Automation Prototype Ⅱ Description

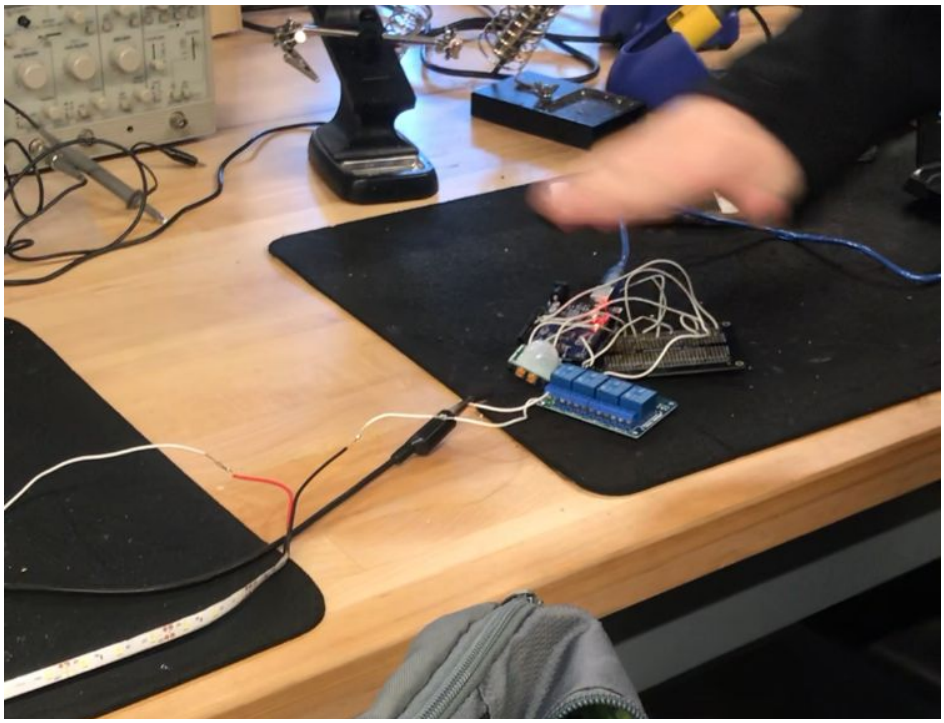
Team 3 Automation: Deliverable G

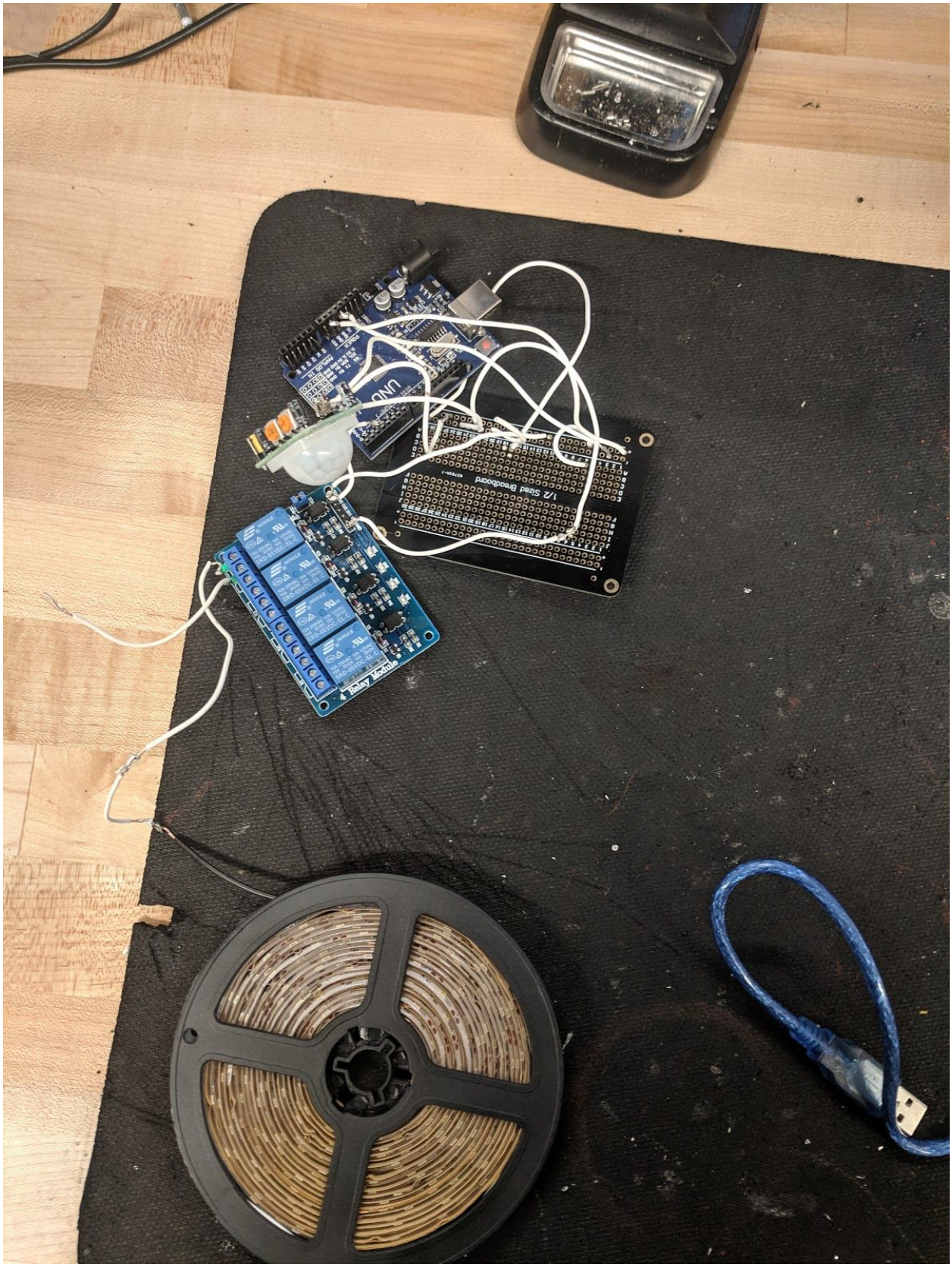
Noah, Sinthu, Tal, Jay, Brydon

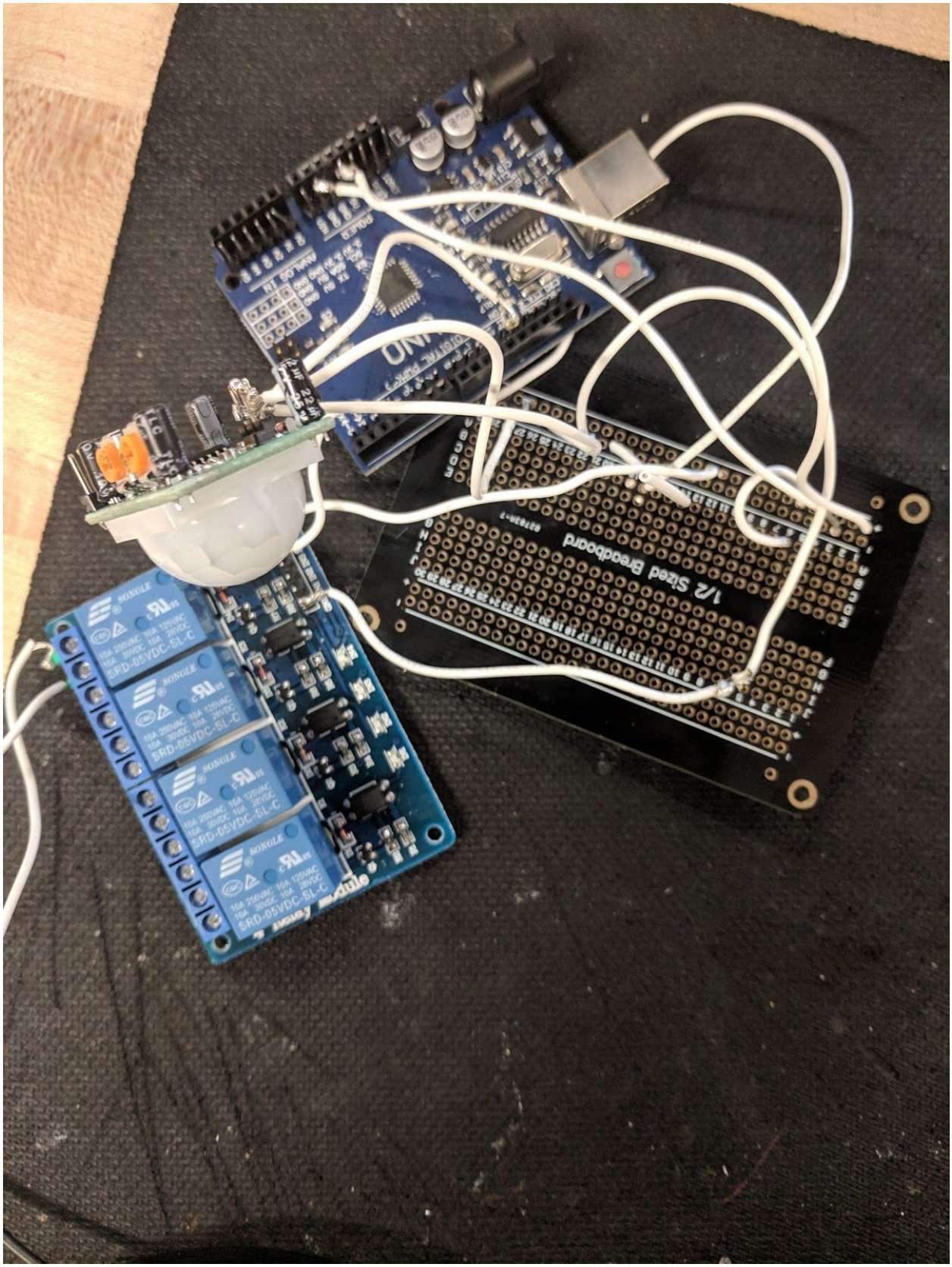
Prototype Ⅱ Goals:

The idea behind the second prototype was to present a physical product so that the client can get a visual of how the house will be automated. One of the more important automation goals in a home is lighting and that is why we built a prototype of our light source. This required us to purchase materials that will also be used in our final design such as an arduino, LED lights, Motion sensor, and other materials. The prototype didn't just give the client a better look but also let us have a better idea on how our other ideas will be implemented and created while creating concepts for how everything will be implemented into the house. Some of these concepts included casing for the arduino, quick connections, and how our designs will fit into the build. We decided that optimizing lighting is the most important sub-system, as it does the most to minimize energy usage, as well as vastly improves the resident's quality of life. We created an experimental model to verify that the lighting would be adequate, as well as that the motion sensor could successfully control the lighting. Our stopping criteria for this prototype was for the prototype to successfully

Prototype Created:




UNO
Solid Breadboard
4 Relay Module


1/2 Sized Breadboard
SONGLE
SRD-05VDC-SL-C

Arduino Code Used to Test:

```
/*
 * PIR sensor tester
 */

int ledPin =3 ;                  // choose the pin for the LED
int inputPin = 13;                 // choose the input pin (for P
int pirState = LOW;               // we start, assuming no motion
int val = 0;                      // variable for reading the pin

void setup() {
  pinMode(ledPin, OUTPUT);       // declare LED as output
  pinMode(inputPin, INPUT);      // declare sensor as input

  Serial.begin(9600);
}

void loop(){
  val = digitalRead(inputPin);  // read input value
  if (val == HIGH) {            // check if the input is HIGH
    digitalWrite(ledPin, LOW);  // turn LED ON
    if (pirState == LOW) {
      // we have just turned on
      Serial.println("Motion detected!");
      // We only want to print on the output change, not state
      pirState = HIGH;
    }
  } else {
    digitalWrite(ledPin, HIGH); // turn LED OFF
    if (pirState == HIGH){
      // we have just turned of
      Serial.println("Motion ended!");
      // We only want to print on the output change, not state
      pirState = LOW;
    }
  }
```

Information Learned From Experimental prototype:

From our experience with the experimental lighting prototype, allowed us to do three major things. Firstly, we were able to successfully verify that our lighting concept would work

properly, We were able to successfully test the lighting, verifying that one lighting strip would be adequate. Additionally, we were able to verify that the lighting could be easily triggered by motion sensor hooked up to the arduino. The two other things the second prototype allowed us to do was understand the voltage needed, and current draw of running these lights. We attempted to run the LED lights off both a 9-volt battery and a 12-volt power supply, the difference in light quantity was shocking, and we verified that we indeed would need a 12-volt power supply. This prototype also informed us of the current draw of running just the lights off of our relay with a 12-volt power supply drawing an average of 5 amps of current.

Objectives Moving Forward:

Lighting:

Our current lighting design has been built and tested and works to our standards. The next step for our lighting concept is re-designing some components so that it can be built into the home with ease. To do this it will require longer wires to the motion sensor so that it can be placed in a higher range of places. The wires connecting the LED strip to the relay and power must also be longer so that the lights can be placed near the ceiling but have the arduino at an accessible place.

Door Sensor:

Now that the components for the door sensor have come in, we will begin working on door detection. We will sense the distance from the door to an object, and when this passes a certain threshold, we will trigger lighting and sound indications within the house. We will begin working on this early in the next week, to try to have it completed before friday.

Temperature Control:

We will begin to use the relay and temperature sensor to regulate the temperature with a fan. We have basic arduino code created for doing so, and moving forward, will work to implement the physical hardware to integrate this into the house.

Arduino:

The prototype created a realization that the arduino needs to be encased in something that can make it accessible for any needed maintenance. We also talked about creating quick connections so that the motion sensor, fan, lights, and alarm system can be disconnected separately so that it would be easier to take down the home and rebuild it.

Client Feedback:

Our client seemed very impressed by our initial prototype, as having a physical, working prototype to demonstrate allowed her to better understand both our design and current place in the process. Although the lighting was minimal, as the lights were being run off of a 9-volt battery, rather than the 12-volts they will be finally run off, the client believed that the motion sensing was a good solution, and was glad to be able to see this process in action. The client told us that the lighting ring for our third prototype, door detection seemed slightly redundant, as there is a window very near to the door, however, we still want to create this as a proof-of-concept for a larger house where there may not be a window near the door. Overall, the client seemed very happy with our progress, and we look forward to continuing to create and verify prototypes in order to help optimize the house as best as possible.