

Monitoring of Air Pollutant and Noise Pollution Level Using IOT-A Review

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Abstract - Air and noise pollution is a growing issue these days. Most of the cities in developing and developed countries are suffering from adverse effect of it. Therefore, it is necessary to monitor air and noise quality and keep it under control. To overcome this, we proposed a pollution monitoring system that allows to check and monitor the live air quality and noise level in a particular area using IoT. This system detects the gaseous pollutant like CO₂, PM10, NO₂, Air Quality Index (AQI) and sound intensity. Also, the temperature and humidity of the surrounding is measured. These data is collected by respective sensor devices. The cloud-based monitoring module processes the data and transmits the data over the application with the help of Wi-Fi module. The data is collected periodically which may be helpful for pollution control measures, government organizations and also available to common users.

Index Terms - Air pollution and sound level monitoring, IoT, Air Quality Index, Sensor Devices.

1.INTRODUCTION

Air pollution rate has increasing day by day due to urbanization, industrialization and other activities. Many cities across India are facing issues of poor air quality which were not meeting their standards of air for healthy living. Gaseous pollutant is a major cause of infections, allergies, various kind of respiratory infections and also the reasons of death to some people. It also harms the existing creatures like animal, food crops, water bodies, historical places, monuments, ecology, etc. The air pollutants are also responsible for environment calamities such as acid rain, depletion of ozone layer and greenhouse effect. [3]

Noise is something unwanted, unpleasant sound that causes discomfort for all living beings. Exposure to

loud and intense sound for prolong period cause temporary hearing loss to permanent health disorder such as headache, nausea, insomnia, vomiting, coma and may cause death in some cases. Intensity of sound is measured in terms of pressure and expressed in decibel (dB). For a person with normal hearing, when it comes to pitch the human hearing range starts low at about 20 Hz. That's about the same as the lowest pedal on a pipe organ. On the other side of the human hearing range, the highest possible frequency heard without discomfort is 20,000Hz. While 20 to 20,000Hz forms the absolute borders of the human hearing range, our hearing is most sensitive in the 2000 - 5000 Hz frequency range. As far as loudness is concerned, humans can typically hear starting at 0 dB. Sounds that are more than 85dB can be dangerous for your hearing in the case of prolonged exposure.

Table 1 Standard Noise Level Limits in Different Areas

Area Code	Category of Area	Limits on dB (A) Leq	
		Day Time (6:00 AM to 10.00PM)	Night Time (10.00PM to 6.00AM)
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

1.1 Internet of Things (IOT)

“IoT is a network of physical objects or the devices that are connected to each other. These devices collect the data and publish it among themselves using internet.” IoT plays a major role in development of pollution monitoring system and also the efficient way to monitor the pollution level periodically in a particular area. IoT and connected module will help to analyse the level of pollution. Through this data the steps may be initiated to control the pollution which

will further results in reducing the effects of pollution on human health, living being and surrounding environment.

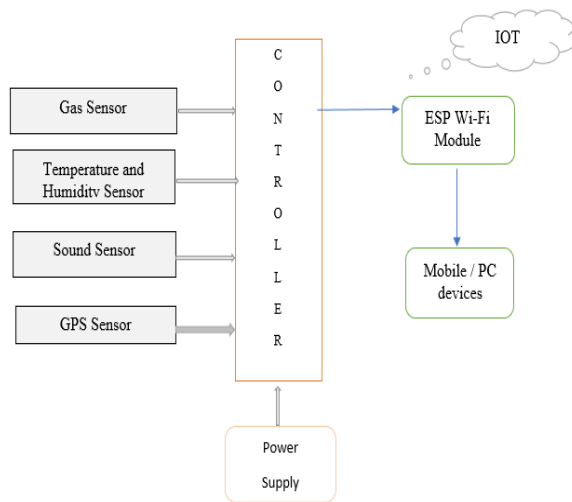


Fig. 1 Block Diagram of Monitoring System

2. LITERATURE REVIEW

Kaushik Vipul R. et.al. (June-2019) Explain the units of hardware and software used in the air and sound pollution monitoring system along with the modelling through the working of components used in IoT monitoring system. Conclude that it is easy to use as compare to practical method.[1]

Lalit Mohan Joshi et.al. (November-2017) In this paper a solution to monitor air and noise pollution level in industrial environment by using wireless embedded computing system to design and implement an adequate monitoring system through which the pollution parameters are monitored in a particular area is proposed. To predict the behaviour the data of CO and noise level is collected by keeping sensor devices at different location.[2]

Md. Abdullah Al Ahasan (July-2018) Arduino based air pollution detector with small sized with reliable stability, rapid response recovery and minimum cost sensor to an Arduino micro-controller unit is proposed to collect the data of air pollutants like CO₂, CO, SO₂ at a distance of 3m,6m,9m and 12m by using mosquito coil, motorcycle smoke, cigarette smoke.[3]

Shambhavi Chaturvedi et.al. (August-2021) proposed Air quality and sound level monitoring system that

allow to monitor and check live air quality in a particular area through IoT. CO, CO₂, SO₂ and noise levels were tested in four areas of Visakhapatnam. Wi-Fi network adaptor, motion sensor, raspbeberry-pi which processes the collected data and upload on the web over the application. For a particular area it is analysed and continuous monitoring is not performed.[4]

Arnab Kumar Saha et.al. (2018) Air quality index and noise intensity monitor by the IoT based technology comprising of AQI monitoring module, sound intensity detection module and anomaly notification module. It is low cost, precise and efficient method of monitoring. In further addition to the concept of machine learning may be applied to forecast the possible environment data.[5]

Nanda M B, Madhura K et.al. (July-2020) The air quality monitoring carried out by MQ-135, sound intensity with the help of LM393 sensor. Threshold values are set in storage unit notification module sends the notification to the authorized user with location of the system and it may be implanted in remote and industrial areas where the bulky equipment cannot be placed.[6]

Martina Marjanovic, Sanja Grubesa et.al. (September-2017) The mobile crowdsensing solution (MCS) for air quality and noise pollution monitoring is carried out in city of Zagreb, Croatia in residential and business area on CO₂, NO₂, Noise, temperature, and humidity from practical experience, sensor calibration to data acquisition and analysis. Conclude that air and noise pollution are significantly higher during peak hours.[7]

Prof. Smita Agrawal, Prof. Parita Oza et.al. (2017) The paper given an idea to monitor noise pollution using IoT technique area taken through which the environment gets affected is noted such as industrial zone, commercial area or the major cities of area. Arduino controller used to record and process data.[8]

Palaghat Yaswanth Sai (March-2017) To check and monitor the live air quality, sound pollution the system is designed through IoT which uses air sensors and sound sensor in surrounding atmosphere and continuously transmit the data on LCD and display on

online server with Wi-Fi module. The data collected and analysis results will be available to end user and if system detects the air quality and noise issues it alerts the authorities.[9]

A. D. Sonawane et.al. (2021) propose an air quality as well as sound pollution monitoring system that allow to monitor and check live air quality as well as sound pollution monitoring in particular areas through IOT System uses air sensor to detect or sense presence of harmful gases, compounds in the air and constantly transmit data to microcontroller. Also, system keeps measure sound level and report it to the online server over IOT. It is user friendly and easy handling.[10]

Earthea Nance (2021) Mobile monitoring was found to best capture the variability of PM_{2.5} during the disaster, research contributes to understanding the effects of PM_{2.5} on mortality during a disaster. Its suggested real-time monitoring and mobile monitoring. [11]

Nicolas Renard (2015) only 8 of 74 cities monitored by China's Ministry of Environmental protection met air quality standards and world's largest emitter of carbon dioxide (CO₂). China established a national air quality monitoring system divided into national and local-level networks. China faces problems related to: the use and dissemination of information, the link between air quality management data and policy making, the credibility of data.[12]

Lomate Varsha (2015) Studies on air quality of Maharashtra 6 districts ambient air quality data is collected during 2013-14 and analyzed NO₂ is more than limit in pune and Mumbai SO₂ within limit and Amravati do not show any change in 2013 and 2014.[13]

Anjalah Guthi (July 2017) Noise and Air pollution monitoring using IoT. The proposed system Sends the sensor values to the cloud and update the status of pollution but There is no preventive action had taken.[14]

Somansh kumar (Nov-19) Air quality monitoring system using Raspberry-pi Sending the data to the cloud using Raspberry-pi. Monitoring the pollutants level and alerts the authorities. [15]

Ms. Aarthi, Karan Kapoor et.al. (October-2018) The air and sound pollution monitoring devices can be access by the each and every people curious about the pollution level. The system will show the pollution level through the application installed in the mobile device. They were selected four types of sensors and collected data is latched in microcontroller, then after by the Wi-Fi module connect microcontroller to the access point and then finally upload the data to the channel. [16]

V.Kameshwaran, Ms. Radhika Baskar (2018) The proposed system is connected to the IoT platform sensor node is implemented with Raspberry pi board and microsensors interact with among them and process the data and transmit over the application. This system makes use the authority to monitor the live air and noise levels.[17]

Kuruva Peddaiah, Shri. Ravi Shankar (2021) The target of the project is utilizing different sensors, GSM/GPRS module and cloud server to plan a productive and remote system to observe the various pollutant causing pollution with live updates to stay away from conflicts.[18]

P. V. Hari Prasad, Garimella Keerthana et.al. (July-2021) An efficient implementation for internet of things (IoT) is employed for monitor to temperature and humidity using thermistor for sensing temperature and humidity sensing element for humidity. The system observe environment using Arduino microcontroller, WSN & GSM technology is proposed to enhance quality and method of monitoring. [19]

3. CONCLUSION

The concept of IoT used in the system is a step taken toward to monitor and analyse the gaseous pollutant, particulate matter, temperature, humidity and sound intensity. some of the system uses GPS to detect location and warning system to alert related authorities and alarm if it exceeds above certain limit such that people should get continuously update about their surrounding environment of air quality, humidity, temperature and noise intensity levels.

The IoT based pollution monitoring system uses the network connectivity, remote sensing, Wi-Fi module, sensor devices by which it becomes reliable. The

sensor used are small sized, easily available, portable, easy to handle, low cost with continuous update of change in quality of surrounding and can be checked indoor as well as outdoor. The data stored in the cloud (Google Spread Sheet) used to analyse the various threats, patterns, polluted areas, hours of peak emulsion of gases in different areas of city, pollution of industrial zone and environment fluctuations.

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