

Arduino: Gas Sensor

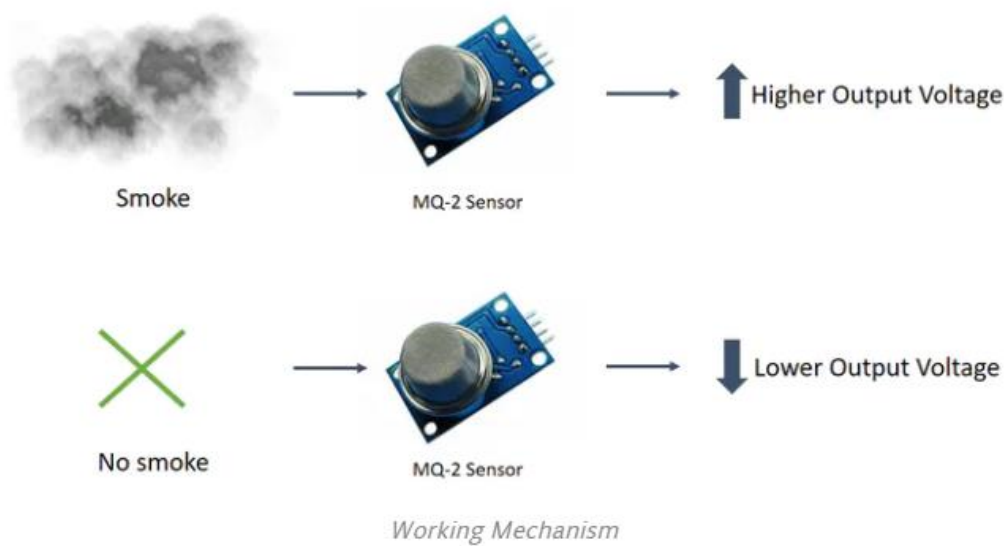
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Gas Sensor: is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leaks or other emissions and can interface with a control systems so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

The voltage that the sensor outputs changes accordingly to the smoke/gas level that exists in the atmosphere. The sensor outputs a voltage that is proportional to the concentration of smoke/gas.



Pin Wiring

The MQ-2 sensor has 4 pins.

Pin-----Wiring to Arduino Uno

A0-----Analog pins

D0-----Digital pins

GND-----GND

VCC-----5V

So, before jumping into the coding part, let's check whether we've assembled all the necessary hardware components.

2. Write the following code

```
int const gas_sensor = A1; //Sets Signal of Gas Sensor to Analog Port 1;
                           //Gas Sensor has a range based on how dense the weight of air is around it

int ledgreen = 7;
int ledyellow = 6;
int ledorange = 5;
int ledred = 4;

void setup(){
  pinMode(ledgreen, OUTPUT);
  pinMode(ledyellow, OUTPUT);
  pinMode(ledorange, OUTPUT);
  pinMode(ledred, OUTPUT);
  Serial.begin(9600);
}

void loop(){

  int value = analogRead(gas_sensor); //Gas Sensor is analog because there is a range

  Serial.print ("Gas Sensor Value = ");
  Serial.println (value);

  digitalWrite(ledgreen, HIGH); //Green LED always ON. Could Represent Machine is ON

  if (value >= 400) //Turns Yellow LED ON when Sensor is value is greater than 400.
    {digitalWrite(ledyellow, HIGH);} //Otherwise LED is OFF
  else
    {digitalWrite(ledyellow, LOW);}

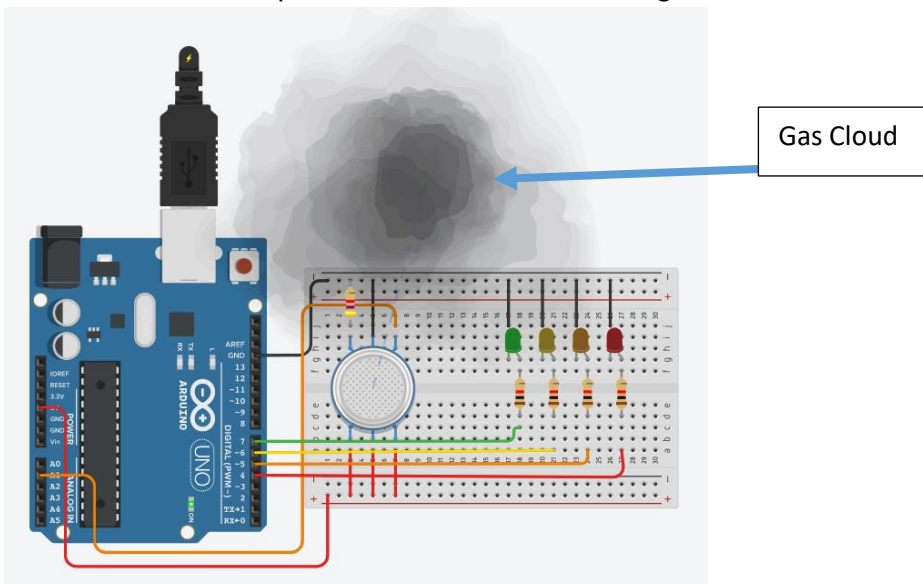
  if (value >= 500) //Turns Orange LED ON when Sensor is value is greater than 500
    {digitalWrite(ledorange, HIGH);} //Otherwise LED is OFF
  else
    {digitalWrite(ledorange, LOW);}

  if (value >= 700) //Turns Red LED ON when Sensor is value is greater than 700
    {digitalWrite(ledred, HIGH);} //Otherwise LED is OFF
  else
    {digitalWrite(ledred, LOW);}

  delay(250);
}
```

3. Run Simulation > Open Serial Monitor to look at the Output Values

To test the Gas Sensor Click on the sensor > simulated smoke cloud will appear > Hold Left Mouse Button on Cloud and Move Close or Far away from the sensor > Notice the lights turn on and off depending on where the smoke cloud is.



Assignment:

Add the following components to the circuit

1. Slide Switch (Machine On Button): to represent the on Switch of a machine > Gas Sensor will not start working until this switch is in the On Position
2. DC Motor (Machine): Represents a machine running given the following conditions
 - a. On
 - i. Slide Switch ON
 - ii. Gas Sensor Below 700
 - b. Slide Switch Off Motor is off
 - i. Slide Switch is Off
 - or
 - ii. Gas Sensor is Greater than 700
3. Push Button (Emergency Stop): To be used to turn OFF the Piezo Speaker and DC Motor when the following holds true (Idea is the operator is at the machine and does not want to listen to the alarm while operating on the machine)
 - a. Slide Switch is ON
 - b. Piezo Speaker is ON (Gas Sensor is above 600), Turn Off DC Motor if operator presses Button
 - c. Optional
 - i. Red Light Stays ON Until the following
 - Operator Presses the Push Button a 2nd Time

NOTE: Slide Switch is still in the ON State
4. Piezo Speaker
 - a. Turns ON when Gas Sensor is above 600
 - b. Turns OFF when one of the following happens
 - i. Gas Sensors goes below 600 (Scenario: Gas dissipates naturally)
 - ii. User has pushed the Push Button (Emergency Stop) (Scenario: Operator is working on the machine)

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