intro.html

overview.css

```
Maximum ‘Surveillance’ {
  [For Beginners Workshop]

    Create your very own security system!

}
```

intro.html

summary.css

Summary of Workshop ‘Contents’ {

01 What Components are we Using?

02 RFID Scanner

03 PIR sensor

04 the Buzzer

05 Putting Everything Together

}

components.html

01 {

[What Components are we Using?]

A quick refresher on the key components

}

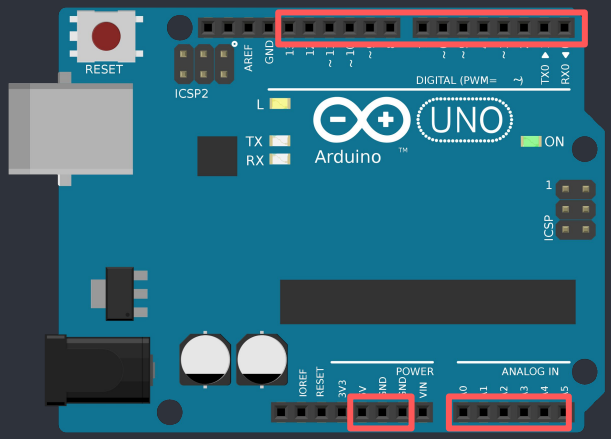
components.html

The Arduino; {

The brain of our circuit, connected to our computer using a USB cable.

It can input and output both digital and analog values, while providing 5V and GND to our components

}



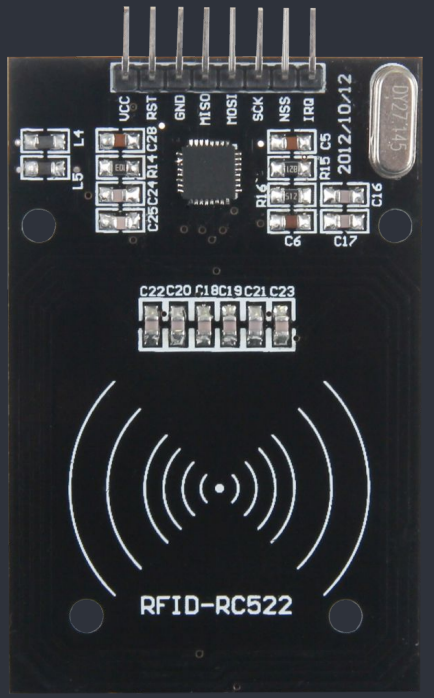
components.html

The MFRC522; {

This is an RFID scanner, recognizing cards placed nearby using their UID.

It works by emitting electromagnetic waves and detecting its reflection by RFID chips

}



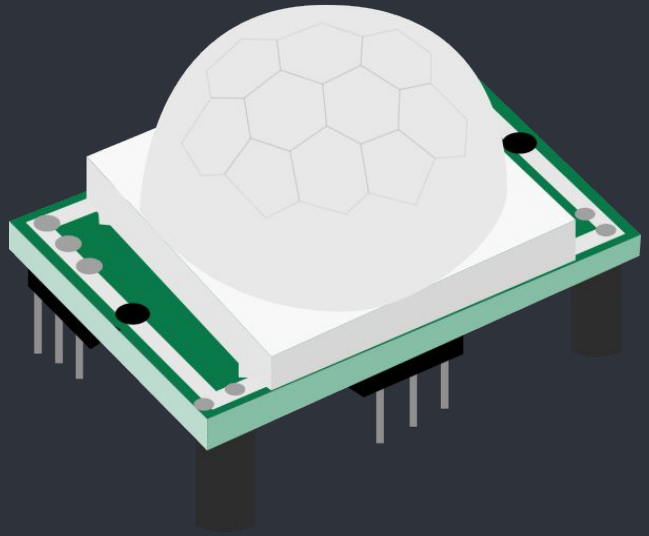
components.html

The PIR Sensor; {

Detects motion using two sensors in the shell measuring the difference between heat signals.

The sensitivity and delay for when motion is detected can be adjusted using dials on the side

}



components.html

The Buzzer; {

Makes sound with a piezoelectric disk which we can force to vibrate using electricity. Alternating high and low power deforms the disk back and forth.

}

RFID_scanner.html

MFRC522_example.ino

02 {

[RFID Scanner]

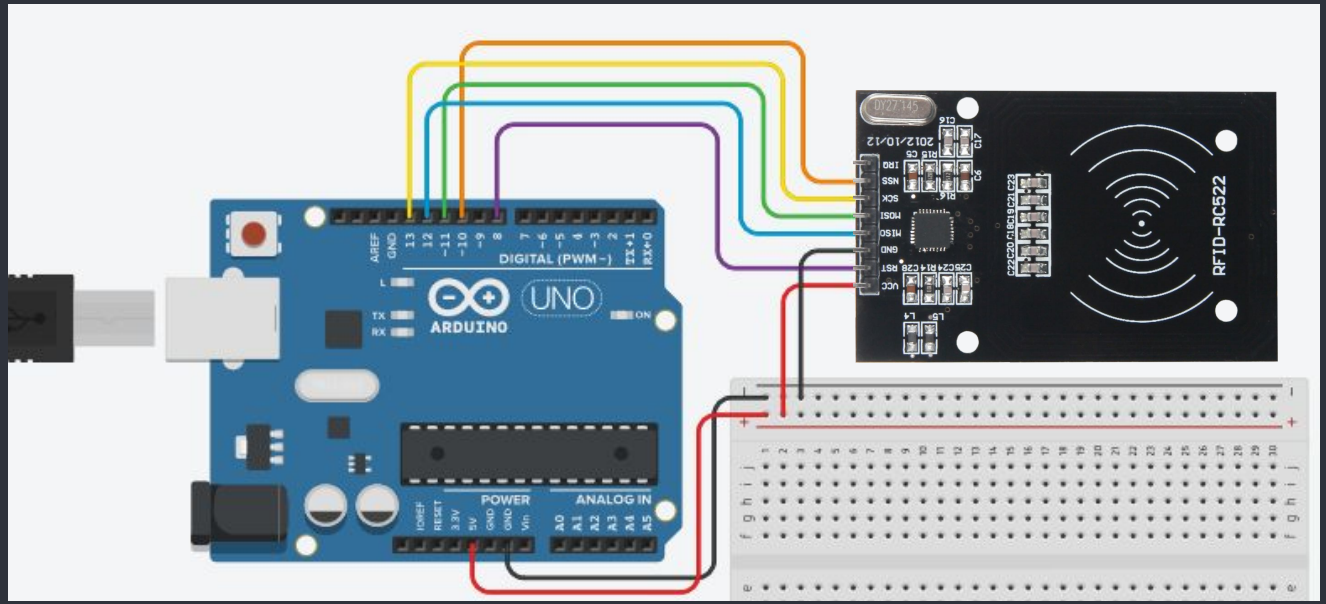
Getting the Arduino to recognize a specific RFID card and act upon it

}

RFID_scanner.html

MFRC522_example.ino

Electrical Wiring; {

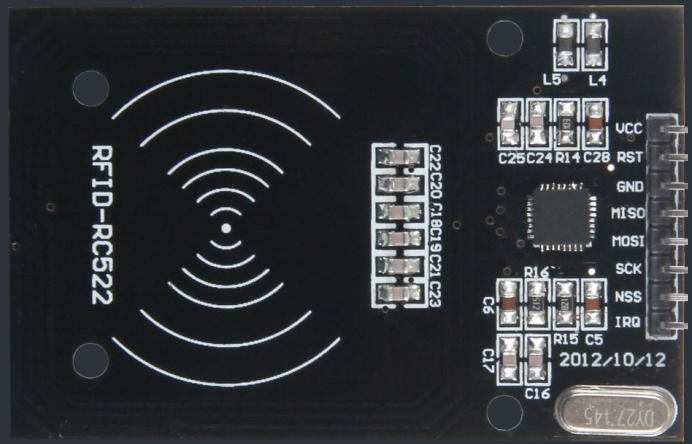


}

RFID_scanner.html

MFRC522_example.ino

Electrical Wiring; {



RFID Pin	Arduino Pin
VCC	5V
RST	8
GND	Ground
MISO	12
MOSI	11
SCK	13
NSS	10
IRQ	nil

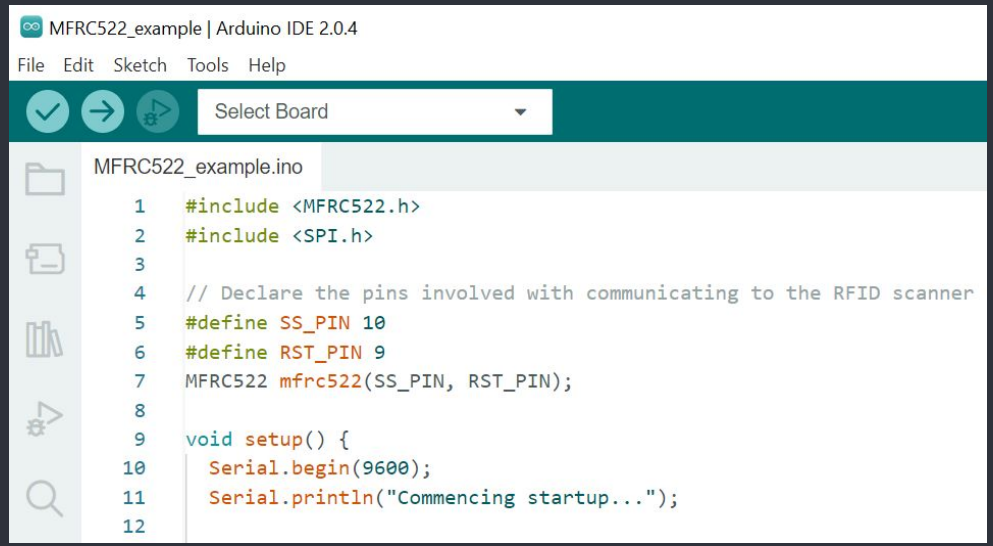
}

RFID_scanner.html

MFRC522_example.ino

Load up the Code; {

AlarmTutorial



} Upload the Code and open Serial Monitor to test if it works!

RFID_scanner.html

MFRC522_example.ino

How the code works

```
1
2
3   void setup() {
4     Serial.begin(9600);
5     Serial.println("Commencing startup ... ");
6
7     SPI.begin();
8     mfrc522.PCD_Init();
9
10    Serial.println("Startup complete.");
11    Serial.println("Place card next to reader");
12  }
13
14
```

Start up the serial monitor, then initialize the RFID scanner and its way of talking to the arduino (SPI).

RFID_scanner.html

MFRC522_example.ino

How the code works

```
void loop() {
    delay(300);
    if(mfrc522.PICC_IsNewCardPresent() &&
                mfrc522.PICC_ReadCardSerial()) {
        Serial.println("User detected! Scanning
                                card ... ");
        String RFID_code = "";
        for(byte i=0; i<4; i++) {
            RFID_code.concat(String(
                mfrc522.uid.uidByte[i], HEX));
            if(i<3) {RFID_code.concat(" ");}
        }
…
```

In the repeating loop, delay a bit, then keep checking if a card is detected that can be read.

Once found, go through every element in the input and store it in RFID_code

RFID_scanner.html

MFRC522_example.ino

How the code works

```
…
          RFID_code.toUpperCase();
          Serial.println("RFID Code is: " +
     RFID_code);

          if(RFID_code == "16 9E 8D 8D") {
               Serial.println("User Authorized");
          } else {
               Serial.println("Access Denied");
          }
     }
}
```

Format the UID nicely, print it, then check whether it is authorized.

(?) How would you change the code to allow several cards?

PIR_sensor.html

PIR_example.ino

03 {

[PIR Sensor]

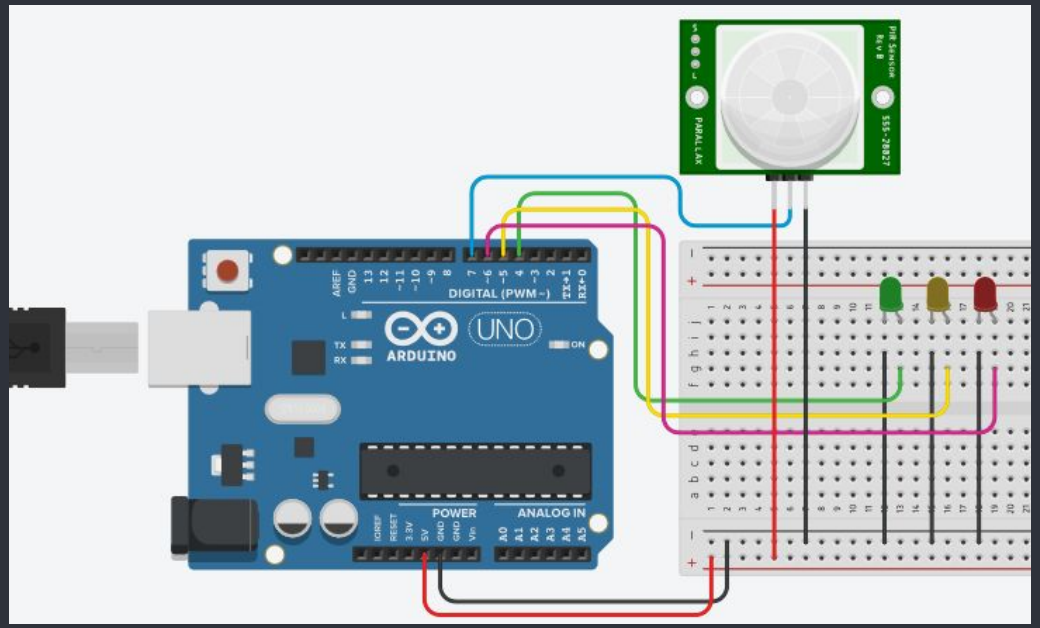
Detecting motion and reacting to it through LED lights

}

PIR_sensor.html

PIR_example.ino

Electrical Wiring; {



Component Pin	Arduino Pin
OUT (PIR)	7
Red LED	6
Yellow LED	5
Green LED	4

}

Then load up the file PIR_example

PIR_sensor.html

PIR_example.ino

How the code works

```
void setup() {
    Serial.begin(9600);
    Serial.println("Commencing startup...");
    pinMode(RED_PIN, OUTPUT);
    pinMode(YELLOW_PIN, OUTPUT);
    pinMode(GREEN_PIN, OUTPUT);
    pinMode(PIR_PIN, INPUT);
    digitalWrite(RED_PIN, LOW);
    digitalWrite(YELLOW_PIN, HIGH);
    digitalWrite(GREEN_PIN, LOW);
    Serial.println("Startup complete.");
    Serial.println("Searching for movement...");
}
```

```
#define PIR_PIN 7
#define RED_PIN 6
#define YELLOW_PIN 5
#define GREEN_PIN 4
```

^ Establish the different pins.

< Declare the outputs and inputs, before leaving just the yellow one on.

PIR_sensor.html

PIR_example.ino

How the code works

```
int pir_state = 0;
bool alarm = false;
bool search_movement = false;
unsigned long time_stamp = 0;
void loop() {
  pir_state = digitalRead(PIR_PIN);
  if(alarm == true) {
    if(pir_state == LOW) {
      alarm = false;
      search_movement = false;
      Serial.println("Alarm disengaged.");
...
```

Store the PIR sensor value in *pir_state*. If it's LOW (i.e. no motion), turn off the alarm by switching the LED to red

PIR_sensor.html

PIR_example.ino

How the code works

```
...
else if(pir_state == HIGH && search_movement == true &&
                        millis()-time_stamp > 3000) {
    alarm = true;
    Serial.println("Intruder found!");
}
else if(pir_state == LOW && search_movement == true &&
                        millis()-time_stamp > 300) {
    Serial.println("False alarm. Disengaging alert.");
    search_movement = false;
}
...
```

After waiting 3s (3000ms) since last detection, check for motion again. Activate the alarm if motion detected but disengage otherwise

PIR_sensor.html

PIR_example.ino

How the code works

```
...
else if(pir_state == HIGH && search_movement == false) {
    Serial.println("Movement detected. Verifying ... ");
    search_movement = true;
    time_stamp = millis();
  }
}
```

If not waiting but motion is detected, note down the time and start waiting for 3s

buzzer.html

buzzer_example.ino

04 {

[the Buzzer]

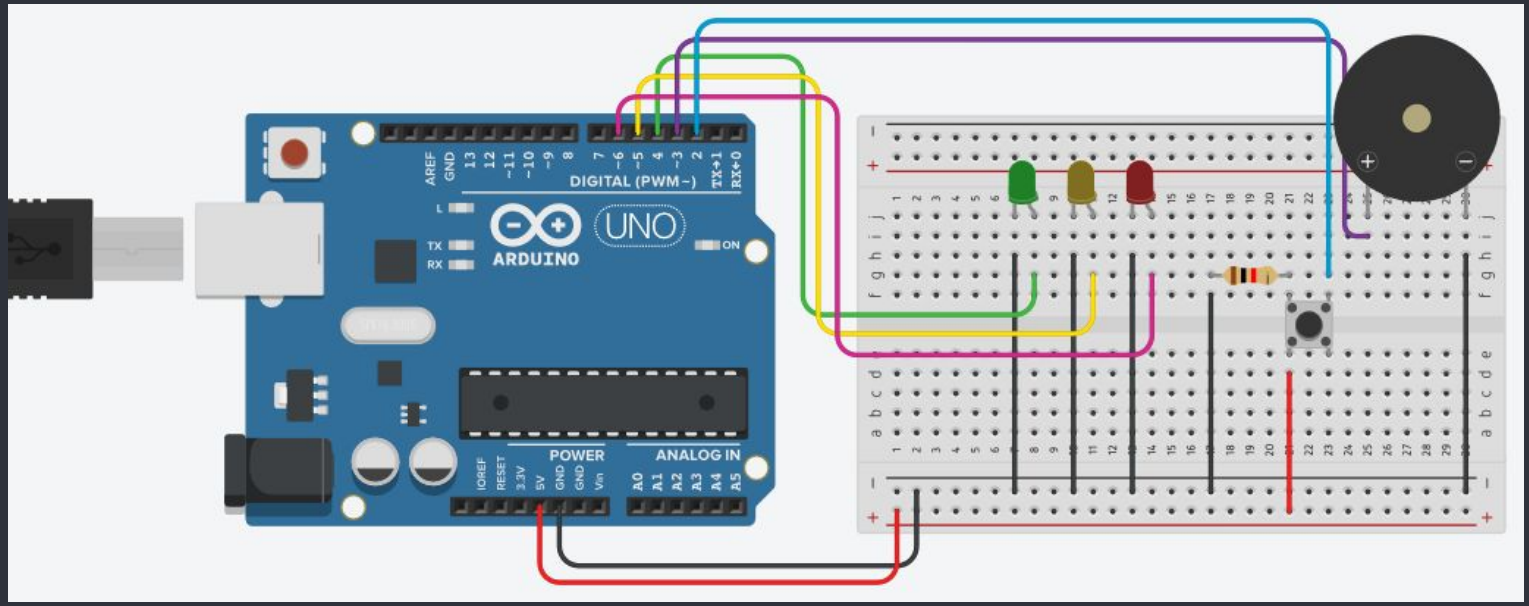
Making a noise every time the alarm is engaged

}

buzzer.html

buzzer_example.ino

Electrical Wiring; {



}

buzzer.html

buzzer_example.ino

How the code works

```
#define BUZZ_PIN 3
#define BUTTON_PIN  2
 ...

void setup() {
     ...
     pinMode(BUZZ_PIN, OUTPUT);
     pinMode(BUTTON_PIN, INPUT);
     ...
}
```

Keep the same code that we had previously for the LEDs, with this setup added onto it for the buzzer and button

buzzer.html

buzzer_example.ino

How the code works

```
int button_state = 0;
bool primed = false;

void loop() {
  button_state = digitalRead(BUTTON_PIN);
  if(!primed) {
    if(button_state == HIGH) {
      Serial.println("Turning the alarm on...");
      primed = true;
      digitalWrite(GREEN_PIN, LOW);
      digitalWrite(YELLOW_PIN, HIGH);
    }
```

The alarm is initially considered to be off, but as soon as we press the button it is activated, switching the yellow LED on

buzzer.html

buzzer_example.ino

How the code works

```
1
2
3       else {
4           if(button_state == LOW) {
5               Serial.println("Turning the alarm off...");
6               primed = false;
7               digitalWrite(GREEN_PIN, HIGH);
8               digitalWrite(YELLOW_PIN, LOW);
9           }
10          digitalWrite(BUZZ_PIN, HIGH);
11          delay(10);
12          digitalWrite(BUZZ_PIN, LOW);
13          delay(5);
14      }
```

While the alarm is on, the button NOT being pressed will deactivate the alarm, switching the light to green. Keeping the alarm on will sound a buzzer

everything_together.html

final_result.ino

05 {

[Putting Everything Together]

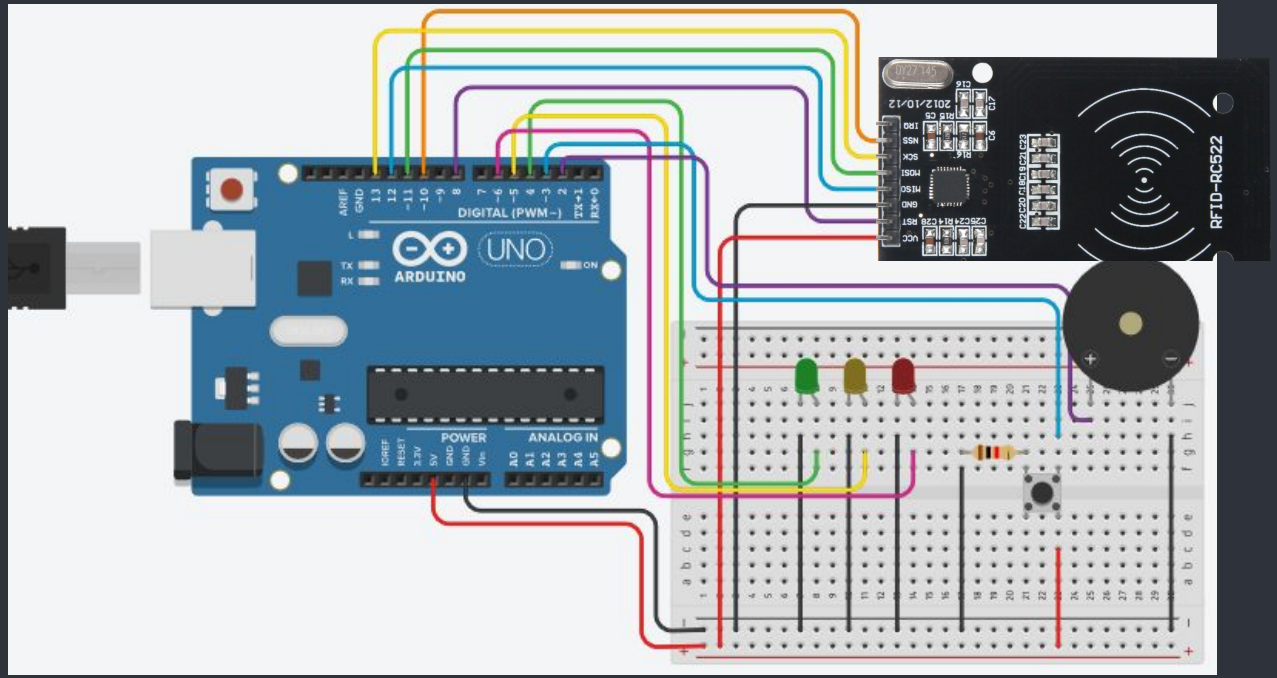
Assembling and understanding the final circuit

}

everything_together.html

final_result.ino

Electrical Wiring; {



}

everything_together.html

final_result.ino

Check the Wiring; {

RFID Pin	Arduino Pin
VCC	5V
RST	8
GND	Ground
MISO	12
MOSI	11
SCK	13
NSS	10
IRQ	nil

}

Other Components	Arduino Pin
OUT (PIR)	7
Red LED	6
Yellow LED	5
Green LED	4
Button	3
Buzzer	2

everything_together.html

final_result.ino

Execution; {

Upload the code to try it out!

Play around with the system and use the code given (final_result.ino) to try and figure out how it works. The comments should help you figure out the function of each section

To take things a step further:

💡 Can you make the buzzer sound two notes instead of one tone?

💡 Can you have two authenticated cards? Can you have a card that immediately activates the alarm?

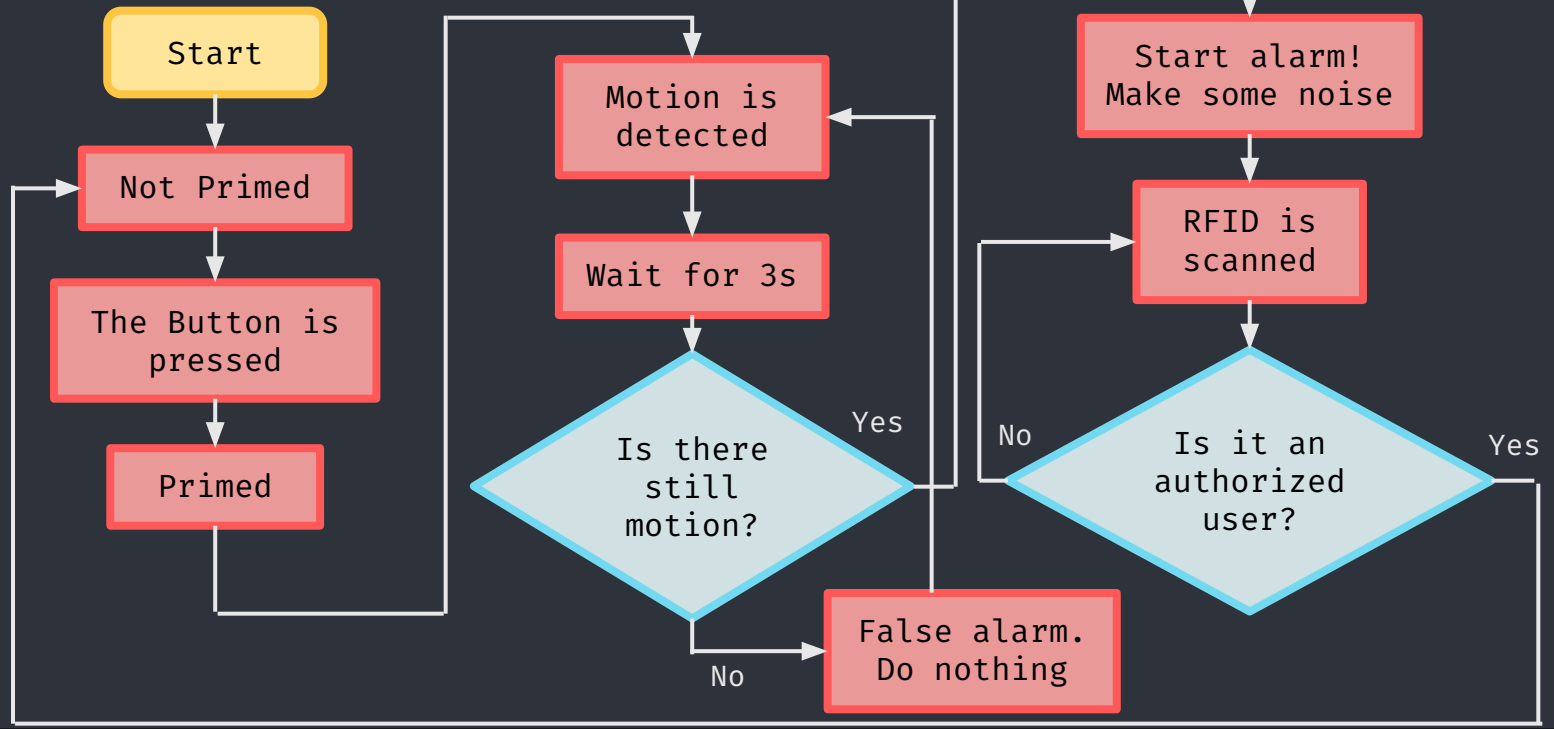
💡 Would it be possible to have a ‘master card’ that can register new cards as authorized users?

}

everything_together.html

final_result.ino

The Process; {



}

feedback.html

Thank you for listening; {

Please fill in the feedback form below!

https://bit.ly/RoboticsClubFeedback

}