POLLUTION MONITORING SYSTEM USING IoT

T. Palaniappan[1] , Vidya P Janaki[2],D.Abishega[3] , G.Srinivasan[4]
[1,2,4]Assistant Professor, [3]UG Scholar
[1]Department of ECE,
Kamaraj College of Engineering and Technology, Virdhunagar, Tamilnadu.

Abstract- ***The level of pollution has increased with time because of factors like the increase in population, increased vehicle use, industrialization and urbanization . Increased pollution affects health of population exposed to it. This creates a need for measurement and analysis of real-time air quality monitoring so that appropriate decisions can be taken in a timely period. This paper presents an IoT Based Air Pollution Monitoring System using which the Air Quality is measured over a web server using internet and necessary actions can be taken when the air quality deteriorates. Gas sensors have been used which measures the level of various gases. The pollution level can be monitored anywhere using computer or mobile app.***

Keywords: **Gas sensor,IoT, Arduino.**

I. INTRODUCTION

Air pollution is the biggest problem of every nation, whether it is developed or developing[1]. It is caused due to the presence of particulate matter, harmful materials and biological molecules in earth atmosphere. It has adverse effect on living organisms and also cause damage to the natural environment. It may also give rise to allergies, harmful diseases such as cardio vascular diseases, lungs diseases and can also cause death. According to a survey, due to air pollution 50,000 to 100,000 premature deaths per year occur.

Air pollution is now a major concern across the globe and World Health Organization (WHO) has developed certain guidelines to restrict the limits of certain gases like Ozone (O3), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2)[2]. IOT Based Air Pollution Monitoring System monitors the Air quality over a web server using Internet and preventive measures can be taken when the air quality goes down beyond a certain threshold level. The drawbacks of the conventional monitoring instruments are their large size, heavy weight and extraordinary expensiveness.

The previous techniques involves the use of wireless sensor networks for air pollution monitoring. This system makes use of large number of Wireless Sensor Network Air Pollution Monitoring System to monitor air pollution. It makes use of an Air Quality Index (AQI). In another technique, Mobile Discovery Net (MoDisNet) is developed to monitor and analyze real time air pollution on the basis of traffic conditions, emissions, ambient pollutant concentration and human exposure.

In another methodology, environmental parameters were monitored with amperometric sensors and gas sensors (infrared) using the PIC18F87K22 microcontroller. Sensor nodes are set up in different areas for real time monitoring of environment. The results are displayed on the city map.

It was proposed that RFID technology can be effectively used to solve transport related problems One RFID Tag is placed on each vehicle to send vehicle identification to traffic information database. RFID reader is placed with embedded controller at Toll Gates, Parking areas and also in traffic signal areas.

Here an air quality monitoring system that allows us to monitor and check live air quality in an area through IoT is proposed . System uses gas sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data. The sensors interact with arduino uno which processes this data and transmits it over the application. This allows authorities to monitor air pollution in different areas and act against it.

II. SYSTEM ARCHITECTURE

In the context of our work we propose a set of Air Quality Monitoring Sensors , which are used to measure the concentration of various Air pollutants namely CO , LPG and air quality . The model was designed using an Arduino Uno microcontroller , Bluetooth module , MQ135 gas sensor , MQ5 Gas Sensor , MQ7 Gas Sensor . All the Air Sensors are interfaced with a embedded platform equipped with network connectivity and are interconnected to internet making it a global network of connected things .

Data on air quality was collected using the MQ135 sensor. The Sensitive material used in MQ135 gas sensor is SnO2. The conductivity of this material is lower in clean air. The sensor conductivity increases with the increasing concentration of target pollution gas. MQ135 can monitor different kinds of toxic gases such as sulphide, ammonia gas, benzene series steam and CO2. The detection range is 10-10,000 ppm with the voltage rate of about 5.0V±0.1V AC.

The carbon monoxide (CO) level was collected using MQ7 sensor and the LPG , Natural gas level was collected using MQ5 sensor . The data collected in sensor is the analog output voltage proportional to the equivalent concentration of polluting gases in Parts Per Million (ppm) .

Bluetooth helps in transmitting the collected data through low power radio waves . It transfers on a frequency of 2.45 gigahertz . The measured data is transferred to internet with the help of Bluetooth . Bluetooth module is configured to transfer measured data to an application on a remote server called " Thing speak". The Thing speak is a famous IoT platform. The online application provides global access to measured data via any device that has internet connection capabilities . Through this platform, the level of gas pollutants can be viewed from anywhere.

The signal sent is detected by an App created using MIT App inventor. The app has buttons for connecting and disconnecting the Bluetooth. It has labels for displaying the latitude and longitude. Once a signal is detected, the app makes use of the location sensor of the mobile, and logs the GPS value in the respective fields to IoT.

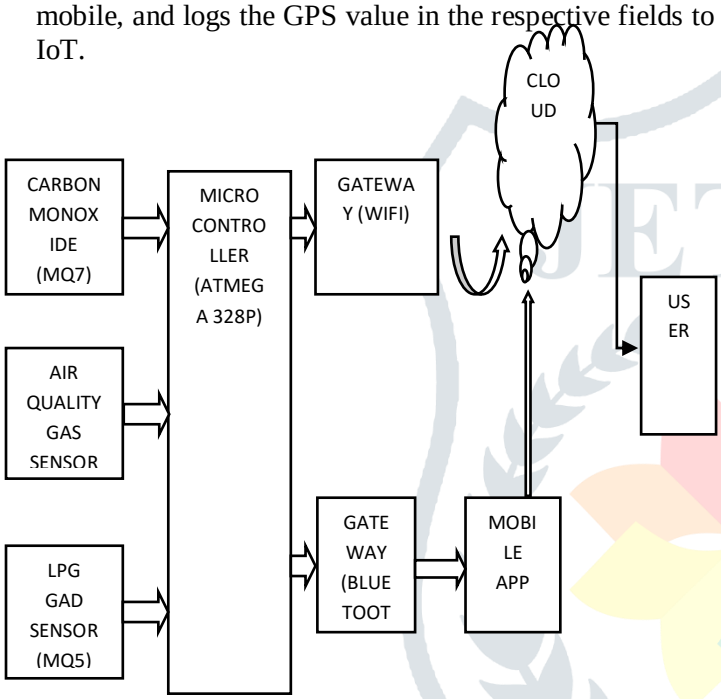

Fig 3: System Design

a. Design

App Inventor makes Android app development highly visual. The android APP has been developed using the MIT App inventor. The block diagram of the App is shown in Fig.4

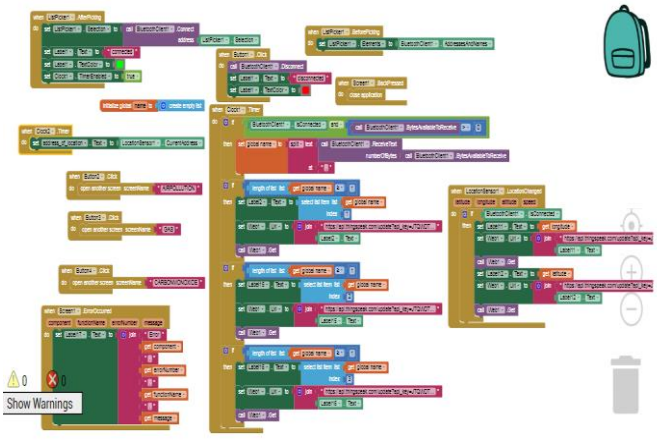

Fig 4:App Inventor for Bluetooth connection

The app has two buttons for connecting and disconnecting the Bluetooth module. The App also searches for the nearby Bluetooth devices along with MAC addresses. It is implemented through list picker. The user has to just select the required MAC address displayed in the list picker for establishing connection with that device. Once the connection is established, it's shown as connected in the App.

As soon as the connection is established, the value of the sensors from the microcontroller gets displayed in the mobile phone. Apart from these button, the app also provides two buttons for longitude and latitude using which the position values can be loaded to the IoT. The fig.5 shows the application layout with latitude and longitude buttons and the sensor readings displayed. Based on the values displayed in the app, the app also displays information regarding the normal level of various gases and what are the side effects and

Figure 6 and 7 shows data being displayed in thing speak. The measured values in sensor is loaded to the thing speak through the Bluetooth. These values can be viewed from anywhere using a mobile app or using a laptop.

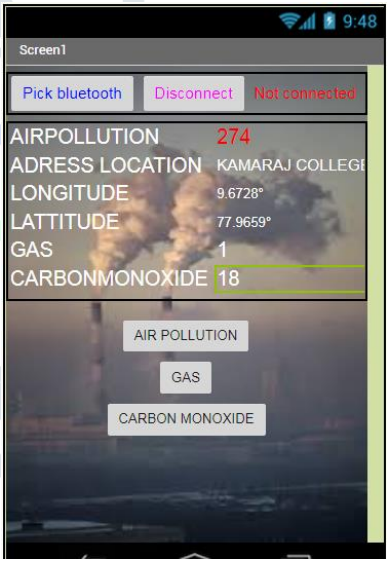

Fig 5: Application Layout

IV.CONCLUSION

The system to monitor the air of environment using Arduino microcontroller and IoT Technology is proposed to improve quality of air. With the use of IoT technology , the process of monitoring various aspects of environment such as air quality monitoring issue has been enhanced.MQ135 gas sensor gives the level of different type of dangerous gas and arduino is the heart of this project which control the entire process. The proposed system provides low cost, low power, compact and highly accurate system for monitoring the environment with the dedicated sensors remotely from any place in this world.

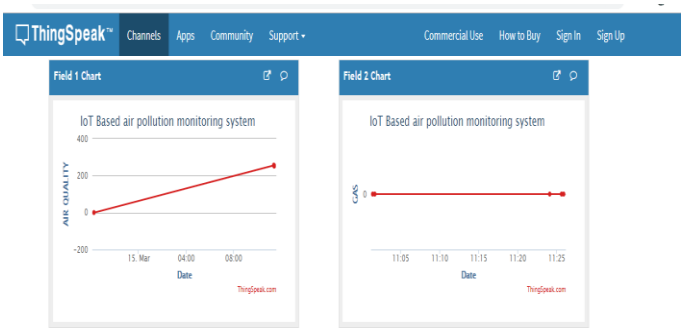

Fig 6:IoT Layout

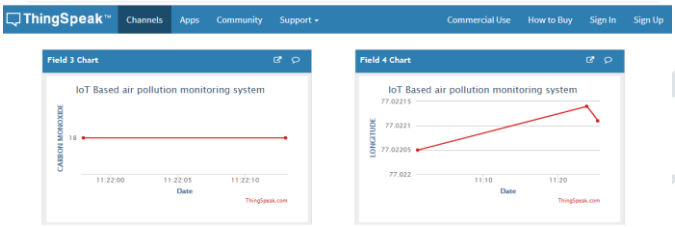

Fig 7: IoT Layout

FUTURE ENHANCEMENT

Future works include addition of a method for automatic controlling of the level of gas by providing required ventilation.

REFERENCES:

[1]. K.K. Khedo, R. Perseedoss and A Mungur, "A Wireless Sensor Network Air Pollution Monitoring System", International Journal of Wireless & Mobile Networks (IJWMN), Vol. 2, No. 2, May 2010.

[2] L E Cordova-Lopez, A Mason, J D Cullen, A Shaw and A I AI- Shammaa, "Online vehicle and atmospheric pollution monitoring using GI S and wireless sensor networks", Journal of Physics: Conference Series, Vol. 76, No. 1, 2007.

[3] E. W. T. Ngai, T. C. E. Cheng, S. Au, K. Lai, "Mobile Commerce Integrated with RFID Technology in a Container Depot", Decision Support Systems, Vol. 43, 62-76.

[4] N. Raza, V. Bradshaw, M. Hague, "Applications of RFID Technology", IEEE Communications Vol. I I , 20 10.

[5] L.Ezhilarasi, 2 K.Sripriya, 3 A .Suganya , 4 K.Vinodhini .: A System forMonitoring Air and Sound Pollution using Arduino Controller with IOT Technology Vol. 3 Issue 2 (2017) Pages 1781 – 1785 .

[6]. Young Jin Jung, Yang Koo Lee, Dong Gyu Lee, KeunHo RyuandNittel, S., "Air Pollution Monitoring System based on Geosensor Network", Geoscience and Remote Sensing Symposium, 2008. IGARSS 2008.IEEEInternational, Vol. 3, pp. 1370 – 1373, July 2008.

[7] Xu.N. "A Survey of Sensor Network Applications," IEEE Communications Magazine, Vol. 40, No.8, pp. 102-114,2002.