Monitoring Carbon dioxide Level for Allergic Person Using IOT

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***Abstract*- Almost every metro cities in India are facing problems such as water, pollution, population etc. for which no proper managements are being done. In this paper one problem among above is discussed is air pollution.. Air pollution severely affects human health leading to several respiratory diseases like asthma, lung cancer, pneumonia etc. . The concerned is to develop an automatic system to monitor air quality and alert the concerned authority as well as residents those who are using the system if pollution level increases more than a threshold value. Air quality sensors, such as MQ 135, MQ 2 can accurately detect level of CO2 in air. The data collected by sensor is sent to information processing centre through wireless medium using an emerging technology Internet of Things (IoT). This system is deployed at Dayananda Sagar University (DSU) campus, IBM lab. Data was collected from lab at ideal condition, Kudllu Gate traffic signal, and BTM. The experimental results were compared with air quality index (AQI) Bengaluru the observation resulted that BTM was most populated.**

***Index Terms*- MQ-135 sensor, Command Line Interface (CLI), Internet of Things, Telegram Bot, Raspberry Pi (RPI).**

I. INTRODUCTION

The development of industry opens the way in progress of science, technology and making living conditions better and simple. The growth in industry or development had put adverse effect on environment increasing in pollution level which has now became a big problem all over the world, especially in big cities like Bengaluru, Delhi, Mumbai, Pune etc.. Air pollution monitoring and reducing pollution is a major concern nowadays. Due to decline in quality of air, more deadly diseases have started spreading like asthma, lung cancer, pneumonia etc.

Main reason for global warming is carbon dioxide emission from different vehicles, households, or factories into atmosphere. In this paper MQ-135 sensor will be placed to detect level of carbon dioxide in the atmosphere and inside house which will help asthma patent to avoid going to such place without precautions.

The development of information technology has three time periods. The first is computer interconnection based internet era; the second is information interconnection based network information era, and the third is present internet of things era [1,2]. Now IoT is widely used in monitoring system, healthcare system, military area, smart home etc.

In this paper MQ-135 sensor is connected to Raspberry pi 3(RPI). Sensor detects presence of CO2 level in air and notifies user through telegram in form of PPM value. Recorded data value is stored in excel sheet, a graph is plotted based on sensor readings which is matched with the standard graph obtained from datasheet of MQ-135 for different concentration of CO2.

An effective use of telegram is made which is a social media platform. User can join the channels created according to the region and notification will automatically be shared with the individuals residing near the locality [2]. If the device is used in a home it will notify to the user as well as will display on the screen wherever it will be placed in the house.

II. PROPOSSED METHODOLOGY

A. Sensor Node

In this research, MQ-135 sensor (shown in Fig. 1.) is used to monitor CO2 level. When polluted air goes through the sensor, heater present inside the sensor reacts differently with different gases, its conductivity increases with the increase of gas concentration in the polluted air. By adjusting the variable register value ranging between (10KΩ to 47 KΩ) we can change the sensitivity as explained in datasheet of MQ135. Further, MQ-135 is very sensitive to Ammonia, Sulphur, Benzene vapour, Smoke, Carbon Dioxide and other harmful gas and is an ideal choice for CO2 monitoring. It is also a low-cost sensor which can be used for a variety of applications which need a large number of this kind of sensors for big coverage with low cost.

Fig. 1. MQ135

B. Raspberry Pi 3 Model B

The RPI as shown in Fig. 2, is a low cost, credit-card sized computer that easily plugged into a computer monitor or TV, and it requires separate standard keyboard and mouse to operate [3]. It is very powerful tool at a very low cost having capability of doing everything that one can expect a desktop computer to do. Sensor analog data is converted to digital form through Analog to Digital Converter (ADC) and is fed to RPI input which is then analysed and further sent to telegram.

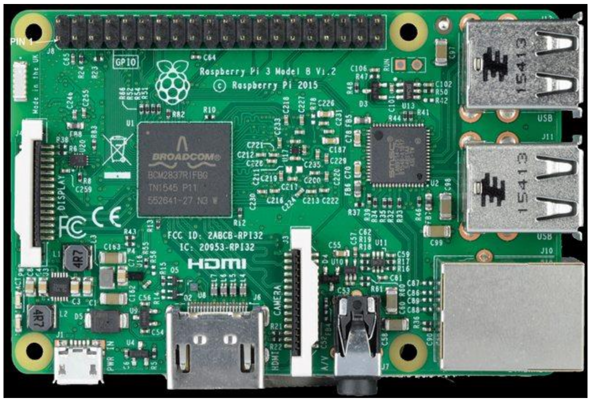

Fig. 2. Raspberry Pi 3 Model B

C. Telegram

Telegram is a non-profit cloud-based instant messaging service [4,5]. Telegram client apps are available for Android, iOS, Windows Phone, Windows NT, macOS and Linux. Users can send messages and exchange photos, videos, stickers, audio and files of any type. It provides multiple features like

1 Account
2 Cloud-based messages
3 Bots
4 Channels
5 Stickers
6 Drafts
7 Secret chats
8 Voice calls

D. IoT Level II

The Internet of Things (IoT) is the network of physical objects—devices, vehicles, buildings and other items embedded with electronics [6], software, sensors, and network connectivity—that enables these objects to collect and exchange data.

IoT is used so that all the devices connected to each other via internet can exchange data. A level-2 IoT system uses a single node that performs sensing and actuation. Sensed data is analysed locally. Data is usually stored in cloud and applications are cloud based.

Sensor node MQ135 sense the presence of CO2 and sends it to RPI which analyses the data locally and compares the digital output received from ADC with the old saved data and send it to telegram through telegram bot which uses Python API to establish communication between RPI and telegram [7].

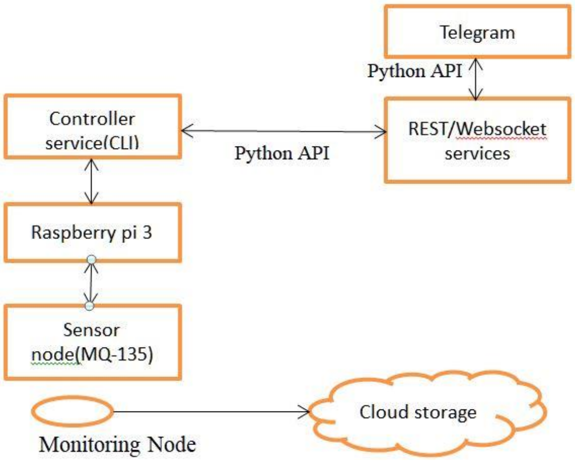

Fig. 3. IoT Level II

III. EXPERIMENTAL SETUP AND MEASUREMENTS

A. Calibrating

A prototype of the CO_2 concentration detection system developed is shown in Fig. 4. The CO_2 concentration detection system requires a threshold voltage to detect the gas to be set to 5V. Sensor sensitivity is adjusted by adjusting the variable register value, which is checked by using multimeter. We have fixed the Rl value as 22KΩ mentioned in datasheet of MQ135. Rs/Ro value in clean air is given as 9.8.

$$\frac{Rs}{Ro} = 9.08\ For\ Clean\ Air$$

B. Testing with CO2

For testing the system with CO_2, the following preparations are required. First, the MQ-135 sensor requires preheating for about 24-48 hours. Once these preparations are done, the MQ-135 sensor is deployed in the location where we need to test for the concentration. Different readings were taken at different locations which are shown in Fig. 5. Graph were plotted with the reading obtained and were matched with the graph from the datasheet shows the accuracy of 99% which is shown in Fig. 4.

$$X_2 = \left(\frac{log_{10}(Y_2) - Y_1}{\text{Slope} + X_1}\right)^{10}$$

Above equation to find gas concentrations in PPM

Where:

Y_2, Y_1, X_1 *Comes from the Graph reading*

$$\text{Slope} = \frac{Change\ in\ Y}{Change\ in\ X}$$

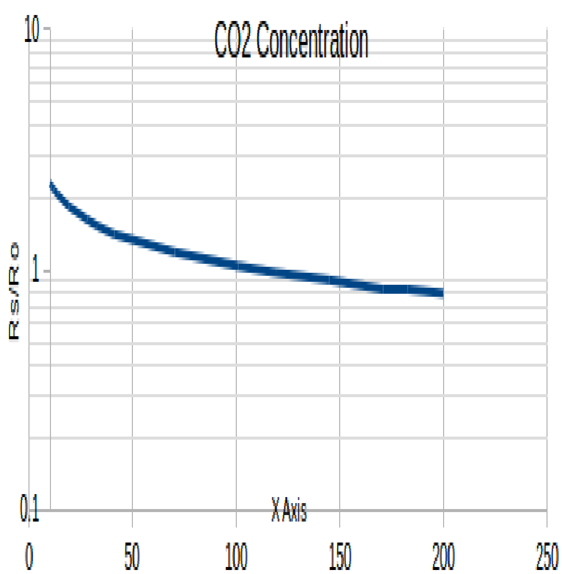

Fig. 4. CO2 graph from datasheet

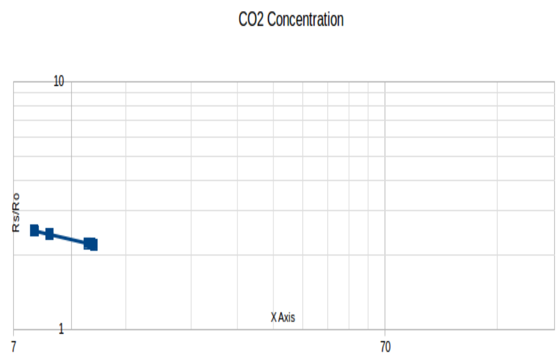

Fig. 5. CO2 graph from experimental environment

Table I. CO2 readings obtained from datasheet and experimental environment

X-Axis	Y-Axis	X-Axis	Y-Axis
10	2.30372	7.94	2.5
10.8629	2.22458	7.98	2.49
11.8004	2.16702	8.73	2.42
13.7169	2.05633	8.76	2.41
19.1005	1.83551	11.06	2.22
27.8256	1.62415	11.07	2.22
32.8352	1.52778	11.5	2.19
40.8424	1.41223	11.32	2.21
70.211	1.18578	13.12	2
100.755	1.04011	18.2	1.9
values from Datasheet		Values from experiment	

IV CHALLENGES

In this paper, only one MQ-135 gas sensor is used so it's easy to manage. If large number of sensors is connected then it will be difficult to read data and maintain collaboration. Since sensors in IOT are battery powered it is challenging task to maintain the battery from draining fast. IOT networks are prone to security threats. Sensors can send data only through internet on real time which makes it challenging task to maintain continuous connectivity. Accurate measurement of carbon dioxide cannot be detected in ppm since it depends on values taken during calibration.

V CONCLUSION

In this paper, experiment was conducted successfully under lab condition and external environment; results that we achieved were matched with the datasheet of MQ-135. After successful completion results were 95% accurate when exposed to external environment.

FUTURE WORK

Calibrating the sensor is difficult since details are not available. This makes the result to vary from researcher to researcher due to different measurement taken. To do verification of collected readings calibration process may vary as per the researcher and device availability and preciseness's. Data sheets of different sensors presents the result and values checked under lab conditions which is different from the behaviour shown by the sensor in the open environment. In future, solar energy can be used to power sensor nodes. If the day is cloudy then rechargeable battery can be used to power sensor nodes. Wi-Fi enabled sensor, one wired technology can be used to connect sensors so that it will be less bulky and easy to maintain. .

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