Brain Wave Sleep System

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Background:

Using our brain waves to interact with electronic devices has been described as the next frontier of human-device interaction. This project will give a sneak peek into the world of end-user brain wave controlled applications using a commercially available portable brain wave monitoring device. In the near future, additional uses of these types of applications could include:

- Selecting music based on a person's emotional state as determined by direct measurement
- Movement of artificial limbs via brain waves to aid disabled people
- Alerting an emergency contact when brain activity indicates a person is having a medical event.
- Using brain wave activity to operate appliances/electronics and adjust thermostats

Project Details:

This Capstone project will build and evaluate a system which will monitor a user's brain waves, recognize when the user falls asleep, and wirelessly dim and eventually turn off a light switch to nearby lights. This can be thought of as a sleep timer for lights without the guess-work of how long it could take you to fall asleep. The system will also provide user feedback on their sleep behavior by showing when the user is in each phase of sleep which will be sent to a cell phone for viewing. This will be accomplished in the following steps:

1. Acquire an off-the-shelf Muse Headband or similar based on the results of a market survey of appropriate hardware or based on available appropriate hardware.
2. The CE student will generate software using the Muse Headband's available software developer kit to collect Alpha, Beta, Delta, and Theta brain wave data from the Muse Headband via a Bluetooth connection to a PC/laptop, flag the data to determine when the user enters light sleep (Stage 1-2), deep sleep (Stage 3-4), and REM sleep, display this data on a cell phone via an app, and show current sleep stage status as voltages at the PC/laptop serial output pins.
3. The EE student will design, model, and construct a short-range transmitter/receiver pair to relay the serial output pin sleep stage status signal to a light switch and cause the light to dim during light sleep and turn off during deep sleep
4. Both students will work together to interface the transmitter and the PC/laptop to ensure that light and deep sleep will have the designed effect on the light switch.