Air Quality Monitoring Using Sensor And Mobile Application

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Abstract- *Air pollution affects our day to day activities and quality of life. It poses a threat to the ecosystem and the quality of life on the planet. The dire need to monitor air quality is very glaring, owing to increased industrial activities over the past years. People need to know the extent to which their activities affect air quality. This project proposes an air pollution monitoring system. The system was developed using the arduino microcontroller. The air pollution monitoring system was designed to monitor and analyze air quality in real-time and log data to a remote server, keeping the data updated over the internet. The air quality measurements taken by the designed system was accurate. The result was displayed on the designed hardware's display interface and could be accessed via the cloud on any smart mobile device.*

Keywords*:* arduino microcontroller, server.

I. INTRODUCTION

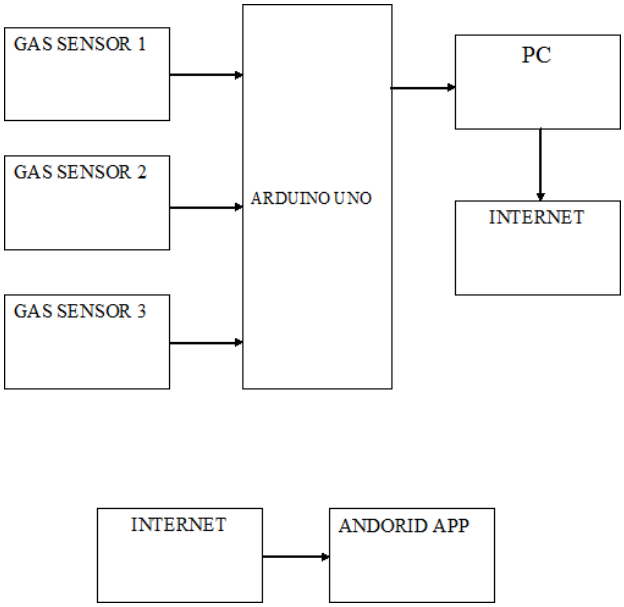
Air is one of the essential elements of man's surroundings. The earth's atmosphere is full of air which contains gases such as Nitrogen, Oxygen, Carbon Monoxide and traces of some rare elements. Humans need an atmosphere of air that is free from contaminants. This is very crucial for human life and health. Any change in the natural composition of air may cause grave harm to life forms on earth. Air pollution is the presence of one or more contaminants in the atmosphere such as gases in a quantity that can harm humans, animals and plant. Air pollutants are measured in Parts per Million (ppm) or ug/m3. Primary pollutants are released directly into the atmosphere. Secondary pollutants are produced when the primary pollutant reacts with other atmospheric chemicals. Air quality affects public health. The effect of air pollution ranges from difficulty in breathing, coughing, aggravation of asthma and emphysema. Polluted air can also impair visibility. Air pollution is accountable for the death of 7 million persons worldwide each year or one in eight premature deaths yearly. Almost 570,000 children under the age of five die every year from respiratory infection linked to indoor/outdoor pollution and second-hand smoke. Children exposed to air pollution have an elevated risk of developing chronic respiratory problems such as asthma. In the monitoring of air pollution, several researchers worldwide have developed models to monitor many of the pollution gases such as Sulphur Dioxide (SO2), Carbon Monoxide (CO), Carbon Dioxide (CO2), Nitrogen Oxides (NO) etc. It focuses on the design and implementation of a smart air pollutant monitoring system. It discusses how the level of pollutants in the air can be monitored using a gas sensor, arduino microcontroller and a Wi Fi module. The main objective of this paper is to design a smart air pollution monitoring system that can monitor, analyse analog data about air quality to a remote server and keep the data up to date over the internet. During the past few years, internet was known as a big mass that we can acquire data from. Embedding mobile transceivers to everyday items and gadgets enabled new forms of bi- directional communication between people with other people, and people with things. That paradigm, known as Internet of Things, that was _rst introduced in 1998by Kevin Ashton, has received recently more attention in the academia and industry, and this would add a new dimension to the world of Information and communication technology. While that paradigm is growing and have high positive impact on many aspects of our lives, challenging issues arise, that should be considered and addressed. The central issues are guaranteeing security and privacy of users and their data. Another issue is fully achieving smartness of interconnected devices by enabling their interaction. Exchanging data and autonomous behaviour is the key to achieving the latter IOT has different definitions from different perspectives, however, they all revolve around "things" generally, collecting, exchanging and communicating data with each other's and with people through the "internet". IOT helps in decision making and automating almost everything around us. The concept of Internet of things (IOT) was introduced by the growth of the widely used global network known as the internet along with the deployment of ubiquitous computing and mobiles in smart objects which brings new opportunities for the creation of innovative solutions to various aspects of life. The concept of Internet of things (IOT) creates a network of objects that can communicate, interact and cooperate together to reach a common goal. IOT devices can enhance our daily lives, as each device stops acting as a single device and become part of an entire full connected system. This provides us with the resulting data to be analyzed for better decision making,

tracking our businesses and monitoring our properties while we are far away from them.

II. PROPOSED SYSTEM

In our project we are going to measure the air quality of the particular area with multiple sensors. Then this parameters are updated to the server, the authorized person can monitor the details with android app.

III. SYSTEM ARCHITECTURE



IV. EXISTING SYSTEM

The main objective of this project is to devise a simple low cost air pollution monitoring system based on microcontroller using wireless technology which detects presence of various gases like CO2,SO,NO,etc and parameters like humidity ,temperature ,etc. , displays it on LCD and forwards it to remote user. This project is developed by using PIC 16F877A Microcontroller, SIM 900 GSM Module, JHD204A LCD display and gas sensors. The advantage of using GSM based technology is that GSM based communication network is distributed over a large area and have almost reached to every part of the world. GSM technology also does provide users with high quality signal and channels, giving them access to high quality digital communication at affordable cost. This embedded system can be useful for anyone who wish to monitor the quality of air at a location without being physically present there .The main advantages of the research are that the system may be able to collect the pollution levels throughout the day and also the data so collected may serve as a data base which can be used for various analysis as and when required. The system may offer pollutant levels of a particular industry and this estimation may serve as an ready reckoner to the government for allowing or disallowing a particular industry to be set up in a particular area. This project using the GSM communication so it has distance limitation. Power consumption of this unit is high.

V. LITERATURE SURVEY

Air pollutant severity prediction using Bi- directional LSTM Network.

Recurrent Neural Networks (RNN) has proved to be very efficient in processing temporal data. However, future input information coming up later than the current time instance is also useful for prediction. RNNs can partially achieve this by delaying the output by a certain number of time frames to include future information. However, it is difficult to obtain optimal merging since different networks trained on the same data can no longer be regarded as independent. To overcome these limitations, it proposed bidirectional recurrent neural network (BRNN) that can be trained using all available input information in the past and future of a specific time frame. The irregularities may occur due to instrumental error or some other external factors like power-shutdown or severance of connectivity etc. A value lying outside the permissible range for a parameter is treated as an abnormal value. It presented an effective way of predicting the severity of pollutants by leveraging various sensor data in 6, 12 and 24 hour in advance using Deep learning models.

Bidirectional Recurrent Neural Network (BRNN) are used to overcome the problem of storing future information ,however there may be delay in storing the future data values due to time frame delay or power cut .

Air pollution monitoring and prediction using IOT

Nowadays the air pollution in urban areas is a major issue in developed cities due to significant impacts of air pollution on public health, global environment and the whole worldwide economy. The proposed work on an air pollution monitoring and prediction system is enables us to monitor air quality with the help IOT devices. The system utilizes air sensors to detect and transmit this data to microcontroller. Then the microcontroller stores the data into the web server. For predicting the microcontroller stores the data into the web server. For predicting the LSTM is implemented. It has a quick convergence and reduces the training cycles with a good accuracy.

IOT is an emerging technology recent times that has a huge impact in the present and will be in the future.

Urban Air Pollution Monitoring System with Forecasting Models

The focus of this paper is on the monitoring system and its forecasting module. Three machine learning (ML) algorithms are investigated to build accurate forecasting models for one-step and multi-step ahead of concentrations of ground-level ozone (O3), nitrogen dioxide (NO2), and sulphur dioxide (SO2). These ML algorithms are support vector machines, M5P model trees, and artificial neural networks (ANN). Two types of modelling are pursued: 1) univariate and 2) multivariate. The performance evaluation measures used are prediction trend accuracy and root mean square error (RMSE). The results show that using different features in multivariate modelling with M5P algorithm yields the best forecasting performances. For example, using M5P, RMSE is at its lowest, reaching 31.4, when hydrogen sulphide (H2S) is used to predict SO2. Contrarily, the worst performance, i.e., RMSE of 62.4, for SO2 is when using ANN in univariate modelling. The outcome of this paper can be significantly useful for alarming applications in areas with high air pollution levels.

These modules and algorithm is used for the past recorded values yet needed to be checked for the current values.

VI. MODULES

1. Detect through sensors.
2. Upload values to SQL server.
3. Retrieve values from SQL server.
4. Display in application.

DETECT THROUGH SENSORS

MQ2 and MQ6 sensors are used to detect the atmosphere values. MQ2 gas sensor is designed with sensitive material of sno2. When the target combustible gas exists, the sensor's conductivity is higher. Signal conditioning circuit is used to convert the change of conductivity to correspond output signal with the input gas concentration.

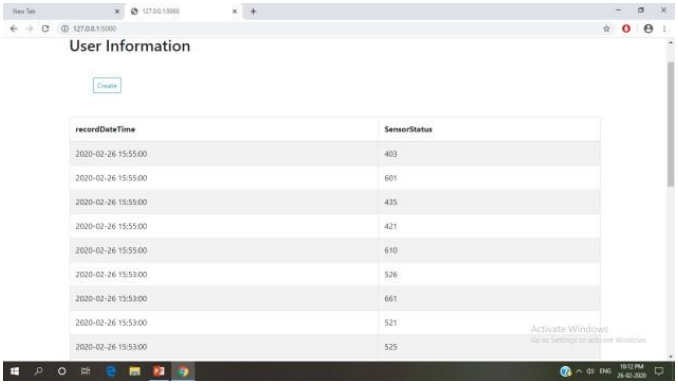
MQ6 gas sensor is designed with sensitive material of sno2.Works in the same way as MQ2 sensor. These gas sensors send values to the arduino controller .It provides set of digital input and analog output pins .It sends values to IOT .

UPLOAD VALUES TO SQL SERVER

IOT upload values to server which got through arduino processor. These values stored in sql server and retrieved when needed through application.

RETRIEVE VALUES FROM SQL SERVER

Values get stored in SQL server. Values are retrieved using basic SQL commands in Liclipse software. Liclipse software is user friendly platform for python and other languages. Admin runs the program to get the values from SQL server. Result would be gas values with current time and date.



DISPLAY IN APPLICATION

User log into the application and view these gas values. Gas values provided with date and time.

VII. FUTURE WORK

In future these sensors can be fitted into mobile. Mobile already consists of sensors like accelerometer, probably if these gas sensors can be fitted inside to get gas values around mobile. Alarm signals can be produced if any increase in assigned values of gases around atmosphere.

VIII. CONCLUSION

The nations are now focusing to generate energy from nuclear reactors and the renewable resources like solar energy, wind energy and hydroelectric power. It is now important to monitor air pollution in real time in most of the urban areas. This project is aimed at developing an IOT device which can monitor air pollution in real time and log data to a remote server. Remote monitoring was facilitated using classical motes in the past, which has some pitfalls like limited memory, processing speed and complex programming strategies. By using Internet of Things and recording sensor data to a remote server, the limitations of memory in the monitoring devices and manual collection of data from the

installed devices can be overcome. The IOT also helps monitoring the data in real time.

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