

DESIGN AND MEASUREMENT OF TOXIC GASES USING POLLUTION MONITORING SYSTEM

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Abstract- Air monitoring is important concept to check whether the surrounding air is suitable to breath by the human being or not. Because of increasing the traffic the rate of carbon concentration present in the air increases. Which result in the fresh air gets polluted. Today each human being wants to live in the healthy atmosphere, they want to check whether the particular area where they have to go is more or less polluted and according to this pollution level information they may choose their route appropriately. Now a day's mobile are available to everyone if it may possible to check the pollution level of each area, it may help them to choose the alternate healthy route. Various technologies are used previously for mofitoriftg the pollution level but accuracy in the reading of pollution level compromises.

Keywords- Air quality, microcontroller, GSM, Zigbee.

I. INTRODUCTION

The main purpose of pollution monitoring is not only to provide the collected data to the end user it may also help the planners, policy makers and scientist to take the decision on pollution level and make the effort to improve the environment. There are various resources of pollution that make the air unbreathable. With the development of automotive industry and communication technology our daily live are largely infected and people tend to spend many time to the vehicle. And it may see that the next generation transportation system is more powerful. The main issues of this are to increasing the traffic and air pollution which may affect the human health. With the rapid development in the transportation system it may seen that the clean air get polluted rapidly. Modern technology is a combination of many techniques such as wireless communication, cloud computing, internet of thing etc... .It consist the many no. of level which is useful to provide several types of services on the real time basis.

Fig 1. Represent the three level of architecture. The first level is a device level which consist a no of device to get communicate with each other. Second level is a communication level where the all devices communicate with the other devices wirelessly and in the last level to get the service from each level by using a gas sensor the range of the toxic can be detected and displayed in LCD and SMS can be obtained on request .

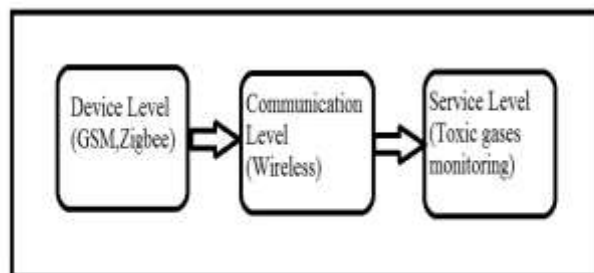


Fig 1. Three Level Architecture

Network play the important role to provide the information of any location.

WSN consist a number of stations. Each station collects the information of pollution level in their nearest locations where the gas sensors are deployed. Monitoring station contains the number of unit. Such as processing unit, sensing unit, power unit, communication unit. And each unit must be operate independently i.e. processing unit must process the information that are collected from the gas sensor. Sensing unit that produce the signal which may change in the physical condition such as humidity, pressure or temperature. Power that consume by each station must be low. Communication unit responsible to transfer the information from each unit to the world i.e. collected information can be sent as a message to the individuals as a alert when requested. This helps the person to choose a safest way to travel with less pollution.

LITERATURE REVIEW

Air monitoring is a social as well as public experiment where the each user wants to know how much the environmental changes affect their daily life cycle. Teco envboard is an environmental sensing platform that carries a number of sensor such as temperature sensor, carbon dioxide sensor, humidity sensor etc.. To provide the information about the indoor as well as outdoor of the air quality [1].

Pimi air box is the other device which help to find the indoor air quality it detect the temperature as well as the matter concentration present in the air.[2]

To monitor the air quality in the city of Mongolia result shows that the dust concentration is more than its standard level it shows 50% of air pollution caused by the soil,30% by the raw coal burning,12% by the vehicle and 3% by the wood burning. From this result soil and dust is the main reason of pollution in the city of magnolia.PM₁₀ and PM_{2.5} techniques can be used to monitor and control the measurement for air pollution monitoring.[3]

monitoring stations are used to monitor the air quality these stations are largely deployed the sensor that collect the pollution information to wireless sensor network is that it is easy to set up, inexpensive and provide the real time data.[4]

The daily activity in the cities around the world which is responsible to emit the 62% of the carbon emission. The relation between the pollution emission and traffic is a one of the most relevant problem faced by the future city. Crowded face the health related problem due to the low air quality in the cities. Due to this , there is a need of effective air quality monitoring programs that complement the current available system and traditional network to perform well in the case of any change in the physical parameter.[5] UrVAMM is the another revolutionary technology used to monitor the environment. it is a new open concept of the smart cities.

PROPOSED WORK

Represent the system architecture. In order to find out the pollution level of each & every square it requires to place the sensor on every square. Collection of nearest sensor creates a sensor node. Each sensor sense the level of pollution and all collected data are uploaded to the main server of the monitoring station. Microcontroller is used to fetch the data from the sensor node. Because of data from the every node are giving the analog reading which is not easily readable by the human being. Microcontroller IC is used to fetch the data. This IC is used to fetch the pollution data from the sensor which is located on each square. Microcontroller is another name of computer which consist a number of input and output. Sensor that allow the microcontroller to determine the present of harmful gas present in the atmosphere. It uses the analog to digital conversion port of microcontroller because whatever the output of sensor is analog in nature which generates the different gas level value.

Different port of the microcontroller are use to transfer the information collected by the gas sensor. Gas sensor that collect the concentration of toxic gases(smoke) present in the atmosphere(combination of liquids & gases) the collected signal are analog in nature i.e. the signal vary continuously with the time. but the microcontroller understand only the digital language therefore it uses the ADC port of microcontroller that convert the analog



Fig 2. Density Measurement setup

signal to the digital format which is understood by the microcontroller. Then it processes the information and provides the result to the output end.

Fig 2 is the setup used to calculate the density of the gases and liquids which are toxic through gas sensor. The density of the gases and liquids are measured as voltage per seconds to find the level or the range of the gases which are affecting the atmosphere.

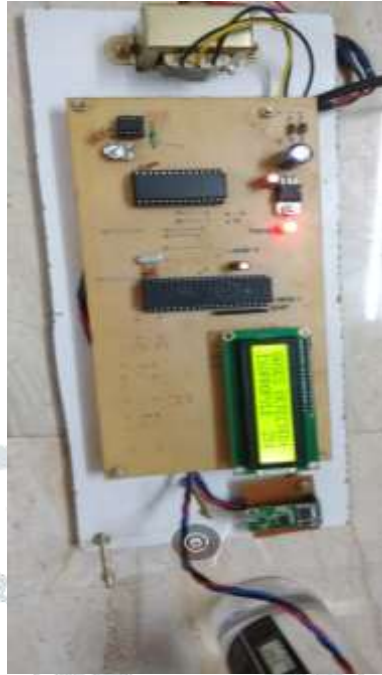


Fig 3 Transmission Zone

Fig 3 represents the working model of transmission zone consisting of microcontroller IC AT89C51 along with ADC, 555 timer, LCD and Zigbee for data transmission.

With the help of the universal gas sensor we have obtained the digital voltage values of few toxic gases and liquids and dumped that data into microcontroller memory so that it can display the name and voltage of the gas or liquid when sensed in the atmosphere and the data can be transmitted through zigbee to the server zone.



Fig 4 Server Zone

Fig 4 represents the working model of server zone where another Zigbee receives the data from the transmission zone and based on the data received by the microcontroller it displays on the LCD that which zone contains what type of gas in high range and transfers that data to the GSM module so that it can send the messages to the citizens on request.

Microcontroller based pollution level sensing system:

It will use an analog gas sensor which will generate the different gas level values then the microcontroller will convert it into digital format.

- System will use AT89C51 microcontroller for data collection and data transfer on different ADC and UART port.

- Almost all sensor used in system will be analog sensor so system will use ADC port from AT89C51 Microcontroller.
- As all the values received by Microcontroller will be in ASCII format system need a serial communication port from transferring data to computer system.

Fig 5 is the screenshot image of the message sent by the GSM. This is the result that can be obtained from the server zone which intimates the toxic levels present in different areas where the transmission zone with universal gas sensors are placed.

This could be helpful to the citizens to know which path to choose to travel with less pollution level to have a peaceful journey.

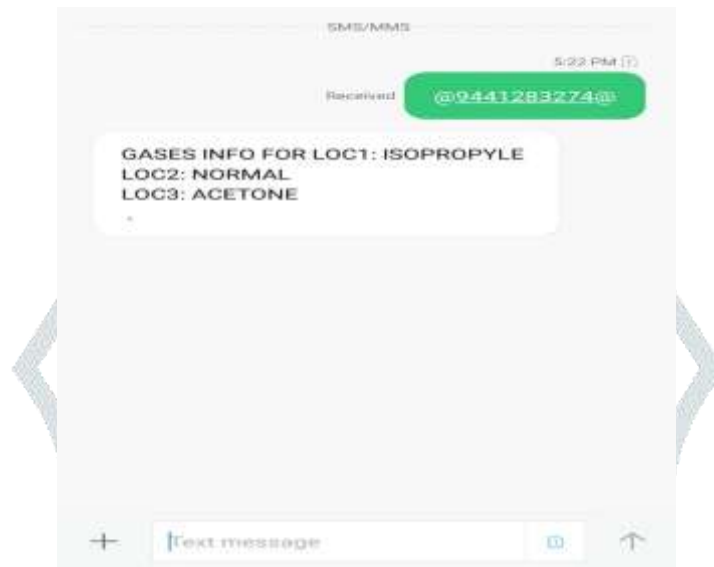


Fig 5 Result Screenshot

CONCLUSION

The project work is designed and developed successfully. For the demonstration purpose, a prototype module is constructed and the results are found to be satisfactory. Since it is a prototype module, a simple module is constructed, which can be used for many applications.

While designing and developing this proto type module, we have consulted few experts those who are having knowledge in embedded systems and these professionals working at different organizations belongs to Hyderabad helped us while fabricating this project work.

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