

POLLUTION DETECTION SYSTEM

Mrs.C.B.Selva Lakshmi
Assistant Professor

Ms. N. Indumathi
UG Scholar

Ms. M. Pavithra
UG Scholar

Ms. B. Akshaya
UG Scholar

Department of Computer Science and Engineering,
Velammal College of Engineering and Technology,
Madurai, Tamilnadu, India

Abstract — *The level of pollution was increased due to several factors such as industrialization, urbanization, vehicles, electronic wastes etc. Out of those factors important criteria for the pollution is vehicular pollution. Nowadays, transportation is an essential need for people to displace from one location to another. For that they use fuels for running those vehicles. While burning those fuels the ejection of several toxic gases are released into the atmosphere. Which cause severe harmful effects to the people. In order to monitor in this project we are going to make an IOT Based Pollution Monitoring System in which we will monitor the Air Quality using different gas sensors like CO₂, smoke, alcohol, benzene, methane, NH₃ etc. By monitoring those gas levels it will show the air quality in PPM on the LCD screen so that we can monitor it very easily. We can install this system anywhere and can also indicate us when pollution goes beyond some level. It displays the safety level of each gases on one side of the LCD screen on the other side it shows the current level in that particular place where the device has been installed. When pollution goes beyond some level, it will instruct the people with some instructions to secure them from harmful infections. Also a text message is sent to the municipality/corporation through GSM module whenever its volume exceeds a particular safe limit intended for a particular application in the environment. From that information they can take steps to control the pollution.*

Keywords — *IoT, GSM, CO₂, Methane, NH₃ Sensors, Pollution Monitoring System.*

1. 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. The main objective of IOT Air & Sound Monitoring System is that the Air and sound pollution is a growing issue these days. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. Due to flexibility and low cost Internet of things (IoT) is getting popular day by day. With the urbanization and with the increase in the vehicles on

road the atmospheric conditions have considerably affected. Analysis of monitoring data allows us to assess how bad air pollution and sound pollution is from day to day.

1.2 Purpose of This Project

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.

1.3 Scope and Objective

To detect and create awareness to the public about the air pollution and provide some guidelines to prevent them

2. EXISTING MODEL

The commercial meters available in the market are Fluke CO-220 carbon monoxide meter for CO, Amprobe CO₂ meter for CO₂, 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. Now each technology has limited uses according to the intended function, as Zigbee is meant for users with Zigbee trans-receiver, Bluetooth. GIS based system is designed, implemented and tested to monitor the pinpoints of air pollution of any area. It consists of a microcontroller, gas sensors, mobile unit, a temporary memory buffer and a web server with internet connectivity which collects data from different locations along with coordinate's information at certain time of a day. The readings for particular location are averaged in a closed time and space. The Global Positioning System (GPS) module is attached to a system to provide accurate representation of pollution sources in an area. The recorded data is periodically transferred to a computer through a General Packet Radio Service (GPRS) connection and then the data will be

displayed on the dedicated website with user acceptance. As a result large number of people can be benefited with the large

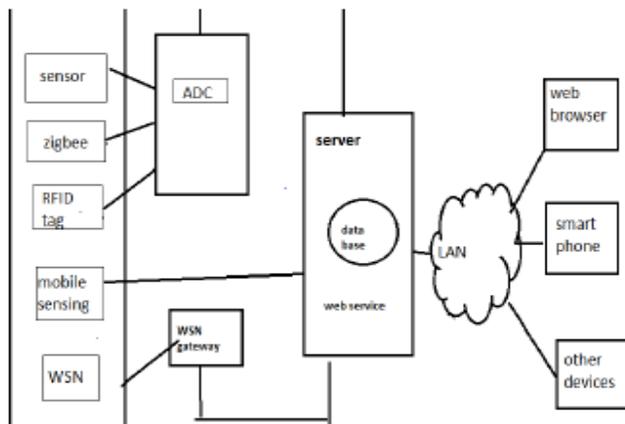


Fig 1: Existing System using Zigbee Technology

2.1 Why This Project

We propose an air quality monitoring system that allows us to monitor and check live air pollution in an area through IOT. System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data. The sensors interact with arduinouno which processes this data and transmits it over the application. This allows authorities to monitor air pollution in different areas and act against it. The commercial meters available in the market are Fluke CO-220 carbon monoxide meter for CO, Amprobe CO2 meter for CO2, ForbixSemicon 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. Now each technology has limited uses according to the intended function, as Zigbee is meant for users with Zigbee transceiver, Bluetooth. We propose an air quality pollution monitoring system to monitor and check live air quality pollution in an area through IoT. System keeps measuring pollution level and reports it. The sensors interact with arduino which processes this data and transmits it over the application.

3. PROBLEM STATEMENT

During past decades, as a result of civilization and urbanization there is a huge growth in polluting industries, open burning of refuse and leaves, massive quantities of construction waste, substantial loss of forests and vehicles on roads that give rise to health endangering pollution. Therefore, it is necessary to regularly monitor and report the hazardous impacts from air pollution. To monitor the quality of air, a new framework is proposed that monitors the parameters of the environment

around us such as CO₂, CO, presence of smoke, alcohol, LPG, temperature and humidity with the help of GSM, Bluetooth and WSN. Pollution monitoring system used to measure the amount of pollution level in our environment. By measuring those values awareness can be created among public to control them.

4. PROPOSED SYSTEM

In this project we are going to make an IOT Based Air Pollution Monitoring System in which we will monitor 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 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.

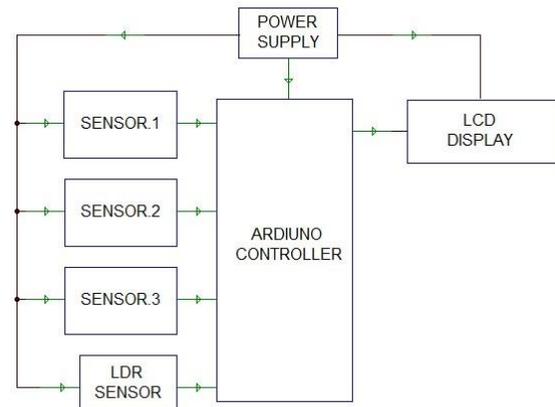


Fig 2 : Block Diagram for Proposed System

4.1. AIR Quality Parameters

The important parameters that are considered in the proposed framework include:

- **Carbon Dioxide (CO₂)** – CO₂ is colorless, odorless gas and non-combustible gas. Carbon Dioxide is a gas essential to life in the planet, because it is one of the most important elements evolving photosynthesis process, which converts solar into chemical energy. The concentration of CO₂ has increased due mainly to massive fossil fuels burning. This increase makes plants grow rapidly.
- **Sulphur Dioxide (SO₂)** -Sulphur Dioxide is a colorless gas, detectable by the distinct odour and taste. In high concentrations may cause respiratory problems, especially in sensitive groups, like asthmatics. It contributes to acid rains.
- **Nitrogen Dioxide (NO₂)** – Nitrogen Dioxide is a brownish gas, easily detectable for its odour, very corrosive

and highly oxidant. It is produced as the result of fossil fuels burning. Usually NO thrown to the atmosphere is converted in NO₂ by chemical processes. In high concentrations, NO₂ may lead to respiratory problems.

- **Smoke-** Every year nearly 4.9 million people died due to smoking according to 2007 report. In addition, second hand smoke is serious threat to the health of people of all age’s causes 41000 deaths each year.
- **LPG-** Liquefied petroleum gas (LPG) is an odorless and colorless liquid which evaporates readily into a gas. LPG may leak in the form of a gas or a liquid. If it leaks in the form of a liquid it evaporates quickly and will eventually form large cloud of gas in air which is relatively heavier than air thus drops to the ground.
- **Temperature and humidity-** Greenhouse effect can be monitored by measuring temperature and comparing temperature changes from historical to present time especially since the industrial revolution using climate data. Humidity is a type of gas that protects us from UV rays from the sun and helps trap heat on Earth, thereby making the climate on Earth, a pleasant one for living. But as humidity increases, the warmth on Earth also increases which makes our life uncomfortable.

level is 350 PPM and it should not exceed 1000 PPM. When it will exceeds the limit of 1000 PPM, then it will cause harmful effects and when it reaches 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 GSM module will send notifications to the respected authority and the LCD will display “Poor Air, OpenWindows”. And when it will increase 2000, the LCD will display “Danger! Move to fresh Air”.

4.2 System Architecture and Working

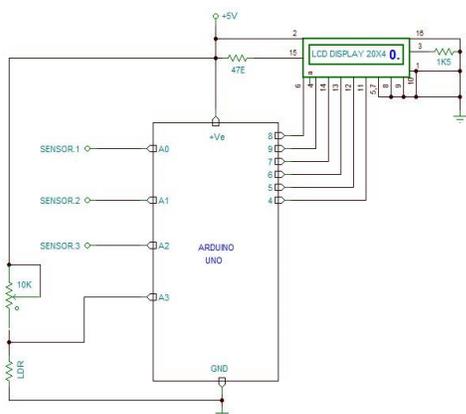
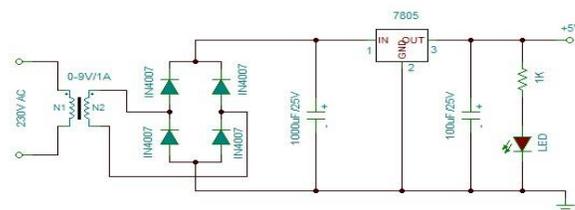


Fig 3 : System architecture

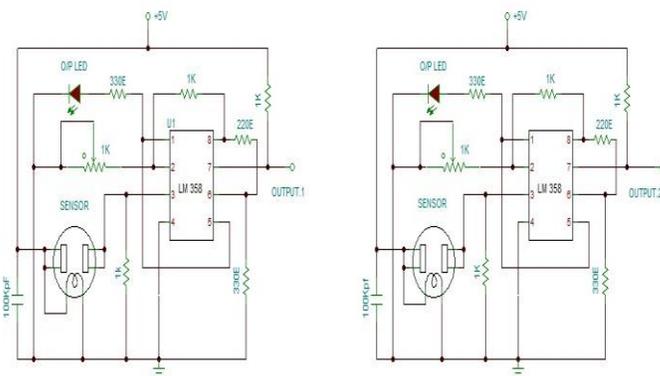
The proposed air pollution monitoring is based on the block diagram as shown in Fig.1 the data of air is recognised by different types gas sensors. The gas sensor can sense NH₃, NO₂, alcohol, Benzene, smoke, CO₂. So it is dynamic gas sensor for our Air pollution Monitoring system. When we will connect it to Arduino then it will sense all gases, and it will give the Pollution level in PPM (parts per million). The 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 gas sensor. Sensor was giving us value of 90 when there was no gas near it and the air quality safe

POWER SUPPLY

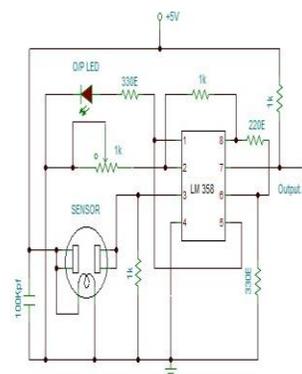


SENSOR MOUDLE CIRCUIT.1

SENSOR MOUDLE CIRCUIT.2



SENSOR MOUDLE CIRCUIT.3



4.3 List of Modules

- Interrogating Module
- Sensor Module
- Dust Module

4.3.1 Interrogating Module

It has 14 digital input/output, 6 analog inputs, a USB connection, a power jack and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

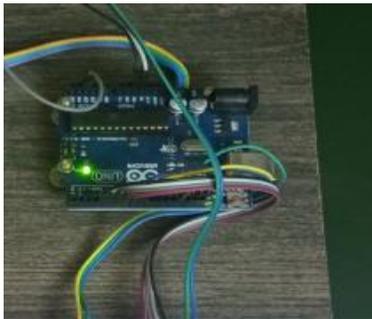


Fig 4 : Interrogating module

4.3.2 Sensor Module

Sensitive material used in MQ3, MQ6, MQ7 gas sensors is SnO₂. Sensors can monitor toxic gases such as LPG, CO, smoke. The detection range is 10-10,000 ppm with the voltage rate of about 5.0V±0.1V AC or DC.



Fig 5 : Sensor module

4.3.3 Dust Module

Dust module used to detect the dust level in the surroundings. We have used the LDR sensor and glass sheet. With the help of the light source dust particles are detected and its level will be indicated in the LCD.

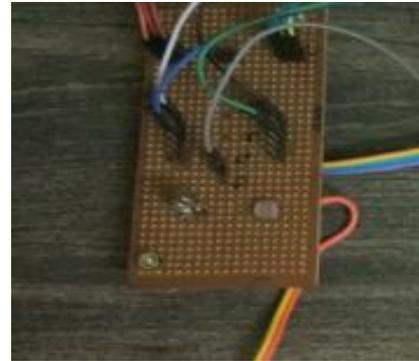


Fig 6 : Dust module

5. TESTING AND ITS OUTPUT

This shows the final output scenario of the project.

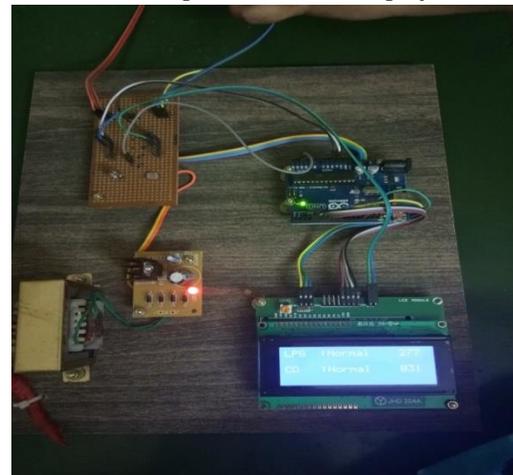


Fig 7 : Screen Shot 1

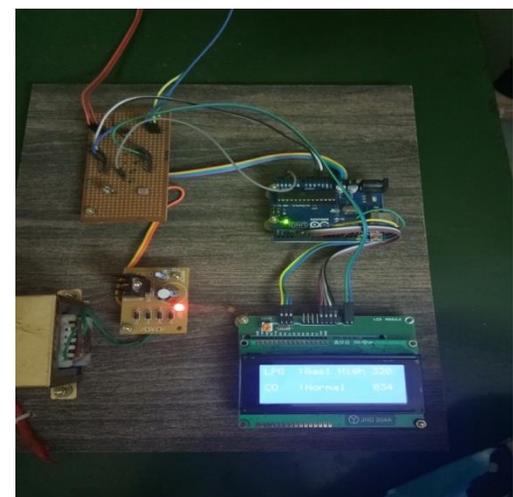


Fig 8 : Screen Shot 2

6. 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 the using of gas sensors gives the sense of different type of dangerous gas and arduino is the heart of this project which controls the entire process. LAN module connects the whole process to internet and LCD is used for the visual Output. The Automatic Air management system is a step forward to contribute a solution to the biggest threat. The air monitoring system overcomes the problem of the highly-polluted areas which is a major issue. It supports the new technology and effectively supports the healthy life concept. This system has features for the people to monitor the amount of pollution on their mobile phones using the application. So, it becomes very reliable and efficient for the Municipal officials along with the Civilians to monitor environment. Letting civilians also involved in this process adds an extra value to it. As civilians are now equally aware and curious about their environment, this concept of IOT is beneficial for the welfare of the society. And it is implemented using the latest technology.

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