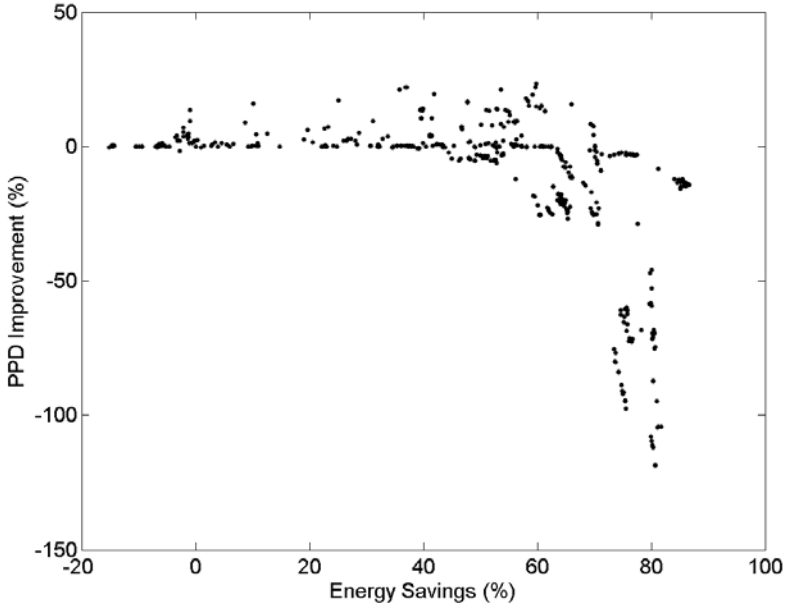
- Temperature and humidity sensing in each room.
- Comfort is partially a function of temperature and humidity.

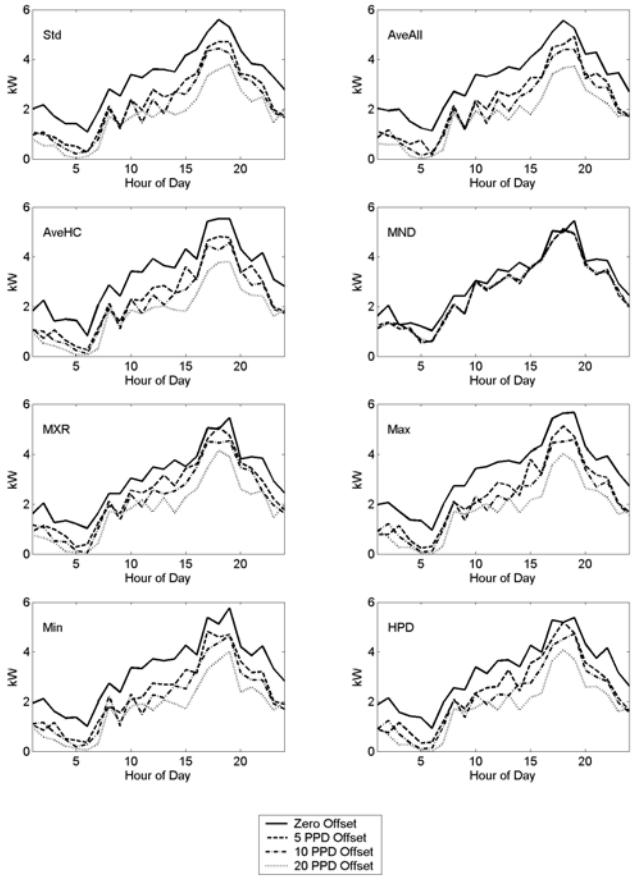




Energy Efficiency and Demand Response

- Simulations support hypothesis that multi-sensor HVAC control strategies can reduce energy consumption without sacrificing comfort.
- Unique load profile for each multi-sensor strategy.



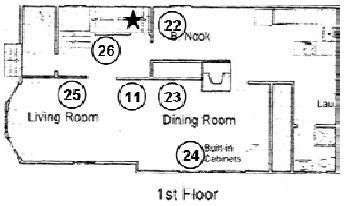


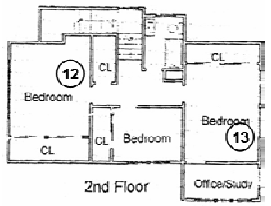
Wireless Sensor Networks

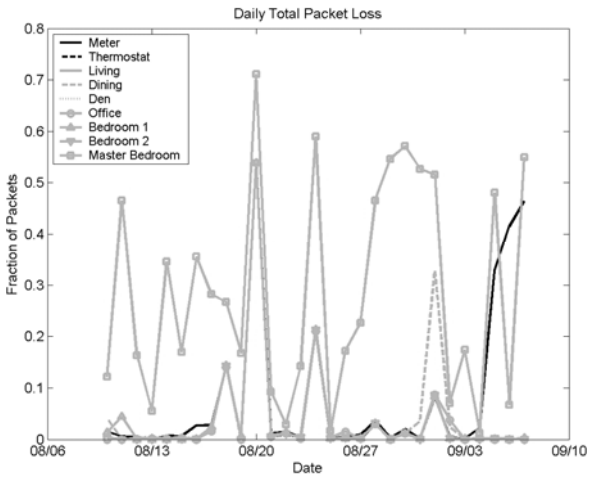
- Packet loss occurs in short “bursty” events.
- Daily patterns exist for packet reliability.

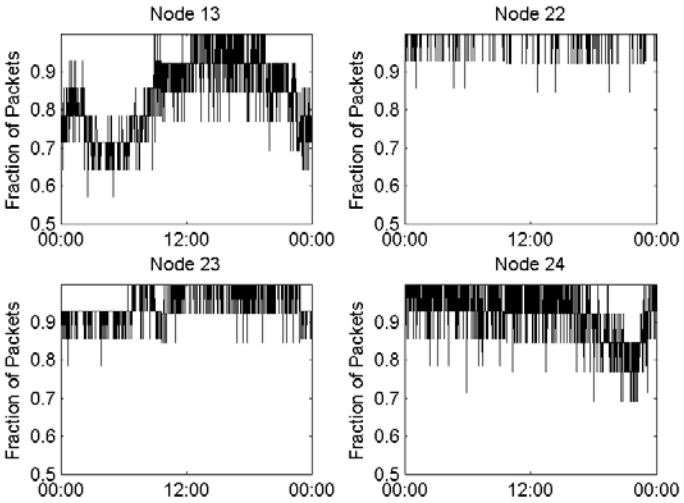












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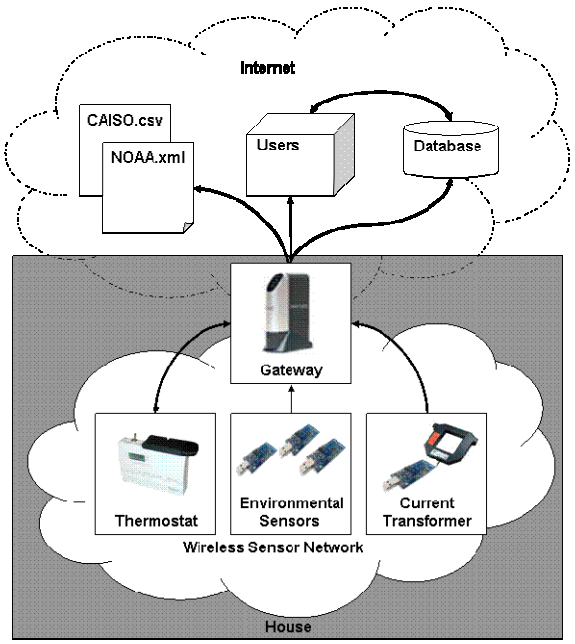
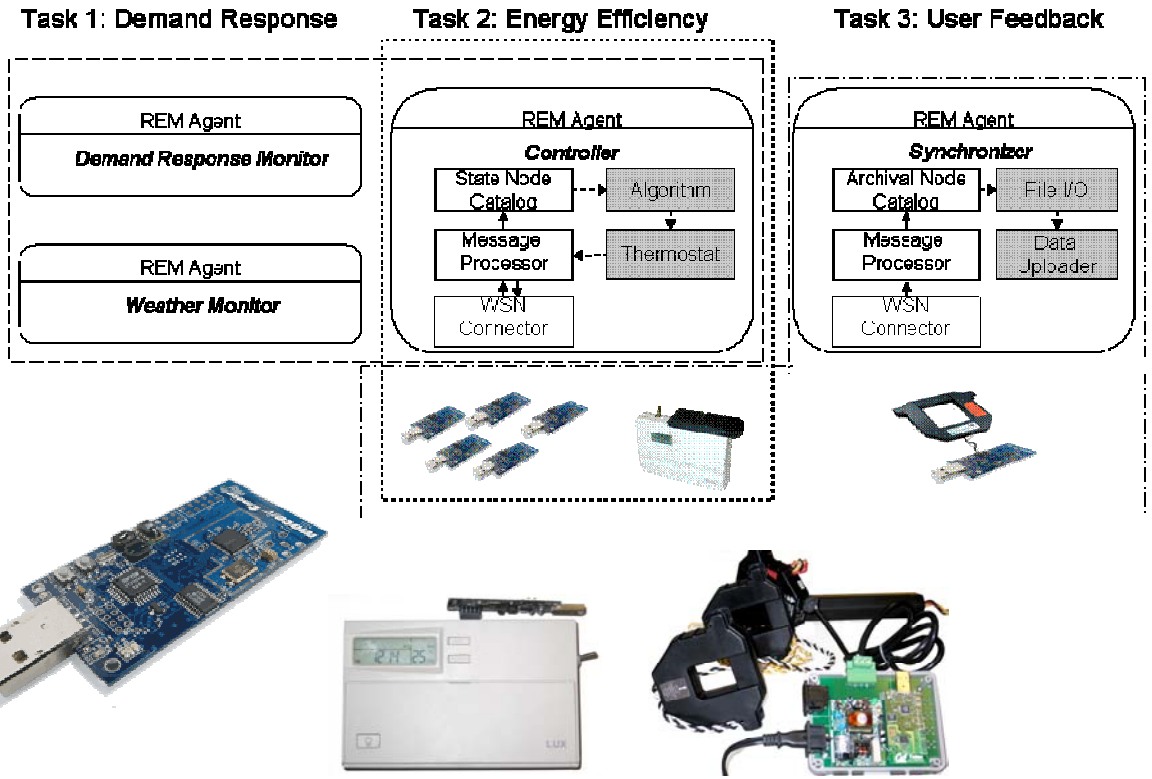
System Engineering

- Perception, actuation, communication, decision making.
- Need for scalable, extensible architecture.





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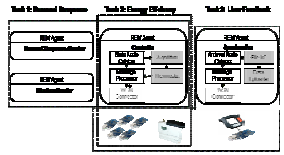
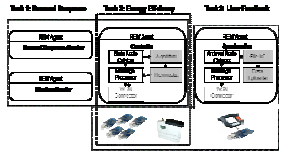
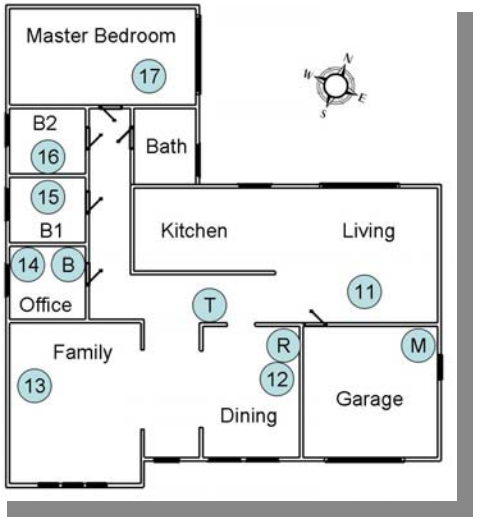
Real World Evaluation

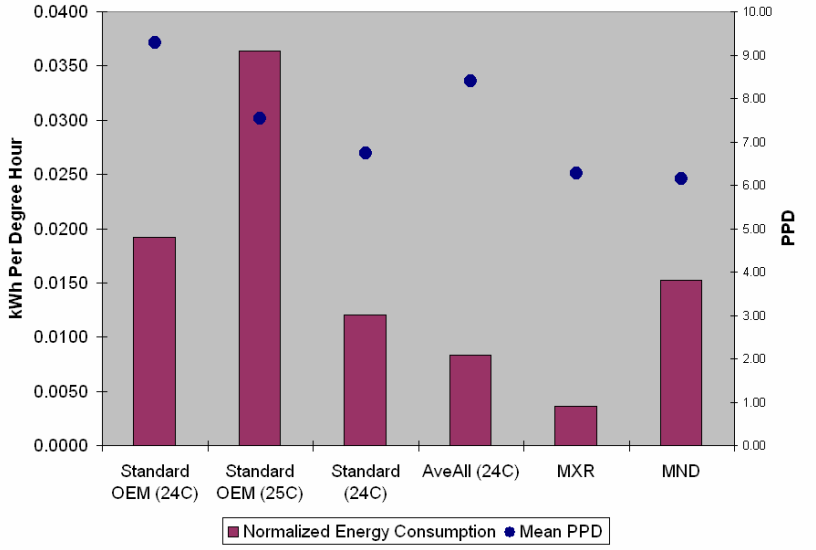


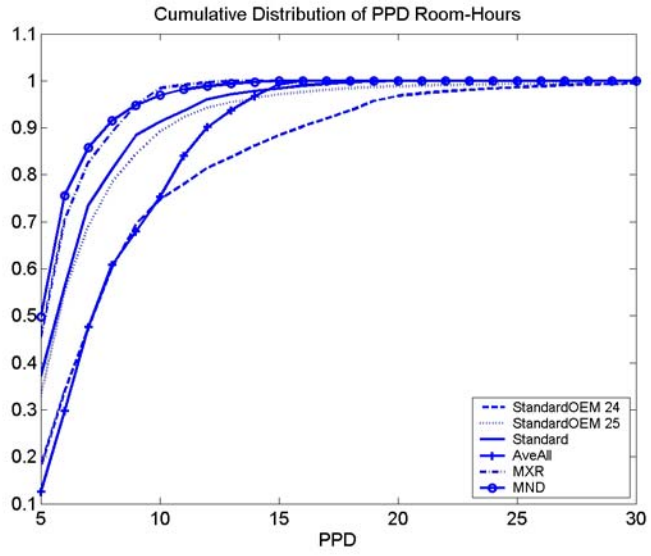


Real-World Evaluation

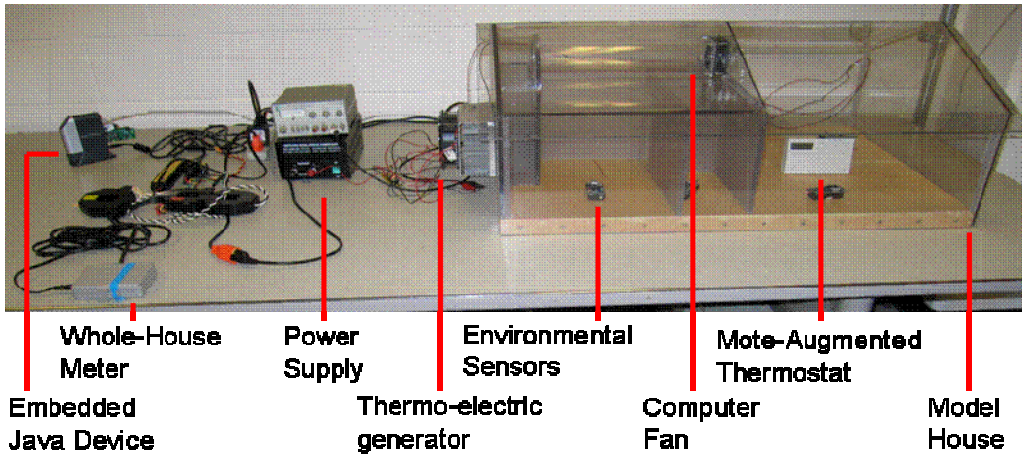
- Multi-sensor control strategies reduce energy consumption without sacrificing comfort.
- Multi-sensor control strategies provide unique "utility curves."

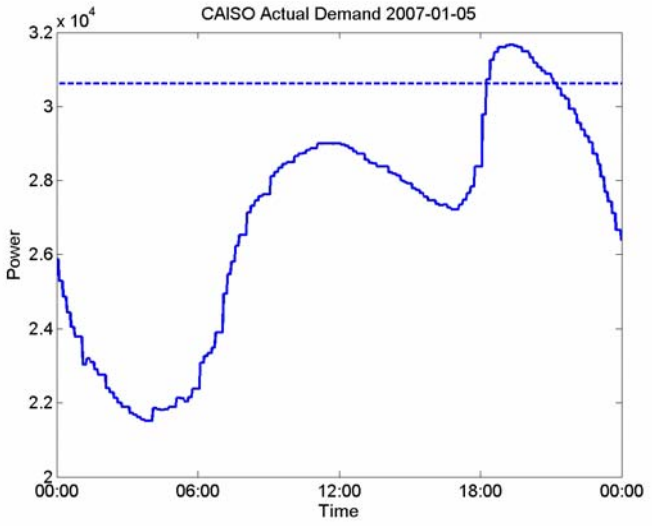


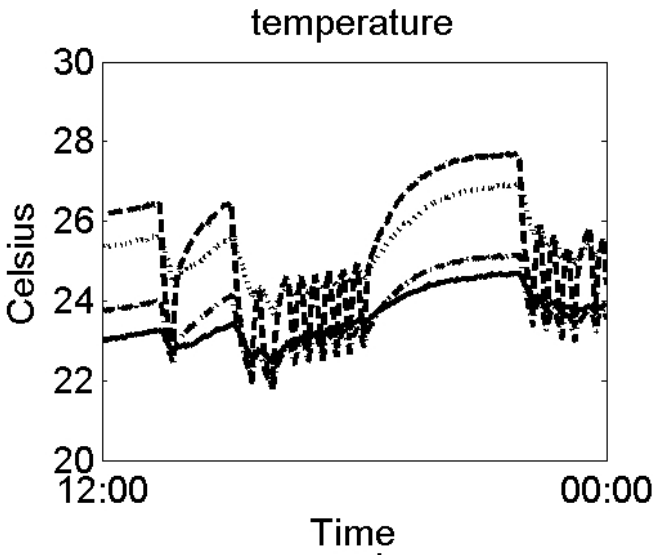


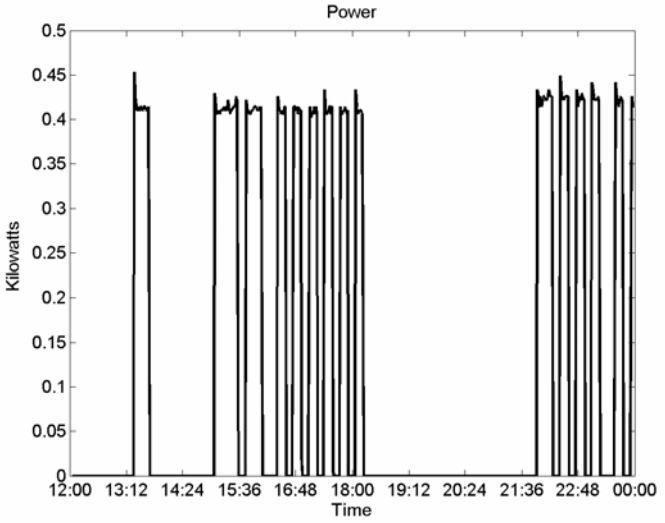


“Proactive” Demand Response



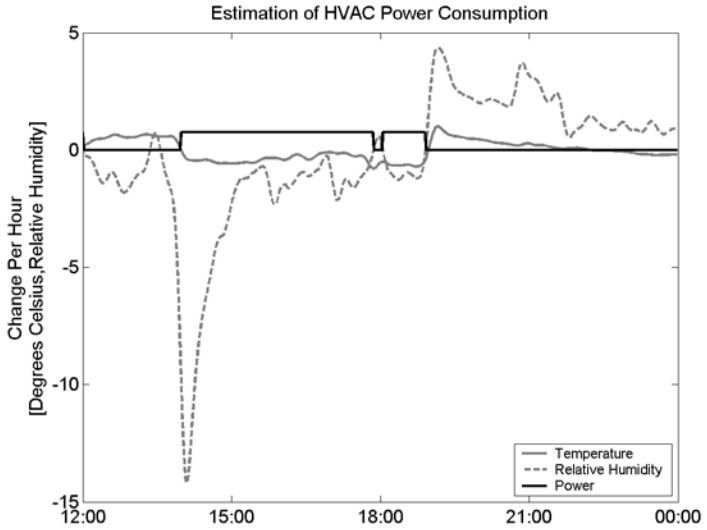


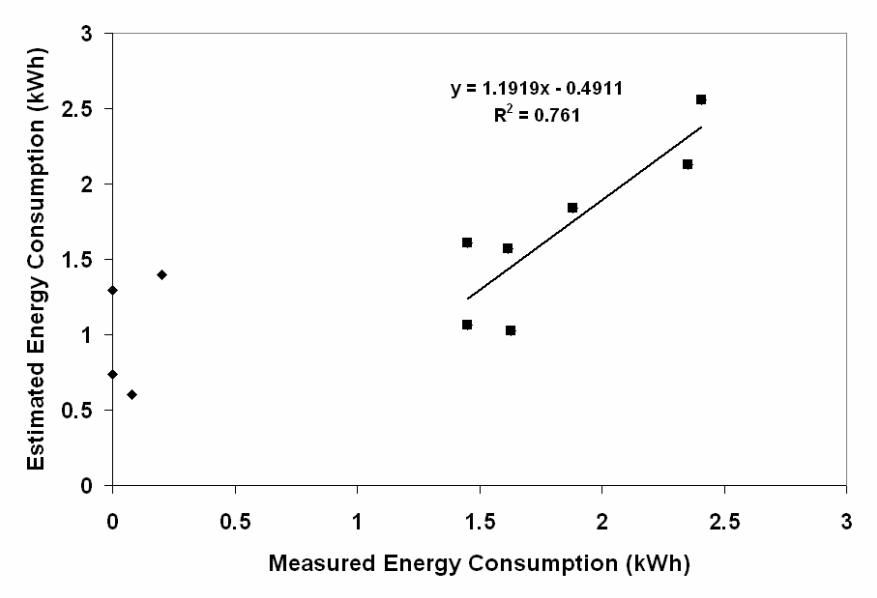




Estimating HVAC Energy Consumption

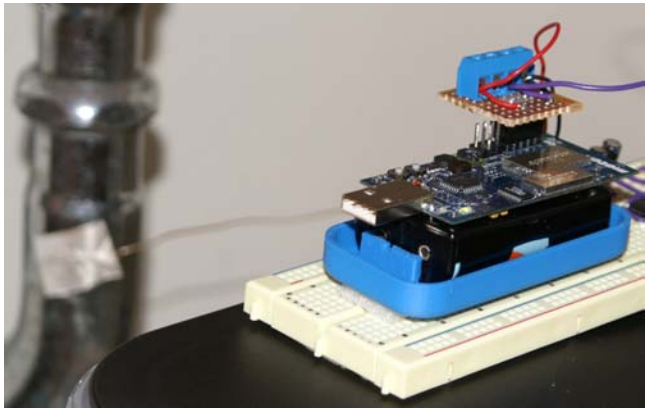
- Low-resolution estimation of HVAC energy consumption.
- Correlation with change in temperature and humidity.



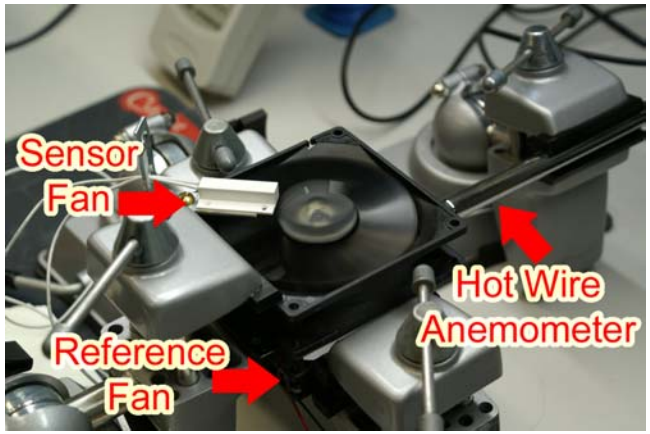


Energy Scavenging Opportunities

- Diverse, low magnitude energy scavenging opportunities.
- Development of low-cost auditor kit.
- Ongoing research to design “residential” scavengers.



Thermocouple



Anemometer

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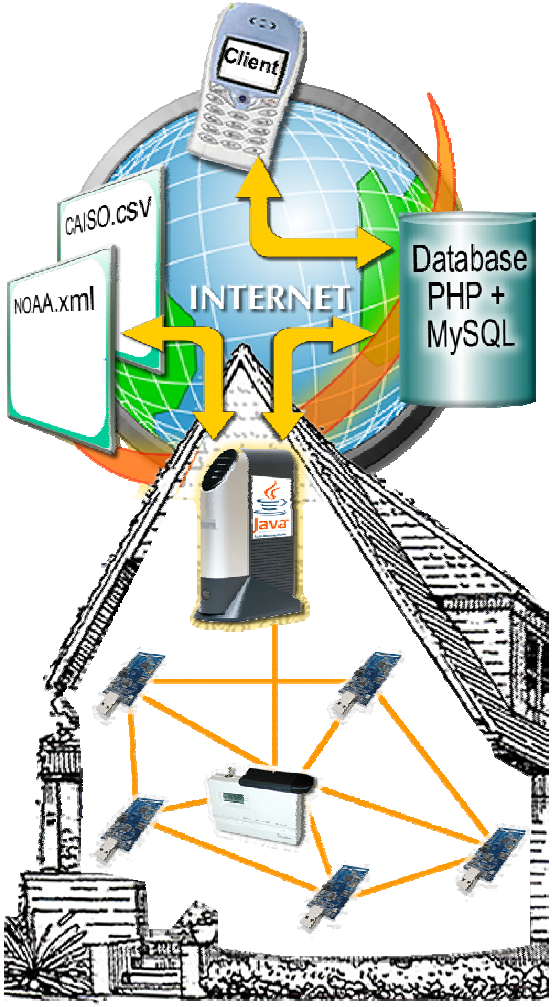

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