



# **Burglar Alarm**

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**Bachelor of Software & Electronic Engineering**

**Galway-Mayo Institute of Technology**

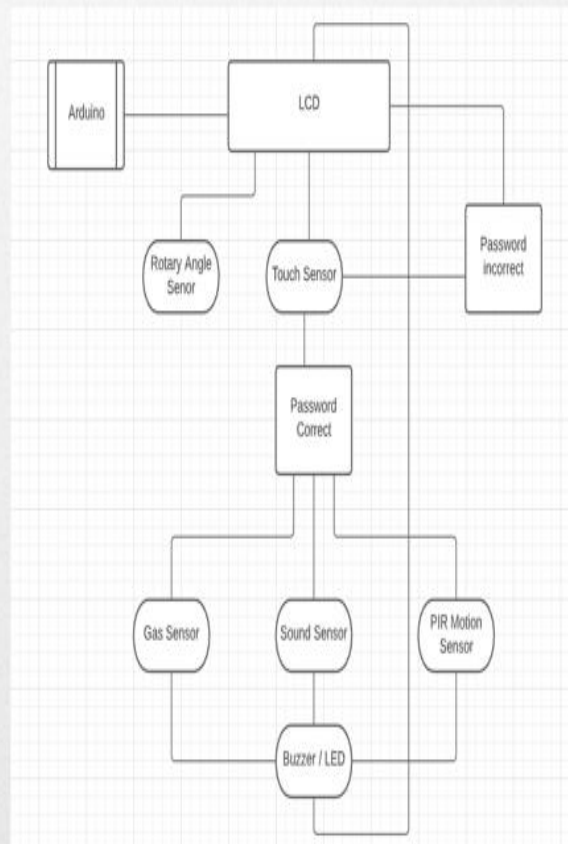
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# Burglar Alarm

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## SUMMARY

- **Burglar alarm** is a smart security alarm. It detects burglars entering the building and it also detects gas in case of fire. A Person is detected by the PIR motion sensor and the Sound sensor. Gas is detected by a Gas sensor. When it detects either one of them, the LED turns on, buzzer goes on and it displays burglar on the lcd in case of a person detected or gas if gas detected.
- For a person to be detected they have to be in range of the pir motion sensor to detect or they have to make a enough sound to be detected. For gas to be detected there has to be a amount of gas that could cause fire to be detected by the gas sensor.



### Components

- Arduino
- Gas Sensor
- PIR Motion Sensor
- Touch Sensor
- Rotary Angle Sensor
- Buzzer
- LED
- LCD

### Language

- C++

## Declaration

This project is presented in partial fulfilment of the requirements for the degree of Bachelor of Engineering in Software & Electronic Engineering at Galway-Mayo Institute of Technology.

This project is my own work, except where otherwise accredited. Where the work of others has been used or incorporated during this project, this is acknowledged and referenced.

## Acknowledgements

I am grateful to my family, friends, and the staff at GMIT for their help, support, and guidance throughout this project and my time in GMIT. I would like to thank my supervisor Paul Lennon for guidance from start to the end of the project.

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# 1 Introduction

I plan to create a Burglar alarm. This alarm will detect intruders entering the building and it will also detect smoke in case of fire. When it detects either of them the buzzer will start buzzing, the LED will turn on and it will display on the LCD which one is detected e.g. 'Burglar', 'Sound heard' or 'Gas'.

I have had an interest in security for some time and always wanted to create my own security alarm with some advanced features such as a password to start the alarm and a PIR motion sensor, Sound sensor and Gas sensor to detect movement and gas. Software used is C++ programming language. The scope of this project involves researching and learning the required features that will be implemented as mentioned above, writing software prototypes, testing, debugging and integration of code to create a Burglar Alarm system for everyone out there. After completing this project, the skills gained from it will be applicable in future projects and will improve my software skills too.

This is a final year project for a Bachelor of Engineering Honours degree, the course is conducted at the Galway-Mayo Institute of Technology. The course is titled Software and Electronic Engineering. For this project, the goal is to implement knowledge gained from the course and research external topics for use in the project.

## 2 The Internet of Things Overview

### Arduino Overview

Arduino is an open-source hardware. Arduino board design use an array of controllers and microprocessors. They are equipped with sets of analog and digital inputs/outputs (I/O) pins. It can interact to various extension boards like shields and breadboards. It includes serial interfaces, including Universal Serial Bus which are used for loading programmes when connected to a PC or a power source can be used. It can be programmed using C and C++ programming using a standard Arduino Language. It is one of the lowest costs and easy to use hardware to interact with their environment using sensors and much more. It is a handy hardware for first time users who start to learn C or C++ programming to build a mini project to start off.

### Arduino Specifications

Microcontroller: ATmega328P, Operating Voltage: 5V, Input Voltage (recommended): 7-12V , Inout Voltage (limit): 6-20V, Digital I/O Pins: 14 (of which 6 provide PWM output), PWM Digital I/O Pins: 6, Analog Input Pins: 6, DC Current per I/O Pin: 20 mA, DC current for 3.3V Pin: 50 mA, Flash Memory: 32 KB (ATmega328P) of which 0.5 KB used by bootloader, SRAM: 2 KB (ATmega328P), EEPROM: 1 KB (ATmega328P), Clock Speed: 16 MHz and LED\_BUILTIN: 13.

### Arduino Grove Base Shield

Grove Base Shield is an Arduino Shield that break out the Arduino pins to grove connectors. You need to plug the Base Shield on the Arduino to use the Grove connectors. Without the shield you will normally use jumper wires to connect pins. Grove Base Shield is easy for wiring for your projects. If the module is an analog device like a potentiometer or a Gas sensor you would use an available connector A0 to A3. If it is a digital device like LED, Touch sensor or Buzzer etc you would use an available connector D2 to D8. If you have an RGB LCD screen you would use any of the 12C Connectors and if it is a UART device, you would use the connector marked as UART.

## **PIR Motion Sensor**

A passive infrared sensor is an electronic sensor that measures infrared light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. PIR can detect animal/human movement in a requirement range, which is determined by the spec of the specific sensor. The detector itself does not emit any energy but passively receives it, detects infrared radiation from the environment.

## **Gas Sensor**

Gas Sensor is used to indicate if there is gas in the area often as part of a safety system. It can sound an alarm to indicate gas in the area when gas is detected. They can be used to detect flammable and toxic gases. These types of devices are mainly used in industries. This type of devices are important because there are many gases that can be harmful in many cases.

## **Sound Sensor**

A sound sensor is described as a module that detects sound. It works similarly to our ears, however what is different is that the sound sensor consists of a built-in microphone, peak detector and an amplifier that is highly sensitive to sound. Apart from building various electronic projects sound sensors can be used in many other day to day applications including consumer electronics such as phones and PC's, security and monitoring systems such as burglar alarms and ambient sound recognition.

## **Buzzer**

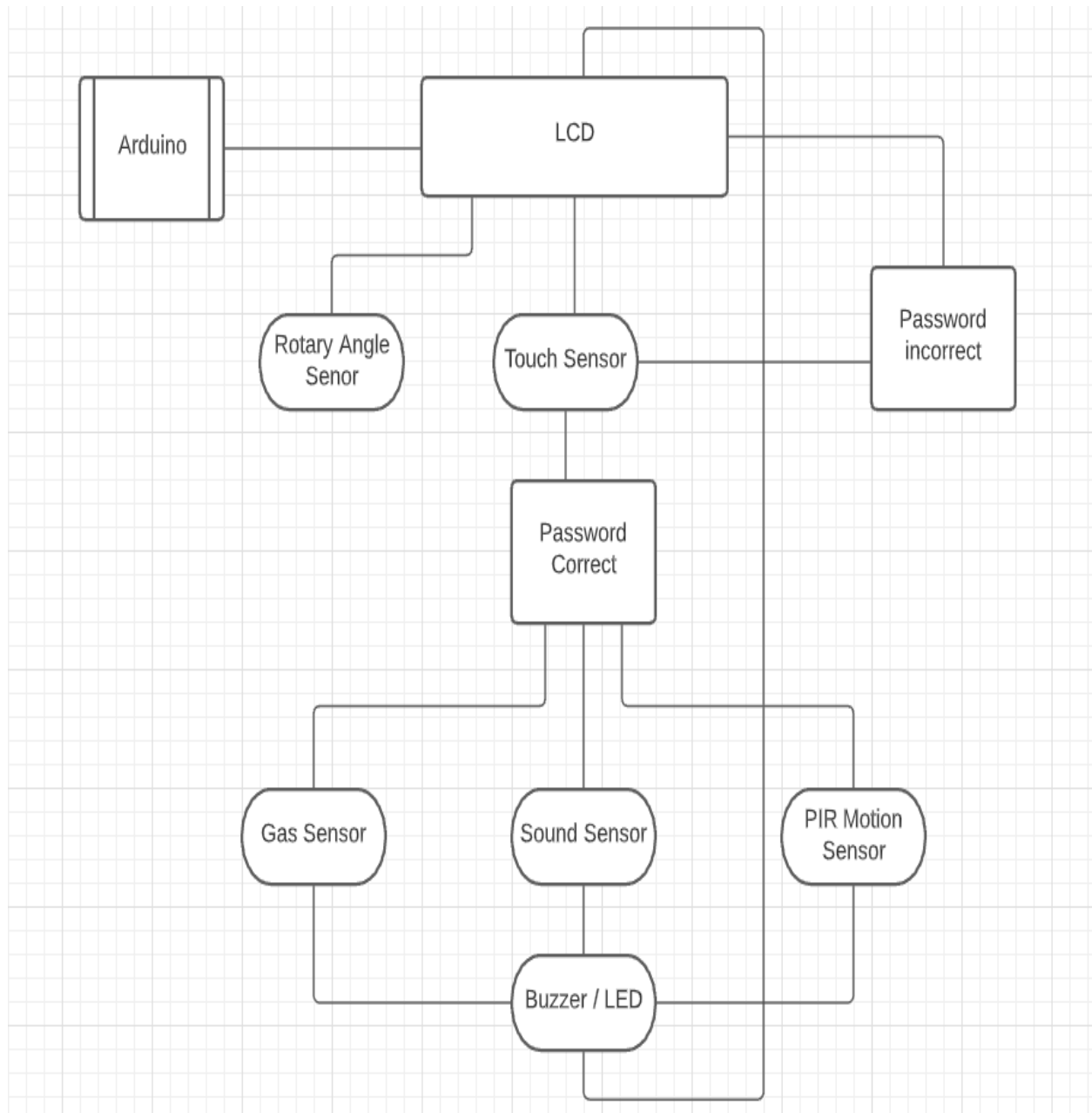
A buzzer is an audio signalling device which generates a loud tone once it goes off. It works similarly as a PC speaker that generates a sound but when the buzzer goes off you need to adjust the code that way that it can turn off after a certain amount of time or it will keep on beeping until you disconnect the module from the board.

## **C++ Programming**

C++ programming is an extension of C programming created by Bjarne Stroustrup. C++ is one of the most widely used programme language that has found its way into many hardware and operating systems. It is known to be able to compile native code efficiently and used for developing OS, apps, device drivers embedded software and much more. The language began as enhancements to C programming first adding classes, then virtual functions operator overloading and much more features. After years of development, C++ programming is widely used and one of the best programming for people who want to learn a programming language to start of a carrier in software industries.



### 3 Project Architecture Diagram



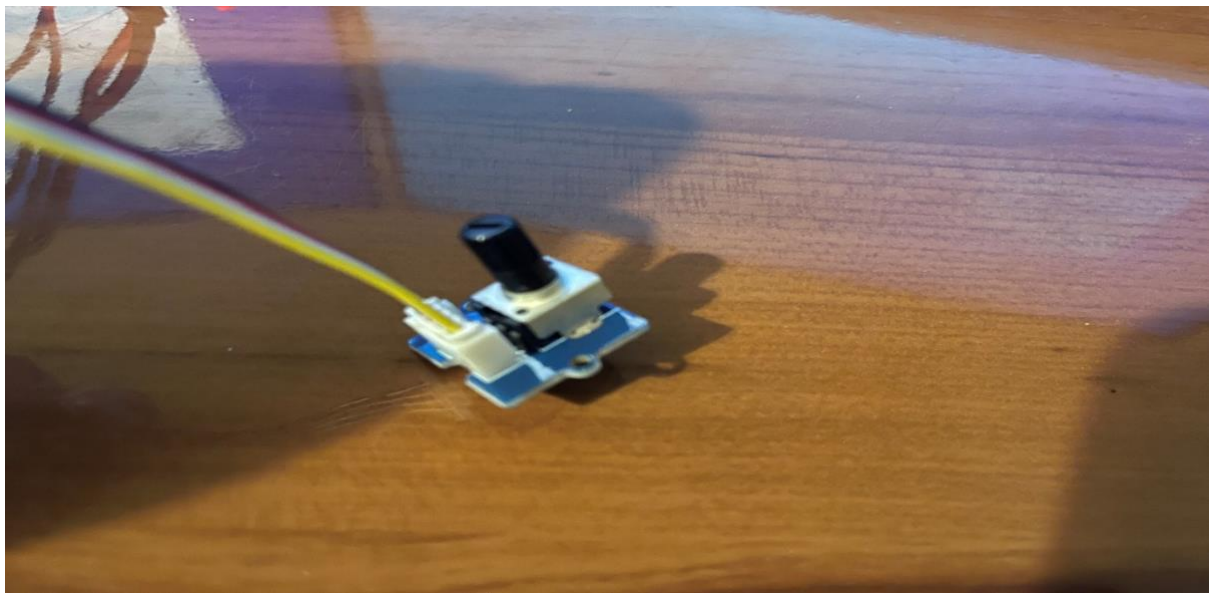
## 4 Development Platform and Tools

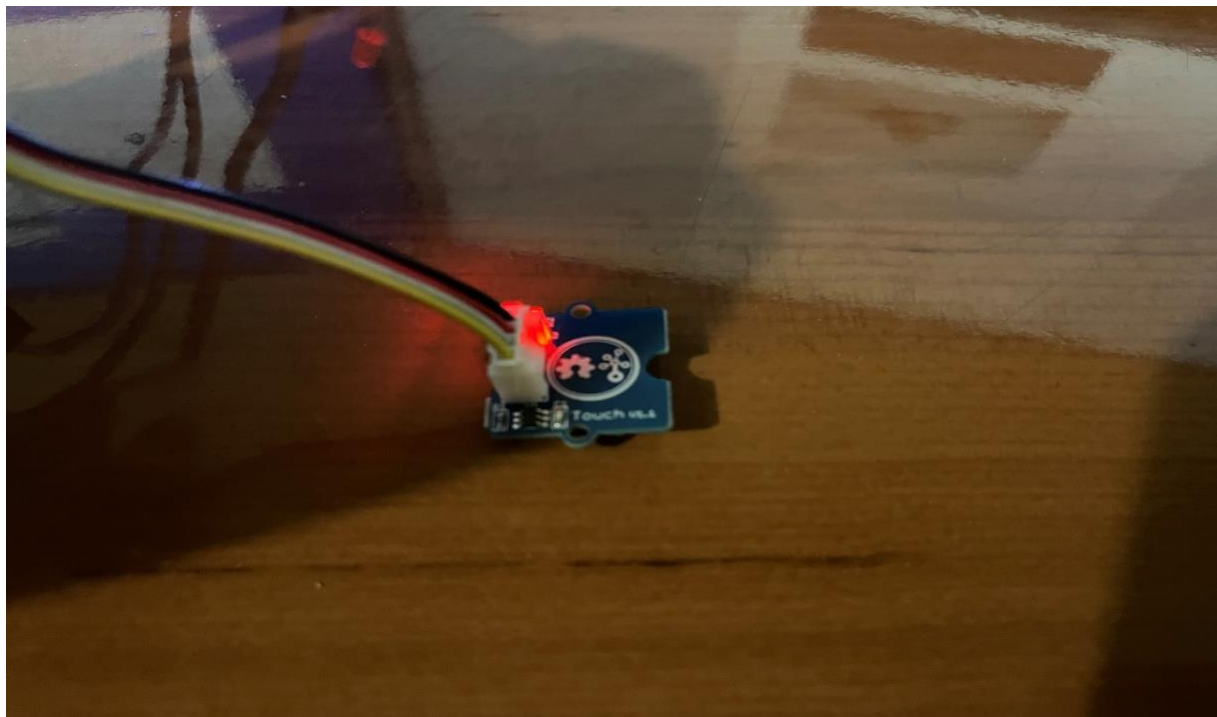
### Arduino IDE

Arduino Integrated Development Environment (IDE) is a cross-platform app that is written in functions from C and C++ programming. Application can be found on Windows, macOS and Linux. It is used to write code and upload to Arduino boards. Arduino IDE only supports C and C++ language using special rules of code structuring and it also supplies a software library from the Wiring project, which provides many common input and output procedures. You will first need to plug the Arduino board using a USB to your PC. Then you need to know what COM port the Arduino is using on your PC, which can be found on your PC settings. Alternatively, the message you get on your PC telling you that the Arduino board has been connected usually specifies the COM port it is using. To load code on the top left of the Arduino window has two buttons, a checkmark to verify your code and a right facing arrow to upload it once it fully verifies the code and gives you no errors to stop it from uploading. The black bar at the bottom of the Arduino window is for messages indicating the success or failure of the code you are trying to upload. Code is loaded over a serial port to the controller.

## 5 Password

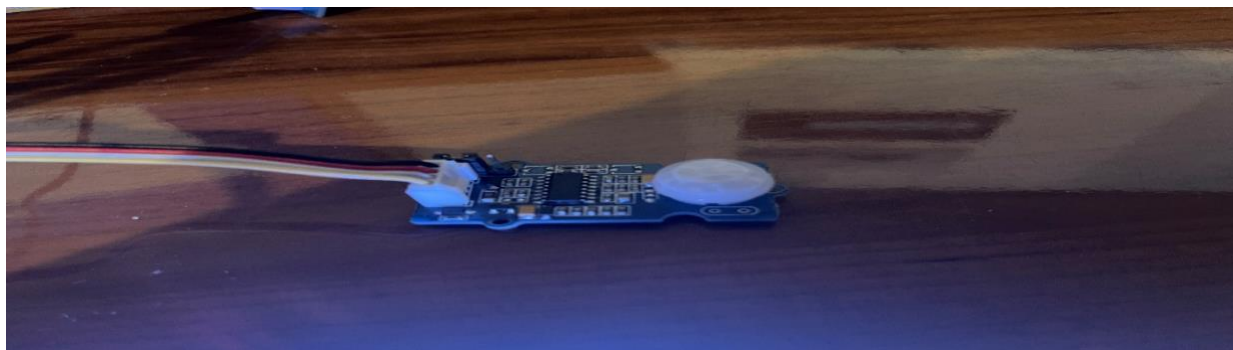
To activate the alarm, you would first need to enter in the correct password. If you enter an incorrect password it will keep on asking you the password until you enter the correct password to go through. You can enter the password using the Rotary Angle Sensor and the Touch Sensor. Rotary Angle sensor is used to change the digits starting from 1 going up to 10 and the Touch Sensor is used to select a digit. The password contains of 4 digits. Password is changeable in the code. Once you enter in the correct password he alarm will activate.





## 6 PIR Motion Sensor

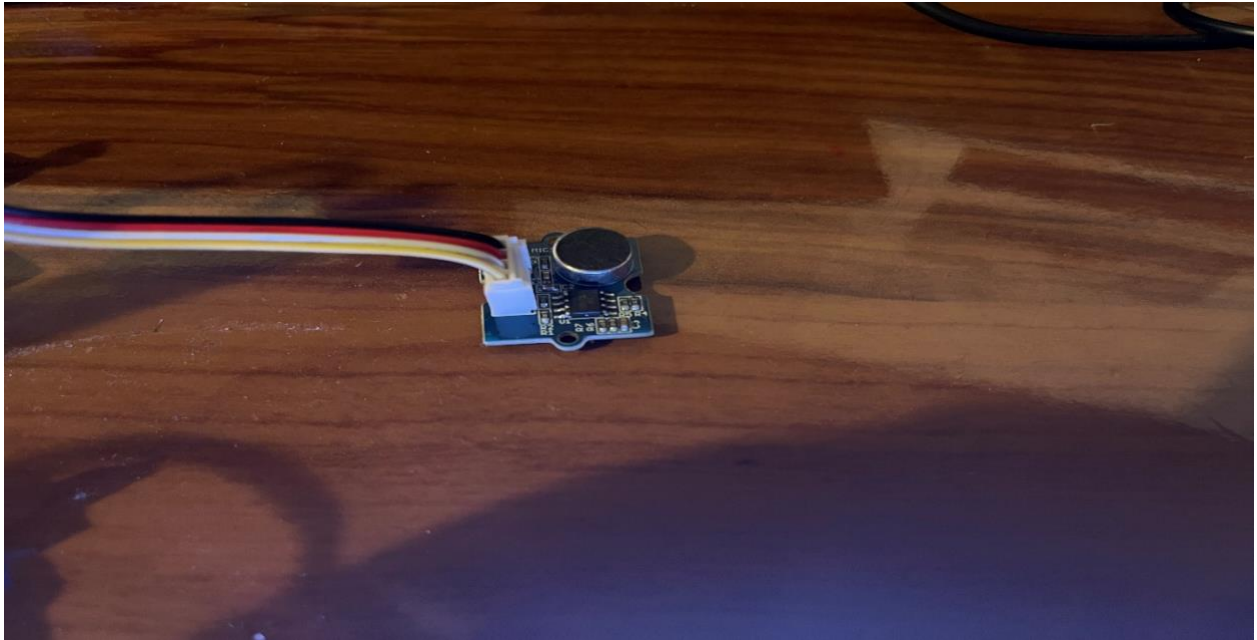
PIR Motion Sensor is used to detect burglars. Once the alarm is activated and someone walks in the distance of the PIR motion sensor it will detect movement and it will trigger the buzzer and the LED will turn on. It will then display on the LCD 'Burglar'.





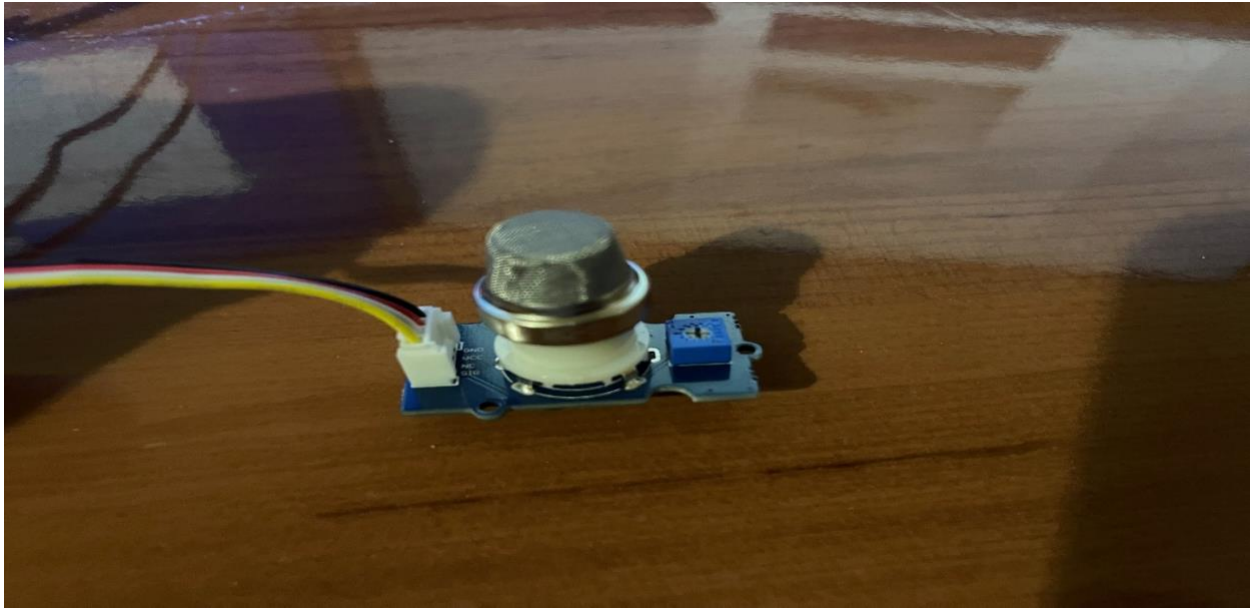
## 7 Sound Sensor

Sound Sensor is used to detect sound example a loud bang. Once the alarm is activated and it detects a large sound it will trigger the buzzer and the LED will turn on. It will then display on the LCD 'Sound Heard'.



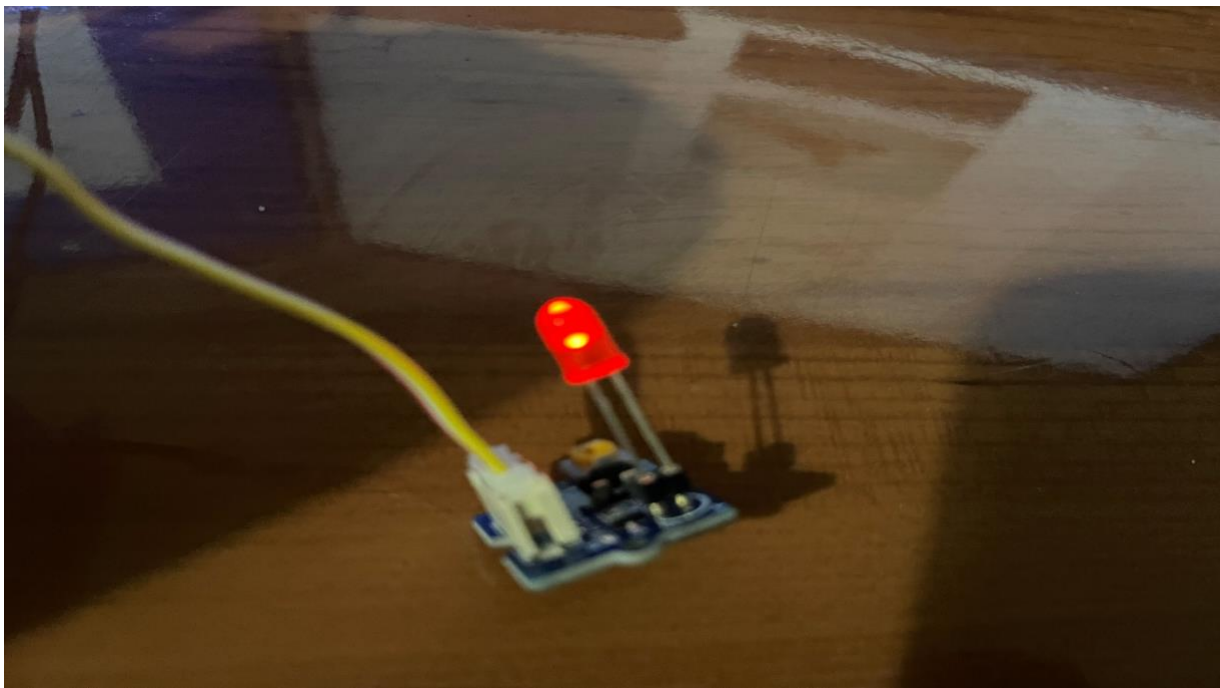
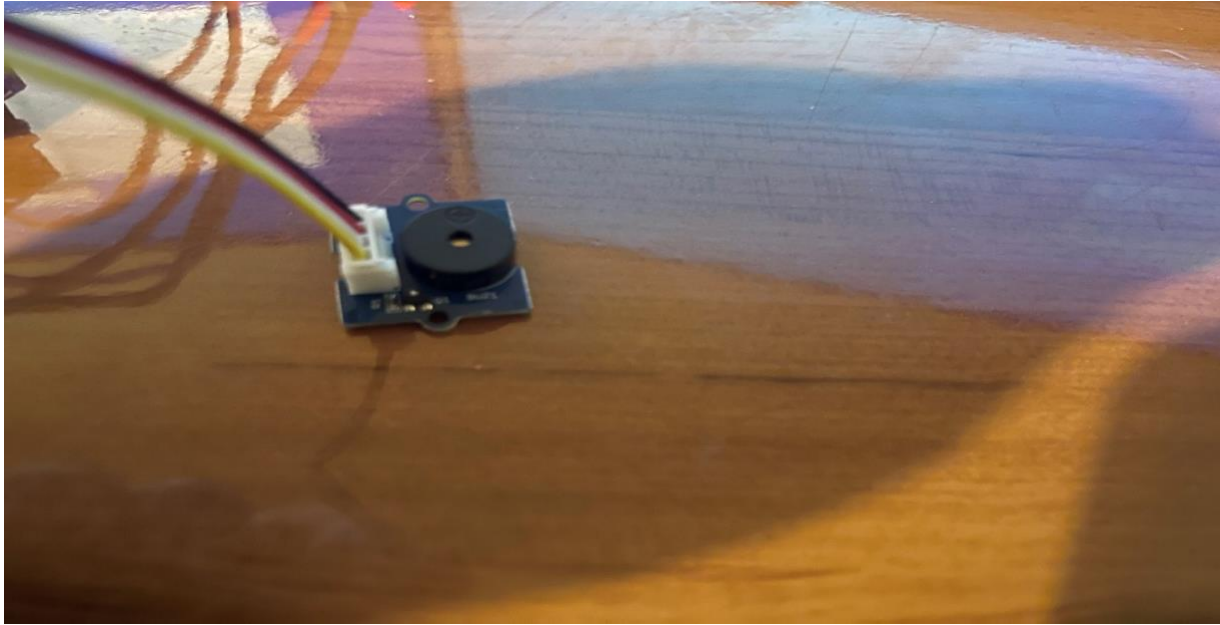
## 8 Gas Sensor

Gas Sensor is used to indicate if there is gas in the area in case of a fire. Once the alarm is activated and it detects gas it will trigger the buzzer and the LED will turn on. It will then display on the LCD 'GAS'.



## 9 Buzzer and LED

Once it detects either the PIR Motion Sensor, Sound Sensor or the Gas Sensor it triggers the Buzzer and turns on the LED. The buzzer pitches a high sound and the LED displays the colour of the LED you have connected.





## 10 Conclusion

The purpose of this project was to create Burglar Alarm system for elderly and people leaving on their own for their safety. PIR Motion sensor is used to detect movement and once it does it triggers the Buzzer and turns on the LED and prints on the LCD 'Burglar'. Sound Sensor is used to detect sound example a loud bang. Once the alarm is activated and it detects a large sound it will trigger the buzzer and the LED will turn on. It will then display on the LCD 'Sound Heard'. Gas Sensor is used to indicate if there is gas in the area in case of a fire. Once the alarm is activated and it detects gas it will trigger the buzzer and the LED will turn on. It will then display on the LCD 'GAS'.

The future for security is very important for everyone out there as anything can happen at any time of day, month or year throughout their life. It is anticipated that this project with the help of this project it would ease a bit of security of them and keep them well and safe. It is a reliable way of recognising a burglar and gas in case of fire. This system can be used by anyone out there and it would be affordable as well.

I wanted to add another feature to send a text message when either sensor was detected. So, it would alert you on your phone that which sensor is detected and you would have enough time to react. But unfortunately, I was unable to do so as I did try but I was running into difficulties sending the text message. If going ahead if I would like to add something else to this project it would be sending text message once the alarm was triggered.

## 11 References

- [1] Instructables. (2017, September 23). Arduino - Sound Sensor (with LED).  
<https://www.instructables.com/Arduino-Sound-Sensor-with-LED/>

## 12 Code

Source code can also be found here - <https://github.com/MohAhmad1/Project-2020-2021>

### Burglar Alarm

```
#include <String.h>
#include "rgb_lcd.h"

// flags
bool alarmActive = 0;
bool pass = 0;
bool statusSensor = 0;

const int potentiometer = A0;    //Rotary Angle Sensor
const int gasPin= A1;           //Gas sensor
const int touchSensor = 2;       //Touch Sensor
const int pinLed = 3;            //LED
const int pinBuz = 4;            //Buzzer
const int soundSensor = 5;       //Sound sensor
const int PIR_motion_sensor = 6; //PIR sensor

const int PASS[4]= {2,2,3,3};    //Password

// variables
int smoke_level;
rgb_lcd lcd;

void setup()
{
    lcd.begin(0, 0); // Clears screen to start off

    pinMode(potentiometer, INPUT); // Configure the rotary angle sensor pin for output
    pinMode(gasPin, INPUT);        //Configure the Touch pin for input
    pinMode(touchSensor, INPUT);    // Configure the touch sensor for input
    pinMode(pinLed, OUTPUT);        // Configure the LED pin for output
    pinMode(pinBuz,OUTPUT);         // Configure the buzzer pin for output
    pinMode(soundSensor, INPUT);    //Configure the Sound sensor for input
    pinMode(PIR_motion_sensor,INPUT); // Configure the Touch pin for input

    do
    {
        if(checkPass())
        {
            lcd.print("Password Correct");    //Prints Password Correct
```

```

        delay(1000);           //Delay
        lcd.clear();           //Clears screen
        lcd.print("Alarm Activated"); //Prints Alarm Activated
        alarmActive = 1;
        pass = 1;
    }
    else
    {
        lcd.clear();           //Clears screen
        lcd.print("Pass Incorrect"); //Prints Password incorrect
        delay(1000);           //Delay
        lcd.clear();           //Clears screen
    }
}while(pass == 0);

}

bool checkPass()
{
    bool goodPassword = 0;
    int keyIn;
    int key[4];
    int star;
    int i;
    int value;
    lcd.print("Enter Password:"); //Prints Enter Password
    delay(1500);                 //Delay
    lcd.clear();                 //Clears screen
    for(i=0;i<=3;i++)           //Does this loop 4 times
    {
        do{
            lcd.clear();         //Clears screen
            lcd.setCursor(0,0);
            value = analogRead(potentiometer); //Read the state of the potentiometer value:
            keyIn = value/100;         //Reads numbers from 1-10
            star =i;
            while(star>0)             //Greater the 0
            {
                lcd.print('*');      //Prints *
                star--;
            }
            Serial.print(keyIn);
            lcd.print(keyIn);         //Prints key
            delay(500);               //Delay
        }while(digitalRead(touchSensor)== 0);
    }
}

```

```

        if(digitalRead(touchSensor))          //Reads the number
        {
            key[i] = keyIn;                    //Prints number
            delay(500);                        //Delay
        }
    }
    lcd.setCursor(0,1);  // Moves it onto the next line
    if(key[0] ==PASS [0] && key[1] == PASS [1] && key[2] == PASS [2] && key[3] == PASS
[3])  //Password
        goodPassword = 1;
    else
        goodPassword = 0;
    return goodPassword;

}

void loop()
{

    if(alarmActive)
    {
        if(digitalRead(PIR_motion_sensor))  //Read the state of the PIR value:
        {
            digitalWrite(pinBuz,1);          //Buzzer on
            digitalWrite(pinLed, HIGH);       //LED on
            lcd.clear();                      //Clears screen
            lcd.print("Burglar!!");           //Prints Burgler
            while(1){
            }
            delay(1000);                      //Delay
            digitalWrite(pinLed, LOW);        //LED off
            digitalWrite(pinBuz,0);          //Buzzer off
            lcd.clear();                      //Clears screen
        }
        if(statusSensor = digitalRead(soundSensor))
        if (statusSensor == 1)
        {
            digitalWrite(pinBuz,1);          //Buzzer on
            digitalWrite(pinLed, HIGH);       //LED on
            lcd.clear();                      //Clears screen
            lcd.print("Sound heard!!");       //Prints Sound heard
            while(1){
            }
            delay(1000);                      //Delay
            digitalWrite(pinLed, LOW);        //LED off

```

```

    digitalWrite(pinBuz,0);          //Buzzer off
    lcd.clear();                      //Clears screen
}

if(smoke_level= analogRead(gasPin))
if(smoke_level > 80)
{
    digitalWrite(pinBuz,1);          //Buzzer on
    digitalWrite(pinLed, HIGH);      //LED on
    lcd.clear();                     //Clears screen.
    lcd.print("Gas!!");              //Prints Gas
    while(1){
    }
    delay(1000);                     //Delay
    digitalWrite(pinLed, LOW);        //LED off
    digitalWrite(pinBuz,0);          //Buzzer off
    lcd.clear();                     //Clears screen
    }
}
delay(1000);                         //Delay
}

```