

IOT Based Air Pollution Monitoring System using Arduino

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Abstract

we are going to make an IOT Based Air Pollution Monitoring System in which we will monitor the Air Quality and monitoring over a web server using internet 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. Quality Assessment will be performed by low cost smart sensors that will be able to collect accurately several quality parameters such as temperature, Physical and chemical etc.

The traditional method of testing, & Temperature is to collect samples manually and then send them to laboratory for analysis. However, it has been unable to meet the demands of quality monitoring today. So, a system of Monitoring of Temperature of quality will be developed. The system consists of Temperature sensor of quality

testing, single-chip microcontroller data acquisition module, information transmission module, monitoring center and other accessories. & Temperature of are automatically detected under the control of single chip microcontroller all day. The sensed data using GPRS modem will send to website, mobileor server and data will be displayed in table form corresponding to each individual sensor, and then processes and analyzes them. If the quality is abnormal, the data will be sent to monitoring center and alert the public through Email ALERT at the same time. It is convenient for management to take corresponding measures timely and be able to detect real-time situation of quality remotely. The main focus is on to construct a low-cost sensor system for real time monitoring of the quality in IOT environment. Previously we have built the LPG detector using MQ6 sensor and Smoke detector using MQ2 sensor but this time we have used MQ9 sensor which is the best choice for monitoring Air Quality as it can detects most harmful gases and can measure their amount accurately. In this IOT project, you can monitor the pollution level from anywhere using your computer

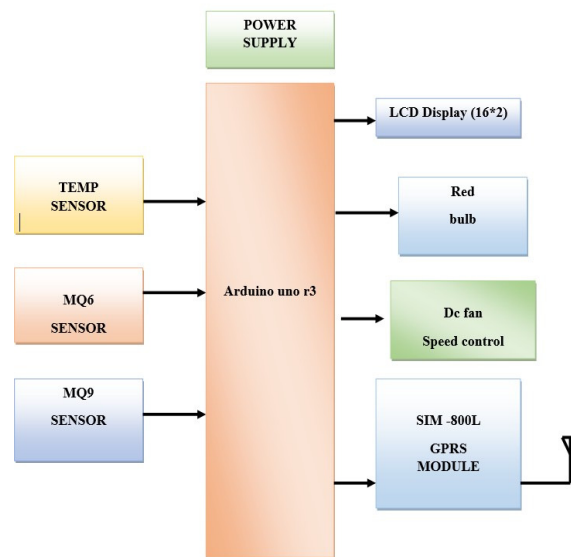
or mobile. We can install this system anywhere and can also trigger some device when pollution goes beyond some level, like we can switch on the Exhaust fan or can send alert to the user

INTRODUCTION

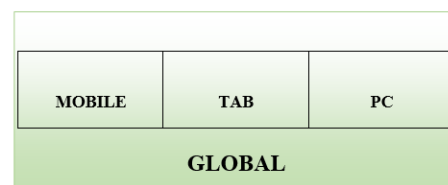
Air pollution is the biggest problem of every nation, whether it is developed or developing. Health problems have been growing at faster rate especially in urban areas of developing countries where industrialization and growing number of vehicles leads to release of lot of gaseous pollutants. Harmful 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 Pollution Monitoring System monitors the Air quality over a web server using Internet and will trigger an alert 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 gas rate. The system can be installed anywhere but mostly in industries and houses where gases mostly to be found and gives an alert message when the system crosses threshold limit. 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 webserver using internet and will trigger an alert when the air quality goes down

beyond a certain level, means when there are amount of harmful gases present in the air like CO, CH₄, 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 gas rate is detected and monitored in the system.

Block diagram:



RECEIVER SECTION ----- IOT WEB SITE



LPG gas is detected using MQ6 sensor and MQ9 sensor is used for monitoring Air Quality as it detects most harmful gases and can measure their amount accurately. In this IOT project, it can monitor the pollution level from anywhere using your computer or mobile. This system can be installed anywhere and can also trigger some device when pollution goes beyond some level, like we can send alert SMS to the user.

WORKING

Proposed Air Pollution Monitoring System is based on the block diagram. The data of air is recognized by MQ9 gas sensor and MQ6 LPG, iso-

butane, propane gas sensor. The MQ9 sensor can sense CH₄, LPG, CO. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. So it is dynamic gas sensed 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). MQ9 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 MQ9 gas sensor and MQ6 sensor. Sensor is giving us the air quality safe level is 200 PPM and it should 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 data. When the value will increase from 200 PPM, then the bulb will start lighting and the LCD and webpage will display data. And when it will increase, the bulb will keep lighting and give an alert message on smartphone through GSM. The LCD and webpage will display data. It will contain temperature and gas rate so it will possibly show the current temperature and gas rate of the air. For temperature we have used LM35 sensor and for gas measurements we have used MQ6 and MQ9. According to the model the 3 sensors work as input data, they transmit data for knowing which gas it is, what is the temperature and gas. LCD, fan and bulb are the output devices. LCD shows the data of the gases in ppm (parts per million) and Bulb, fan is used when ppm crosses above a threshold limit.

Hardware Description

- ARDUINO UNO R3
- TEMP SENSOR
- MQ6 SENSOR
- MQ9 SENSOR
- SIM800L MODEM
- 16X2 LCD DISPLAY
- TERMISTER SENSOR
- Dc fan speed control

- Red bulb
- Relay

Software

- ARDUINO UNO R3
- EMBEDDED C language.

Advantages

- Accurate Pollution Monitoring
- Sensors are easily available
- Detecting a wide range of gases like CO and LPG etc.,
- Updates On mobile phone directly
- Remote Location Monitoring
- Fast Response

CONCLUSION

The smart way to monitor environment and air pollution being a low cost but efficient and embedded system is presented in this paper. In the proposed architecture functions of different sensors and their working procedure were discussed. How they work, their functionality, their optimal uses and their data taking procedures and comparison with standard base data's are also discussed here. The air pollution monitoring system was tested for monitoring the gas levels. It also sent the sensor parameters to the data server. Our project device showed that it is effective and cheap and with some highly working sensors it can really be a reliable one to everybody and its data's will be a key to take some necessary steps for the betterment of the society as it will help to identify the affected area so that we can take early steps to reduce damages for the next generation.

REFERENCES

- [1] IOT based air pollution monitoring system using Arduino by **Muhammad Aqib**

- [2] Air pollution monitoring using IoT by **Sunil Mahesh P** IJARIE-ISSN(O)-2395-4396(Vol-4 ,2018).
- [3] Arduino and Sensor Based Air Pollution Monitoring System Using IOT by **Yerigeri.V** (IRJET-2020-Vol:7).
- [4] IoT based simple Air pollution monitoring system by **vishnutheerth**.
- [5] <https://store.arduino.cc/arduino-uno-rev3>.
- [6] <https://arduino.cc/>
- [7] Riteeka Nayak, Malaya Ranjan Panigrahy , Vivek Kumar Rai and T Appa Rao:IOT based air pollution monitoring system Vol-3, Issue-4, 2017.
- [8] Navreetinder Kaur , Rita Mahajan and Deepak Bagai: Air Quality Monitoring System based on Arduino Microcontroller Vol. 5, Issue 6, June 2016.
- [9] Palaghat Yaswanth Sai: An IoT Based Automated Noise and Air Pollution Monitoring System Vol. 6, Issue 3, March 2017.
- [10] 1 L.Ezhilarasi, 2 K.Sripriya, 3 A .Suganya , 4 K.Vinodhini .: A System for Monitoring Air and Sound Pollution using Arduino Controller with IOT Technology Vol. 3 Issue 2 (2017) Pages 1781 – 1785.
- [11] Exploring Arduino : Tools and Techniques for Engineering Wizardry by Jeremy Blum 1st edition.
- [12] <https://www.w3schools.com/html/>.
- [13] <https://www.tutorialspoint.com/html/>.
- [14] <https://www.w3schools.com/php/>.
- [15] <https://www.phptpoint.com/>.
- [16] https://www.youtube.com/watch?v=NMSIQjm2row&ab_channel=HelpPeople.
- [17] https://www.tutorialspoint.com/arduino/arduino_board_description.htm
- [18] Dr. Siva yellampalli, "IOT Based Air and Noise Pollution Monitoring in Urban and Rural Areas, Important Zones like Schools and Hospitals in Real Time" , Volume 1, Issue 5, May 2017
- [19] L.Ezhilarasi, K.Sripriya, A .Suganya , K.Vinodhini "A SYSTEM FOR MONITORING AIR AND SOUND POLLUTION USING ARDUINO CONTROLLER WITH IOT TECHNOLOGY" , VOL 3 ISSUE 2 (2017), March 23, 2017
- [20] SRM.ArthiShri, NB.Keerthana, "Noise and Air Pollution Monitoring System Using IOT".
- [21] K.Nirosha, B. Durgasree, N. Shirisha,IOT Based Air Pollution Monitoring System, \International Journal of Current Engineering and Scientific Research (IJCESR)",MLR Institute of Technology,issn (print): 2393-8374, (online): 2394-0697, volume-4, issue-6,2017.
- [22] Snehal Sirsikar, Priya Karemore,\Review Paper on Air Pollution Monitoring system",International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 1, January 2015.
- [23] Sukwon Choi, Nakyoung Kim, Hojung Cha and Rhan Ha,\Micro Sensor Node for Air Pollutant Monitoring: Hardware and Software Issues",sensors ISSN 1424-8220 www.mdpi.com/journal/sensors,Sensors 2009.
- [24] V. N. N. K. Chaitali Bagwe, Vidya Ghadi, "IOT based gas leakage detection system with database logging, prediction and smart alertingreview, "International Conference on Innovative and Advanced Technologies in Engineering, Vol. 1, 2018.
- [25] S. B. V. K. U. A. S. K. Vasudev Yadav, Akhilesh Shukla, "Microcontroller based LPG gas leakage detector,"Microcontroller based LPG Gas Leakage Detector, Vol. 2, 2016.
- [26] Y. Justin Dias, P. Jeyanthi, " Environmental Pollution Monitoring System Using Internet of Things (IoT) " Journal of Chemical and

Pharmaceutical Sciences 2018, Vol .10, Issue3, July-September 2017

[27] Al-Ali, A.R., Zualkernan, I. and Aloul, F., 2010. A mobile GPRS-sensors array for airpollution monitoring. IEEE Sensors Journal, 10(10), pp.1666-1671.

[28] . Navreetinder Kaur, Rita Mahajan, and Deepak Bagai, "Air Quality Monitoring System based on Arduino Micro controller" International Journal of Innovative Research in Science Engineering and Technology, vol.5 Issue 6 June 2016

[29] L. K. S. Rohan Chandra Pandey, Manish Verma, "Internet of things (IOT) based gas leakage monitoring and alerting system with MQ-2 sensor, "International Journal of Engineering Development and Research, Vol. 5, 2017

[30] V. N. N. K. Chaitali Bagwe, Vidya Ghadi, "IOT based gas leakage detection system with database logging, prediction and smart alertingreview, "International Conference on Innovative and Advanced Technologies in Engineering, Vol. 1, 2018