International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 422-426 www.ijaem.net ISSN: 2395-5252

Iot Based Air Quality Monitoring Robot Using Blynk Cloud Service

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Date of Submission: 10-07-2023 Date of Acceptance: 20-07-2023

ABSTRACT –
Air pollution is getting worse every day, harming everyone in both wealthy and developing nations and lowering the air quality index. The swelling population, expanding industries, quickening urbanisation, and excessive use of fuel-intensive transportation are just a few of the factors contributing to this sudden rise in air pollution. Thus, there is a growing demand to monitor air quality in an energy-efficient, widespread, and linked way. This project presents a cutting-edge real-time air quality reporting system that is powered by Internet of Things (IOT) architecture. The Internet of Things (IoT) is a web of tangible items, or "things," that are connected to sensors, software, and perhaps other technologies to facilitate information exchange as well as interaction with certain other appliances and systems. The deteriorating state of the air has been a concern recently, and real-time air quality monitoring enables us to keep an eye on it. The scale used to gauge how contaminated the air is is called air quality. Higher air pollution means air that is more hazardous to human health. The device shown here combines hardware and software from the Arduino IDE with gas sensors from the MQ135, MQ7, MQ9, and DHT11 families that aid in the detection of gases like NO2, CO, ammonia, and sulphur dioxide. With the aid of GPS and IOT, live location tracking and data updating will also be possible. Also, this research project uses devices connected to the internet and an IOT analytics program called BLYNK to monitor the Air Quality. Additionally,
it may include real-time data into our mobile app. Finally, the circuit uses an Android application that downloads data from a sensor over the Internet of Things to display PPM values as well as the degree of gas air quality. The present model has been successfully implemented and can be used to construct actual systems.

I. INTRODUCTION

The study discusses monitoring of the indoor air quality and a network of fire alarms devices, and accident avoidance owing to gas leaks. The sensors built within this portable device can be put on buildings such as homes, shopping centers, garages, hospitals, and businesses. This project is IoT-based. Recently, Pakistan's air pollution has risen to dangerous levels, particularly in its major cities. The Natural Resources and Environment Ministry claims that there are numerous causes that contribute to pollution. For instance, the concentration of CO_2 is raised by emissions from cars, construction projects, businesses, forest fires, and power plants. Human health is significantly impacted by air pollution, which also has an impact on nearby residents and workers in related industries. The air is unhealthy to breathe in due to a number of toxic gases. There are some gases, such as methane gas, that, if not eradicated or at least recognised in the right time, might result in serious accidents. Instead of air monitoring detectors, Pakistani firms are primarily concerned with equipping fire extinguisher detectors. Concentrating on someone's health is especially crucial because this kind of small neglect results in serious health issues and occasionally even death. Many gases that are hazardous to health are undetectable by human senses. Therefore, it is difficult to supervise the degree of air pollution. We need to create an detector of air pollution in order to carry out our plan. We looked for a model that could gauge the pollution level. To monitor or track the elevated levels of air pollution, we built a working prototype of an Internet of Things-based air pollution detector. In today's smart world, IoT offers a wide range of applications. It facilitates the connection of common objects to the internet,

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allowing us to utilise computers and exchange data with little disturbance from people. Natural environment detection is one of the crucial IoT applications. The most crucial component of human existence is keeping a record of one's environment and surroundings. IoT has influenced many technological advancements, including cloud computing and machine learning. In addition, the Internet of Things (IoT) helps us make changes to the procedures for environmental monitoring, health enhancement LCD, and other human welfare-related areas. helps us make changes to the procedures for environmental monitoring, health enhancement LCD, and other human welfare-related areas.

II. RELATED WORK

A. LITERATURE SURVEY

[1] Shengin, Jianting, et al, Radypurbakawaca, ariefsabdoyuwono , i. Dewa made subrata, supandi , and husinalatas designed an inexpensive air quality monitoring system that uses metal oxide sensors to measure carbon monoxide (CO), sulphur dioxide (SO2), nitrogen dioxide (NO2), and particulate matter (PM) concentrations using laser diffraction, a microcontroller, and a general packet radio service module. Our air quality indexmonitoringsystemiscomprisedofasensor node powered by a rechargeable batterypoweredby either a solar panel or an AC power source. For receiving data, calculating the index of air pollutants,andgainingentrytodata,ourdesigned prototypeisoutfittedwithaninformationsystem, specifically a server as well as a graphical user interface. This paper discusses an uniqueflexible algorithm for cellular network-based transmissionpacketlossreduction.Thisapproach extends response waiting times in accordance with the received signal strength indicationwhile enabling nodes to send datarepeatedly.

[2] QilongHan , Peng Liu , et al., Cai collected information on carbon monoxide, nitrous oxide, SO2 (sulphur dioxide), particulate matter, ozone, temperature, and humidity while utilising the Zigbee network to optimise the network topology. Then, using the method for tracing pollution, we get full coverage Pollution monitoring of the entire city through local monitoring sites, while determining the dilution coefficient and diffusion coefficient of pollution diffusion. Lastly, the suggested is an enhanced short-termmemorycapacity(LSTM)approachto forecast the urban air quality pollution time. The experimental findings demonstrate the revised LSTM prediction model's broad application and high level of precision over time forecasting of pollutedclimate.

[3] Kan Zheng, Shaohang Zhao, Zhe Yang, XiongXiong, et al., presented a novel approach based on cutting-edge Internet-of-Things (IoT) technologies to put the air quality monitoring system in place. With this system, portable sensors quickly gather and transmit air quality data across a low-power wireless local area network. The cloud processes and analysesall air quality data. The total air quality monitoring system, which includes the software and hardware, has been created and effectively used in metropolitan settings. The suggested dependable technique for detecting air quality, accordingtoexperimentalfindings,whichto some extent helps disclose the patterns of air quality change.

III. PROPOSED WORK

A. METHODOLOGY

The aim of this project is to develop a robot that can assess the air quality in a given area. Also, this device can alert the user if the air quality drops below a specific point. This system can detect a variety of chemicals, including NH3, benzene, smoke, alcohol, and CO2. We have suggested a method for combining the Internet of Things and a wireless sensor network to monitor air pollution in real time. Analog inputs from different gas sensors, including the MQ135, dht 11 sensor, MQ7, and MQ9, are received at the analogue input pins of the ESP32. By using the ESP32's ADC, these data are transformed into digital form. Prior to calculating air quality, the obtained data are transformed into parts per million of the gases (ppm). For different types of air detection in this instance, multiple MQ series sensors are used. These results are sent to ESP32, which will then use an IOT mobile application named BLYNK to send the information to the relevant person's mobile device. Real-time data is transmitted via the Internet of Things to the BLYNK APP, where it can be accessible in a mobile phone application that analyses historical data on air quality to determine the state of the air in a particular region at a given moment and serve as an alert mechanism. The mobile application categorizes the air quality into many categories, including mq7, mq9, mq135, humidity, and temperature.

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B. WORKING PRINCIPLE

The suggested structure is an air quality monitoring system based on the Internet of Things. The sensors that we have employed let us detect the existence and concentration of some dangerous gases, particles of dust in the air at that precise moment, as well as to check the temperature and humidity at that specific moment. Depending on whether they have an analogue or digital output, these sensors are linked to the controller in the appropriate way. The controller will not only collect data from multiple sensors, but it will also transmit the collected data to an IoT platform using a built-in Wi-Fi module. IoT platforms will plot graphs, charts, and quantitative figures in addition to storing real-time sensor data. As a result, We might be able to continuously examine the air condition at the site of the installation of the system. Our air quality tracking system's block structure is shown in below Fig. Our system's primary controlling component is an ESP32. The sensors are picking up on various environmental factors like temperature, humidity, Carbon monoxide and particulate debris, and the gas carbon dioxide. The ESP32 is connected to the sensors. The ESP32 collects data picked up because of the sensors and sends them incessantly via the internet to the cloud. The ESP32 device is also wired with a buzzer that will sound whenever the amount carbon dioxide in the atmosphere reaches a certain threshold, or the point at which it becomes dangerous to human health. a buzzer that produces digital data.

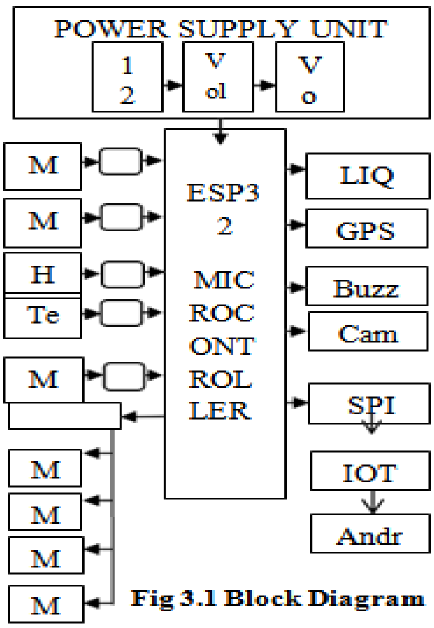

Fig 3.1 Block Diagram

C. MODULEDESCRIPTION

C.1. ESP32MICROCONTROLLER

In this project, we used the ESP32 microcontroller. The ESP32 microcontroller features a potent chip with two processor cores. It is therefore quicker than the other controllers mentioned above. It has an integrated Wi-Fi and is a low-cost, low-power microcontroller, Bluetooth Low Energy (BLE) on-chip, and good deep sleep modes. 18 12-bit ADC channels and 2 8-bit DAC channels are available. ESP32 processes all of the incoming sensor data.

C.2. MQ-135 - GASSENSOR

Ammonia (NH3), sulphur (S), benzene (C6H6), carbon dioxide (CO2), and other hazardous gases and smoke can be detected by this sensor. This gas sensor has a pin for both output(a digital andanalogue), same as the other MQ series gas sensors. When the level of these gases in the air is high and reaches a specific threshold, the pin of the digital output goes high. The threshold value can be modified using the on-board potentiometer. The analogue output pin generates a voltage that can be used to roughly calculate the concentration of different atmospheric gases. The MQ135 air quality sensor module uses 5V and draws around 150mA. It must be heated up in order to produce trustworthy results.

C.3. MQ9 GASSENSOR

The MQ9 Gas Sensor belongs to the MQ Gas Sensors family, which also includes Gas sensors MQ 2, MQ 4, MQ 3, and MQ 135 are examples. Gases like propane, methane, and carbon monoxide are primarily sought after using it.. This MQ9 smoke sensor has a sensing component made primarily of ceramic with an aluminum- oxide base that has been coated in tin dioxide (SnO2) and is housed in a stainless steel mesh. The resistivity of the sensing element changes each time gas comes into contact with it.

C.4. HH10D HUMIDITYSENSOR

an EEPROM used to store the calibration, a humidity sensor of the capacitive type, and a CMOS capacitor to frequency converter variables make up the HH10D relative humidity sensor module. The system may react to changes in humidity very quickly because of the properties of capacitor-type humidity sensors.

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C.5. THERMOMETERSENSOR
The initial slave was linked to an LM35 temperature sensor. This measures the engine's temperature and gives the current temperature.

C.5. GAS SENSOR MQ7
The Gas sensor MQ7 belongs to Gas Sensors of the Metal Oxide Semiconductor (MOS)type, whichalsoincludestheMQ2,MQ4,MQ3,MQ 8, MQ 135, and others. The main purpose of it is to detect carbon monoxide.

IV. SOFTWARE IMPLEMENTATION

BLYNK App
To design, activate, and remotely handle connected electrical devices of any size, ranging from small personal IoT devices to large industrial IoT projects to enormous numbers industrially related products, a full software suite known as Blynk is required.
Blynk allows anyone to connect their equipment to the cloud, develop no-code iOS, Android, and online services, examine real-time and statistical data from systems, and operate them remotely from anywhere, receive important alerts, among other things.
Blynk is a system of multi-tenancy. You may manage how users access the data by defining roles and establishing permissions.

The Internet of Things links everyday "items" to the internet. Computer engineers began integrating sensors and CPUs into everyday objects in the 1990s. But, because the chips were so big and hefty, the process started out slowly. RFIDtags,whicharesmall,low-powercomputer chips, were initially employed to track expensive machinery. These processors evolved throughout time to become smaller, quicker, and smarter as computer devices shrunk insize.

V. RESULTS AND DISCUSSIONS

The Data from the sensors and the controller are received as experimental results. The data is sent to the Iot device and the results are depicted through mobile. The live status is picturized through the web camera.

Fig 5.1 The entire hardware setup of our air quality monitoring robot

The results from the sensors and the activity status are attached below as results.

Fig 5.2 Humidity sensor reading

Fig 5.3 Temperature sensor reading

Fig 5.4 The entire hardware setup of our air quality monitoring robot

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VI. CONCLUSION

The anonymity of data customers and the privacy of metadata were the privacy-preserving challenges that were addressed by distributed access control in such systems (policy- hiding).The new system is secured from users and authorities working together to obtain protected metadata or access data illegally. For distributed cloud storage, an effective PDP method is created. To enable dynamic scalability on numerous storage servers, we have proposed a cooperative PDP technique based on homomorphism verified response and hash index hierarchy. The key generation is happening between the cloud storage and the client so user cannot able to access the data, but user can able to review the content. Further this application can be extended to through an android app development.

REFERENCES

[1] P. K. Hopke, et al., ‘‘Spatial and temporal trends of shortterm health impacts of PM2.5 in Iranian cities; a modelling approach (2013– 2016),’’ Aerosol Air Quality Res., vol. 18, no.2,pp.497–504, 2018, doi: 10.4209/aaqr.2017.09.0325.

[2] M.Iriti,P.Piscitelli,etal.,‘‘Airpollutionand health: The need for a medical reading of environmental monitoring data,’’ Int. J. Environ. Res. Public Health, vol. 17, no. 7, p. 2174, Mar. 2020, doi: 10.3390/ijerph17072174.

[3] M. Kowalska, et al., ‘‘Effect of NOx and NO2 concentration increase in ambient air to daily bronchitis and asthma exacerbation, Silesian Voivodeship in Poland,’’ Int. J.Environ. Res. Public Health, vol. 17, no. 3, pp. 1–9, 2020, doi:10.3390/ijerph17030754

[4] P. Rafaj, G. Kiesewetter, et al., ‘‘Outlook for clean air in the context of sustainable development goals,’’ Global Environ. Change, vol. 53, pp. 1–11, Nov. 2018, doi: 10.1016/j.gloenvcha.2018.08.008.

[5] Government of the Republic of Indonesia. (2020). Regulation of the Minister of Environment and Forestry of the Republic of Indonesia no. 14, of 2020 Concerning the Air Pollution StandardIndex.

[6] G. Zhao, et al., ‘‘Innovativespatial–temporal network modeling and analysis method of air quality,’’ IEEE Access, vol. 7, pp.26241–26254, 2019, doi: 10.1109/ACCESS.2019.2900997.

[7] I. Gryech, et al., ‘‘Moreair: A low-cost urban air pollution monitoring system,’’ Sensors, vol. 20, no. 4, pp. 1–24, 2020, doi: 10.3390/s20040998.

[8] S.Dhingra,etal.,‘‘InternetofThingsmobile-air pollution monitoring system (IoTMobair),’’ IEEEInternetThingsJ.,vol.6,no.3,pp.5577–5584,Jun.2019,doi:10.1109/JIOT.2019.2903821.

[9] A. Olesiński, et al., ‘‘An adaptive energy saving algorithm for an RSSI-based localization system in mobile radio sensors,’’ Sensors, vol. 21, no. 12, p. 3987, Jun. 2021, doi: 10.3390/s21123987.

[10] Beijing’SAirWouldbeStepupforSmoggy Delhi. Accessed: Jan. 26, 2014. [Online]. Available:http://https://www.nytimes.com/2014/ 01/26/world/asia/beijings-air-would%-be-step- up-for-smoggy-delhi.html