Lab1

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Introduction

The requirements for lab 1 is based on ICP3 (weather station), ICP2 (pulse bear monitoring with LCD display), and ICP1 (LED light indicator and push buttons).We need to use pulse, temperature, light, barometer, UV, and dust sensors for data collecting pieces and the data collected from these sensors will be display on the LCD display. As the data got collected from these sensors, we will also push data to io.adafruit.com for visualization purpose and change the color of LED light on the breadboard for additional alerting. The alerting check I created will check the value of light recorded from light sensor. When the light is too bright, it will turn on LED light 1 and dim LCD light 2. Otherwise, it will turn on LED light 2 and dim LCD light 1.

Part 1:

- Link sensors to Arduino
- Display data on LCD display

Part 2:

- Add LED lights for alerting purpose
- Add push buttons for turn on/off the LCD display

Part 3:

- Push data to io.adafruit.com for visualization purpose

Objectives

The objectives for this lab are:

- Review how to connect LED light to Arduino (ICP1)
- Review how to connect push button to Arduino (ICP1)
- Review how to connect pulse sensor to Arduino (ICP2)
- Review how to connect LCD display to Arduino (ICP2)
- Review how to connect WIFI module to Arduino (ICP2)
- Review how to connect temperature, light, barometer, UV, and dust sensors to Arduino (ICP3)
- Review how to code in Arduino (ICP1-3)
- Learn how to ingest data to io.adafrduit.com for visualization
- Learn how to integrate all ICP together

Member Contribution

We did this one together, so each member will have same contribution.

Approaches/Methods

For Lab1, I worked on it by myself due to the time conflict between me and my group member (and upcoming bad weather). I used all of the previous circuit diagrams and materials provided by instructor and built the circuit board for lab 1. The circuit board I created contains some changes due to the different types of hardware modules we received and I found there are some dead spots on the breadboard (unable to send grand/voltage over to certain rows and columns). I rewrote entire source code for lab 1 and used a custom solution (python script) to push data to io.adafruit.com.

Workflow

Here is the build workflow for lab 1:

- Build the circuit board for all sensors with Arduino
- Connect LCD display to Arduino
- Test each sensor by displaying data on LCD display
- Connect WIFI module
- Add LED lights and push buttons

- Write complete code for this lab

- Create account on io.adafruit.com

- Write a python program to ingest data into io.adafrduit.com Here is the code workflow for lab 1:

- Arduino connects to WIFI with WIFI module

- Arduino displays greeting on the LCD display

- Arduino collects data from various sensors while listening for button press (user can press button at anytime to turn on/off the display)

- Arduino ingests data to thinkpeak.com

- Arduino check for alerting based on collected data

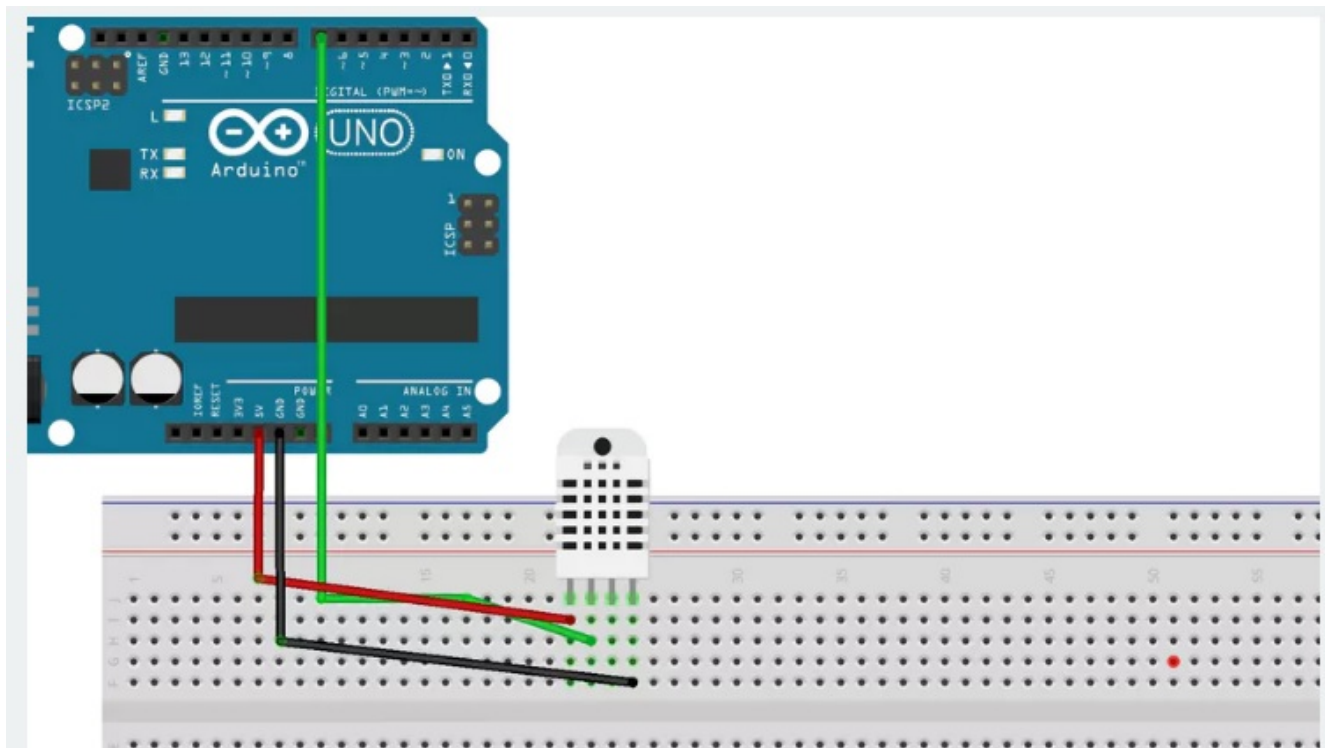- Python program ingests data pushed to thinkspeak.com into io.adafruit.com

Circuit Diagram

Barometer sensor:

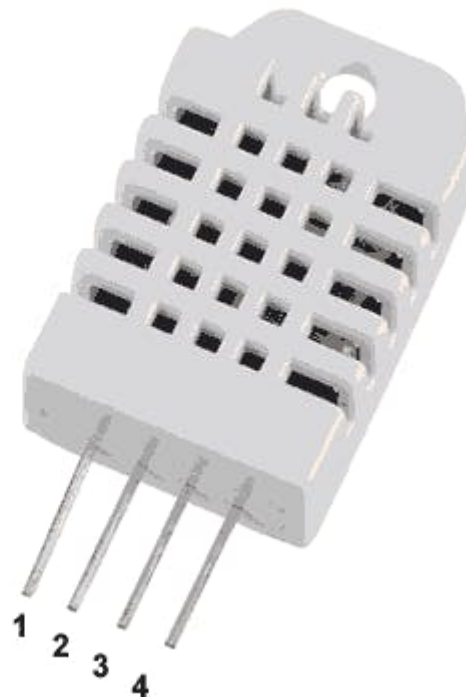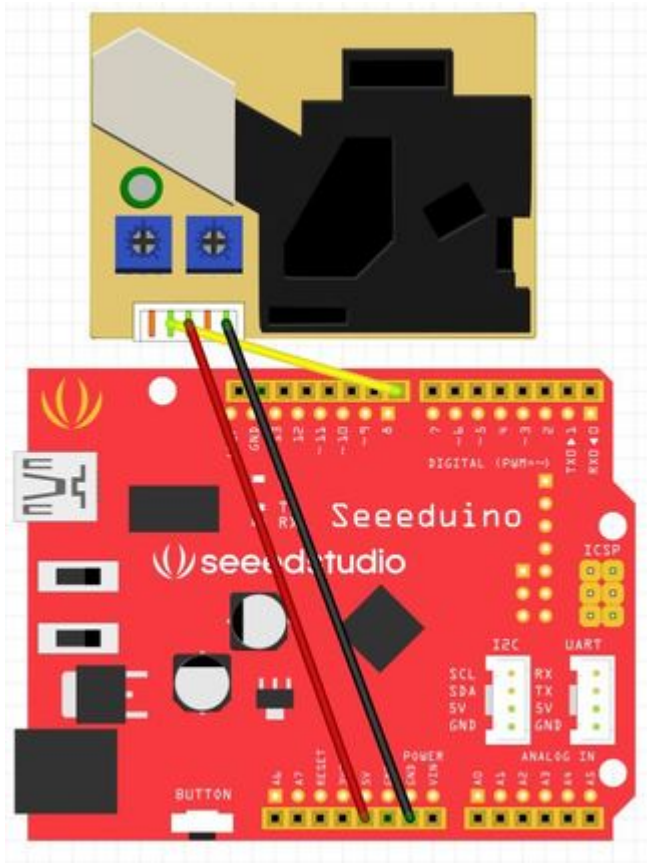Red : VCC
Black : Gnd
Green : SCL
Blue : SDA
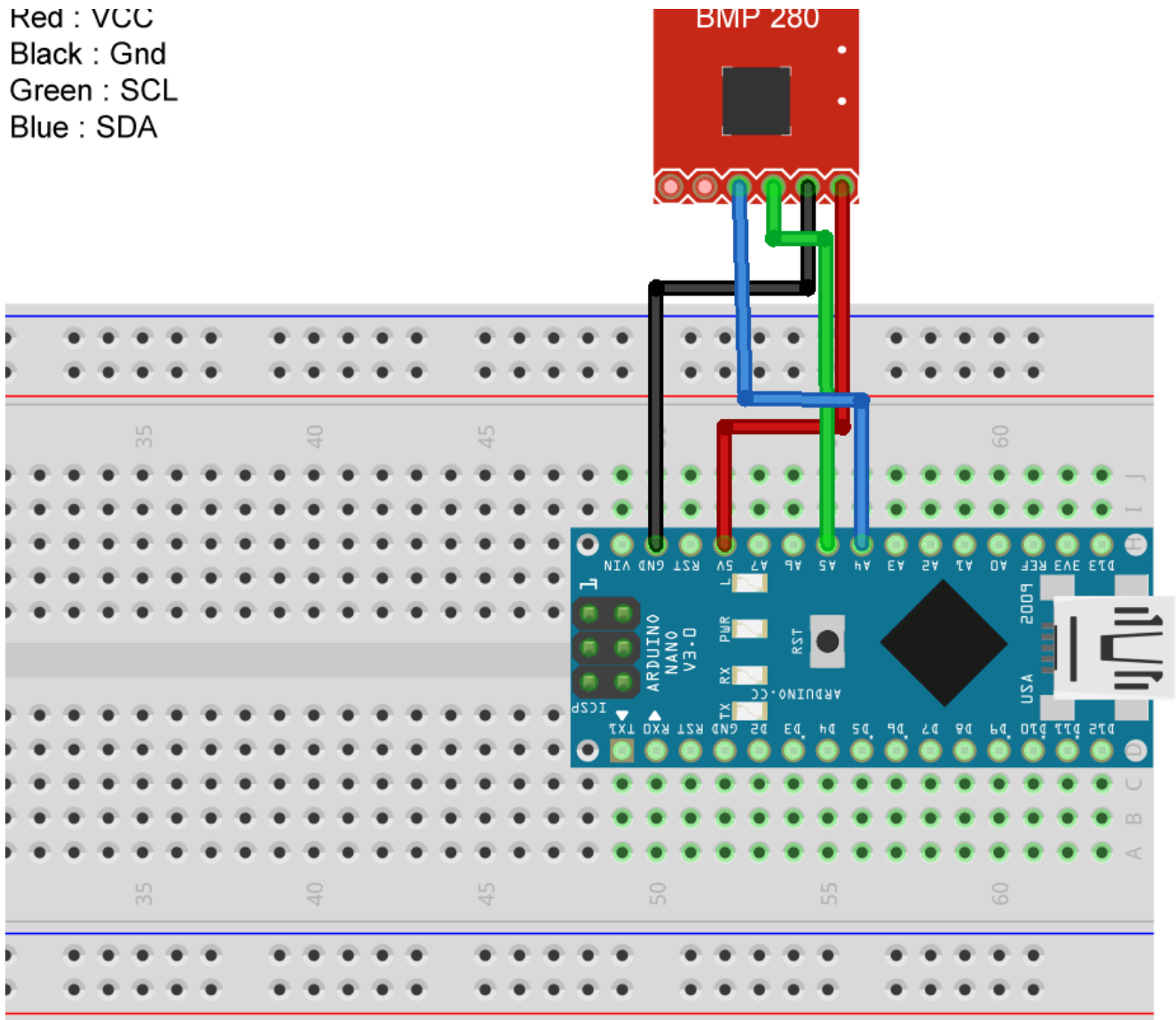
Temperature sensor:

DHT22 pins	
1	VCC
2	DATA
3	NC
4	GND

Dust sensor:

LED and push button:
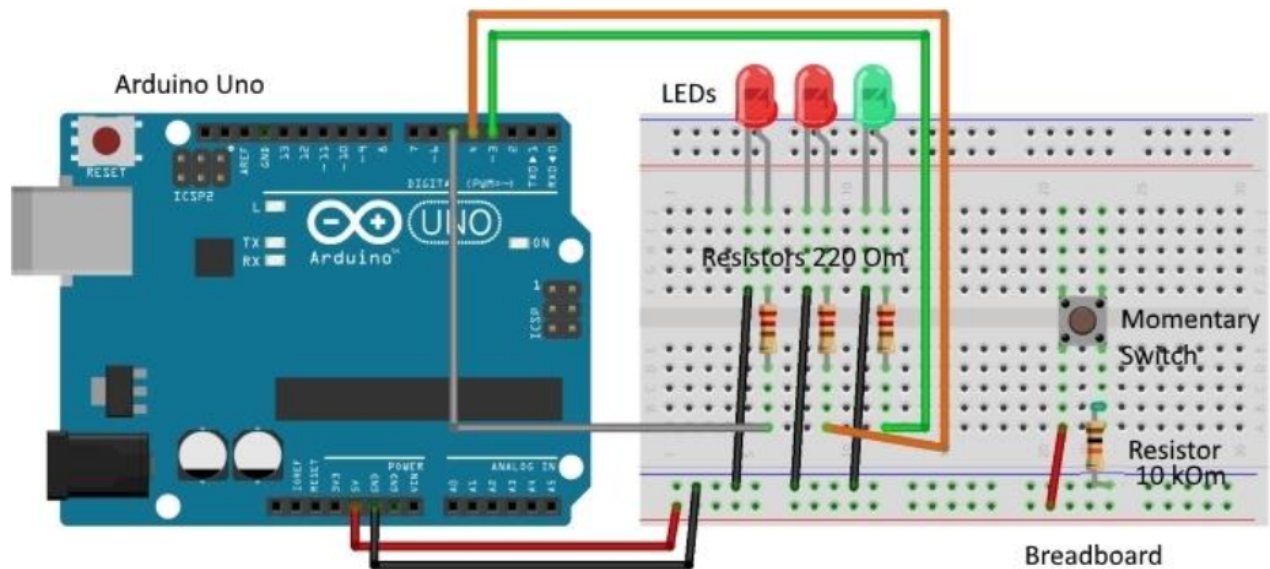
Pulse sensor, LCD display, and WIFI module:
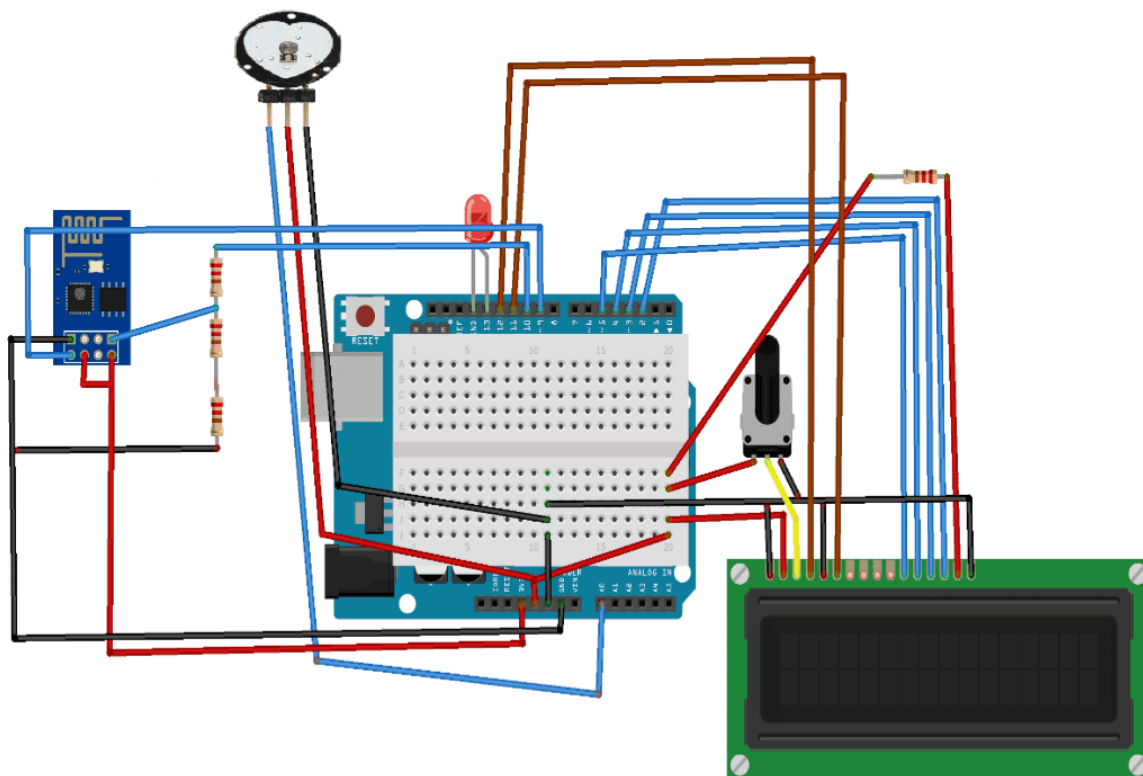
Completed diagram:

Additional images
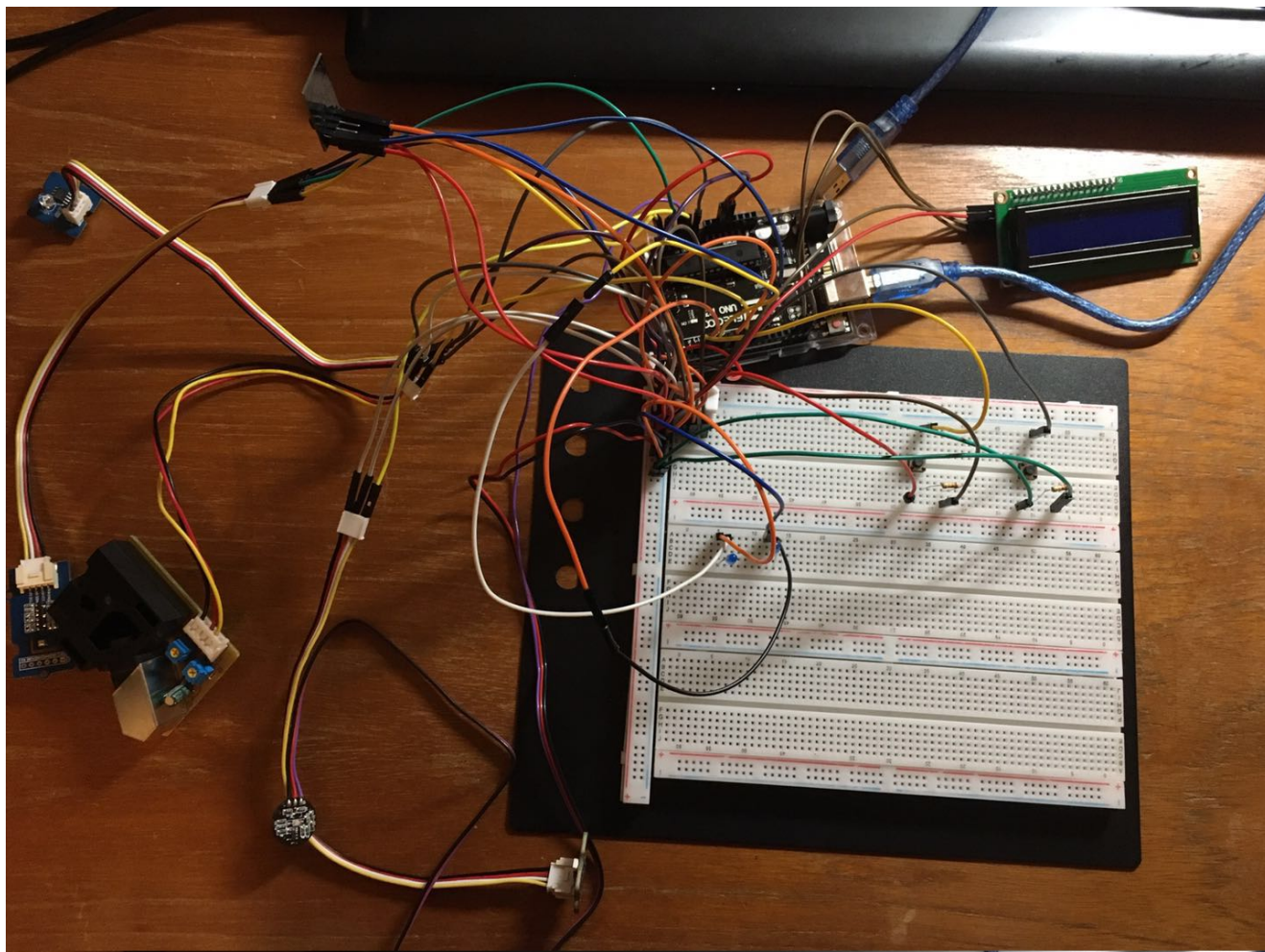
Thinkspeak API endpoint:

Adafruit visualization:

#Parameters There is no special parameters for this ICP.

Evaluation & Discussion

I had several issues during this lab and most of them were caused by fatal hardware components.

1. Unable to prevent pullup resistor to the push button as the resistor I received is broken
2. Unable to send data to io.adafruit.com from Arduino due to a bug (long string concatenation caused empty string). This may be due to the Arduino itself. I sent explanation to TA via email.

Conclusion

From this lab, I reviewed the materials I learned from previous three ICP re-practiced them in order to completed this lab. I also used a custom solution to perform data ingestion and display data on io.adafruit.com. I am much more comfortable with Arduino compared to the first day of this class.

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