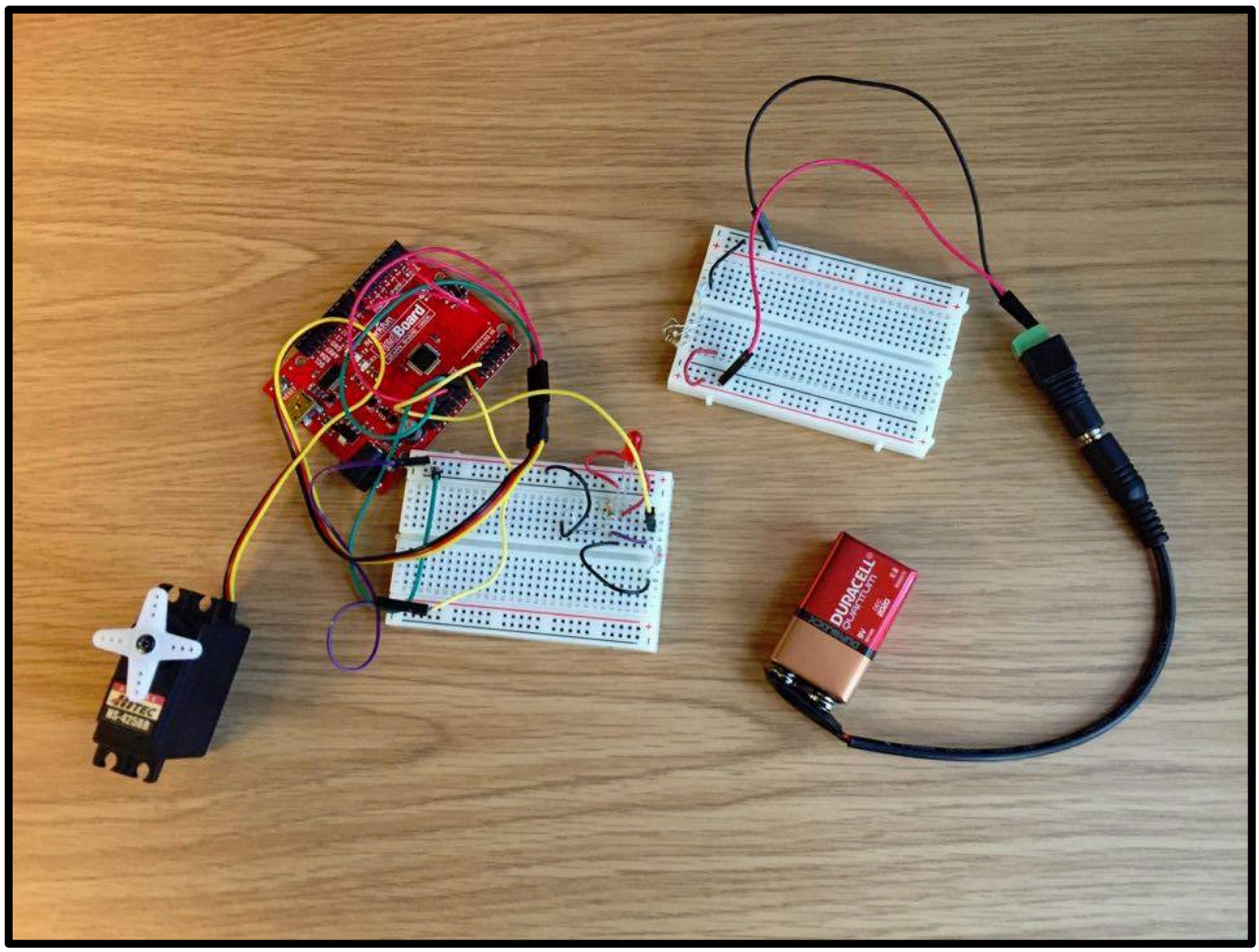


Wireless Door Locking System

Aniruddha Pispati, Shounak Ray & Siddhant Jain
ECE 110 Honors Lab

Introduction

Our goal is to create a wireless lock that allows the user to wirelessly lock and unlock their door with a remote. The idea is that humans are inherently lazy so why make them get up to open or close a lock now they can do it without getting up. To build this wireless lock remote, we used 3 sensors - an IR LED, an IR Receiver and a Push Sensor. The concept is pretty simple. A push sensor is used to trigger the IR LED, which in turn emits a signal that is received by the IR Receiver. This IR Receiver triggers the servo motor system that in practice should unlock/lock a door.

Analysis of Components

- Arduino
  The Arduino we used is a standard RedBoard that is included with the lab kit. We used it to program the output from the IR receiver to activate the servo motor.

- Servo motor
  We used a standard servo motor that can be attached to different mechanisms that can be used to unlock a door.

- IR LED
  The IR LED emits Infrared when current is supplied to it – and we built an IR transmitter using this IR LED.

- IR Receiver
  The IR Receiver will output different values when it receives infrared from different sources. In this case, from the IR LED.

- Push Sensor
  The Push Sensor is used to trigger the IR LED – it is essentially just a basic switch.

Design Description

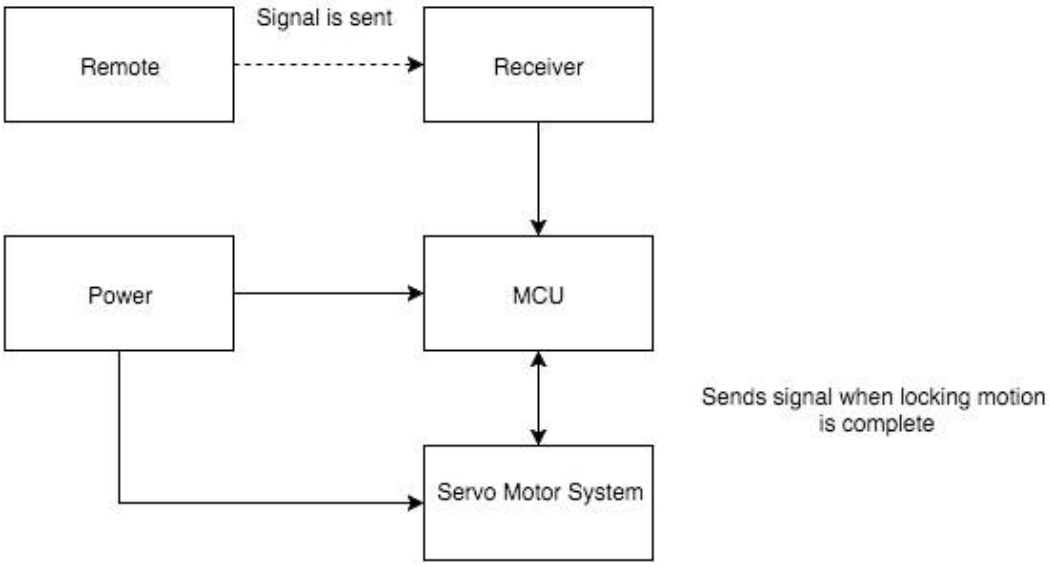


Figure 1 Block Diagram of Wireless Remote Locking Mechanism

```
if (k % 2 == 0  && (sensorvalue >10 && prev <= 10))
{
  Serial.println("Lock");
  Serial.println(sensorvalue);
  for (pos = 0; pos <= 180; pos += 1)
  { // goes from 0 degrees to 180 degrees
    // in steps of 1 degree
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(10);                       // waits 15ms for the servo to reach the position
  }
}

else if (k % 2 != 0 && k != -1 && (sensorvalue >20 && prev <= 20))
{
  Serial.println("Unlock");
  Serial.println(sensorvalue);

  for (pos = 180; pos >= 0; pos -= 1)
  {
  // goes from 180 degrees to 0 degrees
    myservo.write(pos);              // tell servo to go to position in variable 'pos'
    delay(10);                       // waits 15ms for the servo to reach the position
  }
}
delay(250);
prev = sensorvalue;
```

Figure 2 Picture of code used for Arduino to simulate opening and closing for door

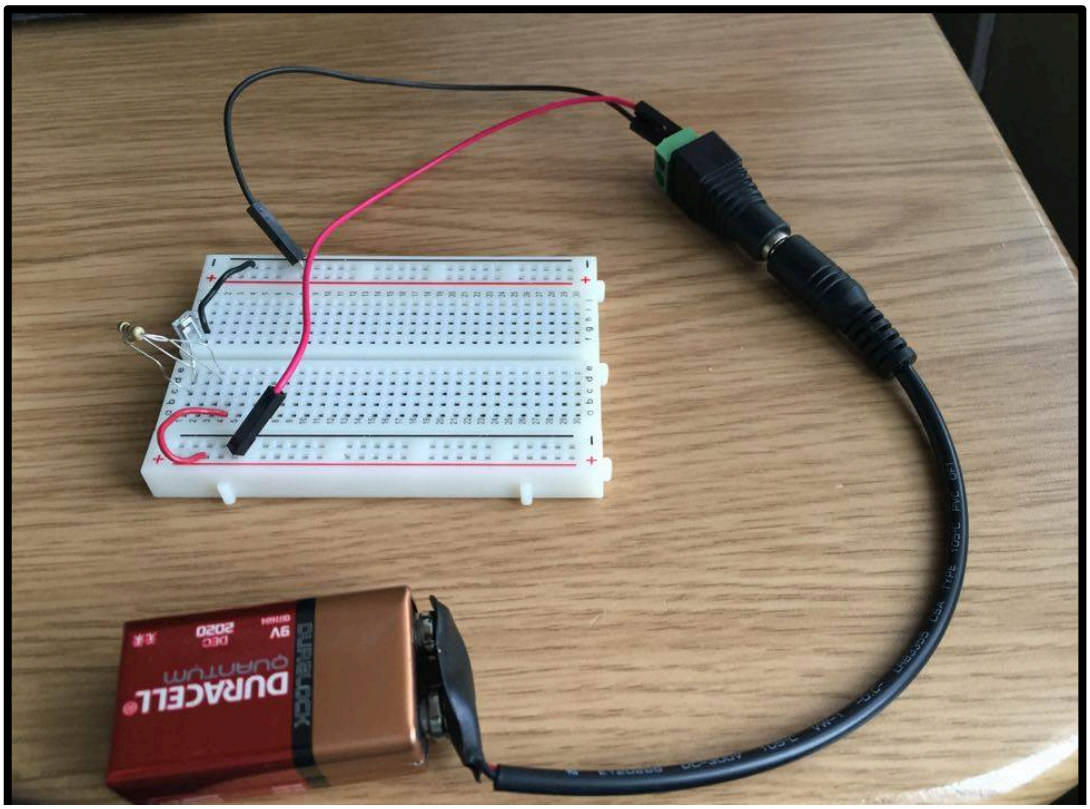


Figure 3 Wireless IR Remote

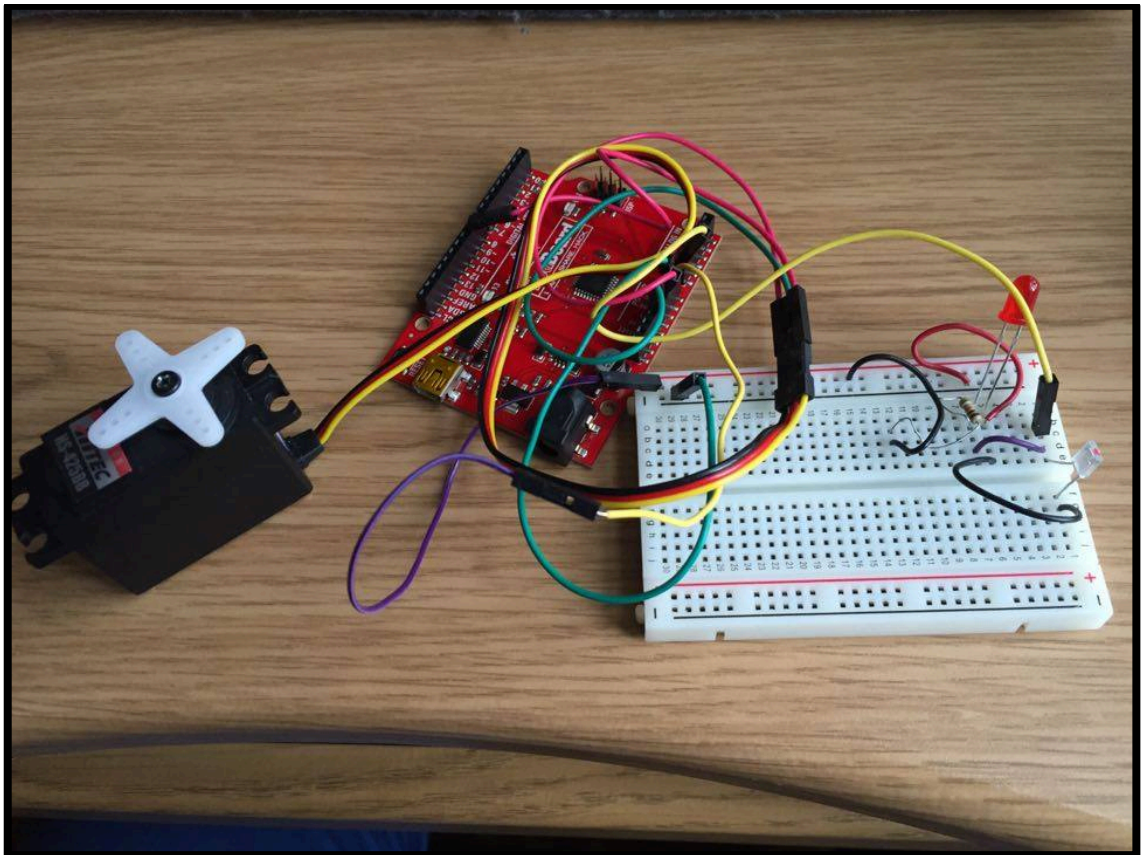


Figure 4 Pictures of Servo Motor attached to Arduino and IR Sensor and LED

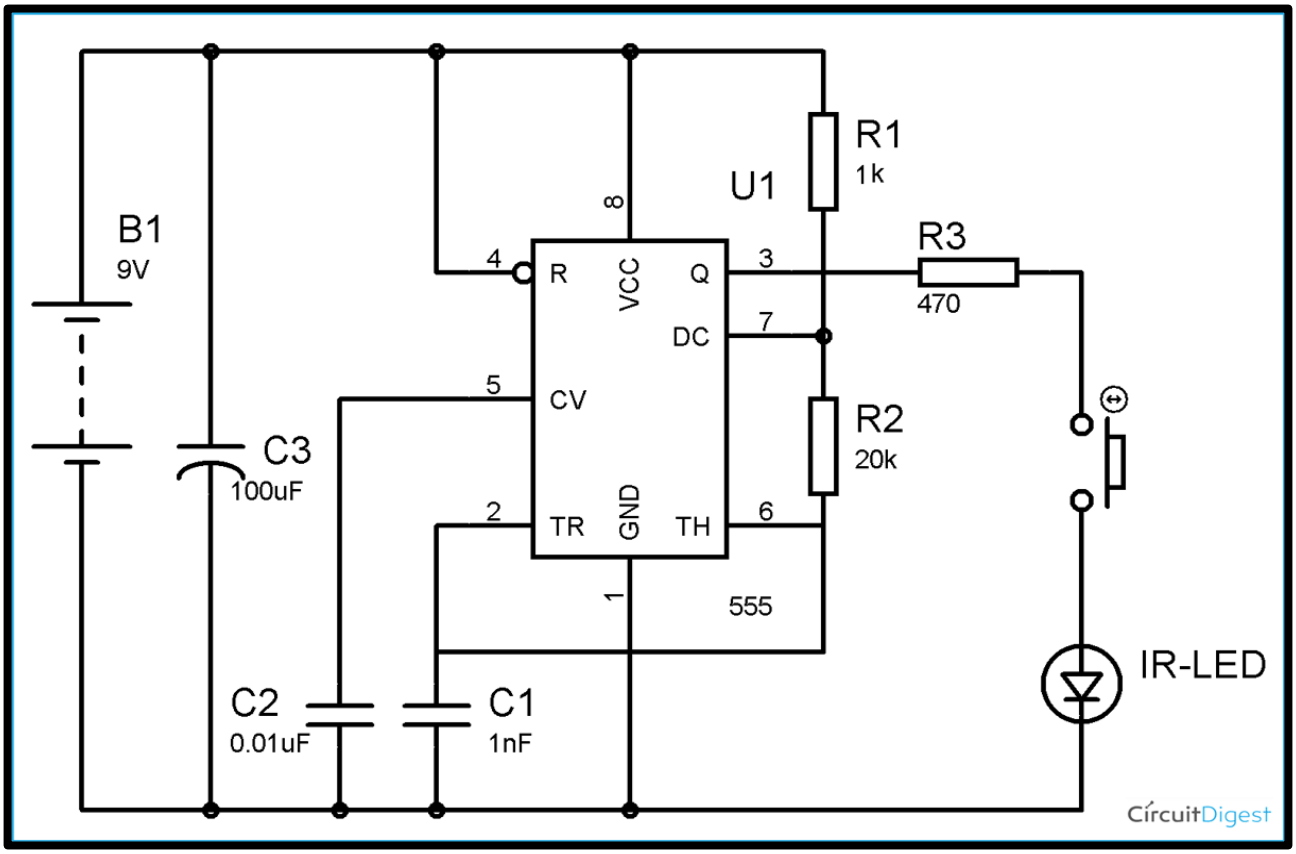


Figure 5 IR LED Transmitter

This schematic is what we used to build our IR LED Transmitter. As seen, the IR-LED is the key component in this setup. In addition, we used a combination of other components, such as a 100uF capacitor, 1nF capacitor and a .01uF capacitor. We also used 1k, 470, and 20k ohm resistors. In the final leg of wires (before it reaches the IR-LED), we put our push sensor to stop and start the transmission of infrared.

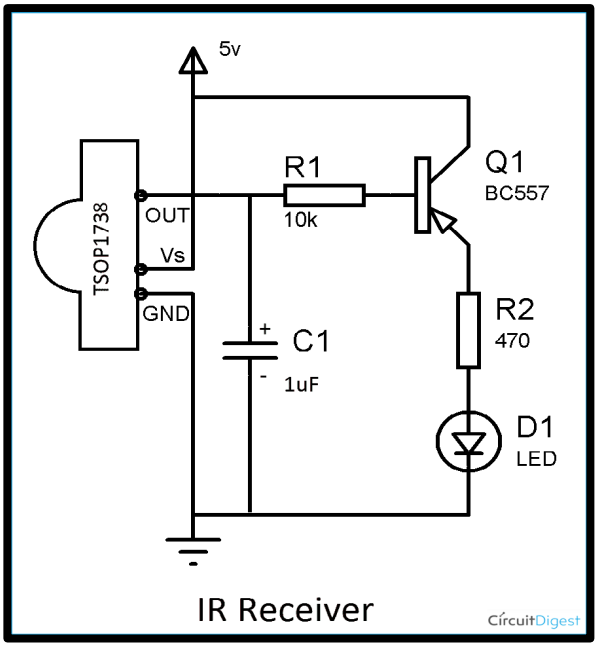
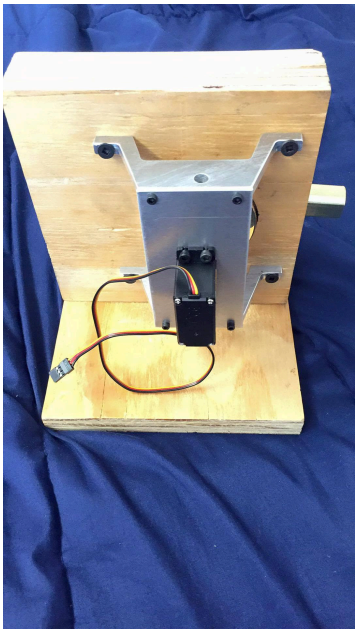


Figure 6 IR LED Receiver

The second part of the circuitry is the receiver. This was built using the TSOP1738 part, and a few capacitors and resistors. Specifically, we used a 1uF capacitor, a 10k ohm resistor and a 470 ohm resistor. These components together allowed us to build an efficient mechanism to capture the IR signals being emitted by the transmitter. This receiver was then hooked up to an Arduino, allowing us to control the servo that locks/unlocks a door.



Conclusion

Figure 7 Back of Lock with Servo Motor Attached

Figure 8 Front of Lock

We faced many challenges and obstacles as we worked through this lab. Perhaps the biggest was coding the Arduino to unlock/lock the imaginary door by having the servo motor turn. Another complication we faced was with our equipment. Since we were doing a unique project, we had to plan from scratch. We had to read online material and visit the ECE Service Shop to see what supplies they had. Once we figured it out then we could go out and test this project. The first step was to get the IR sensor to work, once we got the Push Button it to trigger then we hooked it up to the Arduino. The goal was to get it to print out Unlock and Lock sequentially when clicking the push bottom. This was important as the next step was to hook up the Servo Motor to the Arduino. Lastly, the IR range was short but we figured it out how to extend by using a 9V battery in order to make it was wireless remote otherwise it was tethered to the Arduino. Perhaps the biggest and most important lesson we learned through the course of this lab was that theory and practical implementation are two different things. Something may look like it's going to work on paper, but for it to actually work in real life needs hours of debugging, testing and trial and error. The next steps for the project would be to create an app that could interact with the redboard in order to lock/unlock the door wirelessly. Also we would implement RFID tags which would make it easy to unlock with minimal effort.

References:

http://circuitdigest.com/electronic-circuits/ir-transmitter-and-receiver-circuit