

Abstract:

factors like industries, urbanization, increasing in population, vehicle use which can affect human health. IOT Based Air Quality Monitoring System is used to monitor the Air Quality over a web server using Internet. It will sense and display the air quality down beyond a certain level, means when there are sufficient amount of harmful gases present in the air like CO₂, smoke, alcohol, benzene, NH₃ and NO_x. It will show the air quality in PPM on the LCD and as well as on webpage and it will indicate the quality of air on the basis of rating so that air pollution can be monitored very easily.

Introduction:

Air pollution is the biggest problem of every nation, whether it is developed or developing. Health problems have been growing at faster rate especially in urban areas of developing countries where industrialization and growing number of vehicles leads to release of lot of gaseous pollutants. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma. According to a survey, due to air pollution 50,000 to 100,000 premature deaths per year occur in the U.S. alone. Whereas in EU number reaches to 300,000 and over 3,000,000 worldwide. IOT Based Air Quality Monitoring System monitors the Air quality over a web server using Internet and will trigger an alarm when the air quality goes down beyond a certain threshold level, means when there are sufficient amount of harmful gases present in the air like CO₂, smoke, alcohol, benzene, NH₃, LPG and NO_x. It will show the air quality in PPM on the LCD and as well as on webpage so that it can monitor it very easily. LPG sensor is added in this system which is used mostly in houses. The system will show temperature and humidity. The system can be installed anywhere but mostly in industries and houses where gases are mostly to be found and gives an alert message when the system crosses threshold limit. The main aim is that based on the PPM it will display the quality of air based on the Rating



Fig 1: Air Quality Monitoring System

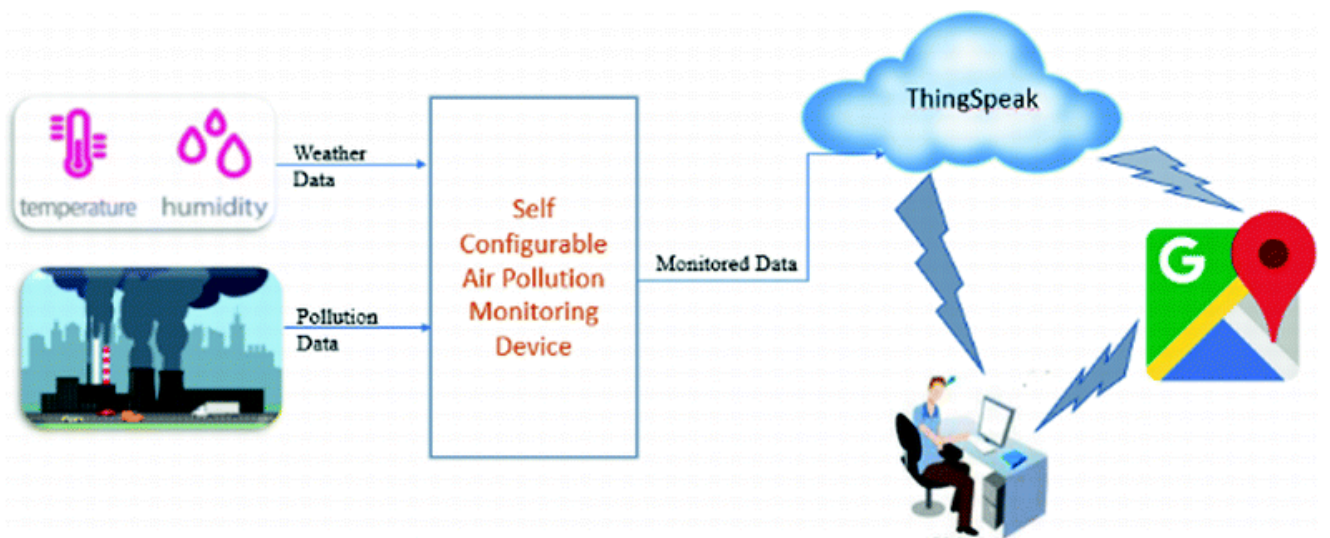


Fig2:Basic Overview that how we can see the data

MODULES AND MAIN COMPONENTS:

1. Gas Sensor (MQ 135)



Fig.3: Gas sensor (MQ 135)

The MQ-135 is used to measure air quality. The MQ series of gas sensors use a small heater inside with an electrochemical sensor. They are sensitive to a range of gasses and are used indoors at room temperature. The output is an analog signal and can be read with an analog input of the Arduino. Also, the sensitivity can be adjusted by the potentiometer. The MQ-135 alcohol sensor consists of a tin dioxide (SnO_2), a perspective layer inside aluminum oxide micro tubes and a heating element inside a tubular casing. The end face of the sensor is enclosed by a stainless-steel net and the back side holds the connection terminals. Ethyl alcohol present in the breath is oxidized into acetic acid passing through the heater element. With the ethyl alcohol cascade on the tin dioxide sensing layer, the resistance decreases. By using the external load resistance, the resistance variation is converted into a suitable voltage variation. It has high sensitivity to ammonia, sulphide and benzene steam, also sensitive to smoke and other harmful gases.

2. Arduino Uno



Fig4: Arduino uno

The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits[1] . The board features 14 digital pins and 6 analog pins. It is programmable with the Arduino IDE (Integrated

Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. A 3.3-volt supply generated by the on-board regulator and it draw a maximum current of 50 mA. The ATmega328 has 32 KB (with 0.5 KB used for the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM [3, 4].

3.16X2 LCD Display



Fig5:16X2 LCD Display

LCD stands for liquid crystal display. Since their interface serial/parallel pins are defined so it's easy to interface them with many microcontrollers. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates to a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 or 5x8 matrix. Where 5 represents number of columns and 7/8 represents number of rows. Maximum size of the matrix is 5x8. We cannot display character greater then 5x8 dimension matrix. Normally we display a character in 5x7 matrix and left the 8th row for the cursor. If we use the 8th row of the matrix for the character display, then there will be no room for cursor.

4.ESP8266 WiFi Module:



Fig 6: ESP 8266(WIFI Module)

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor.

5.Potentiometer



Fig7:Potentiometer

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat.

Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

BLOCK DIAGRAM:

BLOCK DIAGRAM OF AIR QUALITY MONITORING SYSTEM

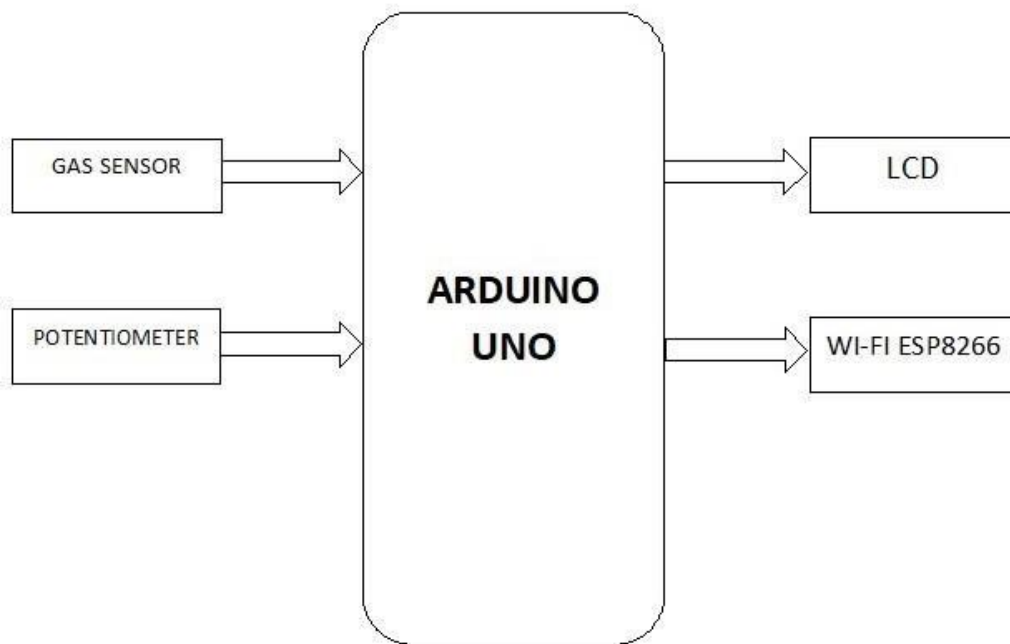


Fig8: Air Quality Monitoring system

WORKING:

The Air Quality Monitoring System (AQMS) is a facility to measure wind speed, direction, other weather parameters, concentration of air pollutants (such as SO₂, NO_x, CO, O₃, THC etc), and particulate matters continuously all year round. Mobile AQMS can also be customized to monitor multiple sites via one system.

The Basic idea of Air Quality Monitoring System it will sense the quality of air using gas sensor (MQ135) it will monitor on the basis of PPM it will tell the Quality of Air like Poor Air Quality, Fresh Air Quality it will display on the basis of Rating And it Will Update the data to the cloud.

Circuit Diagram And Simulation:

Basic Circuit Diagram of Air Quality Monitoring System

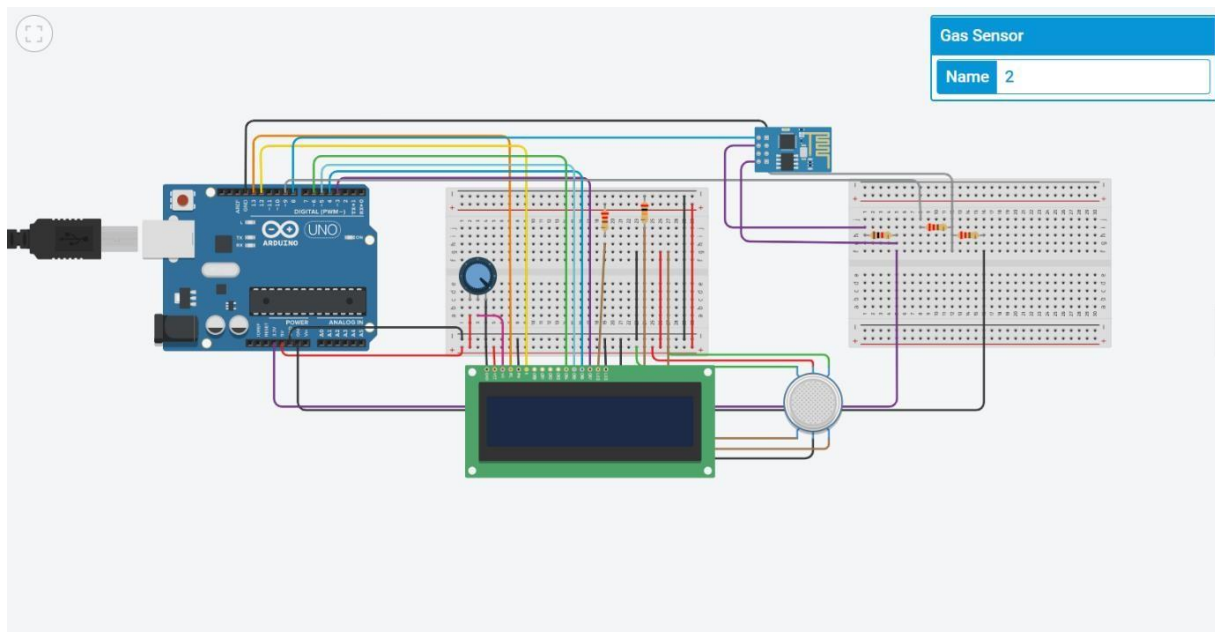


Fig 9: Basic Circuit Diagram of Air Quality Monitoring System

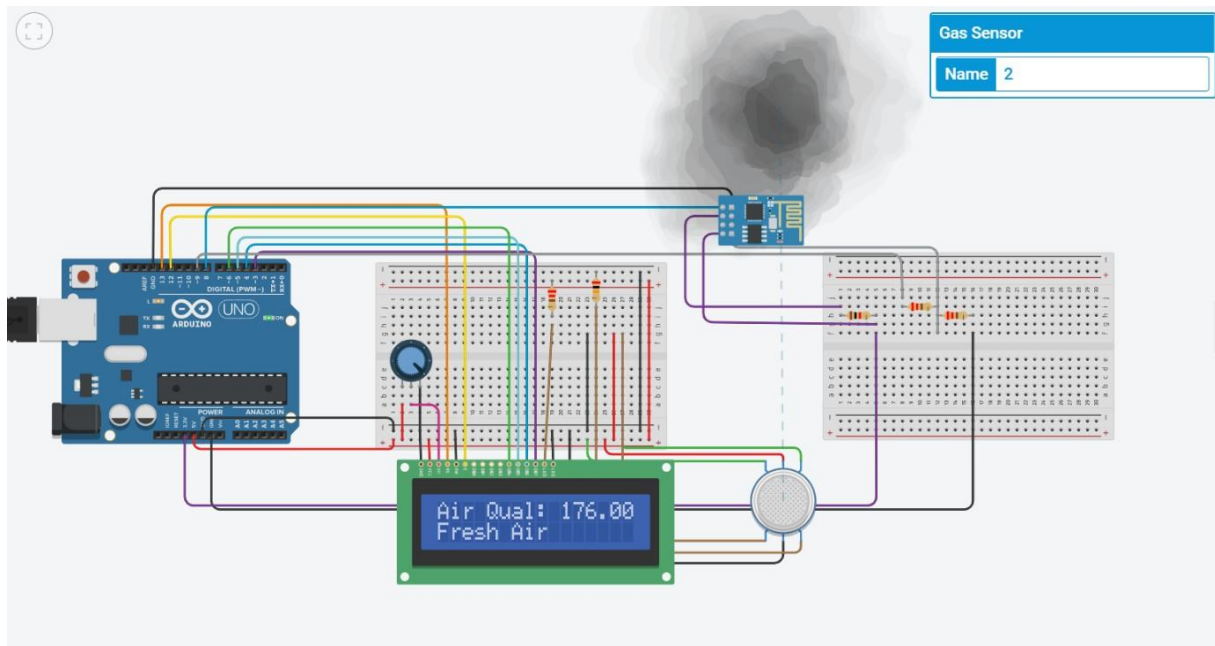


Fig10: Based on the Rating it will display the Quality of Air

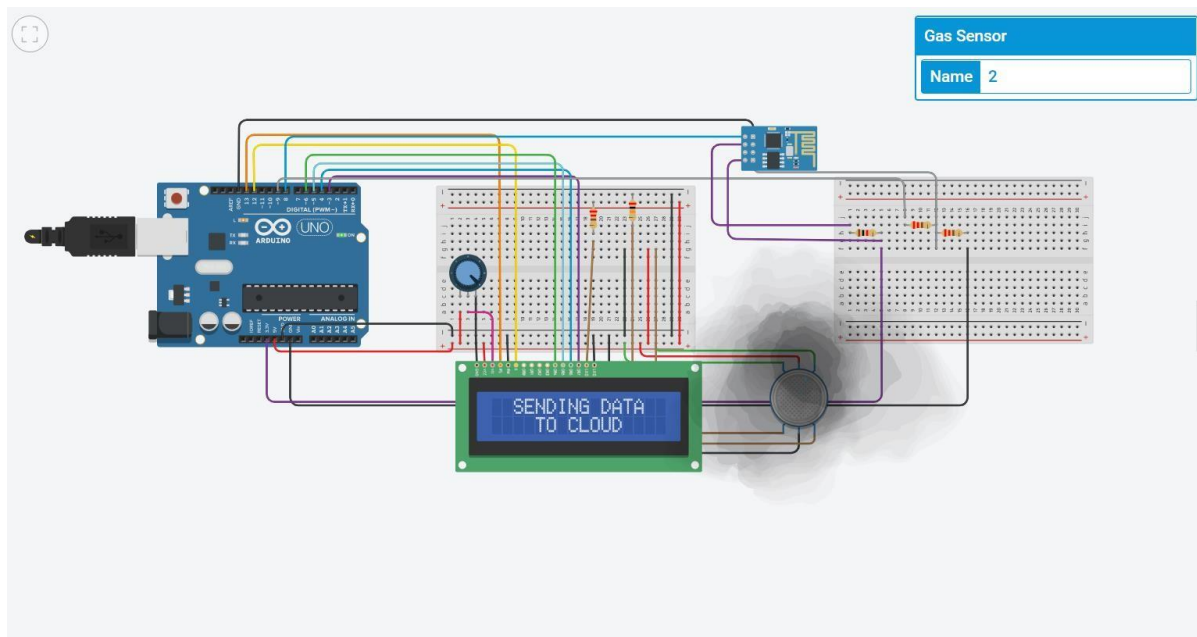


Fig11:Sending Data to cloud

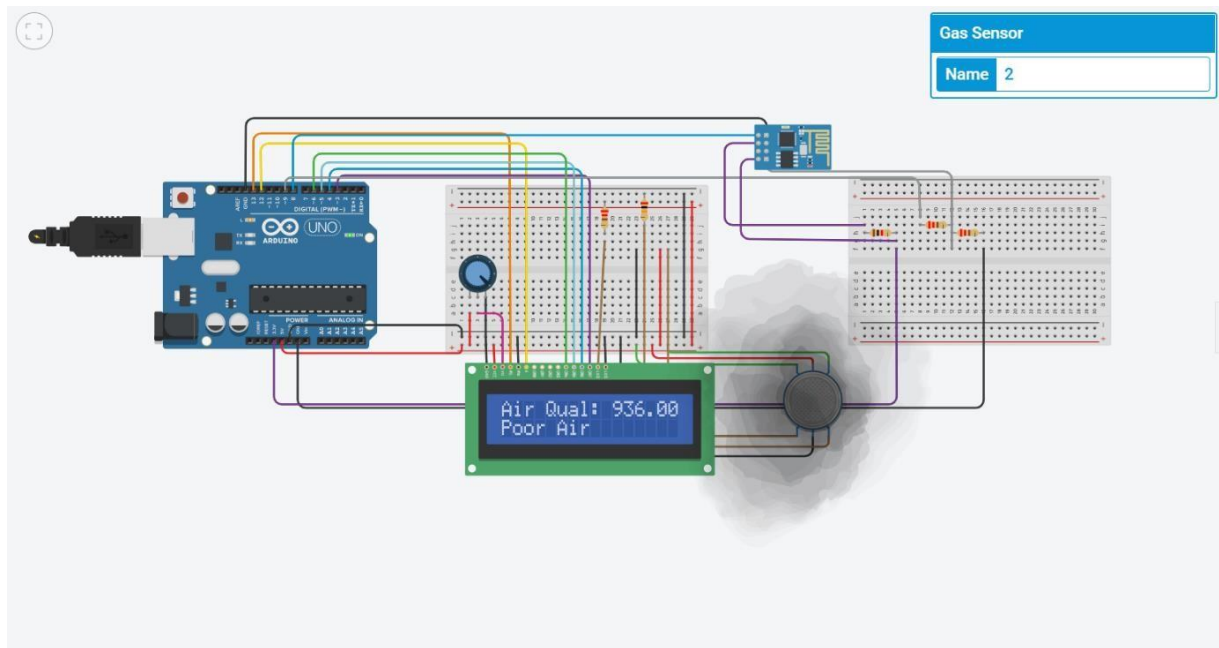


Fig 12: 2nd type of displaying the Quality of Air

Applications:

1. Roadside Pollution Monitoring
2. Industrial Perimeter Monitoring
3. Site Selection For Reference Monitoring Stations
4. Indoor Air Quality Monitoring

References:

- Previous Project