Intelligent Light Automation

CS 426 Final Project

Shireef Sultan
Computer Science
Binghamton University
Binghamton, NY 13901
ssultan6@binghamton.edu

ABSTRACT

Consistently keeping lights on only when needed is a problem that plagues the majority of society, and oftentimes significant energy is wasted despite even the best efforts. Not only is this problematic for environmental conservation, but it is also very costly. This consequently requires a more holistic approach towards efficient light management, which can often be augmented by tracking motion. In this project we propose a solution to this often overlooked issue.

KEYWORDS

PIR, motion sensor, raspberry pi, pi, gpio, automation, smart home, iot

1 INTRODUCTION

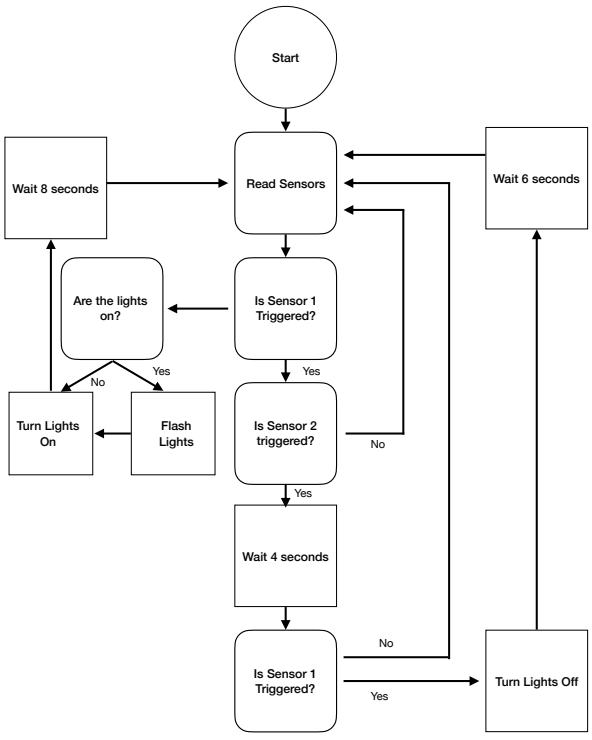
Due to the extremely common nature of this problem, several attempts have been made to solve it, but a use of some form of motion sensing is consistent in many products today. This is often found in external or industrial settings, however in traditional home environments, a manual approach (often controlled through either an auditory or physical interface) is primarily utilized.

Despite being more difficult initially, an automated approach to this process can often result in more consistent, and more efficient energy use by utilizing the same concept of motion sensing.

2 DESIGN AND IMPLEMENTATION

To implement such a system one requires—at the most basic level—at least one motion sensor to trigger, and a controller to manage the lights being used. Below is a data flow diagram as well as a separate explanation of steps that describe the exact process used to automate this system (Figure 2.1).

1. Take Sensor Measurements
2. If Sensor 1 is triggered, check if lights are on.
    a. If on, flash lights, return to normal on state, then wait 8 seconds before returning to Step 1.
    b. If off, turn on then wait 8 seconds before returning to Step 1.
3. If Sensor 2 is triggered, wait 4 seconds, then see if Sensor 1 has been triggered.
    a. If Sensor 1 has been triggered, then turn lights off and wait 6 seconds before returning to Step 1.
    b. If Sensor 1 has not been triggered, then simply return to Step 1



3 HARDWARE

1. Raspberry Pi 3
    - Utilized as the controller for the lights as well as the receiver for the information outputted by the PIR sensors.
    - Primarily chosen due to the flexibility of GPIO pins as well as built in connectivity.
2. PIR Sensors
    - Used to detect motion and output results in a digital manner.
3. 5050 LED Lights
    - Utilized due to their efficiency as well as high level of control allowing for increased appeal for in-home settings.
4. 5V 5A Power Supply
    - Provides power for the 5050 LED Lights.

4 SOFTWARE

1. Neon IDE
    - Built it-text editor for Raspberry Pi
2. Python3

CONCLUSION

Motion sensing is very commonly used to combat the issue of efficient light utilization, and for good reason. The same principles applied in industrial or external settings can also be used inside the home, often proving very effective at reducing energy usage as well as increasing convenience.