ijpam.eu

CITY AIR POLLUTION TRACKER

K.Ramya Devi[1], S.Shilpa[2,] Mr.D.Prabakaran[3]

[1,2,3]Department of ECE, IFET College of Engineering, Villupuram, India

Abstract: The world as it stride towards modernization also creates some serious effects to the environment. The pollution was becoming one of the major challenges for human lives. One such pollution is air pollution that leads human beings to "inhale polluted oxygen" that leads to serious effects like Asthma, Pneumonia, Influenza, Cancer etc. The government and social welfare organization are highly challenged in locating the hotspot location of air pollution. To provide solution for this, we propose a model to locate the polluted area exactly. This can be achieved by employing GIS mapping (maptitude) software that indicating the pollution level using color indicator.

Keywords: Air pollution, location identifier, MQ-2 sensor, GIS mapping

1.   Introduction

Pollution that creates harm to the living area is caused by the unhygienic and unhealthy environment. Large amount of pollution is created due to moisture level contaminants, chemicals, pollutants etc.In current situations Newdelhi is considered as highly polluted state in India .The most viral diseases spread due to the pollutions asthma, lung, and cancer are spreading among the public due to polluted air. Air pollution can be considered as the one of the serious and most harmful pollution among various pollutions. For eg: air pollution are caused due to industrial activities, vehicular explosion and natural disaster. The government feels tough to monitor and control the air pollution. We hereby propose a system for monitoring and controlling the air pollution using sensors with the help of Internet of Things (IoT).

In existing system they have introduced various technologies like LIDAR [3] to spot the location but all comes under failure for locating the polluted area with color variations. In the past, to control the smoke level which is released from the vehicle is also controlled using the various sensor is briefly explained in [1].

Each sensor transmits different information to the corresponding module. The data transmitted can accurately measure with the help of multiple radio technology [2]. In tracking area the past work defines that it can able to track only in the urban environment specifically the exact data cannot be spotted. [4].By using wireless sensor the data have been transmitted to the base station and by using mobile applications the process is been completed but the exact solution is not been obtained for solving the current scenario [5].So we have proposed an efficient design based on the pollution tracking.

2. Current Technologies- A Review

Mitesh Rathod, Ranjana Giter et al 2017 [1] has discussed about how to monitor and control the pollutants from the vehicle.MQ-7 gas sensor is used to monitor the pollution level. The pollution level cannot be completely eradicated but it can be controlled.

Movva Pavani , P.Trinatha Rao et al 2016 [2] proposed a model to maintain data accuracy, calibration of each sensor is performed by comparing data transmission using any of the multiple radio technology. This paper mainly focus on the industrial based air pollution .An attempt is made to monitor it in a real time system.

Philip Sallis ,Clemens Dannheim et al 2014 [3] have together explains the concept about determining the degree of air pollution or fog .In this LIDAR technology is used to monitor the weather conditions and fog level. In this paper they have used front camera and LIDAR laser scanner for monitoring the fog level. So this will be a major drawback which increases the cost of the project.

Ali Marjovi, Adrian Arfire et al 2015 [4] has shared their views in sensor network coverage is spatially and temporally dynamic; we leverage models to estimate the values for the locations and times where the data are not available. In this paper they have used LDSA map to spot the location which the network coverage will withstand only for a small period of time. So this temporary measure is the major drawback in this proposed project.

Abdullah Kadri, Elias Yaacoub el at 2013 [5] have utilized the backend server to collect the real time data from the stations and converts it into information

delivered to users through web portals and mobile applications. Hereby they are used two main components which is multigas monitoring system and M2M communication. The data has been collected for the past four months and then data has been transmitted using GPRS communication which is considered to be a very slow process.

3. Proposed Scheme

This paper describes a model that influence people by tracking the pollution level in the atmosphere and can exactly locate the spot with the color variation. The main module used here is MQ-2 sensor which can indicate the gases present in the open surface. The main module MQ-2 sensor comprises Arduino UNO, GPS receiver antenna, GPS module. The working of MQ-2 sensor is to initially detect the surrounding moisture level and according to MQ-2 Sensor it detects the gas like carbon monoxide (CO), Sulphur oxides (Sox), Carbon dioxide (CO2), and Nitrogen oxide (Nox). This sensor can store only for a small period of time so it continuously sends the data collection to the ARDUINO UNO. The process of Arduino is the sensor sends the data towards the controller it receives the data and wait for the GPS module signal after receiving the latitude and longitude values from antenna this process continuously works. A separate power supply is allocated for this module which is of 12V. After interfacing the Arduino UNO with the PC the values starts monitoring form that the values are been noted and then it is interfaced with the GIS Software.
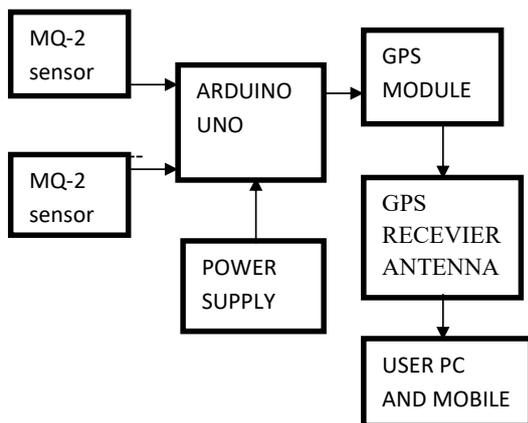
Fig: 1 Block Diagram Of Proposed Model

3.1 MQ-2 Sensor

The main component used in our project is MQ-2 gas sensor. We are generating smoke to the sensor. This sensor senses the smoke and send to Arduino UNO. The operating voltage of MQ-2 gas sensor is 5V and heat consumed is 800Mw.It can senses the gases like LPG, carbon monoxide, alcohol, propane, hydrogen, methane etc. It has built in potentiometer so that it can adjust the sensitivity of the device .If the gas produced level is more the output will be very high, lower level of gases lower the output voltage. It can detect the gas concentration ranges from 300 – 10000ppm.The features of the gas sensor is it has wide detecting scope ,long life time, fast response. It can also be applied in the applications of gas leak alarm, air quality monitor, safety standard maintenance.

Fig: 2 Mq-2 Sensor

3.2 Arduino Uno

MQ-2 gas sensor is interfaced to the ARDUINO UNO microcontroller. After sensing the smoke the sensor transmits the values to controller. It works on serial communication interfaces. The power supply to controller is provided through USB cable. The MQ-2 gas sensor is connected to the analogy pins A0-A2 used to read value from sensor and convert to digital value. There are 14 digital I/O pins .6pins are used for pulse width modulation digital pins used are responsible for serial communication .It has voltage regulator and its function is to control voltage given to arduino and stabilizes the voltage. Transmission and reception of data depends on baud rate.

A. Features

- Easy interfacing,
- convenient to manage power,
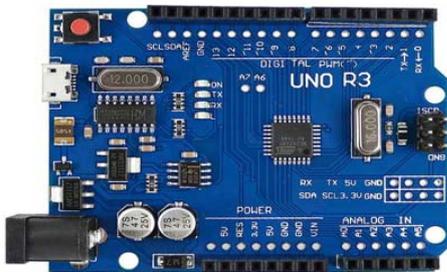- 32KB of flash memory for storing the coder.

Fig: 3 Arduino Uno

3.3 GPS receiver

GPS receiver is connected to GPS module. The function of GPS receiver is to receive the information from the satellite and calculates the device location. The data is received only When the clear line of sight (LOS) is available. It can track about 32satellites revolving around the earth. It can accurately determine the location of the device. It receives the information from many of the revolving satellites. It determines the location of the device through the latitude and longitude values. The latitude and latitude values are projected on the serial monitor.

Fig: 4 Gps Receiver

3.4 Maptitude

The second module of our project is Maptitude GIS mapping software .The interfacing of hardware and software part is achieved in second module .The software is mainly used for mapping the location of the polluted areas. The latitude and longitude values which are obtained from the hardware part are given as I/P to the software part .It is helpful for visualization of the location of device using latitude and longitude values. This mapping deals with the storing and retrieving of information which provides clear representation of given data. The purpose of going for GIS mapping is to clearly enhance the geographical location of the sensor. The location can spotted with difference colors as required. The representation can be produced in the form of graphs, points, and links. This software allows us to create a map of our own and incorporates the   analyzed values.

A.   Features

1)   Buffer – To analyze proximity
2)   Area of influence
3)   Geographic overlay- overlap for estimating demographical
4)   Hotspots
5)   Shortest path
6)   Surface analysis
7)   50 fill types, CAO formats, excel, d base, ASCII, G

4. Result Analysis

The ultimate aim of our project is to measure the pollutant level and to indicate the location of more polluted area using latitude and longitude value.

The GPS receiver antenna is fixed to receive the data from satellite. The acknowledgement is received in the GPS module. The ARDUINO UNO is interfaced with GPS module and receiver the data from GPS receiver.

The smoke is produced in the MQ-2 sensor. The range of 100ppm is the minimum range. The value of MQ-2 sensor in which the smoke produced is varied once the GPS receiver is connected with the GPS module .The latitude and longitude of values are obtained.

If the value of MQ-2 sensor changes continuously the latitude and longitude value is to be plotted in GIS Mapping with the latitude and longitude value the excel sheet is created with the obtained database. The next procedure is to create map with the database.

The color theme helps to identify or to indicate the variation of pollution level in the location spotted .The map is created with the values which spots the location with more polluted area.
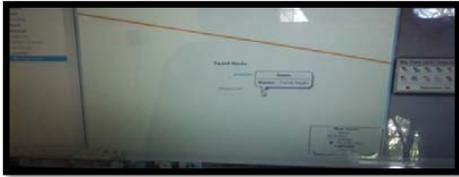
Fig 5 : Spotted Map Location

Table I : Pollution Level Color Description

TYPE OF GAS	SENSOR USED	CONCENTRATION LEVEL OF GAS	VARIATION OF SENSOR	LATITUDE AND LONGITUDE	COLOUR INDICATED
LPG	MQ-2 NODE-1	450ppm	150-340	11.12680, 7.51496	Green
LPG	MQ-2 NODE-2	600ppm	250-680	16.18546, 6.78231	Orange
LPG	MQ-2 NODE-3	750ppm	360-820	12.921054, 14.83512	Red

This table says about the color variations according to our project the color variations here by the following color descriptions, for the LPG gas ,at node 1 the MQ-2 sensor defines that the level of gas is up to 450ppm,it defines that less polluted level in that specified latitude and longitude area ,the next defines that node-2 the sensor with the range of 600ppm which defines that it is average level of the area which is indicated by orange color and finally the node-3 with 750ppm which defines that highly polluted area because the level of gas which is indicated by red color . So these are the varies color descriptions about the pollution levels.

5. Conclusion

With this we conclude that our project will help to map or track that pollutant area in a easy method. And we can able to easily identify by color indications. Without the help of GIS this would not be possible. This helps the people to see their area pollution level in their own town itself. As advanced technology this can be implemented by Sending information as a picture view.

References

[1] Mr.E.SunilKumar, Mr.P.V.Vara Prasad Rao and Mrs.G.SatyaPrabha," Automated Control System for Air Pollution Detection in Vehicles," International Journal & Magazine of Engineering, Technology, Management and Research, ISSN No: 2348-4845, Volume No: 2 (2015), Issue No: 7 (July).

[2] M. Ranga Reddy & S. Sarath Chandra," An Intelligent Air Pollutant Vehicle Tracker System Using Gas Sensor And GPS", IJCSIET-- International Journal of Computer Science

[3] Vasana Prathyusha1 & P. BalaMurali Krishna," Pollution Check in Vehicles and Alerting System using Location Identifier", International Journal

[4] Mohammad Akthar Ali And M.VenkataSIreesha," Automated Control System for Air Pollution Detection in Vehicles," International Journal of Scientific Engineering and Technology Research-IJSETR, ISSN 2319-8885 ol.03, Issue.32 October-2014.

[5] H. Karl and A. Willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley and Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, England, 2005.

[6] D. D. Lee and D. S. Lee, Environmental gas sensors, IEEE Sensors J., Vol. 1, No. 3, pp. 214–215, 2001.

[7] NihalKularatna, and B. H. Sudantha, An Environmental Air Pollution Monitoring system Based on the IEEE 1451 Standard for Low Cost Requirements , IEEE Sensors Journal, Vol. 8, No. 4, 2008.

[8] Young Jin Jung, Yang Koo Lee,DongGyu Lee, Keun Ho Ryu, Silvia Nittel , Air pollution monitoring system based on geosensor network, IEEE International Geoscience and Remote Sensing symposium, pp.III-1370–III-1373, 2008.

[9] LEONARD, John, et al. A perception

[10] UTKIN, A. B., et al. Forest-fire detection by means oflidar. In: Proceedings of IV International Conference on Forest Fire Research, Luso, ortugal. 2002. S. 58.

[11] HSU, Chan Wei; HSU, TsungHua; CHANG, Kuang Jen.Implementation of car-following system using LiDAR detection. In: ITS Telecommunications (ITST), 2012 12th International Conference on. IEEE, 2012. S. 165-169.

[12] R. Beelen, O. Raaschou-Nielsen, M. Stafoggia, Z. J. Andersen,G. Weinmayr, B. Hoffmann, K. Wolf, E. Samoli, P. Fischer, andM. Nieuwenhuijsen, "Effects of long-term exposure to air pollutionon

natural-cause mortality: an analysis of 22 European cohorts within the multicentre escape project,"

[13] P. Avino, S. Casciardi, C. Fanizza, and M. Manigrasso, "Deep investigation of ultrafine particles in urban air,"Aerosol and Air QualityResarch, vol. 11, no. 6, pp. 654–663, 2011.

[14] J. Garcia, F. Teodoro, R. Cerdeira, L. Coelho, and M. Carvalho, "Developing a methodology to predict PM10 urban concentrations using GLM,"

[15] World Health Organization (WHO), "Monitoring Ambient Air Quality for Health Impact Assessment", WHO Regional Publications, European Series, No. 85, 1999.

[16] World Health Organization (WHO), "WHO Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide", Global

[17] J. F. Artiola, I. L. Pepper, and M. L. Brusseau, "Environmental Monitoring and Characterization", Elsevier Academic Press, 2004.

[18] K. Martinez, J. K. Hart, and R. Ong, "Environmental Sensor Networks", IEEE Computer, p.p. 50-56, 2004.