CLOUD BASED AIR AND SOUND POLLUTION MONITORING SYSTEM WITH TEMPERATURE AND HUMIDITY SENSING

Dr.M.Abhilash Kumar Reddy, P.Sudhakar Rao

Faculty, AVN Institute of Engineering and Technology, Hyderabad

Sneha.G, Nandhini.J, Likhitha.E, ShivaLeela.E

UG Scholar AVN Institute of Engineering and Technology, Hyderabad

Aim:

Air and sound pollution is a growing issue these days. It is necessary to monitor the air and sound pollution levels to ensure a healthy and safe environment.

Problem Statement

With the rapid increase in infrastructure and industrial plants, environmental issues have greatly influenced the need of smart monitoring systems. Due to its low cost, high efficiency and versatility, Internet of Things (IoT) has become very popular now these days. Internet of Things (IoT) allows interaction between devices and humans. It forms a communication medium from human to machine

Abstract

In recent day scenario, the incessant increase in air and sound pollution prove to be an alarming problem. It has become mandatory to control and appropriately monitor the situation so that the required steps to curb the situation can be undertaken. In this project, an IOT-based method to monitor the Air Quality Index and the Noise Intensity of a region, have been proposed. The recommended technology comprises of four modules namely, the Air Quality Index Monitoring Module, the Sound Intensity Detection Module, the Cloud-based Monitoring Module and the Anomaly Notification Module. Firstly, the Air Quality Index is measured considering the presence of the five criteria air pollutants. Then the sound intensity is detected using respective sensor. After that, the Cloud-based Monitoring Module ensures the process of acquiring the data with the help of Wi-fi-module present in Raspberry Pi which fulfils the objective of analysis of information on a periodical basis. Finally, the Anomaly Notification Module alerts the user in case of an undesired condition.

1. Introduction

Air quality in most of the cities in India has drastically decreased in recent years. Other than the common pollutant like Carbon Dioxide (CO2), many newer pollutants like Nitrogen Dioxide(NO2), Sulphur Dioxide(SO2), Carbon Monoxide(CO) also has been added into the atmosphere. Most of the pollutants have harmful effects on our health. But CO is more hazardous. It is called as “Silent Killer” because it takes life quietly and quickly. It directly enters into blood and replaces the oxygen molecules thus depriving the brain and heart of necessary oxygen to function. If it is present in the air, it quickly goes into the blood causing symptoms like headache, flu, nausea, dizziness, confusion etc. As the level increases, person may get vomiting, unconsciousness and if exposure is too long it may result in damage of brain or death.

2. Literature Review

First, L.Ezhilarasi et al. have proposed a monitoring technique using a Zigbee wireless sensor network to monitor the various environmental parameters. It uses RFID means to store and retrieve data through

electromagnetic transmission to an RF integrated circuit. The WSN gateway method is used to conveniently collect the data at any time and place

Mahantesh B Dalawai et al. in their paper have used a GPRS/GSM module and a web server to efficiently monitor the various pollution levels. In the module the smoke sensor and noise sensor will upload the data to the server or cloud at every instant of time so that the pollution level can be monitored using the internet.

Arushi Singh et al. have proposed a system which uses air and sound sensors to monitor the data constantly and then transmit the data. A raspberry pi module interacts with the sensors and processes the data thereby transmitting it to the application

Dr. A Sumithra et al. have proposed the concept of a smart city. Technology and communication is the basis of this smart city. Various sensors and modules have also been used to monitor the various environmental parameters. This system uses air and sound sensors to monitor the data and then upload the data on the cloud server as digital data. The cloud storage managers analyze the data and notify accordingly

Mohannad Ibrahim et al. have proposed the design of a cost effective environmental monitoring device using Raspberry pi. The information is collected by the sensors and uploaded to the internet where it could be accessed anytime. The system was found to be accurate in terms of measuring humidity, temperature etc

Giovanni B. Fioccola et al. have proposed Polluino, an Arduino based air pollution monitoring system. The data is then uploaded to a cloud based platform which manages the data coming from the sensors.

SRM. ArthiShri et al. have proposed the idea of monitoring the parameters using a PIC microcontroller which senses the atmosphere signals. Gas sensors are used to measure the pollution level. This data is uploaded on the internet and can also be viewed through an app

Seung Ho Kim et al. have designed a monitoring system that uses an environmental parameter analyzer and sends the results in a server through a LTE communication network. The resulted data was compared with the data obtained by the National Ambient air quality Monitoring Information System (NAMIS)

Somansh Kumar et al. have given the idea of a real-time air quality monitoring system including various parameters like P.M. 2.5, CO2

3. Existing System

D.J. Briggs et al. [1] have developed a methodology that maps traffic related air pollution within GIS environment. They have considered NO2 in Huddersfield, Prague and Amsterdam. Theirs results show good predictions of pollution levels.

V. Singh et al. [2] have proposed a system that estimates and interpolates daily ozone concentrations. This approach is based on a technique called cokriging.

In [3], M Mead et al. have deployed the sensor nodes in static network in the Cambridge (UK) area and mobile network. They have provided the results for quantification of personal exposure.

P. Dutta et al. [4] have proposed system where individual can measure their personal exposure using participatory sensors then groups to summarize their members' exposure.

K Hu et al. [5] have collected urban air pollution data with high spatial density by using many software applications and hardware devices. They have devised a web based tool and mobile app for the estimation and visualization of air pollution. Their system shows accurate exposure than the current systems.

V. Sivaram et al. [6] developed a project that uses many mobile sensors attached to vehicle to measure the air pollution concentration. The collected data is uploaded to user's mobile. Afterwards pollution maps are created that show the exposure history and accordingly the route can be planned to reduce the future exposure.

K B Shaban et al. [7] developed a system that uses motes equipped with gaseous and meteorological sensors. These communicates to an intelligent sensing platform that comprises of various modules. Mainly four modules have been used for receiving data, preprocessing and converting the data into meaningful information, predicting the pollutants and presenting the information through short message services, web portal and mobile app. They used three ML algorithm namely Support Vector Machine, MSP Model trees and Artificial Neural Networks.

D Hasenfratz et al. [8] have collected the measurements for more than a year through mobile sensor nodes. These nodes were installed on top of public transport vehicles in Zurich (Switzerland). From this obtained data, they developed regression models that create pollution maps with high resolution of 100m

Ke Hu et al. [11] have introduced a machine learning model that takes fixed station data and mobile sensor data and then estimate the air pollution for any hour on any given day in Sydney city. They have used seven regression models and ten-fold cross validation.

Arnab Kumar Saha et al. [12] have used have used cloud based Air Pollution Monitoring Raspberry Pi controlled System. They measured Air Quality Index based on five criteria pollutants, such as particulate matter, ground level ozone, Sulphur Dioxide, Carbon Monoxide and Nitrogen Dioxide using Gas Detection Sensor or MQ135 Air Quality.

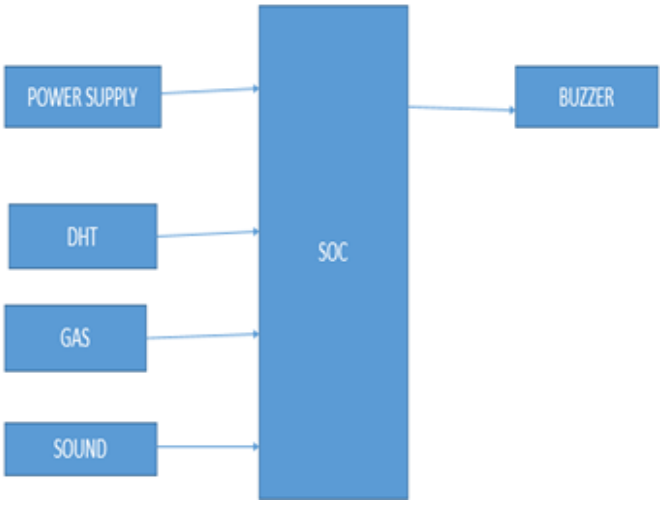
Kavitha B C et al. [13] have deployed various IoT sensors on the industrial floor to collect the data and implemented a pollution monitoring system

A Orun et al. [14] have used artificial intelligence technique such as Bayesian Networks to establish relation between traffic and traffic related air pollutants.

Nitin Sadashiv Desai and John Sahaya Rani Alex [15] have measured CO and CO2 level in the air with GPS by using pollution detection sensor and uploaded into Azure Cloud Services.

E Suganya and S Vijayashaarathi [16] have proposed a system that uses Mobile Ad Hoc Network routing algorithm and monitors the travelling vehicles by using number of sensors. The collected data is stored in cloud network to access the information about levels of pollution.

4. Block Diagram



An IOT-based method to monitor the Air Quality Index and the Noise Intensity of a region, have been proposed. The recommended technology comprises of four modules namely, the Air Quality Index Monitoring Module, the Sound Intensity Detection Module, the Cloud-based Monitoring Module and the Anomaly Notification Module. Firstly, the Air Quality Index is measured considering the presence of the five criteria air pollutants. Then the sound intensity is detected using respective sensor. After that, the Cloud-based Monitoring Module ensures the process of acquiring the data with the help of Wi-fi-module present in Raspberry Pi which fulfils the objective of analysis of information on a periodical basis. Finally, the Anomaly Notification Module alerts the user in case of an undesired condition.

5. Conclusion

Humans are considered responsible for this polluted and dangerous environment. This is a major concern for the whole world. Thus, a smart way to monitor the various environmental parameters using a Raspberry Pi module has been discussed in this paper. The concept of IoT helps improve the quality of air, monitor the level of noise, temperature and humidity [12][13].It is a low-cost, precise and efficient method of monitoring. The monitoring of accumulated data in the cloud storage helps to analyze the various patterns in the environmental parameters and accordingly notifies the public.

Future Work Many possible solutions have been highlighted in this paper, as to how we can monitor air and sound pollution levels along with humidity and temperature using Internet of Things. Our proposed model gives us real -time data so that we can analyze the environmental parameters. We would like to implement the concept of machine learning soon so that we can forecast the possible environmental data. It gives an estimate of the upcoming weather conditions and creates an awareness amongst the public

Reference

[1] L.Ezhilarasi, K.Sripriya, A .Suganya, K.Vinodhini, " A System For Monitoring Air And Sound Pollution Using Arduino Controller With Iot Technology." , International Research Journal in Advanced Engineering and Technology (IRJAET)

[2] Mahantesh B Dalawai, Siva Yellampalli, Pradeep S.V, "IOT Based Air and Noise Pollution Monitoring in Urban and Rural Areas, Important Zones like Schools and Hospitals in Real Time.", International e-Journal for Technology and Research-2017.

[3] Arushi Singh, Divya Pathak, Prachi Pandit1, Shruti Patil, P Priti. C. Golar , "IOT based Air and Sound Pollution Monitoring System." International Journal of Advanced Research in Electrical,

[4] A. Sumithra, J.Jane Ida, K. Karthika , S. Gavaskar, "A Smart Environmental Monitoring System Using Internet Of Things." International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2, Issue-3, March 2016

[5] Mohannad Ibrahim , Abdelghafor Elgamri , Sharief Babiker . Ahmed Mohamed, "Internet of things based smart environmental monitoring using the Raspberry-Pi computer." Fifth International Conference on Digital Information Processing and Communications (ICDIPC), 2015 [6] Giovanni B. Fioccola , Raffaele Sommese, Imma Tufano, Roberto Canonico, Giorgio Ventre, " Polluino: An efficient cloud-based management of IoT devices for air quality monitoring." IEEE 2nd International Forum on Research and Technologies for Society and Industry Leveraging a better tomorrow (RTSI), 2016

[6] SRM.ArthiShri, NB.Keerthana, S.Sandhiyaa,P.Deepa, D.Mythili," Noise and Air Pollution Monitoring System Using IOT." SSRG International Journal of Electrical and Electronics Engineering– (ICETM-2017) - Special Issue- March 2017.

[7] Seung Ho Kim ; Jong Mun Jeong ; Min Tae Hwang ; Chang Soon Kang, "Development of an IoT-based atmospheric environment monitoring system." International Conference on Information and Communication Technology Convergence (ICTC)., 2017

[8] Somansh Kumar, Ashish Jasuja," Air quality monitoring system based on IoT using Raspberry Pi.", International Conference on Computing, Communication and Automation (ICCCA), 2017.

[9] Himadri Nath Saha, Nilan Saha, Rohan Ghosh, Sayantan Roychoudhury, "Recent trends in implementation of Internet of Things — A review", IEEE 7th Annual Information Technology,

Electronics and Mobile Communication Conference (IEMCON), 2016

[10] Himadri Nath Saha, Abhilasha Mandal, Abhirup Sinha, " Recent trends in the Internet of Things", IEEE 7th Annual Computing and Communication Workshop and Conference (CCWC), 2017

[11] Himadri Nath Saha, Supratim Auddy, Subrata Pal, Avimita Chatterjee, Shivesh Pandey, Rocky Singh, Rakhee Singh, Debmalya Ghosh, Ankita Maity, Priyanshu Sharan, Swarnadeep Banerjee, "Pollution Control using Internet of Things (IoT).", 8th Annual Industrial Automation and Electromechanical Engineering Conference (IEMECON), 2017

[12] Himadri Nath Saha, Supratim Auddy. Subrata Pal ; Avimita Chatterjee; Susmit Sarkar, Rocky Singh, Amrendra Kumar Singh, Ankita Maity, Priyanshu Sharan, Sohini Banerjee, Ritwik Sarkar,"IoT solutions for smart cities.", 8th Annual Industrial Automation and Electromechanical Engineering Conference (IEMECON), 2017