Spring 2024 | EECS 113

Final Project:

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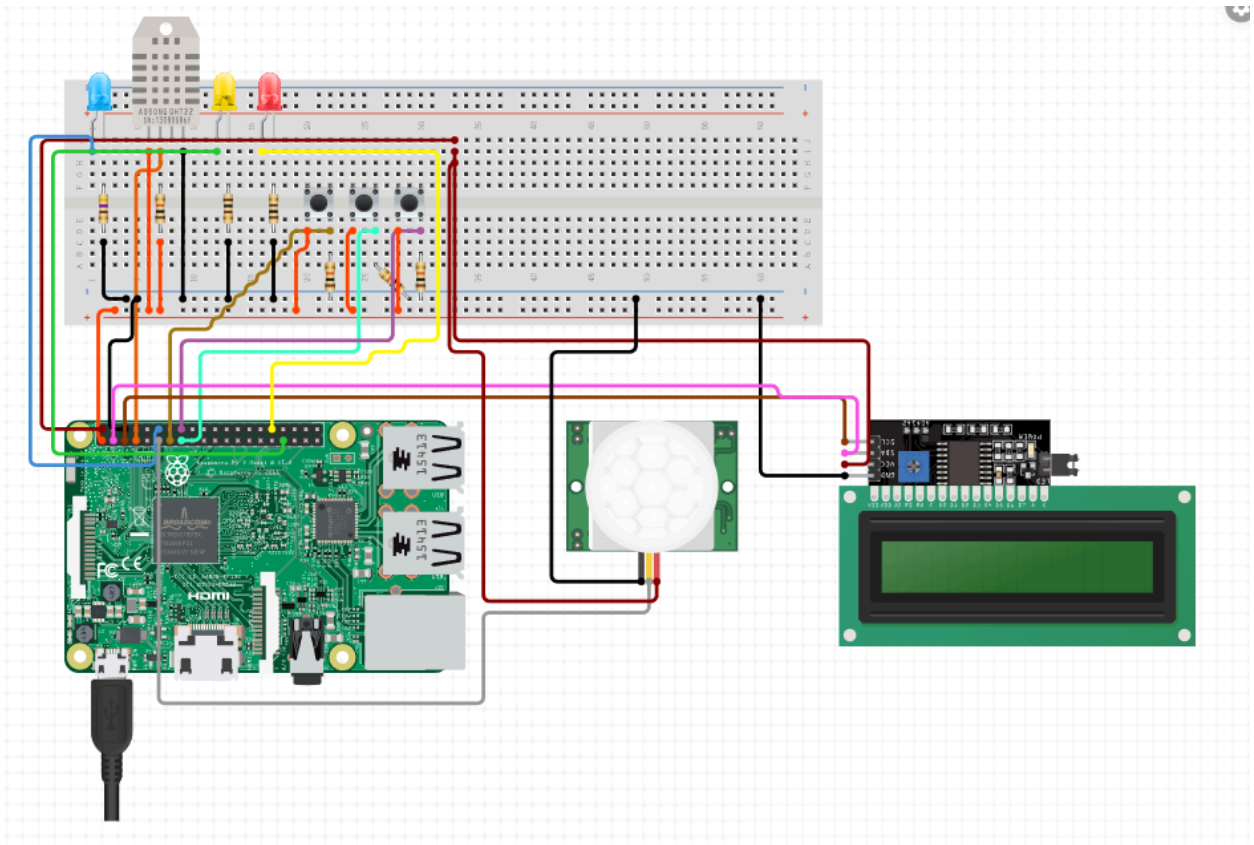
Schematic

Schematic should include a GPIO shield but it was not in my schematic software.



LCD

The LCD in this project uses the 16x2 LCD I2C. This module has VCC, GRD, and SDA and SCL which are connected to SDA/SCL 1 on the GPIO. The LCD is written to anytime a state is changed. LCD uses .message() and .clear() and .setCursor() the most, since anytime a state is changed the screen must be cleared, then the message must be posted at a position set using the setCursor. LCD fully clears if the door is open, closed, or HVAC functions are turned on.

HVAC

There are three functions of the HVAC: Off, AC, Heat. These three states are represented by two LED's, AC is blue and heat is red. By using the DHT11 sensor we obtain the temperature, and using the CIMIS API we obtain humidity to determine a weather index. Using this weather index, we compare it in our main loop to the desired temperature. If the index is 3 degrees above or below desired temperature, the HVAC system turns on.

The desired temperature can be set using the left and right buttons which are set up using GPIO Zero. GPIO Zero developed more libraries and functions for components. These two buttons both use .when_pressed to call their respective functions, updesired and downdesired. These functions updated the LCD and increased the global variable desired temp.

FIRE ALARM

If the weather index is ever above 95 degrees, the LED's will both flash on and an emergency message will appear on the LCD. This is done using a simple check between index and 95, and using the LCD functions as described.

AMBIENT CONTROL

The ambient light, also known as the alert light, indicates whether or not there is a user within the range of the PIR sensor. This PIR sensor is set up to interrupt and run the pir_motion function, updating the LCD and turning on the alert light. When the alert light goes on, the rest of the LED's should be enabled. AC and Heat have their own LED's. The PIR sensor is configured with on board potentiometers according to the Freenova Ultimate tutorial.

SECURITY SYSTEM

The door is implemented by the big middle button. When the door is opened/closed, the display is cleared and a message appears on screen. The HVAC system turns off once the door is detected.

Project States:

0 : Initializing LCD and Sensors. DHT will run, then continue to run until the length of the temperature arrays is more than 3. Once it is more than 3 the initializing state will be over.

1 : Main state shows desired temp, weather index, hvac state, sensor state, door state.

2: If heat or ac turn on, the display will clear, a message will appear, and the main state will appear again

3: if the door opens or closes, the display will clear, a message will appear, and the main state will appear again

4: If the sensor detects over 95 degrees, both lights will turn on and a message will appear saying fire.

BONUS

There is a system clock that runs, and when an event occurs it is logged to log.txt. This was the only easy part of the project.
Big button for big door!!!

I added a 3d printed stand for the LCD screen. I intended on adding a bunch more features, such as a potentiometer. I even wired the ADC. sadly this failed. In my code theres also an option to turn from celsius to fahrenheit. My plan was to add an OLED display