

TASK 1 (Literature review)

1) Problem Statement Understanding:

The major cause of air pollution in cities is due to vehicles. Vehicular pollution leads to a vital increase in the emission of loads of myriad toxins into the environment. The commercial systems available in the market are devices that use the semi-conductor sensors at the smoke emission outlets of vehicles and this system detects the pollutant levels and also indicates this level to the owner of the vehicle with a meter. When the pollution level increases beyond a particular threshold level, the alarm will start ringing in the vehicle to indicate that the limit has been attained and the vehicle will automatically stop running after a certain time [1][2]. This type of individual usage system does not help the public to get into an awareness zone. Bharat stage emission standards are the emission standards set by the Indian Government to regulate air pollutants from internal combustion engines in motor vehicles. Also over the years, several regulations have been made by the Government to regulate and reduce the emission from vehicles but in vain. Also, other cost-effective measures were introduced to control air pollution by calculating the levels of every pollutant [3][4][5]. Based on the observed values, the air quality index for that region is calculated and the values are made available through a web page. But the main disadvantage of this system is that users are not provided with a portable application to view pollution levels then and there and also a pictorial format is missing for easy view [7][8].

A real-time air pollution monitoring system was developed which measures the levels of almost all the pollutants with good accuracy [6]. Libelium wasp nodes are used for wireless communication and the data is displayed through a web interface both in a chart and numerical format. But the usage of these libelium wasp nodes has resulted in the production of an expensive system for public usage as it consumes more energy from the batteries [4][10].

Further, a low-cost wireless monitoring system was developed to measure the levels of harmful gases based on a multilayer distributed model using the Arduino platform. In addition, to achieve data transmission, a software component was built using the C/C++ language. The data is collected and sent to a webpage to make the data available in real-time. The system is quite complicated since various software languages have been used in this system i.e C/C++ for conversion of analog data to digital form [10][11].

The air pollution monitoring system is installed in a particular locality where there are traces of acute air pollution to detect the constituent gases of air

which may lead to harmful effects on human health and other living beings. This system uses Arduino and several gas sensors to predict the level of various harmful gases like CO, NH₃, particulate matter, and smoke. Carbon Monoxide is given the highest preference, as it is a greenhouse gas and a major pollutant that is warming the earth. The previous products did not have the advantage of getting the pollution rates up to date. So to overcome this, an android app is used, which the public can install to get regular updates on the quality of air in the area they live.

2)Software and Hardware Requirement:

Software:

- + Arduino
- + Proteus
- + C programming

Hardware:

+ MQ135 gas sensor:

The MQ135 sensor can sense NH₃, NO_x, alcohol, Benzene, smoke, CO₂ like gases. (Range- 10~1000ppm)

+ Temperature sensor LM35:

The LM35 is a precision integrated-circuit temperature sensor, whose output voltage is linearly proportional to the Celsius temperature. (Range -55°C to 150°C).

+ Humidity sensor SY-H5220:

The humidity sensor is of a capacitive type, comprising an on-chip signal conditioner.

(DC 1.980 mV (at 25°C,60%RH))

Wifi module:

The ESP8266 Wifi module is a complete WiFi network where you can easily connect as a serving Wi-Fi adapter, wireless internet access interface to any microcontroller.

Lcd 16x2:

To display air quality in ppm.

3)Additions And Updates:

- a) Buzzer (It will beep when air quality goes too high)
- b) We can develop an android app.

4)Applications:

IoT Based Air Pollution Monitoring System monitors the Air Quality over a web server using the internet and will trigger an alarm when the air quality goes down beyond a certain level, which means when there are amount of harmful gases present in the air like CO₂, smoke, alcohol, benzene, NH₃, NO_x.

5)Advantages:

Sensors are easily available. Detecting a wide range of gases like CO₂, CO, etc. Simple, compact, and easily handle. Continuous update of change in percentage of quality.

6)Conclusion:

The paper proposes real-time monitoring of air pollution at various locations and zones in India. The IoT system designed measures pollution in real-time at any desirable location and hence is cost-effective when compared to the existing system of stationary monitoring. It also avoids the problem of inconsistent pollution values. The user interface helps people to know the pollution level in a certain area and the health hazard associated with it. People with specific allergies can refrain from visiting the place and hence be free from air-prone health hazards. The system is scalable and supports any

number of IoT devices that may be deployed since it's based on a cloud platform. The interface supports all operating systems too.

7) References:

- [1] Ramagiri Rushikesh and Chandra Mohan Reddy Sivappagari, "Development of IoT based Vehicular Pollution Monitoring System", International Conference on Green Computing and Internet of Things (ICGCIoT),2015.
- [2] Siva Shankar Chandrasekaran, Sudharshan Muthukumar and Sabeshkumar Rajendran, "Automated Control System for Air Pollution Detection in Vehicles", 4th International Conference on Intelligent Systems, Modelling and Simulation,2013.
- [3] Akshata Tapashetti and Divya Vegiraju, "IoT-Enabled Air Quality Monitoring Device - A Low Cost Smart Health Solution",IEEE Global Humanitarian Technology Conference,2016.
- [4] Marin B. Marinov, Ivan Topalov, Elitsa Gieva and Georgi Nikolov, "Air Quality Monitoring in Urban Environments", 39th International Spring Seminar on Electronics Technology (ISSE),2016.
- [5] Neha R. Rewatkar,Prof. Deepali M. Khatri, "A Review: Cost Effective IOT Based Air Pollution Monitoring and Air Quality Analysis", International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169,Volume: 5 Issue: 1,2017
- [6] Khaled Bashir Shaban, Senior Member, IEEE, Abdullah Kadri, Member, IEEE, and Eman Rezk,"Urban Air Pollution Monitoring System",With Forecasting Models, IEEE Sensors Journal, Vol. 16, No. 8, April 15, 2016.
- [7] Santosh G Bhandarakawathe, Prof.S. B. Somani, "A Survey on WiFi Based Air Pollution Monitoring System", International Journal of Innovative Research in Computer and Communication Engineering Vol. 5, Issue 3, March 2017
- [8] Kgopotjo Simon Elvis Phala, Anuj Kumar, and Gerhard P.Hancke, "Air Quality Monitoring System Based on ISO/IEC/IEEE 21451 Standards" ,IEEE Sensors Journal, Vol. 16, No. 12, June 15, 2016
- [9] Dongyun Wang, Chenglong jiang, Yongping Dian, "Design of air quality monitoring system based on internet of things",10th International Conference

on Software, Knowledge, Information Management & Applications (SKIMA),2016

[10] Ch.V.Saikumar, M.Reji P.C.Kishoreraja , “IOT based Air Quality Monitoring system”,International Journal of Pure and Applied Mathematics Volume 117 No. 9 2017, 53-57

[11] Navreetinder Kaur,Rita Mahajan ,Deepak Bagai, ” Air Quality Monitoring System based on Arduino Microcontroller”,International Journal of Innovative Research in Science,Engineering and Technology Vol. 5, Issue 6, June 2016

[12]<https://circuitdigest.com/microcontroller-projects/iot-air-pollution-monitoring-using-arduino>.

[13]<https://ijarcce.com/upload/2017/march-17/IJARCCE%2097.pdf>

[14]https://www.gsma.com/iot/wp-content/uploads/2018/02/iot_clean_air_02_18.pdf