IoT based Noise & Air Pollution Monitoring System

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Abstract— Now a days, The pollution of air and sound is increasing abruptly. To bring it under control its monitoring is majorly recommended. To overcome this issue, we are proposing a system through which the level of sound and the existence of the harmful gases in the surroundings can be detected. The growing pollution at such an alarming rate has started creating trouble for the living beings, may it be high decibels or toxic gases present in the environment leaves a harmful effect on human's health and thus needs a special attention. The main objective of Air & Sound Monitoring System is to monitor air quality and noise level and keep it under control for a better future and healthy living for all. We propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality as well as sound pollution in an area using IOT technology. Proposed approach uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit the recorded data. The sensors interact with Arduino which processes the recorded data and transmits it over to the android app. This allows authorities to monitor air pollution in different areas and act against it. Also, authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas, and if system detects air quality and noise issues it alerts authorities so they can take measures to control the issue.

Key words: Air Pollution, Noise Pollution, Monitoring System & IoT

I. INTRODUCTION

Present innovations in technology mainly focus on controlling and monitoring of different activities. These are increasingly emerging to reach the human needs. Most of this technology is focused on efficient monitoring and controlling different activities. An efficient environmental monitoring system is required to monitor and assess the conditions in case of exceeding the prescribed level of parameters (e.g., noise, CO and radiation levels). When the objects like environment equipped with sensor devices, microcontroller and various software applications becomes a self-protecting and self-monitoring environment and it is also called as smart environment. The longitudinal learning system could provide a self-control mechanism for better operation of the devices in monitoring stage. The framework of the monitoring system is based on a combination of pervasive distributed sensing units, information system for data aggregation, and reasoning and context awareness.

II. LITERATURE SURVEY

Some of the research works carried out for monitoring the pollution parameters in a particular area of interest for making the environment smart in that area, different techniques and methods which were used in the past are discussed in this section. Smart Environment Monitoring using Wireless Sensor networks [1] focuses on the making the city environment smart, by deploying wireless sensor networks in all over the city and moving public transportation system buses and cars. By accessing all the sensor networks, environmental behaviors are collected as a streaming data base to identify the environmental conditions. This methodology gives the monitoring data from stationary nodes deployed in city to the mobile nodes on public transportation buses and cars. Toward a Green Campus with the Internet of Things – the Application of Lab Management this research work adopts the concept of "Internet of Things" and implements an idea of energy-saving by proper management of computers and air conditioners. The architecture and the prototype of the system is explained in [2].Here the objects of Internet of Things are computers and air conditioners. WSN- and IOT-Based Smart Homes and Their Extension to Smart Buildings [3]. This work mainly aims to design and develop reliable, efficient, flexible, economical, real-time and realistic wellness sensor networks for smart home systems. The sensor and actuator nodes based on wireless networking technologies are deployed into the home environment. These nodes generate real-time data related to the object usage and movement inside the home. Further extends the smart home system to smart buildings and models the design issues related to the smart building environment.

III. PROPOSED WORK

We propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality as well as sound pollution in an area using IOT technology. Proposed System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data. Also, system keeps measuring sound level and reports it. The sensors interact with Arduino controller which processes this data and transmits it over the application. This allows authorities to monitor air pollution in different areas and act against it. Also, authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas. The proposed embedded device is for monitoring noise and CO levels in the atmosphere to make the environment intelligent or interactive with the objects through wireless communication. The proposed model is shown in figure 1 which is more adaptable and distributive in nature to monitor the environmental parameters.

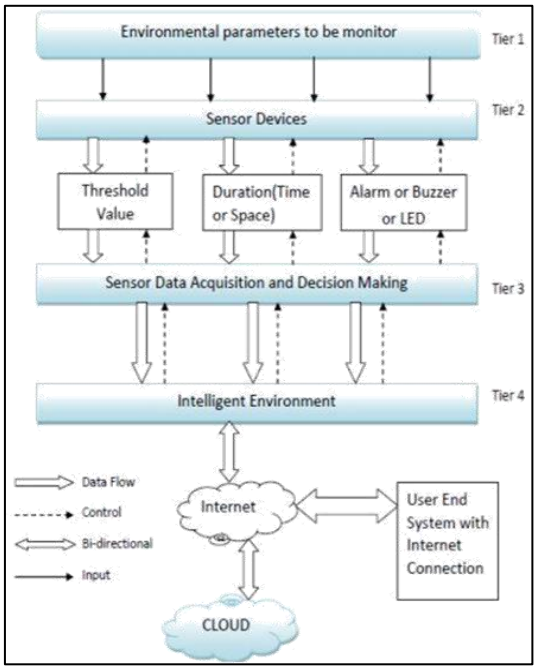

Fig. 1: Proposed System

The proposed architecture is discussed in a 4- tier model with the functions of each individual modules developed for noise and air pollution monitoring. The proposed model consists of 4-tiers. The tier 1 is the environment, sensor devices in tier 2, sensor data acquisition and decision making in tier 3 and intelligent environment in tier 4.The proposed architecture is shown in figure 1.

The tier 1 provides information about the parameters under the region which is to be monitored for noise and air pollution control. Tier 2 deals with the sensor devices with suitable characteristics, features and each of these sensor devices are operated and controlled based on their sensitivity as well as the range of sensing. In between tier 2 and tier 3 necessary sensing and controlling actions will be taken depending upon the conditions, like fixing the threshold value, periodicity of sensing, messages (alarm or buzzer or LED) etc. Based on the data analysis performed in between tier 2 and tier 3 and also from previous experiences the parameter threshold values during critical situations or normal working conditions are determined. Tier 3 describes about the data acquisition from sensor devices and also includes the decision making. Which specify the condition the data is representing which parameter. In the proposed model tier 4 deals with the intelligent environment. Which means it will identify the variations in the sensor data and fix the threshold value depending on the identified level of CO or noise levels. In this tier sensed data will be processed, stored in the cloud and also it will show a trend of the sensed parameters with respect to the specified values. The end users can view the data in mobile phone through an application as well as in computer.

The sensor used for prototype is MQ7 and sound sensor. Sensor sense the gases and the sound level. Pollution level and sound level is measured in PPM (parts per million) decibels respectively. MQ7 gas sensor gives the output in form of voltage levels which is converted into PPM. The sound sensor gives the output in form of voltage levels and we need to convert it into Decibels. A threshold value is set for both parameters. Based on the sensor value the categorization result like suitable, not advisable, good air quality and poor air quality is displayed in the application.

A. Sound Sensor

Sound Sensor board along with the microphone as shown in figure 2, has a small built-in amplifier (integrated circuit LM386), because only the microphone would not be able to send data for Arduino. The connection scheme is very clean, composed of only 3 pins: Vcc, GND and S (signal). In the middle of the plate, there is a potentiometer for sensitivity adjustment.

The board works with 5V voltage, and the signal pin should be connected preferably to an analog port of Arduino, since the generated signal is variable, and thus we can see the different levels of noise picked up by the microphone.

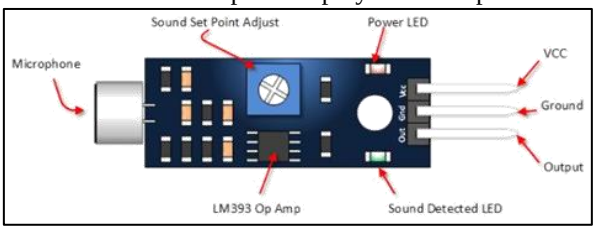

Fig. 2 Sound Sensor

B. Air Quality Check Sensor

In today's world, different gasses being emitted in atmosphere such as home appliances like air conditioner and industrial chimneys. Monitoring of these gasses is very important with safety point of view. Gas Sensors are very helpful in accomplishing this task. Small nose like sensor spontaneously respond to the alteration of gas concentration and keep our systems updated for special tasks.

The gas sensor module as shown in figure 3 consists of a steel exoskeleton under which a sensing element is housed. This sensing element is subjected to current through connecting leads. This current is known as heating current through it, the gases coming close to the sensing element get ionized and are absorbed by the sensing element. This changes the resistance of the sensing element which alters the value of the current going out of it.

Fig. 3: MQ-7 Sensor

IV. RESULTS & DISCUSSION

The results are discussed in this section. Figure 4 & 5 shows the graph of air and noise pollution. The authority/user is able to monitor the pollution level continuously through the graph. The data can also be used for further analysis.

Fig. 4: The Graph of Air Pollution

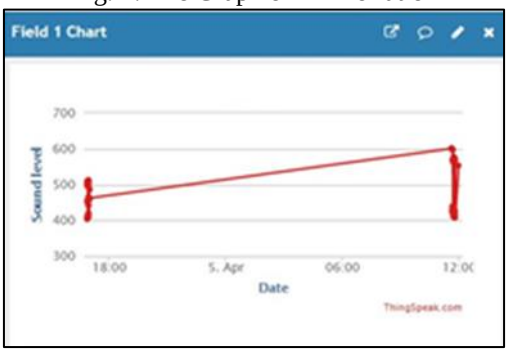

Fig. 5: The Graph of Noise Pollution

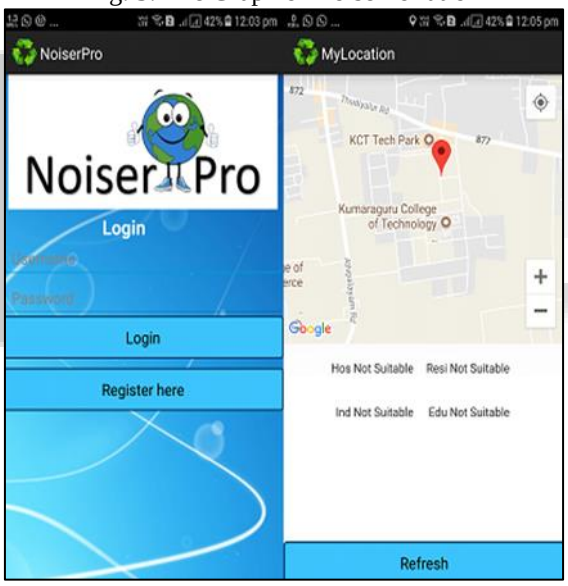

Fig. 6: Mobile App Login & Location

The Figure 6 shows the Mobile application page. In this page, the location where the pollution level is monitored is also notified. The location is notified in Google map. So that it is easy to track the location of polluted area and necessary actions can be taken.

V. CONCLUSION

The smart way to monitor environment and an efficient, low cost embedded system is presented with different models. In the proposed architecture functions of different modules were discussed. The noise and air pollution monitoring system based on Internet of Things concept experimentally tested for monitoring two parameters. The sensor parameters values are stored in the cloud. This data will be helpful for future analysis and it can be easily shared to other end users. This model can be further expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment.

REFERENCES

[1] Navreetinder Kaur, Rita Mahajan, Deepak Bagai,"Air Quality Monitoring System based on Arduino Microcontroller," International Journal Innovative Research in Science, Engineering and Technology (IJIRSET),Vol 5, Issue 6- June 2016.

[2] Shadrach Tunde, Akinkaude, kowawole, Peter Fasae, "A Survey of Noise Pollution in Ado-Ekiti Metropolis Using Mobile Phone," Science Technology Department, Science Research Publishing, October-2015.

[3] Diego Méndez, Alfredo J. Pérez, Miguel A. Labrador, Juan José Marrón, "P-Sense: A participatory sensing system for air pollution monitoring and control"(Department of Computer Science and Engineering, University of South Florida, Tampa, USA) Published on IEEE at: 12 May 2011 , DOI: 10.1109/PERCOMW.2011.5766902

