IOT BASED AIR QUALITY MONITORING SYSTEM

S.Chenchu Jyoshna , S.Chandrakala, P.Srividya, UG Student, Department of ECE, Narayana Engineering College, Gudur, AP, 524101
CH.Manjusha Associate Professor, Department of E.C.E, Narayana Engineering College (Autonomous), Gudur, 524101 Email : chenchu.jyostna@gmail.com, manjusha.chinta1@gmail.com,

Abstract—*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 air quality, we developed an IOT Based Air Pollution Monitoring System in which Air trigger a alarm i.e., message will be sent when the air quality Quality is monitored over a web server using internet and will goes down or above 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 on the LCD as well as on webpage so that we can monitor it very easily. In this IOT project, you can monitor the pollution level from anywhere using your computer or mobile.*
Keywords: IoT, MQ135, MQ3, MQ5, MQ7, Thingspeak

I. 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. The main reason for the climate change and people health is air pollution. It has brought changes in climate like global warming, global dimming, over raining, drought, storms, acid rain, foggy weather etc. The living things on earth and under water are suffering many problems like change in life due to lack of proper facilities of life.

1.1-Embedded system implementation

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems, etc.

1.2-Embedded system:

Embedded system includes mainly two sections, they are

1. Hardware
2. Software
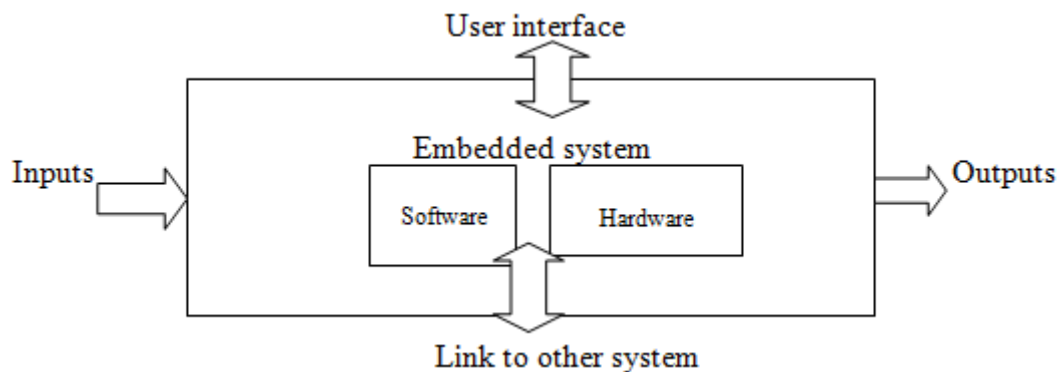
Fig:1.1- Overview of embedded system

1.2.1-Embedded System Hardware:

As with any electronic system, an embedded system requires a hardware platform on which it performs the operation. Embedded system hardware is built with a microprocessor or microcontroller. The embedded system hardware has elements like input output (I/O) interfaces, user interface, memory and the display. Usually, an embedded system consists of:

- Power Supply
- Processor
- Memory
- Timers
- Serial communication ports
- Output/Output circuits
- System application specific circuits

1.2.2-Embedded System Software:

The embedded system software is written to perform a specific function. It is typically written in a high level format and then compiled down to provide code that can be lodged within a non-volatile memory within the hardware. An embedded system software is designed to keep in view of the three limits:

- Availability of system memory
- Availability of processor's speed
- When the system runs continuously, there is a need to limit power dissipation for events like stop, run and wake up.

II.LITERATURE REVIEW

IEEE Transaction(2019), Air Quality Arduino Based Monitoring System, Abdullah J. Alabdullah. This paper presents a design for a system that aims to notify the residents of VOC's concentration level in both indoor and outdoor environments. The system is Arduino-based, it will monitor and detect total volatile organic compounds (TVOC) and then inform the user via wireless communication system of its levels to take actions.

IEEE Transaction(2020), Air Quality Sensing and Reporting System Using IoT, Rohan Kumar Jha. The circuit finally displays the PPM values as well as Air Quality level of gases on an Android application which fetches data from ThingS peak. The current model is implemented successfully and can be deployed for real system implementations.

IEEE Transaction(2020), Design and Analysis of IoT based Air Quality Monitoring System, Ajitesh Kumar, The system can measure local area air contamination and generate analyzed data based on which it alerts the people through a buzzer device integrated into the system. The user-friendly and easy handling of the system technology is such that it can be installed in houses and in small places.

III.EXISTING SYSTEM

The existing system is Zigbee based wireless air quality monitoring device. The communication between nodes and host is based (Zigbee protocol) using the Zigbee module and the communication between host and PC is performed through an USB interface.

3.1-DRAWBACKS FOR EXISTING METHOD

- Zigbee is only for limited distance
- Due to this we cannot monitor the air quality from long distances
- It requires PC to monitor the values, we cannot carry PC and Zigbee receiver all the time.

So we moved to proposed system.

IV.PROPOSED SYSTEM

The proposed IoT based Air Pollution Monitoring System is as the block diagram as shown. The data of air is recognized by MQ135,MQ3, MQ5, MQ7 gas sensors. The sensor can sense NH3, NOx, alcohol, Benzene, smoke, CO2. So it is dynamic gas sensored for our Air pollution Monitoring system. When it is connected to Arduino, then it will sense all gases, and it will give the Pollution level in PPM (parts per million). Gas sensor will give the output in the form of voltage levels and we have to convert it into PPM.
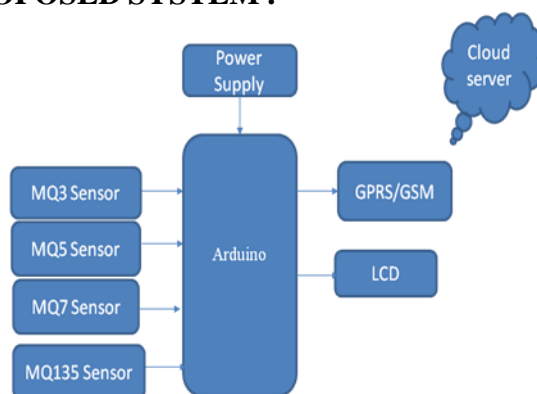
BLOCK DIAGRAM OF PROPOSED SYSTEM :

Fig:4.1- block diagram of proposed method
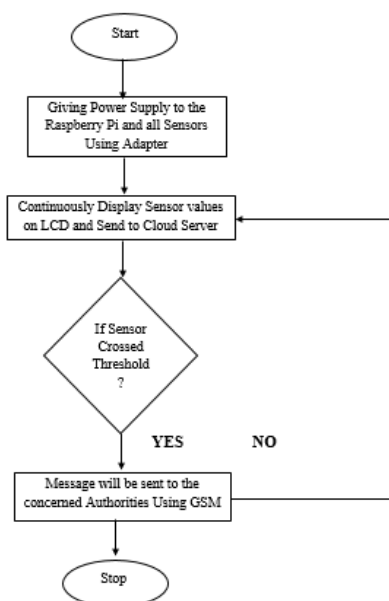
4.2-FLOW CHART FOR PROPOSED METHOD

Fig:4.2- Flow chart of proposed method

V.HARDWARE AND SOFTWARE REQUIREMENTS
## HARDWARE REQUIREMENTS

- **ARDUINO**
- **GSM/GPRS**
- **SENSORS**
  - **MQ3 sensor**
  - **MQ5 SENSOR**
  - **MQ7 SENSOR**
  - **MQ135 GAS SENSOR**
- **LCD**

5.6-SOFTWARE REQUIREMENTS
Arduino IDE:

Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

VI.RESULTS
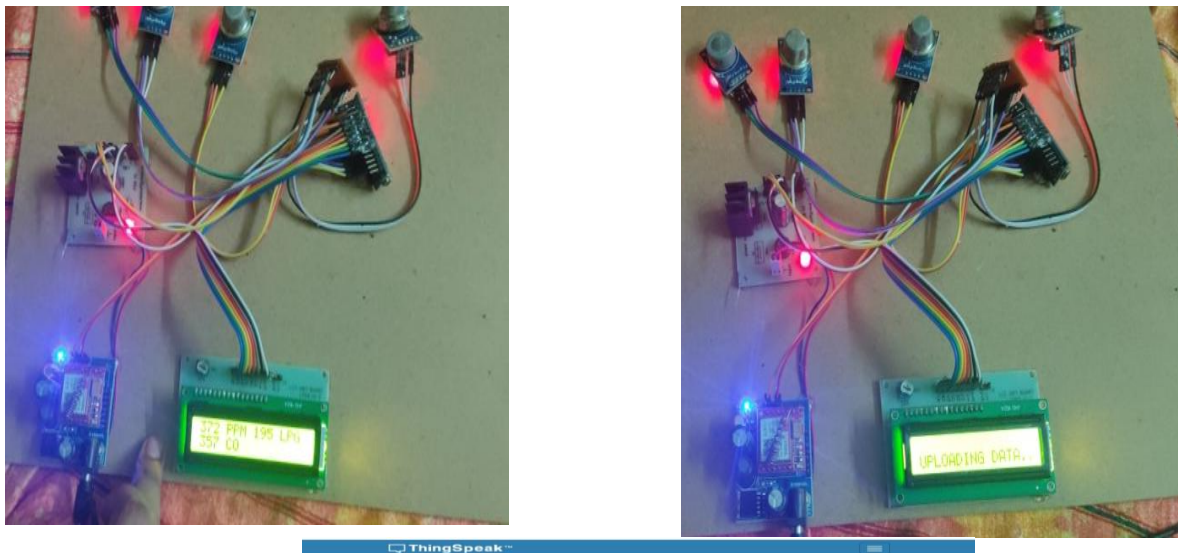
The graphical analysis of the collected values with time on X axis and AirQuality PPM on Y axis. We see the output on LCD screen also.

VII.CONCLUSION

This system includes the sensors that detect the parameters causing pollution. The sensors are NH3, NOx, alcohol, Benzene, smoke, CO2 sensors. Whenever there is an increase in the level of these parameters the sensor senses the situation and an alarm or indication is given. The message is displayed in the LCD display.
 The system to monitor the air of environment using Arduino microcontroller proposed to improve quality of air. Here the using of MQ3, MQ5, MQ7 and MQ135 gas sensor gives the sense of different type of dangerous gas and Arduino is the heart of this project which controls the entire process and LCD is used for the visual Output.

VIII.REFERENCES

1) GSMA, *Air quality monitoring using IoT and big data: a value generation guide for mobile operators*,
   2018,Septembe,2018, HTTPS://WWW.GSMA.COM/IOT/WPCONTENT/UPLOADS/2018/02/IOT_CLEAN_AIR_02_18.PDF.
2) MINISTRY OF ENVIRONMENT, *Investigation results of Ministry of Environment*, MARCH 2019, HTTP://WWW.ME.GO.KR/HOME/WEB/BOARD/READ.DO?BOARDMASTERID=1&BOARDID=727840&MENUID=286.
3) G. PARMAR, S. LAKHANI, AND M. CHATTOPADHYAY, "AN IOT BASED LOW COST AIR POLLUTION MONITORING SYSTEM," IN *2017 International Conference on Recent Innovations in Signal processing and Embedded Systems (RISE)*, BHOPAL, INDIA, OCTOBER 2017.VIEW AT: PUBLISHER SITE | GOOGLE SCHOLAR
4) K. OKOKPUJIE, E. NOMA-OSAGHAE, O. MODUPE, S. JOHN, AND O. OLUWATOSIN, "A SMART AIR POLLUTION MONITORING SYSTEM," *International Journal of Civil Engineering and Technology*, VOL. 9, PP. 799–809, 2018.VIEW AT: GOOGLE SCHOLAR
5) WORLD HEALTH ORGANIZATION, *Air Pollution and Child Health-Prescribing Clean Air*, WHO, GENEVA, SWITZERLAND, 2018, SEPTEMBER 2018, HTTPS://WWW.WHO.INT/CEH/PUBLICATIONS/ADVANCE-COPY-OCT24_18150_AIR-POLLUTION-AND-CHILD-HEALTH-MERGED-COMPRESSED.PDF.
6) G. ROUT, S. KARUTURI, AND T. N. PADMINI, "POLLUTION MONITORING SYSTEM USING IOT," *ARPN Journal of Engineering and Applied Sciences*, VOL. 13, PP. 2116–2123, 2018.VIEW AT: GOOGLE SCHOLAR
7) S. N. KAMARUZZAMAN AND N. A. SABRANI, "THE EFFECT OF INDOOR AIR QUALITY (IAQ) TOWARDS OCCUPANTS ' PSYCHOLOGICAL PERFORMANCE IN OFFICE BUILDINGS," *Journal of Design and the Built Environment,* VOL. 4, NO. 2001, PP. 49–61, 2011.
8) E. P. AGENCY, "AN OFFICE BUILDING OCCUPANTS GUIDE TO INDOOR AIR QUALITY," 1997. [ONLINE]. AVAILABLE: HTTP://WWW.EPA.GOV/IAQ/PUBS/OCCUPGD.HTML.
9) M. G. APTE, W. J. FISK, AND J. M. DAISEY, "INDOOR CARBON DIOXID CONCENTRATIONS AND SBS IN OFFICE WORKERS," *Healthy Buildings, vol.* 1, PP. 133–138, 2000.
10) C. A. ERDMANN, K. C. STEINER, AND M. G. APTE, "INDOOR CARBON DIOXIDE CONCENTRATIONS AND SICK BUILDING SYNDROME SYMPTOMS IN THE BASE STUDY REVISITED: ANALYSES OF THE 100 BUILDING DATASET," *Indoor Air, pp. 443–448, 2002.*
11) S. DE VITO, G. FATTORUSO, R. LIGUORO, A. OLIVIERO, E. MASSERA, C. SANSONE, V. CASOLA, AND G. DI FRANCIA, "COOPERATIVE 3D AIR QUALITY ASSESSMENT WITH WIRELESS CHEMICAL SENSING NETWORKS," *Procedia Engineering, vol. 25, pp. 84–87, Jan. 2011.*
12) CHEMICAL SENSING NETWORKS," *Procedia Engineering, vol. 25, pp. 84–87, Jan. 2011.*
13) ZISHAN KHAN, ABBAS ALI, MOIN MOGHAL, "IOT BASED AIR POLLUTION USING NODEMCU AND THINGSPEAK", IRANS, PP. 11-16, MARCH 2014.
14) SAIKUMAR, M. REJI, P.C. KISHORERAJA "AIRQUALITY INDEX IN INDIA", IEEE CONFERENCE CHENNAI, AUGUST 2014.
15) MOHAN JOSHI, "RESEARCH PAPER ON IOT BASED AIR AND SOUND POLLUTION MONITORING SYSTEM", IETS JOURNAL, PP. 11-17, SEPTEMBER 2015