

COST-AWARE RESIDENTIAL THERMOSTAT MANAGEMENT

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MOTIVATION

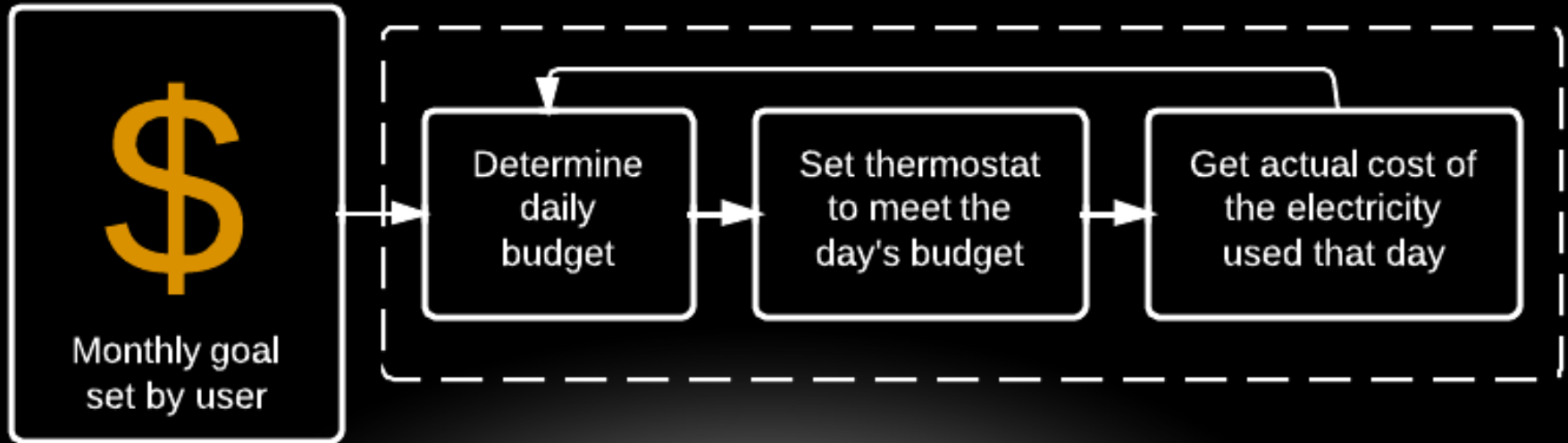
- Design for low-income population
 - Often overlooked wrt technology, sustainability
 - Greater relative benefit in saving \$5/month
 - Need for automated tools, not another app
- Pervasive computing:¹
 - Networked devices embedded in the environment
 - Capable of constant and unobtrusive connectivity
 - Provide human benefit without explicit awareness of the underlying computing and communications

¹<http://www.journals.elsevier.com/pervasive-and-mobile-computing/>

BEYOND THE NEST: COST-AWARE THERMOSTAT MANAGEMENT

- Smart thermostats have downfalls:
 - User gains no insight of conversion from temp setting to cost
 - Most savings occur if house is empty during the day

Goal: Automate the process of meeting a monthly HVAC budget



IMPLEMENTATION DETAILS

Simplifying Assumptions

- Use Nest with API to control thermostat setting
- Use historical individual home data to map from temp setting to cost
- HVAC smart meter data available
- Someone is home all day
- Use previous day's costs to determine hourly budget
- Budget and control thermostat only

Real-World Extension

- Build low-cost interface to other thermostats
- Use algorithm to approximate map for any house, w/o historical data
- Disaggregate HVAC from whole-home smart meter data
- Take advantage of user schedule and pre-cooling algorithms (Nest)
- Incorporate seasonal information and weather forecast
- Incorporate other non-essential demands