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Final Project: Energy Efficient Lighting

Website Link: https://kthanigaivelan.github.io/ece_153b_project/

Overview/Goal/Purpose:

We would like to create an energy efficient lighting system that will only draw as much power as is absolutely needed. To do this, we will implement a light sensor, which will monitor the ambient light of the space and make adjustments in the LED brightness to maintain a standard level of overall brightness in the space. With the bluetooth module (HC05), we can communicate in between the STM microcontroller and the lamp itself. A secondary goal to further conserve energy is to implement motion or infrared based triggering, so the light only turns on once there is someone in the vicinity, and turns off once they leave.

Peripherals

- LED/smart lamp or dimmer switch: LIFX White E26 smart bulb
- Bluetooth module: HC05
- Light sensor: Adafruit BH1750
- Optional motion/infrared sensor: Onyehn Infrared PIR Motion Sensor Detector

Serial Interfaces

- I2C (Light sensor)
- UART (Bluetooth transmission to python script used to control light bulb)

Software Structure

If implementing motion detector: From an idle state, system is "woken up" by an interrupt triggered by the pulse from motion sensor.

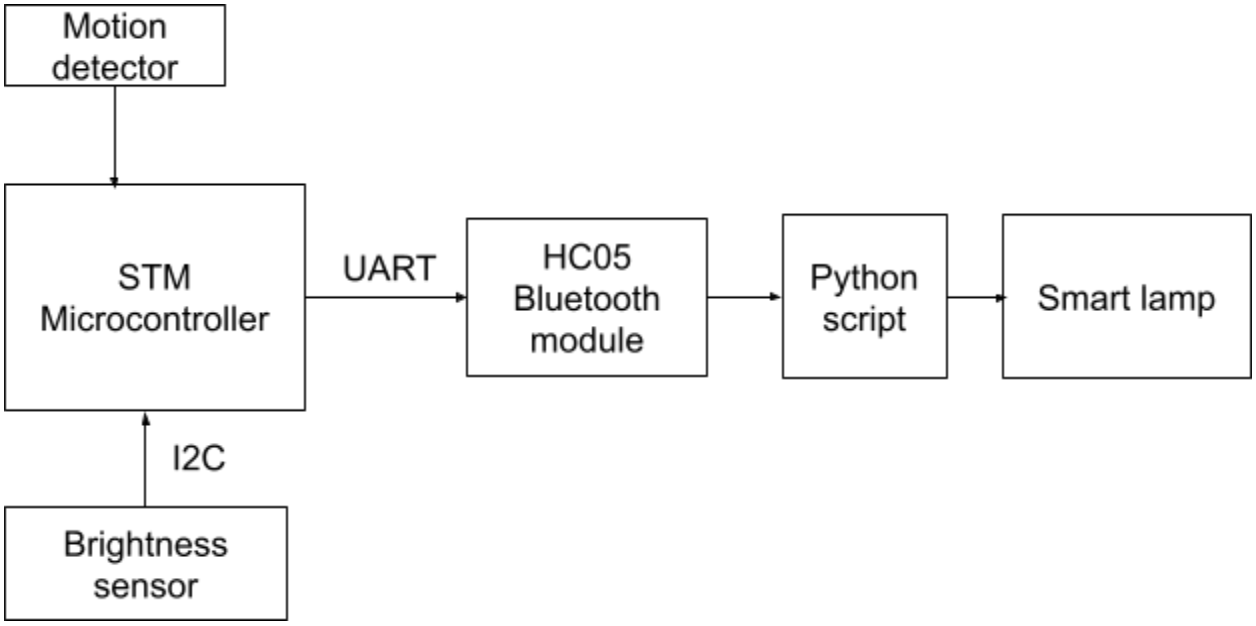
If manual wake: Simply powering on the circuit will let the system enter a monitoring state.

The system, when awake, will take continuous readings from the light sensor, and use the comparison of this lux value to determine how much the bulb should be adjusted. This is sent

via UART to a bluetooth module, which interacts with a Python script. This script uses the LIFX API to control the brightness of the bulb, adjustable by percentage.

If implementing motion detector: Once motion is no longer detected, or a timeout stage is reached, the light will turn off. This is to ensure that there are no false positives which would force the light to always stay on.

Block Diagram



Responsibility List

1. Python script used for communicating with the LIFX API (which can be done before parts arrive) will be tasked to Archana.
2. Microcontroller I2C programming which is used for brightness sensor interfacing will be tasked to Krithika.
3. Microcontroller UART interfacing which is full connection of the system will be a combined effort since it will require both software and hardware inputs.