Course Number: EENG 403

Lab Title: Final Project

House Monitoring System

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Description

The goal of this project is to employ what you have learned about Arduino and your knowledge of to design and develop a standalone house monitoring system by taking advantage of the ultrasonic distance sensor, movement detection sensor, passive/active buzzer and the RGB LED provided in your equipment kit.

Code

```
#define NOTE_C5 523

// Define connection pins:
#define pirPin 6 //set the motion detector pin to 6
#define echoPin 13 //set the echo pin for the ultrasonic sensor pin to 13
#define trigPin 12 //set the echo pin for the ultrasonic sensor pin to 12
// Create variables:
long duration; // variable for the duration of sound wave travel
int distance; // variable for the distance measurement
int red_light_pin = 2; //set the red LED pin to 2
int green_light_pin = 4; //set the red green pin to 4
int blue_light_pin = 3; //set the blue LED pin to 3
int Buzz = 8; //set the buzzer pin to 8
int val = 0;
bool motionState = false; // We start with no motion detected.
void setup()
{
  // Configure the pins as input or output:
  pinMode(pirPin, INPUT);
  pinMode(red_light_pin, OUTPUT);
  pinMode(green_light_pin, OUTPUT);
  pinMode(blue_light_pin, OUTPUT);
  pinMode(trigPin, OUTPUT);
```

```cpp
  pinMode(echoPin, INPUT);

  // Begin serial communication at a baud rate of 9600:
  Serial.begin(9600);// Serial Communication
}
void loop()
{
  // Read out the pirPin and store as val:
  val = digitalRead(pirPin);
  // If motion is detected (pirPin = HIGH), do the following:
  if (val == HIGH)
  {


    //if distance is between 50 to 100 cm run the code below
    if (distance > 50 && distance < 100)
    {

    RGB_color(255, 255, 255); // White
    delay(1000);
    RGB_color(0, 0, 0); // no color
    delay(1000);

    }
    //if distance is below 50 cm run the code below
    if (distance < 50)
    {
      tone(Buzz, NOTE_C5, 2000); // Play note C5 (alarm)
      RGB_color(255, 0, 0); // Red
      delay(500);
      RGB_color(0, 0, 255); // Blue
      delay(500);

    }

    //if distance is greater then 100 cm run the code below
```

```
    else (distance > 100);
    {


      RGB_color(0, 0, 0); // LED Turns off
      delay(1000);


    }




    //print Motion Detected in serial monitor when motion sensor detects
motion
    if (motionState == false)
    {
      Serial.println("Motion detected!");
      motionState = true;
    }


  }
  // If no motion is detected (pirPin = LOW), do the following:
  else
  {

    // Change the motion state to false (no motion):
    if (motionState == true)
    {
      Serial.println("Motion ended!");
      motionState = false;




    }
  }
  // Clears the trigPin condition
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
```

```
  // Sets the trigPin HIGH (ACTIVE) for 10 microseconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads the echoPin, returns the sound wave travel time in microseconds
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  distance = duration * 0.034 / 2; // Speed of sound wave divided by 2 (go
and back)
  // Displays the distance on the Serial Monitor
    Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println(" cm");
  delay(2000);

}
//set each pin color to a color value
void RGB_color(int red_light_value, int green_light_value, int
blue_light_value)
{
  analogWrite(red_light_pin, red_light_value);
  analogWrite(green_light_pin, green_light_value);
  analogWrite(blue_light_pin, blue_light_value);
}
```

Result

Tinkercad Diagram
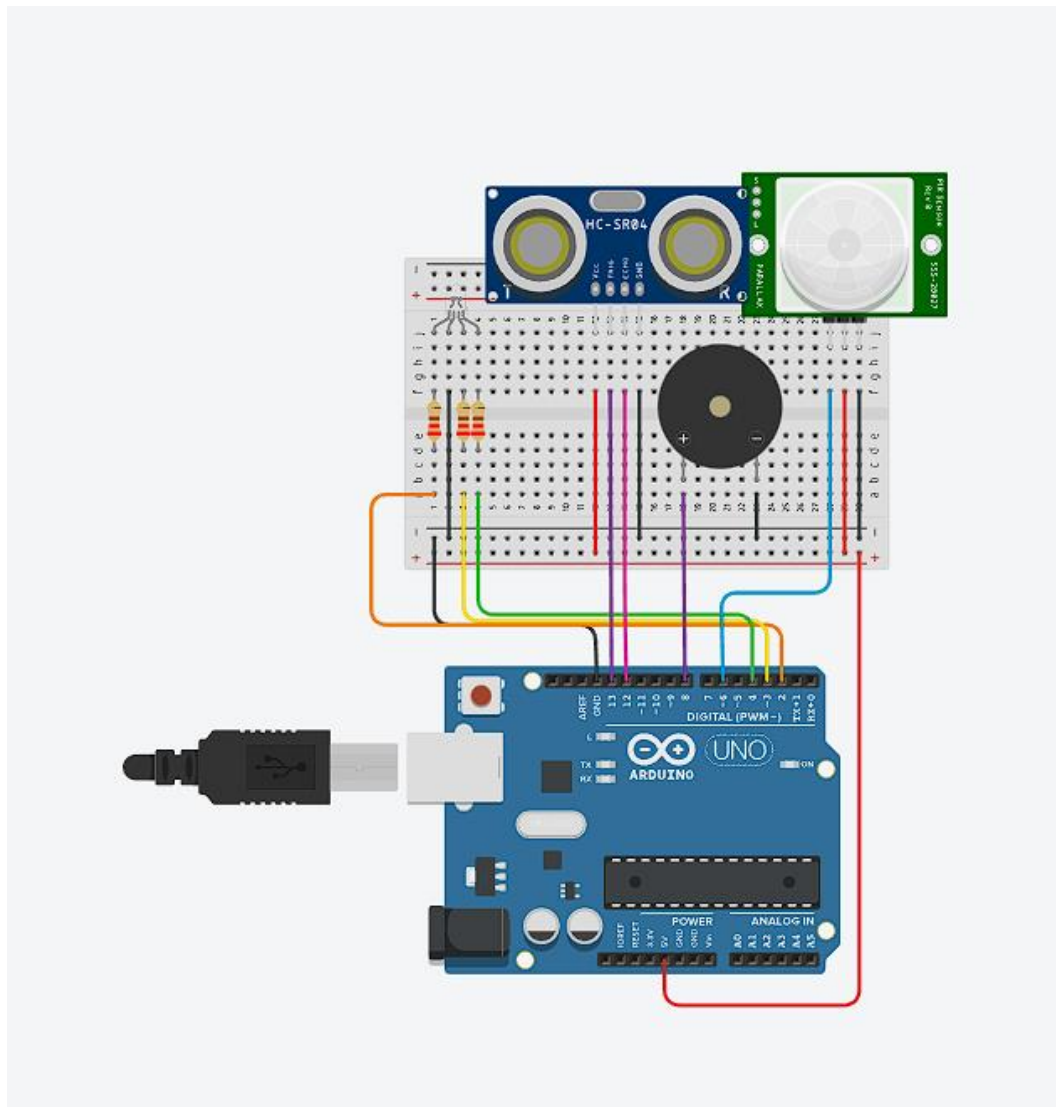
Physical Build
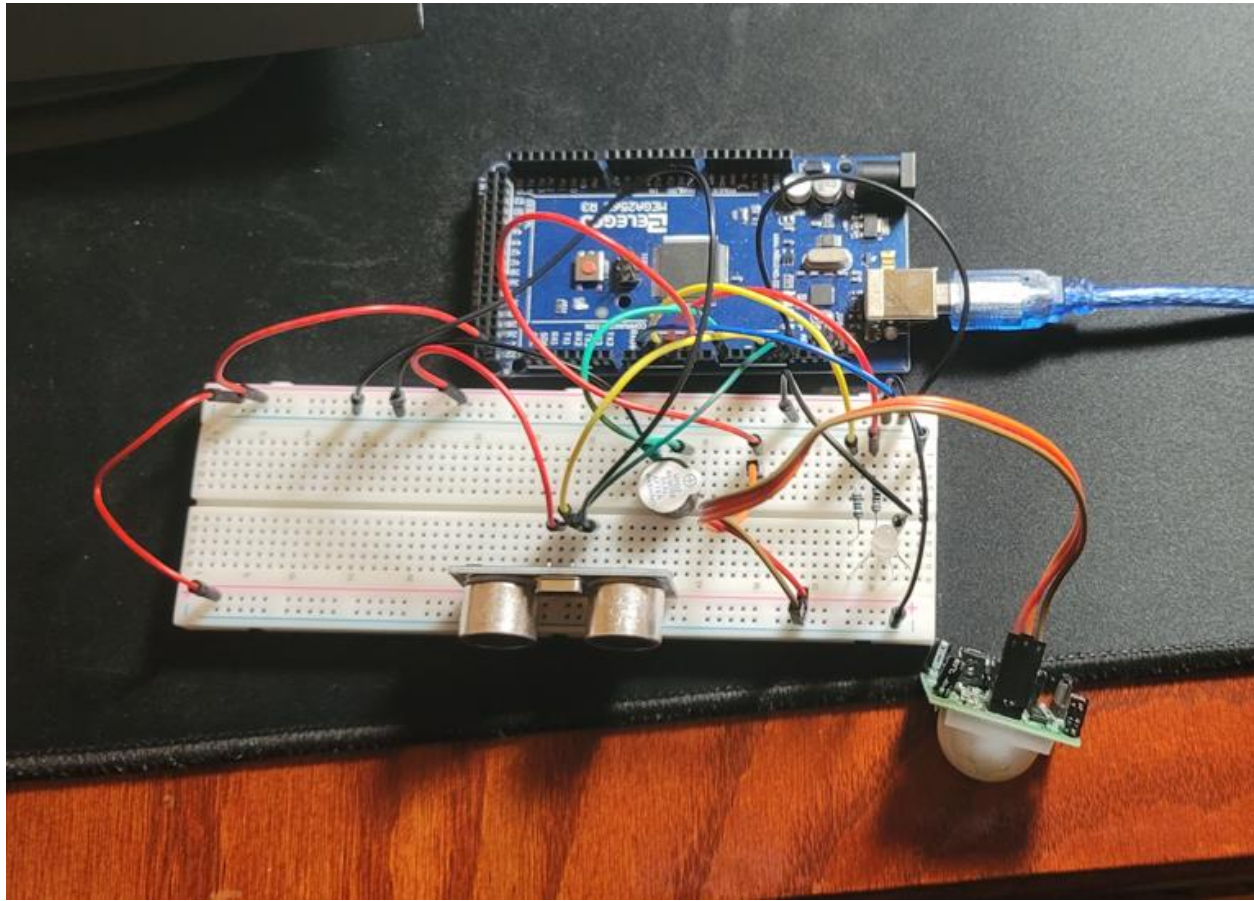
The image above is a motion detector that warns people if they are getting too close to the system. The system will check if there is any motion, once motion is detected, the ultrasonic sensor will check the distance of the person to the system. If they are more than 100 cm, the system will not do anything, but when the person gets within 100 to 50 cm away from the system then it will start to flash a white light to warn them. When they get under 50 cm away from the system, it will flash blue and red light. Afterwards, the buzzer will go off to tell them they are way too close and must move away. As they move away and are greater than 50 cm, the system will flash white. If they go farther than 100 cm, the system will stop. That's how the smart monitoring system works.

Discussion/Conclusion

The design is confirmed as expected because we checked and verified the parts using the code that we came up with. It was our first time building a house monitoring system, which is used in a real-world environment. The house monitoring system that we built showed how we could be able to use our lab assignments and combine them to make an actual prototype that is used in the real world. The project is used in all facilities that want to control the motion when blinking the RGB LED such Blink smart security, which turns on the lights using a motion sensor outside of home. As we built the circuit, it was straightforward to wire them. However, with the code, we had to brainstorm which part of the code would work by certain sections. For instance, when the distance goes under 50 cm, the LED blinks to red and blue as well as buzzing when the motion is detected. Same with between 50 cm and 100 cm, the LED blinks to white while motion is detected. Overall, this was a fun project to build because the motion and ultrasonic sensors were taught from the previous lab assignments, which helped in building this project. We hope that we can use this as a template for making other projects when working in the real industry.