IOT Based Air And Sound Pollution Monitoring System

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Abstract - *The growing air and sound pollution is one of the serious issues these days. This large amount of increasing pollution has made human life prone to large number of diseases. Therefore, it has now become necessary to control the pollution to ensure healthy livelihood and better future. The Air and Sound Pollution Monitoring device can be accessed by the authorities and the common people belonging to the area. The device will be installed through a mobile application which will show the live updates of the pollution level of the area. This device is also capable of detecting the fire in its area and notify the same to the fire brigade authorities so that they could take necessary actions accordingly, and also the mobile applications will be installed in the fire brigades itself so that if a fire is taking place nearby, it could be controlled in time to reduce loss of people and property. This system works on the methods of IOT which is a rising technology based on the fusion of electronics and computer science. The embedded sensors in the system help to detect major air polluting gases such as CO_2, SO_2 and CO and level of sound pollution. The concept of IOT helps to access data from remote locations and save it in database so that we don't need to actually be present in that area.*

Keywords: air pollution, sound pollution, IOT, sensors, monitoring system, Fire Brigade.

1. INTRODUCTION

In this era of modernization, technologies are advancing rapidly. Every day we realize some new technology coming in market to simplify our lives more than ever. Back in time checking the pollution in a particular area was a very tedious task which was not very efficient also. With the increasing pollution and advancing technology various new methods were introduced to keep an eye on the rapid increase in pollution more efficiently. Internet of things is one of the latest works that has been done in this path. The increment in use of internet and the interaction of human with machine gave rise to IOT. It allows exchange of information among various devices like fridge, washing machine, automobiles, watches etc. This exchange of information takes place with the help numerous sensors. The account for the success of IOT is its efficiency and makes it a feasible technology at low cost.[3]

Air and sound pollution are two main constituents that have the most adverse effect on humans as well as the entire earth. Therefore it is very important to check and control it. Traditional methods involves manual work in which data loggers used to visit the site to collect the data, analyze it and perform comparisons to provide the output which was very lengthy and time consuming besides being inefficient.[3] The pollution monitoring system involves use of sensors which measures the sound pollution concentration and level of harmful gases like CO and SO_2 which mainly pollutes the air. Comparisons are done automatically using previously stored data in database and output is stored on cloud to make it accessible from remote areas. This paper involves description of the system that presents its output with the help of an android application which the user can download in their mobile phones and access it whenever they want.[2] It can be used for notifying the fire brigade authorities and fire brigades itself if and fire has taken place in the areas. This device is a useful asset to save precious lives of people and property.

2. LITERATURE REVIEW

The motive of making a smart city can be fulfilled by using technology, thus making the life better and also enhancing the quality of services, therefore meeting every individual's needs. With modern technology in fields of information and communication, it has become easy to interact with the authorized people of city to tell the where abouts of the area or city, how well the city is developing and how to make it possible to achieve a better life quality. In this system, an application was created to make one more step in the fulfillment of the goal. An area is analyzed for evaluating how much pollution is affecting the area. The components of gases and their amounts are calculated and checked. If the amount is higher than normal then the officials are reported about it. After that the people are made to clear the area and taken to a safe place. The combined network architecture and the interconnecting mechanisms for the accurate estimation of parameters by sensors is being explained and delivery of data through internet is presented.[1]

Some of the research work made for monitoring the pollution parameters in a particular location in order to make the environment safe and that area smart. Different methods were used in the past and are described in this section [4]. First is Smart Environment Monitoring using Wireless sensor networks[5] in which the main focus was on the developing an environment free of pollution by making it smart. Wireless sensors are fitted all over the city and in public transports. By monitoring all the sensor networks, all the environmental happenings can be

gathered as a streaming database to analyze the environmental position. The monitoring data gathered from stationary nodes installed in the city to the mobile nodes placed on public transports is given by this technique. Second is Toward a Green campus with the internet of things. It is an implementation of idea to save energy through adequate management of computer machines and air conditioner. It is based on the theory of internet of things [7].Third is WSN- and IOT based Smart Homes and their extension to Smart Buildings [7]. This work is based on the use of reliable, efficient, real-time and economical sensor networks for making smart homes. In this, the sensor nodes are fitted into the different areas of home. These nodes produce data of the movement done in the home or any usage of an object. Further, these homes are extended to smart buildings [4].

3. ARCHITECTURE

This system is made to fulfill the purpose and need of the society to monitor and check the live air quality and sound pollution in an area through IOT. The system uses air sensors to check the presence of harmful and hazardous gases/ compounds [such as Methane, propane, Butane, alcohol, noxious gases, carbon monoxide etc.] in the air and also uses the sound sensor to keep measuring sound level in the surroundings. MQ2 is the air sensors which are used to collect air pollutants and a sound sensor module mic is used to capture sound. These sensors interact with arduino which processes this data and then transmit it over the mobile application. To send the data over remote location WIFI modem is also installed. And whenever the air pollution is detected, a buzzer immediately beeps and when there is a noise pollution an LED starts blinking continuously. With this system not only the authorities but also the localized people can check the transmitted data through their mobile phone and that too without spending single penny and the people can act against it on their level and try to bring the pollution level under control. This system would contribute as a part in the building of a healthy society.
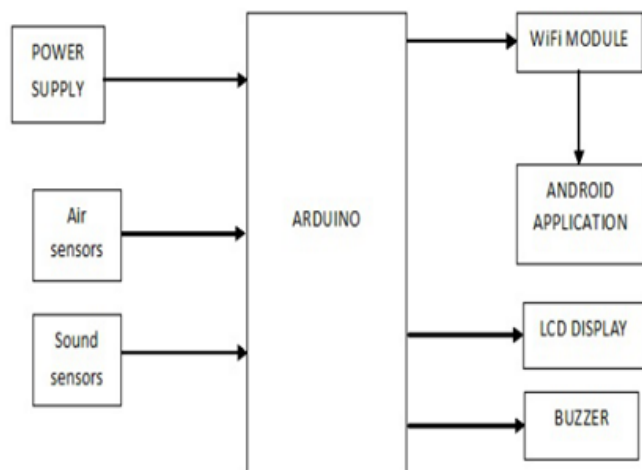

Fig 1: Block Diagram

4. WORKING

The Air and Sound Pollution Monitoring System consists of the Arduino Uno which is based on ATmega328 microcontroller. Arduino is also known as the mind of the device as everything in this system is controlled by the Arduino. Initially, the Arduino is provided with a 5 V DC supply through port 9600. Now the Air sensor is connected to the analog 0 pin and the sound sensor is connected to the 9th pin. These sensors provide the data to the Arduino that is displayed on the LCD display continuously, LCD Display is connected to 2,3,4,5,11,12 pins in the arduino board and if the air pollution exceeds the set limit (defined by the programmer) then the output is shown in the analog form i.e. if the air pollution is raised above 390ppm then it will be displayed on the output pane , Led 1 will blink and the buzzer (connected to the 8th pin) simultaneously buzz and similarly when the sound pollution exceeds the set limit (90dB in this case) the Led 2 will blink and 1 will be displayed as output on the output pane. Now the data which is retrieved from air and sound sensor will be provided to the wifi module which is connected to the 3.3 V pin on the Arduino board. This wifi module (nRF24L01 module) will then provide this data to the android application accessible to all the android phone users and accordingly the local people can take actions on their part[6].

NOTE: The limit at which the air and sound sensor will detect pollution can be changed by the programmer according to the user requirement.
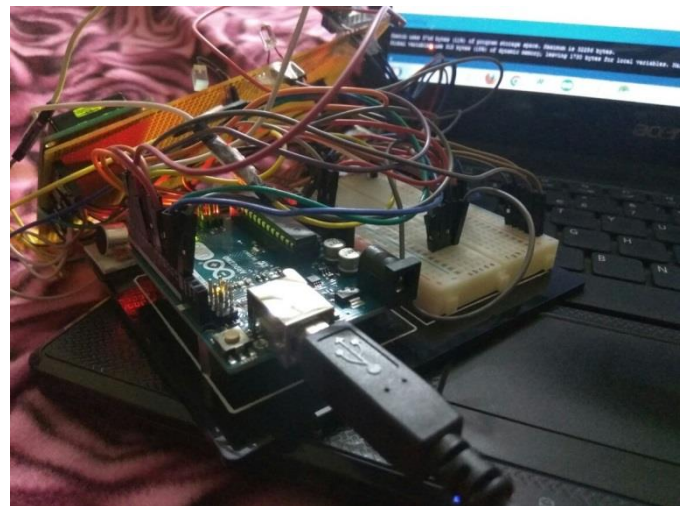

Fig 2: Hardware

Fig 3: Application

5. CONCLUSION

This IOT based air and sound pollution monitoring device is a great step towards a healthy livelihood. With the help of this device not only the municipal authorities but even the common people can participate in the process of controlling pollution and ensure safe environment. This automatic device, once installed is capable of continuously tracking the pollution level and analyse the detected information. The most highlighting feature of this device is that the output is represented in digital as well as analog format with the help of a simple mobile application which is usable on all android devices like smart phones, tablets, PDA's etc. The device itself is very eco-friendly and does not harm the environment in any way. Moreover, it is based on one of the modern technology and also inexpensive as compared to other technologies developed so far and can be installed anywhere. [2].

6. RESULT

The output of this pollution monitoring device is provided using a mobile application. The monitoring systems will be fitted at different locations in the city or any area such as hospitals, highways, streets, parks, homes and malls, etc. Sensors continuously sense the level of air or sound pollution and give the results in ppm i.e. parts per million which can also be expressed as milligrams per liter (mg/L) the indication will be given through the device by a beep sound if the air pollution increases from a certain value (decided by the programmer) in case of air pollution whereas the sound pollution will be shown in binary form (0 and 1) and the LED will blink continuously for the respective region. By using the GPS of the android phone user can check air and sound pollution level in that area. This application can be used to get the knowledge regarding pollution in a particular area, and then the common people can take relative measures accordingly and authorities can warn various industries about the

level of pollution they contribute in and take the required steps and measures. [1]

REFERENCES

[1] https://www.ijareeie.com/upload/2017/march/49_IOT.pdf

[2]http://www.aetsjournal.com/ijaet_issues/Iot-Air-And-Sound-Pollution-Monitoring-System-.pdf.
[3]http://www.ijritcc.org/download/browse/Volume_5_Issues/June_17_Volume_5_Issue_6/1496979869_08-06-2017.pdf.

[4] Meng-Shiuan Pan and Yu-Chee Tseng, "ZigBee Wireless Sensor Networks and Their Applications" Department of Computer Science National Chiao Tung University Hsin-Chu, 30010, Taiwan, 2007.

[5] Hemant Ghayvat, SubhasMukhopadhyay, Xiang Gui and NagenderSuryadevara, "WSN- and IOT-Based Smart Homes and Their Extension to Smart Buildings",Sensors 2015, 15, 10350- 10379; doi:10.3390/s150510350, 2015.

[6] https://www.scribd.com/document/363368641/All-About-Arduino-Boards.

[7]http://www.internationaljournalssrg.org/IJEEE/2017/Special-Issue/ICETM/IJEEE-ICETM-P101.pdf.