

AN ENVIRONMENTAL AIR POLLUTION DETECTION USING GAS SENSOR AND AWARENESS THROUGH IoT

L.Abirami¹, M.Gomathi²

^{1,2} UG scholar

Department Of Electronics and Communication Engineering,
Arjun College of Technology,
Coimbatore.

The level of pollution has increased with times by lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human wellbeing by directly affecting health of population exposed to it. In order to monitor quality of air, IOT Based Air Pollution Monitoring System has been proposed. The Air Quality is monitored over a web server using internet and will trigger a alarm when harmful gases like CO₂, smoke, alcohol, benzene and NH₃ present in the air. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily.

Keywords: harmful gases, Air Pollution, Gas sensor.

I. INTRODUCTION

Air pollution occurs when harmful substances including particulates and biological molecules are introduced into Earth's atmosphere. It may cause diseases, allergies or death in humans; it may also cause harm to other living organisms such as animals and food crops, and may damage the natural or built environment. Human activity and natural processes can both generate air pollution. 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. Various kinds of anthropogenic emissions named as primary pollutants are pumped into the atmosphere that undergoes chemical reaction and further leads to the formation of new pollutants normally called as secondary pollutants. For instance, according to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), nearly all climate-altering pollutants either directly or indirectly (by contributing to secondary pollutants in the atmosphere) are responsible for health problems. Almost every citizen spends 90% of their time in indoor air. Outdoor air quality of the cities of developed countries improved considerably in recent decades. This project is proposed to measure the contamination of air through air quality monitoring device (MQ135 sensor). Air quality is Monitored over a gas sensor and will provide the information of contaminants and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO₂, smoke, alcohol, benzene and NH₃. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily.

II. OBJECTIVE OF PROJECT

- [1] To detect the level of contaminants present in the air.
- [2] To analyze the changes in the contaminants concentration through LCD monitor and web server
- [3] To make the people aware about the air pollution through the web page

III. METHODOLOGY

The proposed system uses the web server to monitor the Air quality over the internet and it will trigger an alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases like CO₂, smoke, alcohol, benzene and NH₃ are present in the air. It will show the air quality in PPM or PPB on the LCD display and as well as on webpage so that we can monitor it very easily. In this MQ135 sensor is used which is the best choice for monitoring Air Quality as it can detect most harmful gases and can measure their amount accurately. In this proposed system, the pollution level can be installed and monitored from anywhere using the computer or mobile by the technique of IoT.

IV. EXPERIMENTAL SETUP

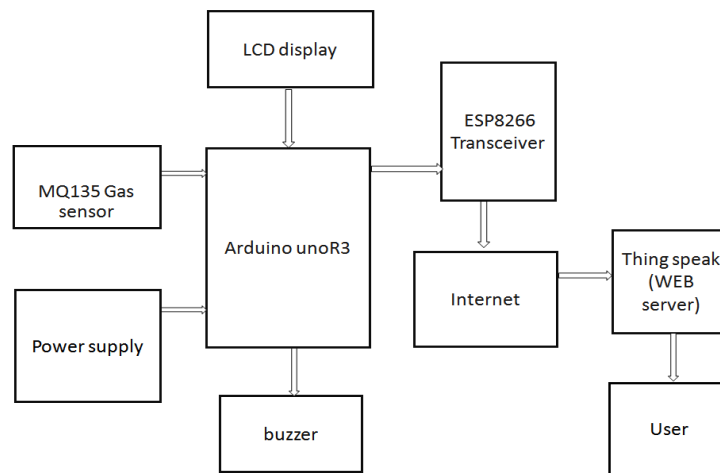


Fig.1.Block Diagram



Fig.2. Experimental Setup

MQ135 GAS SENSOR



Fig.3.MQ135 Gas Sensor

MQ135 sensor can sense, alcohol, Benzene, smoke, CO₂, Carbon Monoxide, Ozone, Nitrogen Dioxide, Sulfur Dioxide, Nitrogen Oxides, Volatile Organic Compounds and some other gases. so it is perfect gas sensor for our Air Quality Monitoring System. When we will connect it to Arduino then it will sense the gases, and we will get the Pollution level in PPM (parts per million).

ARDUINO UNO (R3)



Fig.4.Arduino Uno

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on

the Processing language project. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a USB connection, a power jack, a reset button and more.

ESP8266 WiFi Module

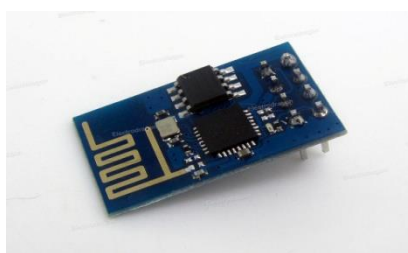


Fig.5.Wifi Module

Wireless communication between Electronic devices and modules is very important, to make them 'Fit' in the World of Internet of Things. HTTP protocol and HTML language have made it possible to transfer the Data anywhere in the world, over the web. We have already covered some projects which use Wi-Fi with Arduino.

ESP-01 version of this module, which has 8 pins: VCC, GND, CH_PD, TX, RX, RST, GPIO0, and GPIO1. Wiring the module is not complicated and should be the same for all versions of this module:

- VCC needs 3.3V.
- CH_PD has to be pulled-up (meaning it has to be connected to 3.3V as well).
- GND is connected to FTDI's GND pin.
- RX is connected to FTDI's TX pin, because you want to create a loop: RX >TX =>RX ->TX.
- TX is connected to FTDI's Other pins are left floating.

LCD DISPLAY

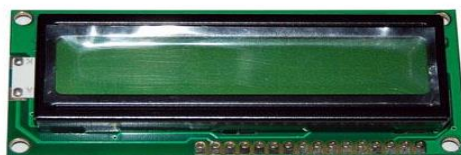


Fig.6.LCD Display

Liquid crystal cell displays (LCDs) are used in similar applications where LEDs are used. These applications are display of display of numeric and alphanumeric characters in dot matrix and segmental displays. LCD consists of two glass panels, with the liquid crystal materials sandwiched in between them. It used to display the pollution level in PPM

V. RESULT

The commercial meters available in the market are Fluke CO-220 carbon monoxide meter for CO measurements, Amprobe CO2 meter for CO2 measurements, Forbix Semicon LPG gas leakage sensor alarm for LPG leakage detection. The researchers in this field have proposed various air quality monitoring systems based on WSN, GSM and GIS. They are uses Zigbee modules for transceiver operations. Current consumption of arduino is high for the development of sensor node. It is difficult to exchange the information from source to destination, due to limitations of battery power, radio range and coverage area.

In the proposed system the air quality monitor MQ135 gas sensor preferred to reduce the power consumption over the existing methods and the ESP8266 Wifi module provides large coverage area .

The sufficient amount of data collected is passed to the cloud data storage, where the data is analyzed by IoT software for future analysis.

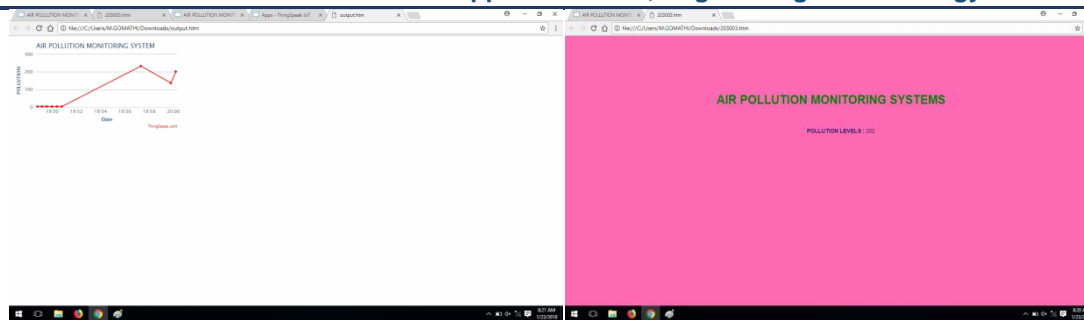


Fig.7. Output Display On Web Page

VI. CONCLUSION

It provides an efficient measurement of monitoring air pollutants using sensor device. The developed system consumes low power and provides large coverage area. In this IOT project, user can monitor the pollution level from anywhere using your computer or mobile. This system also sends the pollutant level data to the server for future analysis. The harmful gases gathered by the sensor is transmitted through a web server and will provide information if it goes beyond critical level. The sufficient amount of data collected is passed to the cloud data storage, where the data is analyzed by IoT software.

VII. FUTURE WORK

This work can be further enhanced by using highly sensible sensors to measure the Ozone gas, indoor and outdoor contaminants. This can also be enhanced by adding the locations using the GPS and the contamination in that area can be monitored through the Internet web sources.

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