JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY,NOIDA-62
SEMESTER-4
COA MINI PROJECT
B15

Anti-Theft Security System

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OVERVIEW

The “Anti-Theft Security System” is a project made using Arduino Uno R3.The Arduino is an open-source microcontroller board which can be programmed to control various electronic devices. In this project, we will be using Arduino Uno R3 and various devices to build an Anti-Theft Security System.

GOALS

1. To design and build a cost-effective and reliable security system using Arduino Uno R3 microcontroller board.
2. To detect entry or disturbance into a protected area or a room and detect the signal.
3. To incorporate various sensors such as PIR motion sensors,ultrasonic sensors and gas sensors to detect and glow the LED or bulb.

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We would like to express our gratitude to Dr. Pawan Kumar Upadhyay Sir and Dr. Taj Alam Sir for providing us this opportunity to learn and experience. We would also be thankful to them for helping us out at every single step.

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INTRODUCTION

An anti-theft security system is a device that helps protect valuables and property from theft or damage. It is designed to detect and respond to potential threats by glowing an LED or a bulb and sending alerts to the user. An anti-theft security system can be used in homes,offices, vehicles, and other places where security is a concern.

In this project, we will be using an Arduino Uno R3 board to build an anti-theft security system. The system will use an ultrasonic sensor to detect any object in front of it, and if an object is detected within a certain range, an LED or bulb will be activated to alert the user.

COMPONENTS USED:

- **Arduino Uno R3 board:** The Arduino Uno R3 is an open-source microcontroller board based on the ATmega328P microcontroller. It has 14 digital input/output pins, 6 analog inputs, a 16MHz quartz crystal, a USB connection, and a power jack. The board is programmable using the Arduino software.
- **16 x 2 LCD Display:** Adding a 16 x 2 LCD display to the anti-theft system using Arduino Uno R3 can provide additional information to the user about the status of the system, such as whether it is armed or disarmed, and any alerts or warnings that have been triggered by the sensors. To incorporate the 16 x 2 LCD display into the system, you would need to connect it to the Arduino board using appropriate jumper wires. The connections required are:
    - VSS to ground
    - VDD to +5V
    - V0 to a 10K potentiometer (for contrast adjustment)
    - RS to pin 12
    - RW to ground
    - E to pin 11
    - D4 to pin 5
    - D5 to pin 4
    - D6 to pin 3
    - D7 to pin 2
    - A to +5V (for backlight)

- **Ultrasonic Sensor:** The ultrasonic sensor is used to detect the distance of any object or person within the sensor's range. The ultrasonic sensor uses high-frequency sound waves to measure distance and can detect the presence of objects at a distance of several meters. To incorporate an ultrasonic sensor into the system,

you would need to connect it to the Arduino board using appropriate jumper wires. The connections required are:

- VCC to +5V
- GND to ground
- Trig to pin 8
- Echo to pin 9

- **PIR(Passive Infrared) Sensor:** Adding a PIR sensor to the anti-theft security system can provide a way to detect any movement of living beings within its range. The PIR sensor detects changes in the infrared radiation levels in its field of view caused by the movement of living beings, and triggers an output signal when such a change is detected. To incorporate a PIR sensor into the system, you would need to connect it to the Arduino board using appropriate jumper wires. The connections required are:
  - VCC to +5V
  - GND to ground
  - Out to pin 7

- **Smoke Sensor:** Adding a smoke sensor to the anti-theft security system can provide a way to detect any potentially hazardous gases or smoke within its range. The gas or smoke sensor detects the presence of hazardous gas and triggers an output signal when such substances are detected. To incorporate the smoke sensor into the system, you would need to connect it to the Arduino board using appropriate jumper wires. The connections required are:
  - VCC to +5V
  - B1,B2,H2 to ground
  - GND to ground
  - Out to Arduino’s analog input pins

- **LDR (Light Dependent Resistor):** Adding an LDR sensor to the anti-theft security system can provide a way to detect any changes in ambient light levels within its range. The LDR sensor detects changes in the amount of light falling on it and triggers an output signal when such changes are detected. To incorporate an LDR sensor into the system, you would need to connect it to the Arduino board using appropriate jumper wires. The connections required are:
    - VCC to +5V
    - GND to ground
    - Out to pin A1

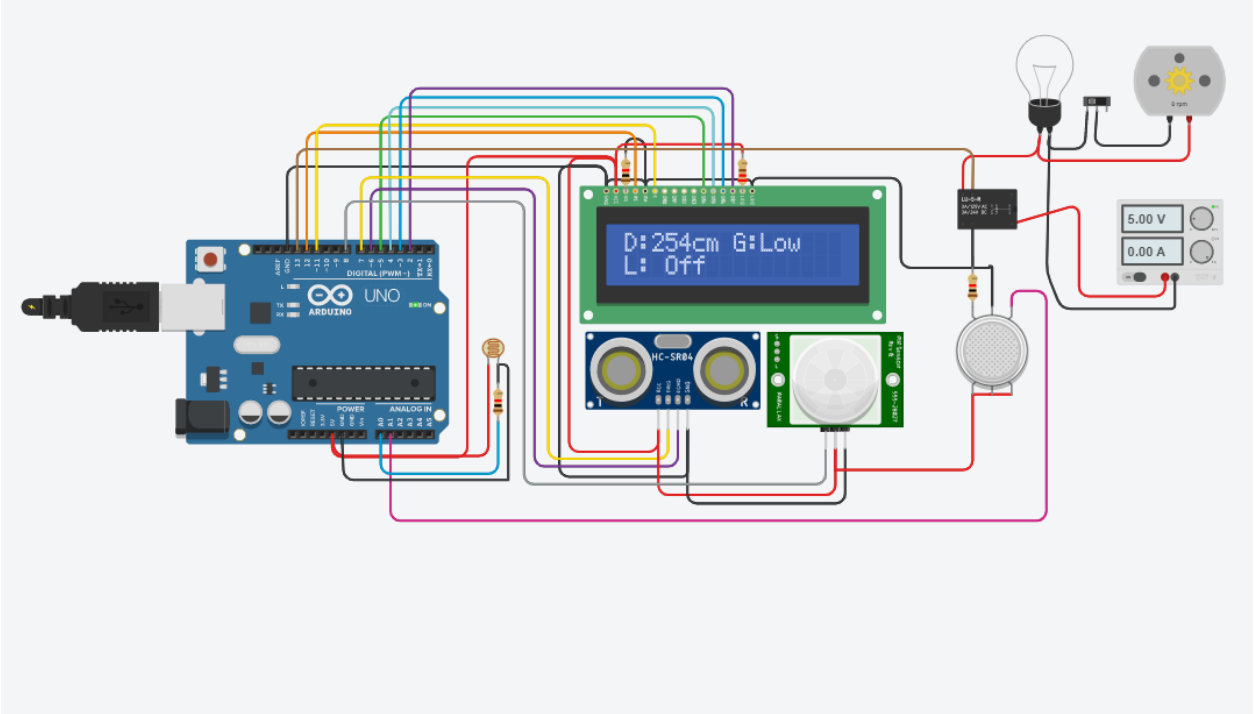
- **Relay Board:** Adding a relay board to the anti-theft security system can provide a way to control high-voltage or high-current devices such as alarms, sirens, or lights. A relay is an electrically operated switch that can be used to control a circuit by a low-power signal. To incorporate a relay board into the system, you would need to connect it to the Arduino board using appropriate jumper wires. The connections required are:
    - VCC to +5V
    - GND to ground
    - Relay's input signal pin to Arduino's digital output pin

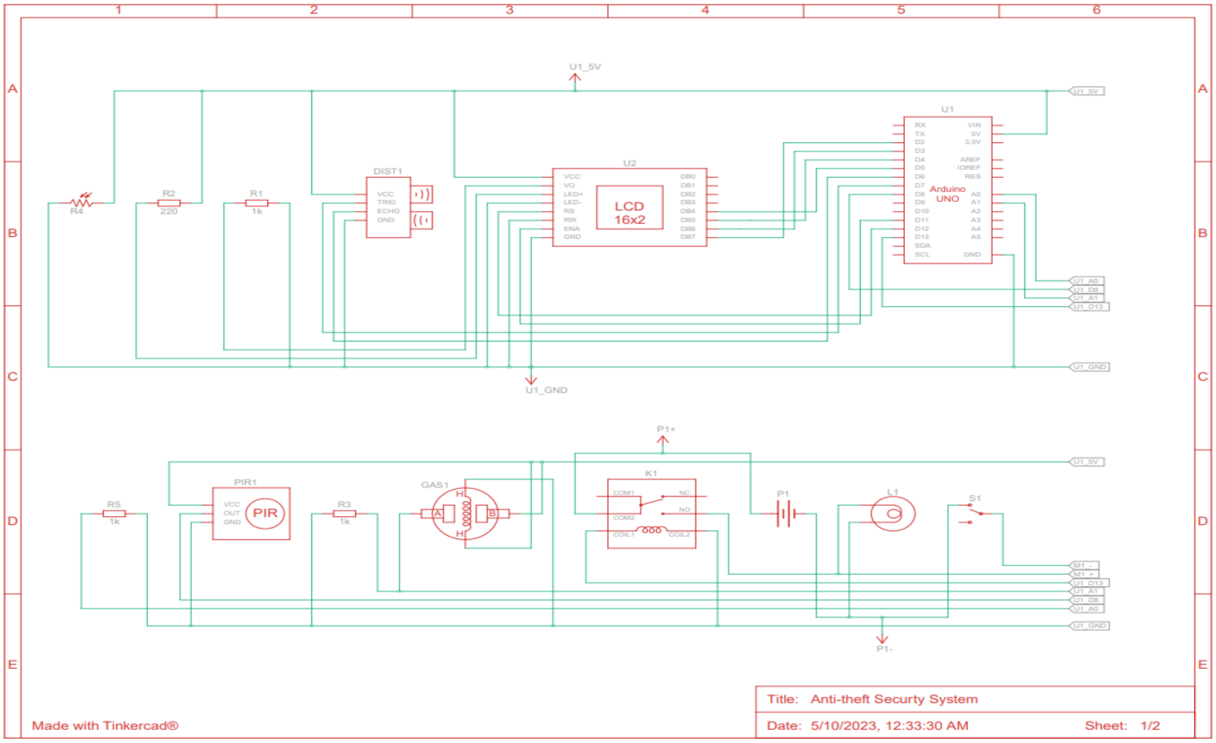
- **DC Power Source:** To power the anti-theft security system , you will need a DC power source that can provide a stable and sufficient voltage and current for all the components and sensors in the system. The Arduino Uno R3 board itself can be powered using a DC voltage in the range of 7-12V, which can be provided by a battery or a DC supply.

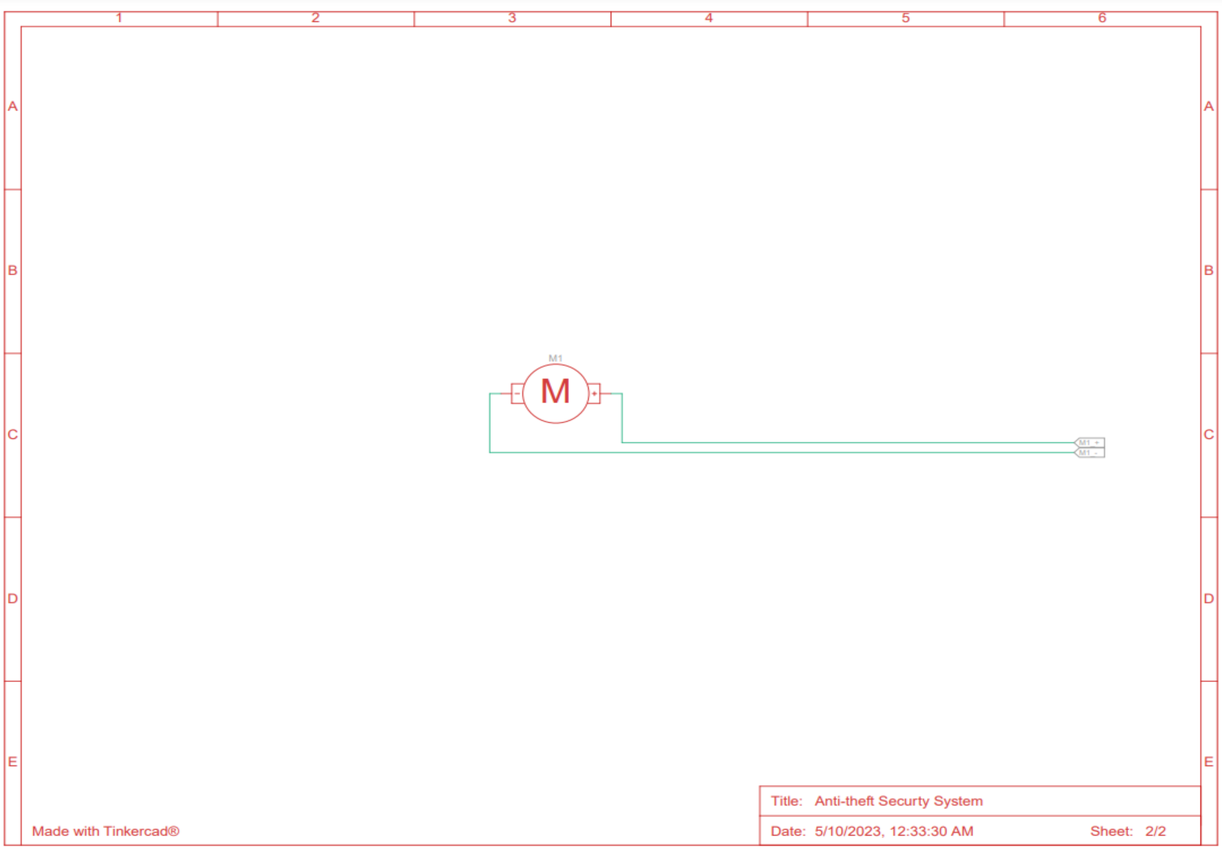
REQUIREMENT SPECIFICATIONS

Name	Quantity	Component
U1	1	Arduino Uno R3
U2	1	LCD 16 x 2
R1 R3 R5	3	1 kΩ Resistor
R2	1	220 Ω Resistor
DIST1	1	Ultrasonic Distance Sensor
PIR1	1	33.684211735886606 , -311.54467199207625 , -234.50172499879346 , -404.283592688643 PIR Sensor
GAS1	1	Gas Sensor
R4	1	Photoresistor
L1	1	Light bulb
M1	1	DC Motor
P1	1	5 , 5 Power Supply
K1	1	Relay SPDT
S1	1	Slideswitch

MODEL




U1_5V
U1
Arduino UNO
U2
LCD 16x2
DIST1
R4
R2
220
R1
1k
U1_GND
P1+
PIR1
PIR
R5
1k
R3
1k
GAS1
K1
P1
L1
S1
P1-
Title: Anti-theft Securty System
Date: 5/10/2023, 12:33:30 AM
Sheet: 1/2
Made with Tinkercad®


M1
M
Title: Anti-theft Securty System
Date: 5/10/2023, 12:33:30 AM
Sheet: 2/2
Made with Tinkercad®

IMPLEMENTATION

```
// include the library code:
#include <LiquidCrystal.h>

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

//For ultrasound sensor
int distanceThreshold = 0;
int cm = 0;
int inches = 0;

//for Relay Control
int releNO = 13;
int inputPir = 8;
int val = 0;
int resuldoSensorLDR;
int sensorLDR = A0;

//For Gas sensor
int const PINO_SGAS = A1;



long readUltrasonicDistance(int triggerPin, int echoPin)
{
  pinMode(triggerPin, OUTPUT);  // Clear the trigger
  digitalWrite(triggerPin, LOW);
  delayMicroseconds(2);
  // Sets the trigger pin to HIGH state for 10 microseconds
  digitalWrite(triggerPin, HIGH);
```

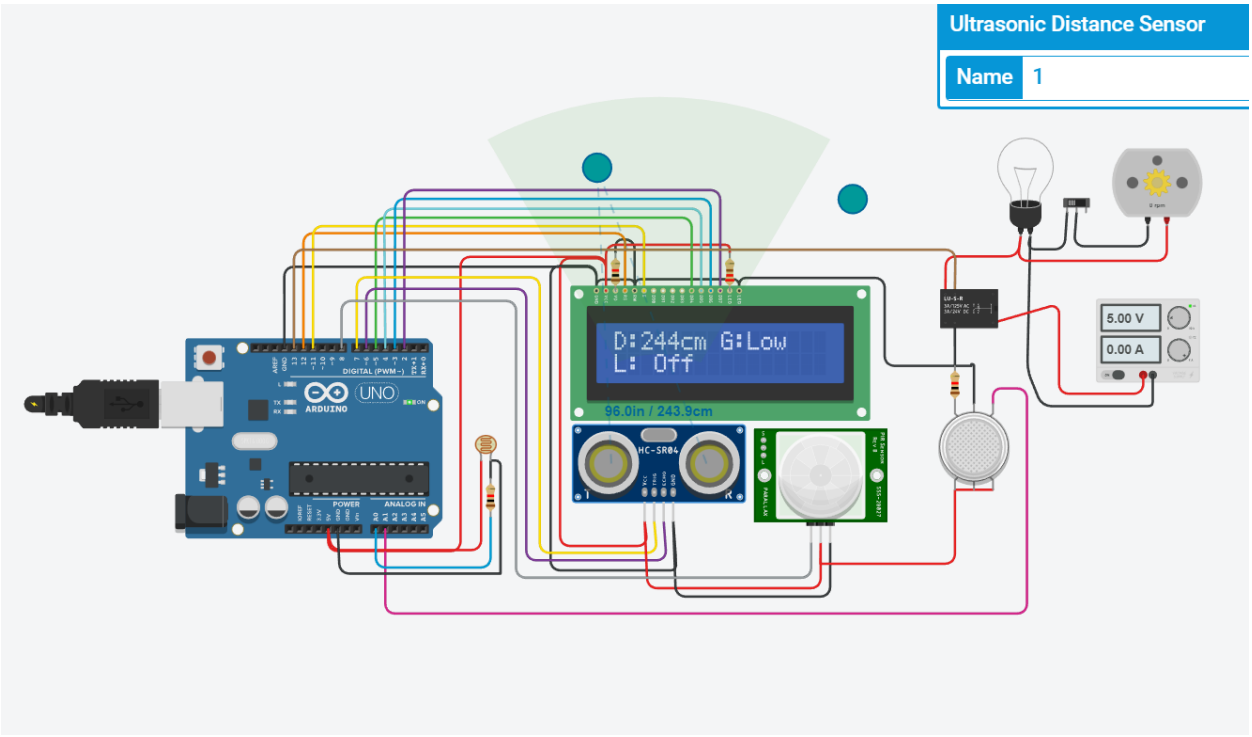
```
  delayMicroseconds(10);
  digitalWrite(triggerPin, LOW);
  pinMode(echoPin, INPUT);
  // Reads the echo pin, and returns the sound wave travel time in
microseconds
  return pulseIn(echoPin, HIGH);
}

void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);

  pinMode(releNO, OUTPUT);
  pinMode(inputPir, INPUT);
  pinMode(sensorLDR, INPUT);
  Serial.begin(9600);
}

void loop() {
  // set threshold distance to activate LEDs
  distanceThreshold = 350;
  // measure the ping time in cm
  cm = 0.01723 * readUltrasonicDistance(7, 6);
  // convert to inches by dividing by 2.54
  inches = (cm / 2.54);

    lcd.setCursor(0,0); // Sets the location at which subsequent text written to
the LCD will be displayed
  lcd.print("D:"); // Prints string "Distance" on the LCD
  lcd.print(cm); // Prints the distance value from the sensor
```

```
  lcd.print("cm");
  delay(10);

    val = digitalRead(inputPir);
  resuldoSensorLDR = analogRead(sensorLDR);
  if(resuldoSensorLDR<600)
  {
    if(val == HIGH)
    {
      digitalWrite(releNO, HIGH);
      lcd.setCursor(0,1);
  lcd.print("L: On ");
      delay(5000);
  }
    else{
      digitalWrite(releNO, LOW);lcd.setCursor(0,1);
  lcd.print("L: Off");
      delay(300);
  }
}
  else{ digitalWrite (releNO, LOW);
  Serial.println(resuldoSensorLDR);
  delay(500);
  }

  int color = analogRead(PINO_SGAS);

  lcd.setCursor(8,0);
  //lcd.print("");
  if(color <= 85){
```

```
    lcd.print("G:Low ");
  } else if(color <= 120){
    lcd.print("G:Med ");
  } else if(color <= 200){
    lcd.print("G:High");
          digitalWrite(releNO, HIGH);
  } else if(color <= 300){
    lcd.print("G:Ext");
          digitalWrite(releNO, HIGH);
  }

  delay(250);
}
```

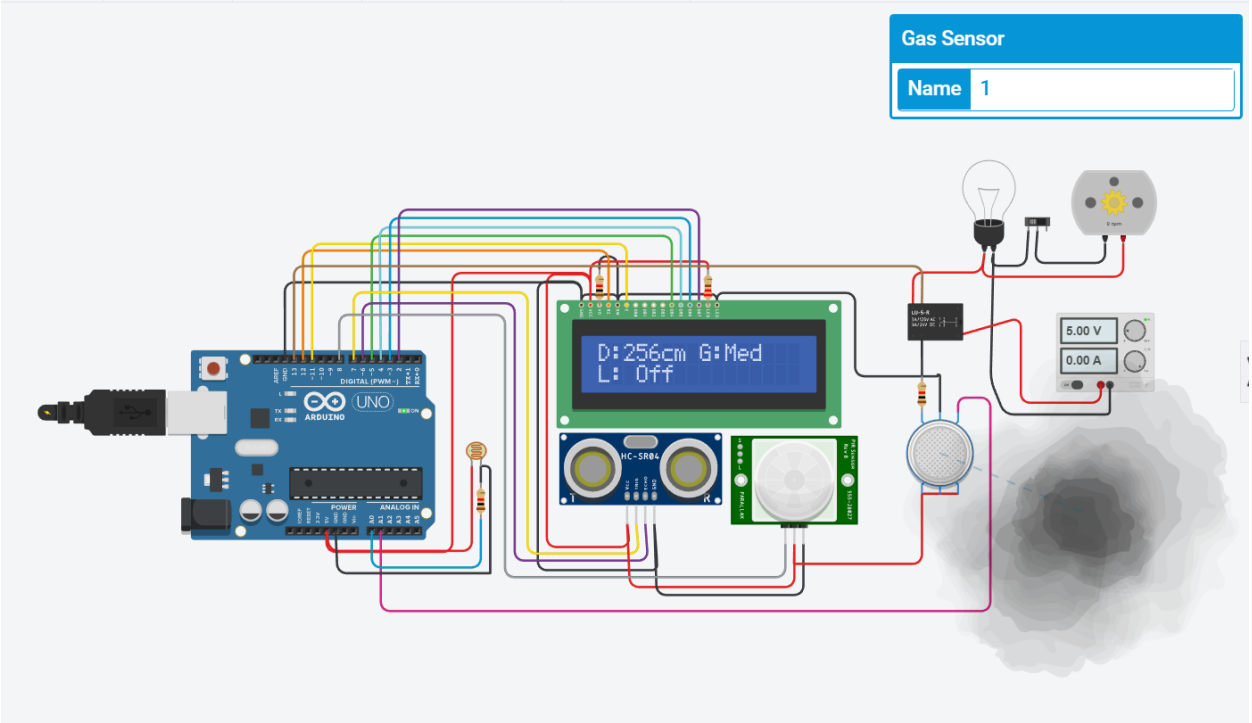
ANALYSIS

Displaying the distance detected by ultrasonic sensor into the LCD display:

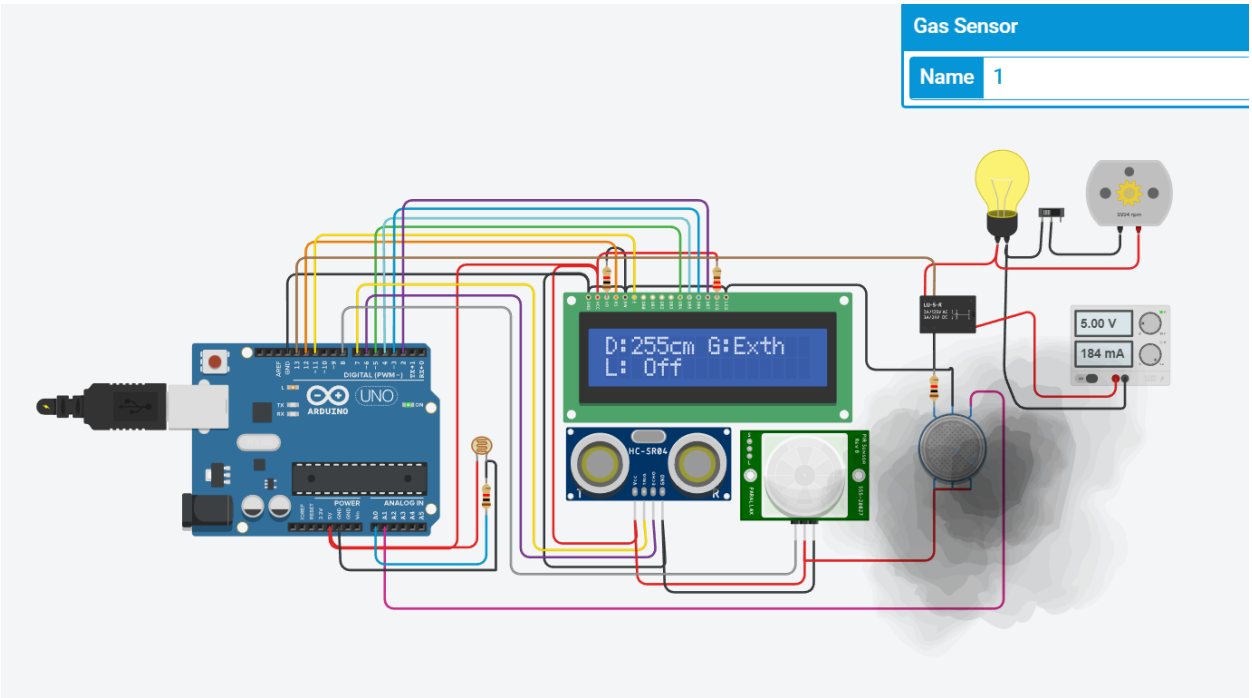


Detection of hazardous gas by smoke sensor:

Gas was at a certain distance from the sensor:

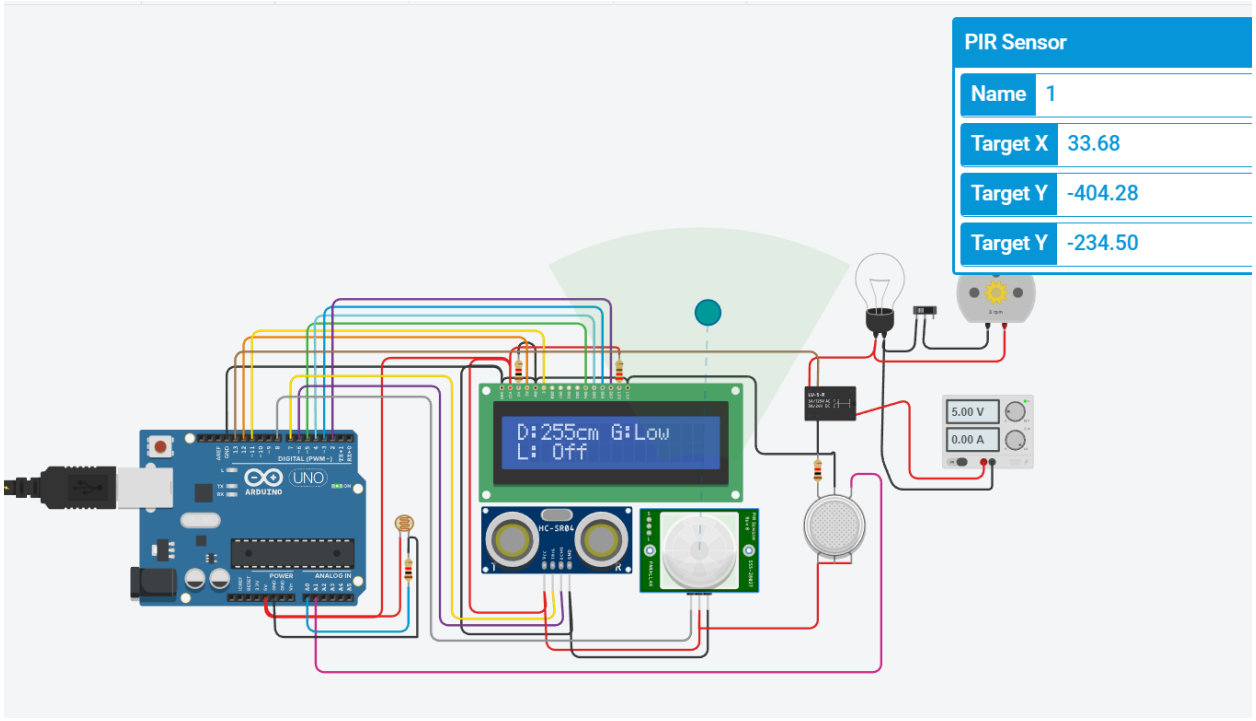


Gas is extremely close to the gas sensor and the bulb glows:

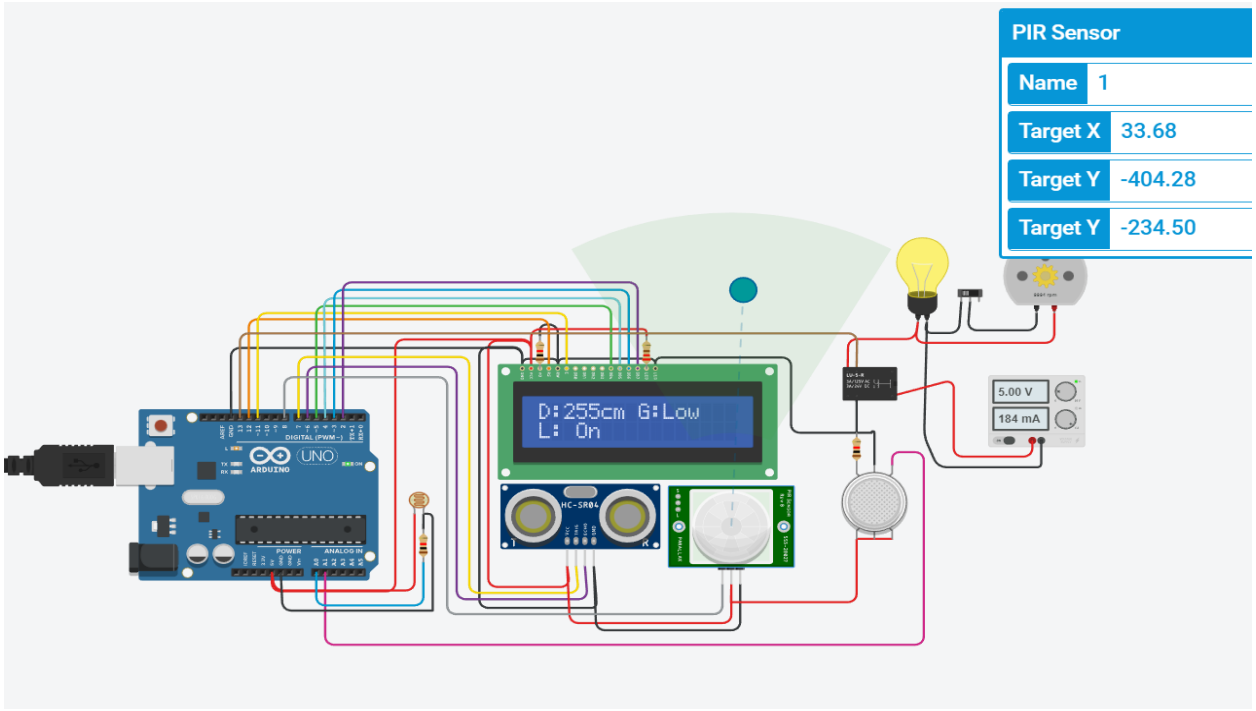


Detection of motion by PIR sensor:

Bulb was off initially:



When movement is observed, the bulb glows:



CONCLUSION

The project involved an Arduino Uno R3 microcontroller to control several sensors and a relay. The sensors include an ultrasonic sensor, a passive infrared sensor for motion detection , a light- dependent resistor (LDR) for measuring light intensity, and a gas sensor for detecting gas concentration. The relay is used to control a load.

The program first initializes the LiquidCrystal library to display information on an LCD screen. It then sets up the pins for the sensors and relay and other main loops. LCD screen displays the distance measured by ultrasonic sensor, detect motion and intensity of gas around the smoke detector.

Overall, this project demonstrates the capability of the Arduino microcontroller to control multiple sensors and perform various tasks based on sensor readings. The use of an LCD screen also adds a visual interface for displaying information to the user. In conclusion, we have implemented a valuable anti-theft security system.

REFERENCES

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