Energy Smart Home
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Goal

To provide a home owner with an interface that allows them to monitor and automate their energy consumption.

Motivation and Objectives

As world population rises and third world countries continue to develop, we must continue to improve the way we manage our energy consumption. Much has been done to PRODUCE energy more efficiently, but now it is time for the individual to CONSUME more efficiently. Energy providers are pushing towards a smart grid, which relies on the individual to use smart appliances and strategically plan use of appliances during off-peak hours. This requires an interface that not only informs the user of their power consumption (making them conscientious of their usage), but also enables them to automate processes that require a lot of energy (such as a dryer or charging a car). Ultimately, the user saves money, the grid is more reliable, and the toll on the environment is lower.

Methodology

- Kill-a-watt provides analog readings of voltage and current.
- Xbee radio transmitter is soldered to amplifier chip of the Kill-a-watt.
- Kill-A-Watt 5V power is converted to 3.3V using a voltage divider in order to power the Xbee.
- Two LEDs are added to the Xbee to indicate that the modules are on and the data is being received.
- XCTU was used to configure the Xbees.
- Each receiver is given a separate address to be uniquely identified.
- Xbee sleep time can be changed in order to save power if necessary.
- The Kill-a-watt casing is adjusted to accommodate the Xbee, and the LED of the Xbee is exposed.
- Xbee receiver is connected through USB to the computer running the application.
- The raw data is taken from the USB using Libusb python library.
- The data is organized and graphed for the user.
- The interface allows the user to switch on/off the outlet.
- USB NET POWER is reconfigured using python to send commands via USB.
- The switch and the Watt data are combined into a single application using python.
- WxPython is used to create a GUI that allows the user to see watt usage and toggle the switch.
- The graph is continually updated and you can read live Watt usage as from the graph.

Results

- The power usage along with the voltage and current drawn from the outlet can be seen from the graph.
- From 0 to 80 a laptop charger was plugged in. At #80 the USB NET POWER is toggled.

Future Work

- Integrate entire system into every outlet of the home to offer complete energy monitoring. The system will turn on/off appliances based off user scheduling and price fluctuations.
- Use an Xbee to implement wireless communication to the USB NET POWER.
- Design a fully integrated device to be placed on each outlet. Application to be accessed from a smart device and/or a central home management display.

Pictures of System

USB NET POWER 8800

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