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 ijircce@gmail.com

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Air Pollution Monitoring System using Wasmote Gas Sensor Board in Wireless Sensor Network

B.Hemalatha¹, C.Likitha², B.Lalithamma³, C.H.Harshavardhan⁴, M.Jaswanth Kumar⁵, C.Madhu⁶

Department of Electronics & Communication Engineering, Siddharth Institute of Engineering & Technology
(Autonomous), Puttur, Andhra Pradesh, India^{1,2,3,4,5,6}

ABSTRACT: The use of motor vehicles in urban areas is very high. It affects the high levels of air pollution produced. The use of motorized vehicles produces smoke exhaust containing harmful gases such as Carbon Monoxide (CO), Carbon Dioxide (CO₂) and Nitrogen Dioxide (NO₂). If the hazardous gas content in the air exceeds the normal limit, it can interfere with human health that inhale it can even cause death.

The problem is the lack of information that can be obtained by the community to find out whether the surrounding area has a safe or dangerous air pollution level. Therefore, an application is needed to monitor and analyze the level of air pollution at certain location and inform the results to the user in graphical form through internet network.

KEYWORDS: Raspberry Pi, DHT11 Sensor, PM2.5 Sensor, MQ2 Sensor, LCD, AD Converter.

I. INTRODUCTION

Particulate matter being a very important parameter gives a clear indication of pollution in that particular time in the area. These pollutant data are extracted using sensors. Most of these sensors produce analog output so an Analog to Digital converter is required before supplying the data to the Raspberry pi microcontroller. Using software and coding of the Raspberry Pi 3B+, the data are analyzed and a graph to show the changes in the locality and time in which the experiment is plotted. The results obtained were verified. The experiment is conducted in a locality at Tirupati, New Town, A.P and the results were compared with that from a local environment control authority. This system would help to take real-time decisions and very effective in today's situation of high air pollution in most of the Indian cities.

Many production processes in industry, agriculture, viticulture and livestock require specific environmental conditions to be monitored at all times. Sometimes the process can generate air pollutants that can be harmful and even deadly to workers in certain concentrations. The fact of having a monitoring system with Wasmote allows controlling the parameters of a production process, sending alerts via GPRS and even activating mechanisms through the relay actuator included in the prototype board.

Besides the potential danger posed by the volatility and flammability, they are soluble (they accumulate in the human body due to its affinity to fats) and toxic, causing eye and throat irritation, headaches, sickness, fatigue, nausea and diverse allergic reactions in the short-term; in the long term, they can damage the liver, kidneys or central nervous system and promote cancer appearing, as in the case of benzene. In conjunction with the NO₂ emitted by vehicles and sunlight, it favours the appearance of ozone, whose excess causes a reddish atmosphere known as photochemical smog, as we saw in this other article on outdoor air pollution.

II. RELATED WORKS

This paper presents a design for a system that aims to notify the residents of VOC's concentration level in both indoor and outdoor environments. The system is IOT-based, it will monitor and detect total volatile organic compounds (TVOC) and then inform the user via wireless communication system of its levels to take actions.

IEEE Transaction (2020) - Rohan Kumar Jha : Air Quality Sensing and Reporting System Using IoT :

The circuit finally displays the PPM values as well as Air Quality level of gases on an Android application which fetches data from ThingSpeak. The current model is implemented successfully and can be deployed for real system implementations.

IEEE Transaction (2019) - Hocine Mokrani: Air Quality Monitoring Using IoT: A Survey :

This paper aims to answer these necessities by reviewing the existing works on air quality monitoring using IoT with the focus on lasted trends and challenges.

IEEE Transaction (2020) - AjiteshKumar: Design and Analysis of IoT based Air Quality Monitoring System:

The system can measure local area air contamination and generate analyzed data based on which it alerts the people through a buzzer device integrated into the system. The user-friendly and easy handling of the system technology is such that it can be installed in houses and in small places.

III. PROPOSED METHOD

We are proposing a technology by using raspberry pi board and some sensors. PM 2.5 sensor is used to detect the number of particles in the air and MQ2 sensor is used to detect the amount of gas in the air and also humidity sensor is used to detect the temperature. These sensor values always upload at the cloud platform. So, by using this system can continuously monitor the weather parameters. Data will display in the LCD.

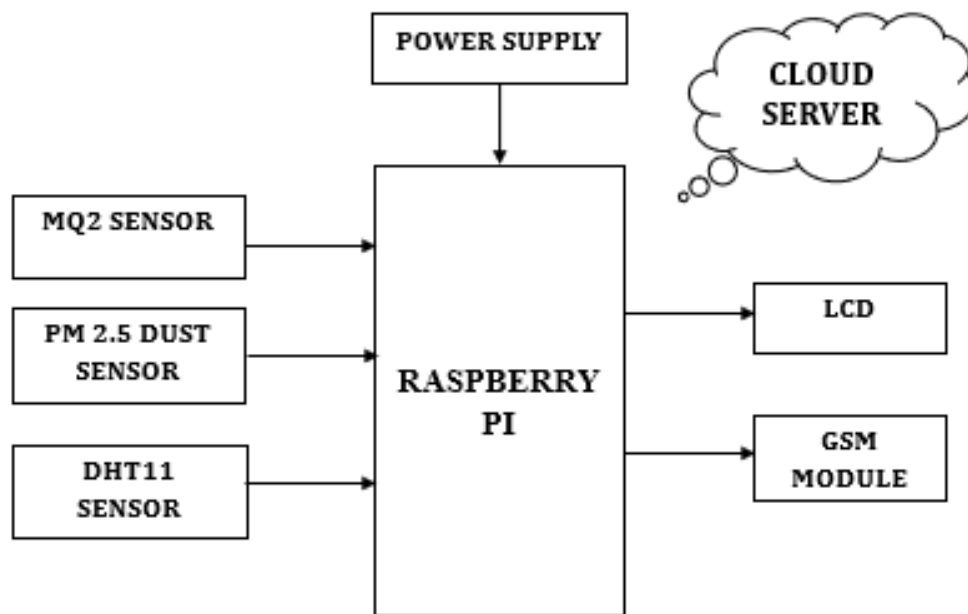


Fig.3. 1:Block Diagram of Proposed System

If the values are greater than the threshold values ,we will get an alert message through the GSM module and the sensor values are stored in a graphical format in thinkspeak cloud.

IV. EXPERIMENTAL RESULTS

In this study, Air Pollution monitoring system is presented.The sensors are used here to detect the humidity, temperature, dustparticles, detectsgases.The results are co;ected into monitor database.This database is also integrated with raspberry Pi,which consist of the basic required code.This study limitation is only on the design and development of monitoring system. Sensors sense the values,if the values is greater than the threshold values required action will be taken.

The data visible in LCD will sent to the server. The output of Thinkspeak shows the output in the graphical format.If the values is greater than the threshold values ,an alert will be sent .

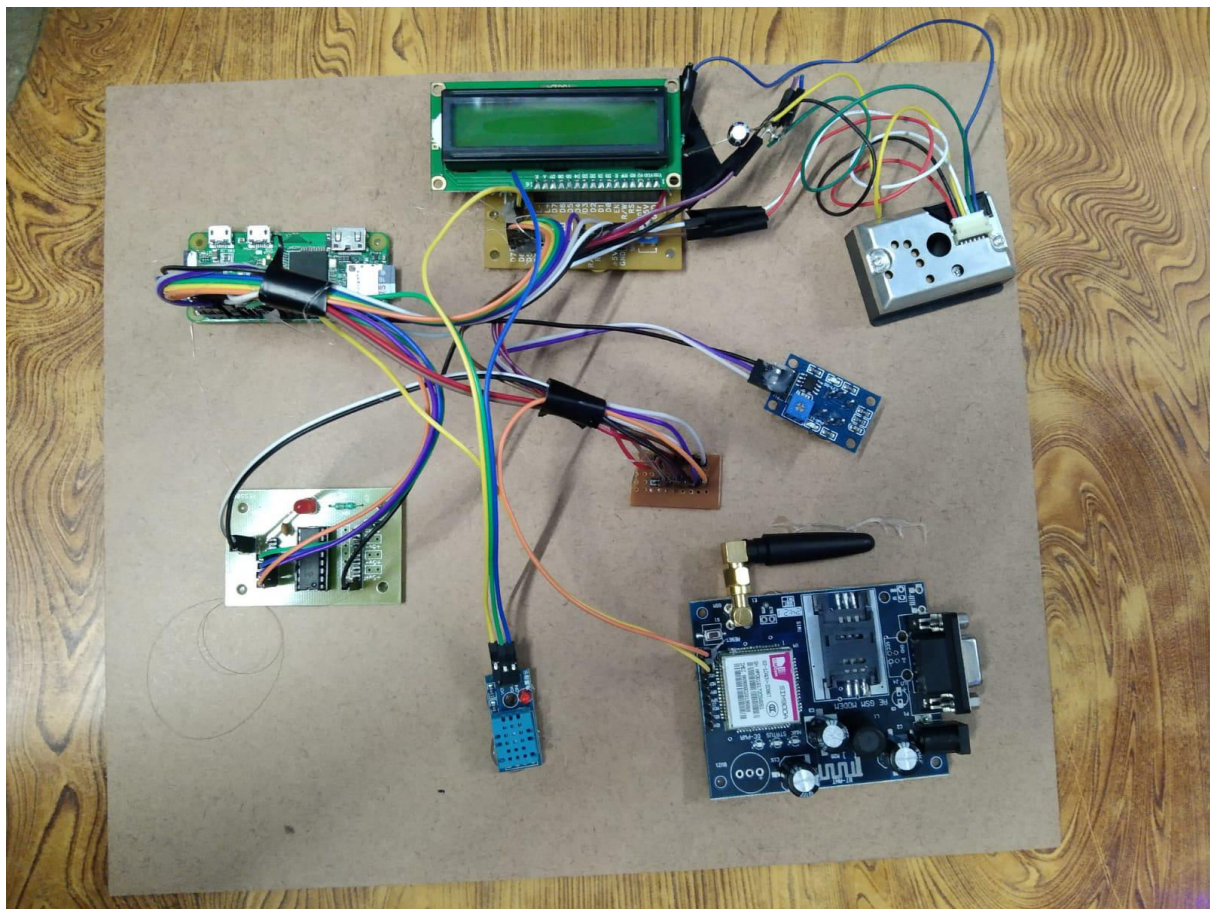


Fig.4.1: Proposed prototype

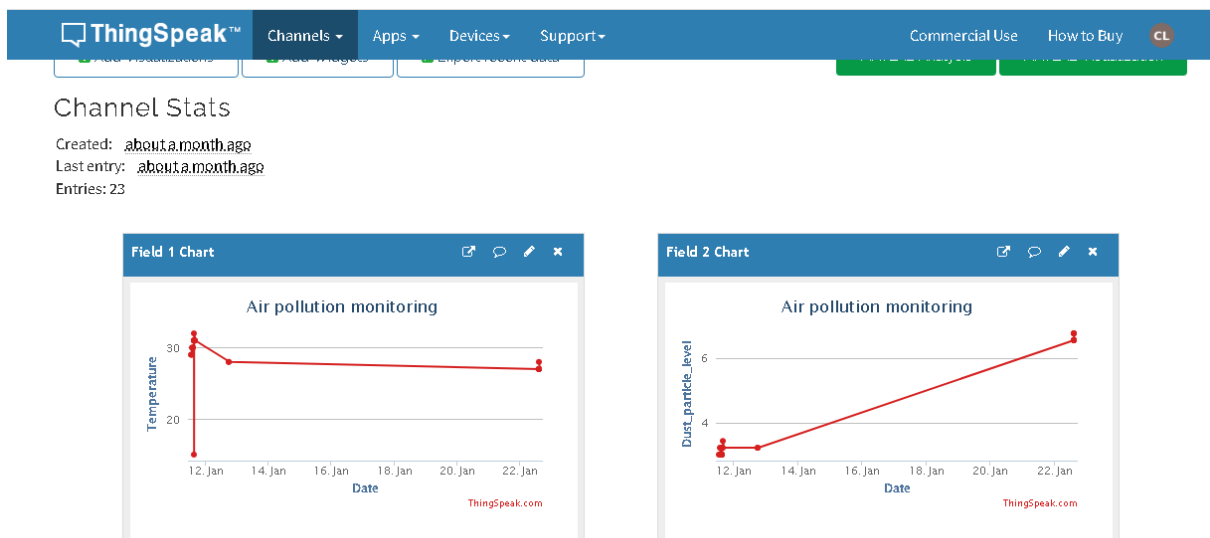
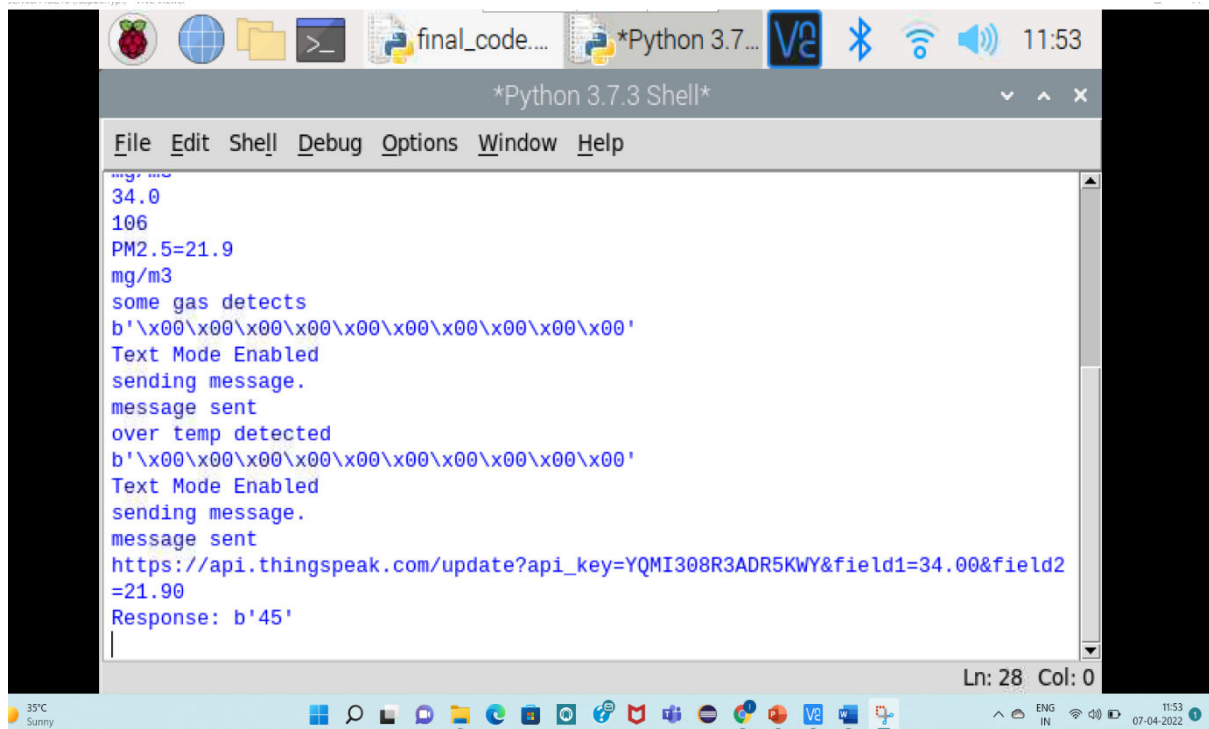


Fig.4.2: Values are stored in thinkspeak cloud



```
File Edit Shell Debug Options Window Help
34.0
106
PM2.5=21.9
mg/m3
some gas detects
b'\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00'
Text Mode Enabled
sending message.
message sent
over temp detected
b'\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00'
Text Mode Enabled
sending message.
message sent
https://api.thingspeak.com/update?api_key=YQMI308R3ADR5KWY&field1=34.00&field2=21.90
Response: b'45'
```

Ln: 28 Col: 0

Fig.4.3: The Output Values of sensors are displayed in VNC Viewer



Fig.4.4: The Output is shown in LCD



Fig.4.5 :MQ2 Sensor value shown in LCD

V. CONCLUSION

The system to monitor the air of environment using raspberry Pi microcontroller, IOT Technology is proposed to improve quality of air. With the use of IOT technology enhances the process of monitoring various aspects of environment such as air quality monitoring issue proposed in this project. Here, using the gas sensor, temperature and dust sensors gives the sense of different type of dangerous gas which control the entire process. The integrated IoT air pollution system is developed to overcome the issues in air quality. The sensors mainly sense the various dangerous gases present in the environment. These sensors can likewise be executed in automatons which can move around and recognize the contaminating gases in the earth. Safety efforts can be upgraded to secure the information that is being sent through the segments by presenting new conventions. The architecture proposed in the system will help in analysing the air quality for the particular surrounding in the real time and it will help the authorities to get the accurate data for the action. We can also launch an app to make sure it is easily available to everyone and install many such setup in each and every area to evaluate that particular area or we can connect it to a satellite so that it is easily accessible

VI. APPLICATIONS

- Weather monitoring stations



- Industries



- Safety System



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