International Journal of Innovative Research in Engineering
Volume 4, Issue 3(May-June 2023), PP: 580-582.
www.theijire.com ***ISSN No: 2582-8746***

IOT Based Air Pollution Monitoring System

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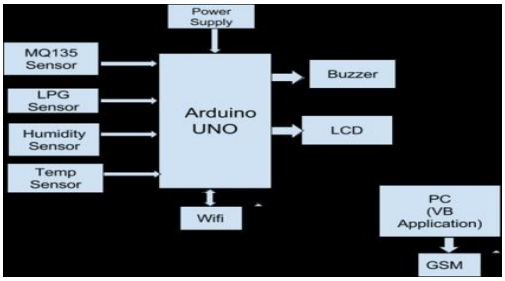
How to cite this paper:
Suraj Kumar[1], Akash Nishad[2] , Rahul Singh[3], Vishal Chaurasiya[4], "IOT Based Air Pollution Monitoring System", IJIRE-V4I03-580-582.

Abstract: *The level of pollution is increasing rapidly due to factors like industries, urbanization, increasing in population, vehicle use which can affect human health. IOT Based Air Pollution Monitoring System is used to monitor the Air Quality over a web server using Internet. It will trigger an alarm when the air quality goes 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 NOx. It will show the air quality in PPM on the LCD and as well as on webpage so that air pollution can be monitored very easily.*
The system uses MQ135 and MQ6 sensor for monitoring Air Quality as it detects most harmful gases and can measure their amount accurately.
Key Word: *Air Pollution, MQ135 Sensor, IOT,Arduino.*

I.INTRODUCTION

Air pollution is the biggest problem of every nation, whether it is developed or developing. Healthproblems 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. Harmfuleffects 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 andover 3,000,000 worldwide. IOT Based Air Pollution 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 NOx. 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.

Block Diagram of The System: -
It can be explained by following diagram



II.LITERATURE REVIEW

The drawbacks of the conventional monitoring instruments are their large size, heavy weight and extraordinary expensiveness. These lead to sparse deployment of the monitoring stations. In order to be effective, the locations of the monitoring stations need careful placement because the air pollution situation in urban areas is highly related to human activities (e.g., construction activities) and location-dependent (e.g., the traffic choke-points have much worse air quality than average).

IOT Based Air Pollution 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 level, means when there are amount of harmful gases present in the air like CO2, smoke, alcohol, benzene, NH3, NOx and LPG.

The system will show the air quality in PPM on the LCD and as well as on webpage so that it can be monitored very easily. Temperature and Humidity is detected and monitored in the system.

Software Requirement

1. Arduino 1.6.13 Software.
2. Embedded C Language.

III.HARDWARE COMPONENT

Arduino UNO: -

Arduino Uno is a microcontroller board based on the ATmega328P It has 14 digital input/output pins 6 analog inputs, a 16 MHz quartz crystal, a USB Connection, power jack, an ICSP header and a reset button.

MQ135 sensor: -

- The MQ135 sensor can sense NH3, NOx, alcohol,Benzene, smoke, CO2 and some other gases.
- It gives the output in form of voltage levels.
- The ESP8266 is a low-cost Wi-Fi chip with fullTCP/IP stack and MCU (microcontroller unit) capability.
- It runs on 3.3V and gives our system access to Wi-Fior internet.

Buzzer: -

A Buzzer or beeper is an audio signaling device. Whenever the air pollution goes above the threshold level the Buzzer starts beeping indicating Danger.

LCD (Liquid Crystal Display): -

This is a basic (16x2) 16 character by 2-line display.Black text on green background.It is used to indicate the Air and Humidity in PPM.

GSM Module: -

- GSM Module is used to establish communication between a computer and a GSM system.
- Global System for Mobile communication (GSM) isan architecture used for mobile communication.

LPG Sensor: -

MQ-6 sensor is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air.

The MQ-6 can detect gas concentrations anywherefrom 200 to 10000ppm

Temperature Sensor: -

The LM35 is precision integrated-circuit temperature sensor, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

It can be used with single power supplies, or withplus and minus supplies.

IV.WORKING

Proposed Air Pollution Monitoring System is based on the block diagram as shown in Fig.1. The data of air is recognized by MQ135 gas sensor and MQ6 LPG gas sensor. The MQ135 sensor can sense NH3, NOx, alcohol, Benzene, smoke, CO2. So, it is dynamic gas sensored for our Air pollution Monitoring system. When it will be connected to Arduino then it will sense all gases, and it will give the Pollution level in PPM (parts per million).

MQ135 gas sensor will give the output in form of voltage levels and we have to convert it into PPM. So for converting the output in PPM, we have used a library for MQ135 gas sensor and MQ6 sensor.

Sensor is giving us value of 90 when there is no gas near it and the air quality safe level is 350 PPM and itshould not exceed 1000 PPM. When it will exceed the limit of 1000 PPM, it will cause Headaches, sleepiness and stagnant, stuffy air. If it exceeds beyond 2000 PPM then it will cause increased heart rate and many different diseases. When the value will be less than 1000 PPM, then the LCD and webpage will display “Fresh Air”. When the value will increase from 1000 PPM, then the buzzer will start beeping and the LCD and webpage will display “Poor Air, Open Windows”. And when it will increase 2000, the buzzer will keep beeping and give an alert message on smartphone through GSM. The LCD and webpage will display “Danger! Move to fresh Air”. It will contain temperature and humidity so it will possibly show the current temperature andhumidity of the air. For temperature we have used LM35 sensor and for humidity SY-HS-220.

According to the model the 4 sensors works as inputdata, they transmit data for knowing which gas it is,what is the temperature and humidity. LCD and Buzzer are the output devices. LCD shows the data of the gases in ppm (parts per million) and Buzzer isused when ppm crosses above a threshold limit.

V.APPLICATIONS

1. Industrial perimeter monitoring
2. Indoor air quality monitoring.
3. Site selection for reference monitoringstations.
4. Making data available to users.

VI.ADVANTAGES

1. Easy to Install.
2. Updates On mobile phone directly.
3. Accurate Pollution monitoring.
4. Remote location monitoring.

VII.EVALUATION

To evaluate the performance of the system, we conducted experiments in a real-world scenario where the system was used to detect and track moving objects in a parking lot. The results showed that the system was able to accurately detect and track the objects with a high degree of reliability and consistency.

VIII.CONCLUSION

The system to monitor the air of environment using Arduino microcontroller, IOT Technology is proposed to improve quality of air. With the use of IOT technology enhances the process of monitoring various aspects of environment such as air quality monitoring issue proposed in this paper. Here, using the MQ135 and MQ6 gas sensor gives the sense of different type of dangerous gas and Arduino is the heart of this project.

Which control the entire process. Wi-Fi module connects the whole process to internet and LCD is used for the visual Output.

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