AIR POLLUTION MONITORING USING ZIGBEE BASED WIRELESS SENSOR NETWORK

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Abstract:
Air quality is a worldwide mission for governments, regulators, city administrators and citizens. Today, air quality monitoring is accomplished by means of large, steeply-priced clinical contraptions completely installed and professionally maintained, at an incredibly small number of constant locations. In the Proposed System, a portable device is fixed in the vehicles and is used to monitor, record and give indication of air quality. The system senses the quality of carbon-monoxide and carbon-dioxide in air and displays it in the form of percentage.
***Keywords*- Air quality, Carbon-monoxide, Gas Sensors**

I.INTRODUCTION

Air pollution can have a lasting effect on productivity in other ways, such as by stunting plant growth which reduces agricultural productivity. It can also make cities less attractive to talented workers, thereby reducing a cities competitiveness. For example, some Indian cities are reporting a reverse migration trend 16 from the city back to the country as citizens take steps to avoid high pollution.

Internet of things was first introduced in 1999 at auto ID centre and first used by Kevin Aston. As evolving this latest burning technology, it promises to connect all our surrounding things to a network and communicating with each other with less human involvement. Shortly it is defined as the things present in the physical world or in an environment are attached with sensors or with any embedded systems and made connected to network via wired or wireless connections. These connected devices are called as smart devices or smart objects. And it consists of smart machines which communicating interacting with other machines, environment, objects etc. Also it incorporates to connect any two machines, machine to human and vice versa etc. this communication is called as M-M communication. With fast development of industrialization and urbanization pollution become more common. Air Pollution is presence of contaminants or pollutant substances that affect human health. If we know the quantity of pollutant, then proper precautions can be taken to minimize the pollution levels in air. Air pollution management is one of the primary problem that the world faces irrespective of the case of developed or developing country. The key issue in the air pollution management is that the environment gets polluted by pollutants. It in turn leads to various hazards such as breathing problems. To avoid all such hazardous scenario and maintain public cleanliness and heath this work is mounted on air pollution monitoring system. The main theme of the work is to invent a smart intelligent air pollutant alert setup for a proper well defined air pollution management. This paper proposes a smart alert system for clearance of pollutants by giving an alert signal to the municipal web server for instant

clearing pollutants with proper verification based on the level of CO2. This process is aided by the CO2 sensor which is interfaced with Arduino UNO to check the level of CO2 in the environment and sends the alert to the municipal web server. The whole process is upheld by an embedded module integrated with IOT facilitation. In addition to this the necessary remedial measures could be adapted. An Android application is developed and linked to the web server to intimate the alerts from the microcontroller to the urban office and to perform the remote monitoring of the clearing process, done by the workers, thereby reducing the manual process of monitoring and verification. The notifications are sent to the Android application using WIFI module .

The commercial meters available in the market are Fluke CO2 carbon monoxide meter for CO, Am probe CO2 meter for CO2, Forbid Semikron LPG gas leakage sensor alarm for LPG leakage detection. The researchers in this field have proposed various air quality monitoring systems based on WSN, GSM and GIS. Now each technology has limited uses according to the intended function, as Zigbee is meant for users with Zigbee transceiver, Bluetooth. GIS based system is designed, implemented and tested to monitor the pinpoints of air pollution of any area. It consists of a microcontroller, gas sensors, mobile unit, a temporary memory buffer and a web server with internet connectivity which collects data from different locations along with coordinates information at certain time of a day. The readings for particular location are averaged in a closed time and space. The Global Positioning System (GPS) module is attached to a system to provide accurate representation of pollution sources in an area. The recorded data is periodically transferred to a computer through a General Packet Radio Service (GPRS) connection and then the data will be displayed on the dedicated website with user acceptance. As a result large number of people can be benefited with the large.

Concentration	Symptoms
50	No adverse effects with 8 hours of exposure
800	Headache, Nausea and Dizziness after 45 minutes of exposure; Collapse after 2 hours of exposure
1000	Loss of consciousness after 1 hour of exposure
6400	Headache and Dizziness after 1-2 minutes of exposure; Unconsciousness and danger of death after 10-15 minutes of exposure

Fig 1 : Symptoms of CO2 level

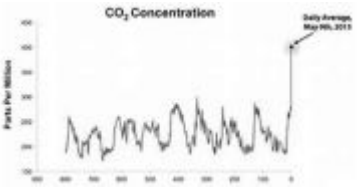

Fig 2 : Concentration of co2

II. Related Work

[1] The objective of this paper is to design an system to detect smoke, carbon monoxide and other toxic gas in close doors with high Value. The hazardous gases like liquid petroleum gas(LPG), Methane, Carbon-Monoxide, Propane and Smoke, were sensed and displayed continuously on the LCD and a popup alarm will be generated if any of the said elements cross specified ranges. In addition to this, the information is also transmitted to the command and control centre over a wireless link, where an alarm is generated. [2]The paper introduces analytical models for air quality mapping and discusses the design of a scientific experiment to test the effectiveness of cloud-based analytics under different scenarios. [3] Indoor Air quality (IAQ) is an urgent topic that worsens because of several of pollutants in the product indoor. [4] a particular critical aspect of home care service with high level of assistance has been analysed using the combination of Failure Mode

Effects and Criticality Analysis and Healthcare Failure Mode Effects Analysis. The results show that the use of both methods increases the efficiency of analysis because it highlights a more complete and effective set of criticalities and vulnerabilities. [5]A new concept of CFD-based virtual sensor data was implemented in a micro-scale air quality management system. This new concept is expected to bridging gaps between present and future USN application. In addition to the VS implementation.[6]Micro-scale air quality management system deals with unexpected pollution events in small scope, by using CFD-based air quality modelling. [7]The Air Scope consists of CFD-based air quality modelling, USN-based sensor monitoring, and multi-modal interaction platform. In this paper, we present a brief overview of Air Scope and several aspects of constructed initial indoor test environment with a few validity tests. The integration of this model into an emission control scheme for the control of the pollution sources may represent a very useful approach to air quality management and assessment

III. Proposed System

In the proposed system we are going to build a Portable Device which is fixed in the vehicles all over the city and is used to monitor, record and give indication of air quality. It is used to show much carbon dioxide is present in air and display in the form of Parts per Million(ppm).Then store the data in the database, so that we can monitor the air quality level whenever we needed .The output is also monitored through mobile Application.

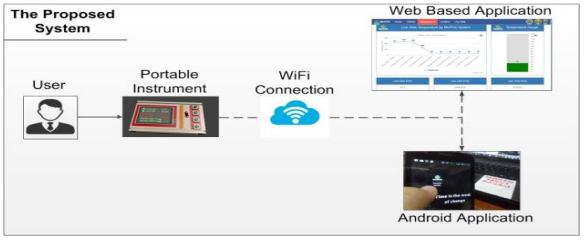

Fig 3 :Proposed System

A.System Flow

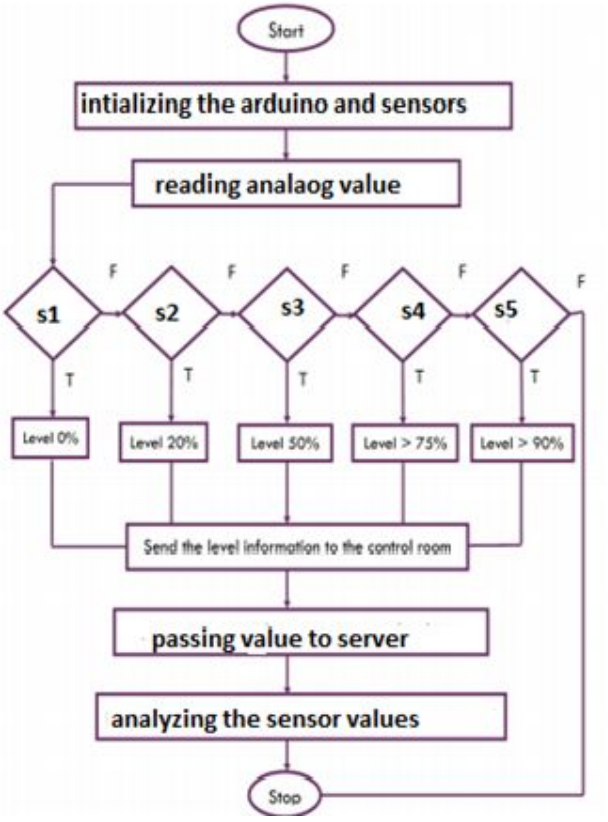

Fig 4 : System Flow

In this Proposed System, the Kit is switched ON and the initialization routine takes place. i.e., Arduino and the Sensors are initialized by connecting the cable. Now, the sensor senses and the value is displayed in the Analog form. The value is displayed in the Liquid Crystal Display(LCD).

The level of gases which is sensed by the sensor is sent to the control room. The value is passed to the Server and then the values are analysed the sensor value is above 90%,the Buzzer which is connected will alarm(ring).

IV. Implementation

A.Module Description

1)Sensor Interface
2)Data Transmission to the Server
3)Mobile Application

B. Algorithm Used

1) Start
2) Initialize the Node, connect to the network
3) Start the Analog pin Read to start the gas sensor
4) Start the TCP connection to the server, send the data using HTTP GET
5) After the acknowledgement ,sensor send the value to the server
6) At last output is viewed through Server and also by the Mobile Application
7) Repeat from step 2 for more samples
8) Stop

1.Sensor Interface

ZIGBEE is connected **with the Arduino .**The TX pin of the ZIGBEE is connected to the pin 1 of the Arduino and the RX pin of the ZIGBEE is connected to the pin 2 of Arduino through the resistors. **MQ135 sensor** is connected **with the Arduino .**VCC and the ground pin of the sensor is connected to the 5V and ground of the Arduino and the Analog pin of sensor is connected to the A0 of the Arduino. Buzzer is connected to the pin 8 of the Arduino which will start to beep when the pollution level exceeds the threshold value

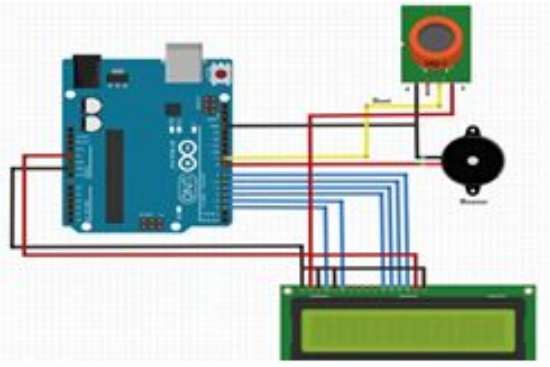

Fig 5 Internal Configuration

2.Data Transmission to the Server

Can upload source data for Server workspace In the Server, Once data is uploaded, users can select the uploaded data for the workspace to use. Uploaded files are stored in a private location accessible to Server. The methods supported for sending files are PUT and POST. The HTTP GET method is supported for browsing files that are already uploaded. Storage is supported and that all requests must be associated with the Server workspace.

3.Mobile Application

At last we will design a Mobile application for the user. The user can view the pollution level by login to their respective account .So that they can view the pollution level

V. Results and Discussions

Portable instrument testing is a device which has connection directly to the environment, which should be tested and controlled ,We are testing the gas values like CO,CO2 .So we are testing the gas value over the area where the kit is placed, after sensing the value from the kit value is displayed in the website. When the gas value cross over the threshold value then buzzer Rings (Alarm)

Mobile :

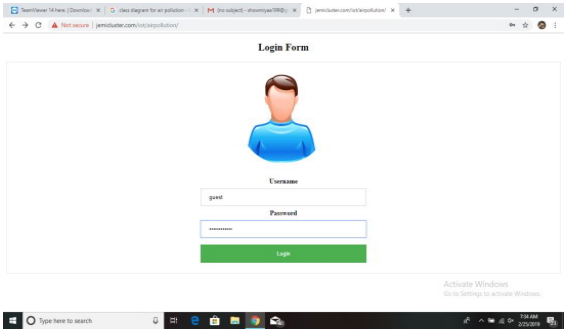

Fig 6 Login Form

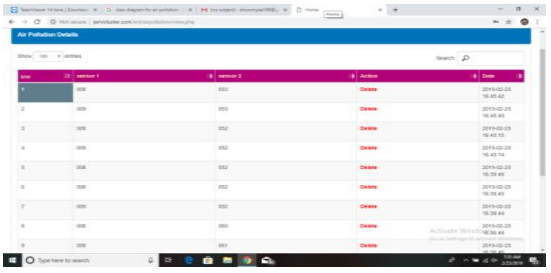

Fig 7 Result outcome of the Sensor Value from Mobile App

Webpage:

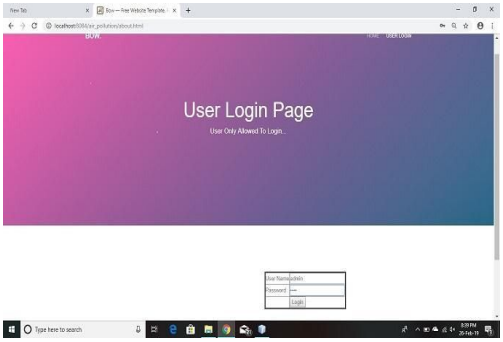

Fig:8:Login form

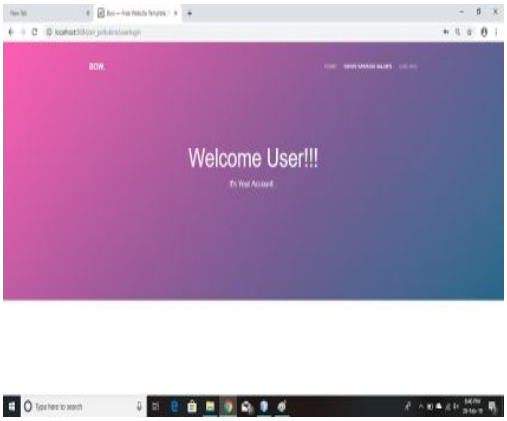

Fig 9 Welcome Page

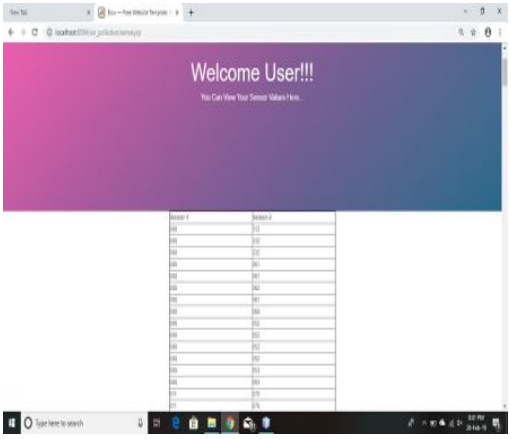

Fig 10 Result outcome of Sensor Value from Server

VI. Conclusion and Future Enhancement

In this paper, we have proposed a system, which objective is to monitor, record and give a warning through the user toward CO2 value. This research can be concluded that the system function properly. The wireless air pollution monitoring system provides information about the CO2 pollution, as well as provides an alert (Alarm)in case of high Threshold value in quality of air.

This information can then be used by officers to take appropriate actions.

REFERENCES

[1] A. Ali, B. Khan ,"Energy Conservation and Efficiency (ICECE)", in 2017 International Conference .

[2] Liu Hong ,Wang Tian Zhang," Advanced Information Management, Communicates, Electronic and Automation Control Conference (IMCEC)",in 2016 IEEE.

[3] Stephen Hensal , Leon Urbas ,"Industrial Informatics (INDIN)", in 2016 IEEE 14th International Conference

[4] Engin Mendi,Caner Yogurtcular,"Medical Measurements and Applications (MeMeS)", in 2014 IEEE International Symposium .

[5]Z.R.Samani,M.Shamsfard,"Computer Sciences and Convergence Information Technology (ICCIT)", 11 6th International Conference

[6]Yong,Tae Won," New Trends in Information and Service Science",in 2009. NISS '09. International Conference

[7]Jorge ejarque,"eScience, 2008.eScience '08"in IEEE Fourth International Conference.

[8]"IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews) (Volume: 30, Issue: 3, Aug 2000).