Glowing Light: Electricity Consumption Monitoring Device

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Project Statement

The purpose of the electricity consumption monitoring device is to use the real-time electricity usage measurements of campus buildings accessible and alert the consumers if the electricity consumption exceeds the usual needs. The device is designed to indicate the current electricity consumed in a building both in numerical values and in colors: green, yellow, red.

Monitoring Device Design

Hardware

The circuit for the electricity monitoring device is mainly built of:

1. Arduino Mega 2560 board
2. Ethernet shield connected to an Ethernet cable
3. Prototyping shield as shown in Figure 2.

On the prototyping shield, six super bright single color LEDs are wired with the corresponding resistors as shown in Figure 2. The light pipe is connected to the LEDs with heat shrinks. The circuit is powered by a 9Volt battery.

Software

The Arduino board is programmed to extract the real-time electricity usage data from a sample html page via Ethernet and displays the data on the LCD screen. The device glows lights in three different colors (green, yellow, red) depending on the current power used in the building and the specified threshold kilowatt values.

LED Design Iterations

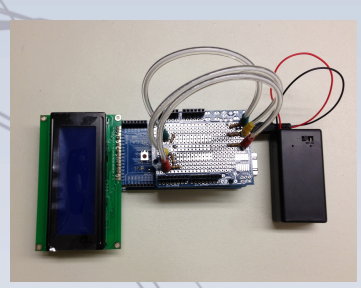
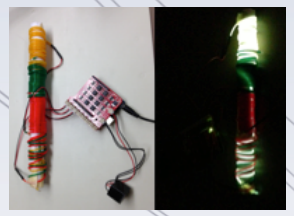
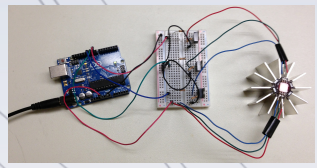


Figure 1. Prototype with electronic components soldered onto prototyping shields





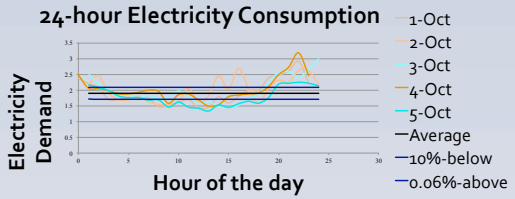
To indicate the electricity usage level, six lighting options were tested:

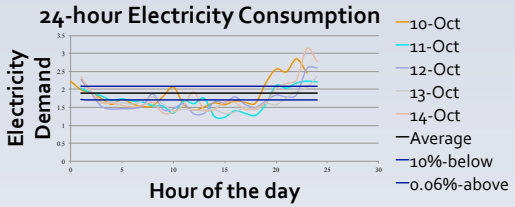
1. Single color LED x6
2. Super bright single color LED x6
3. Diffused LED- 10mm x6
4. Multicolor RGB LED, x2
5. Triple output high power RGB LED x2
6. Electroluminescent wire x3

Result

Super bright single color LED provides the brightest lighting both under the daylight and in the dark and requires less complicated wiring.

Electricity Consumption Threshold Plots





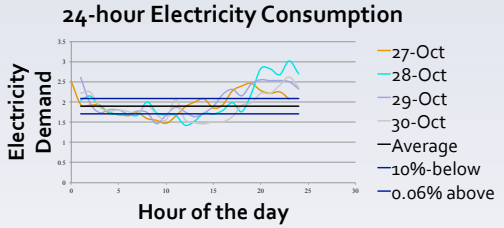


Figure 3

Figure 3 shows Smith College Park Annex electricity consumption for 15 different days in October 2011. The pattern is almost similar. To calculate threshold values (green, yellow and red regions), a percentage margin was created around that average.

Conclusion and Future Work

Future work will be forecasting electricity data (our thesis), putting the device in Park Annex House and observe the demand response from residents.

Acknowledgements

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