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IOT Based Air Quality Monitoring System with Server Notification

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Abstract - The growing air pollution is one of the serious issues these days. As the pollution is increasing it is giving rise to number of diseases. So, it has become necessity to control the pollution to ensure healthy living and better future. The Air Pollution Monitoring device can be accessed by the each and every people curious about the pollution level. The device can be installed through a mobile application which will show the pollution level. This device is can also detect the fire in its area and update the same to the fire authorities as they can take necessary actions on situation and can control it to reduce loss. This system works on the methods of IOT which is a rising technology based on the fusion of electronics and computer science. The concept of IOT helps to access data from remote locations and save it in database so that we don't need to actually be present in that area.

Keywords :Air Pollution Monitoring device Pollution level IOT based device

1.INTRODUCTION

A healthy environment is the first and foremost thing for our happiness. We need a pollution free surrounding for living a safe and secure life. The recent increase in pollution levels in metropolitan cities, especially in Delhi, is a worrying sign. In the world that is advancing rapidly with technology where cars could drive on their own and drones could capture your food, air pollution should not be of much concern but the above statistics just proves it wrong. Our application is one such thing which can provide the surrounding air quality index to the user. This is a basic level system which notifies the user of the various pollutants and their levels present in air. We have also additionally included a buzzer alarm which notifies the user when the pollutants level breaches a certain threshold mark. This will make the user understand that the place is not healthy and safe to live. So, the user can now take necessary steps to reduce air pollution, or move to a safer location. The concept of IoT allows us to store the data containing the types and amount of pollutants present in air so that the user can analyze the changes that happens over a period of time. So the user can decide whether the air quality is improving or reducing over a period of time. There is an urgent need for these kind ofsystems which can be availed by any person especially in places which areheavily polluted. We can therefore think of curbing our daily human activities which leads to air pollution after making thorough analysis of the data. This gives us an opportunity to research on why pollution level is increasing or what good things need to be continued when the pollution level is decreasing. These kind of decisions could be arrived through the data that the user gets through our system.

1) 2.LITERATURE SURVEY:

Gupta, P., & Singh, R. (2016): IoT Based Air Pollution Monitoring System using Arduino. This paper presents a basic air quality monitoring system using Arduino UNO, MQ135 gas sensors, and an ESP8266 Wi-Fi module for uploading data to a web server. It demonstrates real-time pollution monitoring and threshold-based alerts.

Sethuraman, K., & Sivakumar, R. (2017): IoT Based Air Pollution Monitoring and Alerting System with Cloud Integration. This system uses multiple gas sensors and a GSM module to send alerts via SMS and uploads data to a Thing Speak cloud server.

Sharma, R., & Kumar, A. (2018): Design and Development of IoT Based Air Quality Monitoring System. Focuses on monitoring CO_2, CO, and PM2.5 using ESP8266 with a real-time dashboard. Alerts are sent via email using cloud services.

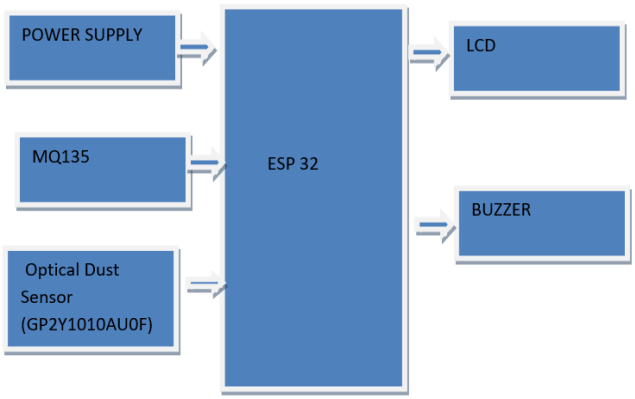
Verma, A., & Sinha, S. (2019): IoT Enabled Real-Time Air Quality Monitoring System with Cloud Storage

Implements a comprehensive system with multiple sensors, data logging on Firebase, and real-time mobile notifications.

Kamble, R., & Patil, A. (2020): Air Quality Monitoring System Using IoT with Automated SMS and App Notification. This system uses an ESP32 microcontroller to gather data and integrates with Twilio and Blynk for sending real-time SMS and app alerts.

Ch.V.Saikumar[1] M.Reji[2] P.C.Kishoreraja[3] Department of ECE , Saveetha School of Engineering Saveetha University, Chennai, India The main objective of this project is to monitor the air eminence in industrial and urban areas. The proposed outline includes a set of gas sensors (CO, and NO2) that are positioned on masses and structure of a IOT (Internet of things) and a dominant server to support both short-range realtime incident management and a continuing deliberate planning. In this Arduino platform is used to communicate the data simply and quickly. WSN (Wireless sensor network) acts as the trans receiver. This provide a real-time low rate monitoring system over the use of low rate, low information rate, and little control wireless communication technology.

BLOCK DIAGRAM



Power Supply
Function: Provides electrical power to all the components in the system. ESP32 (and indirectly powers all other components through ESP32's pins or shared lines).

ESP32
Function: Acts as the central processing unit. It reads sensor data, processes it, and controls output devices (LCD and buzzer).

Connected Inputs:

MQ135 Gas Sensor: Detects various harmful gases like CO_2, ammonia, benzene, smoke, etc.

Optical Dust Sensor (GP2Y1010AU0F): Measures the concentration of particulate matter (PM) in the air like dust and smoke.

Connected Outputs:

LCD: Displays air quality readings or warnings.

Buzzer: Emits sound alerts if pollution levels exceed thresholds.

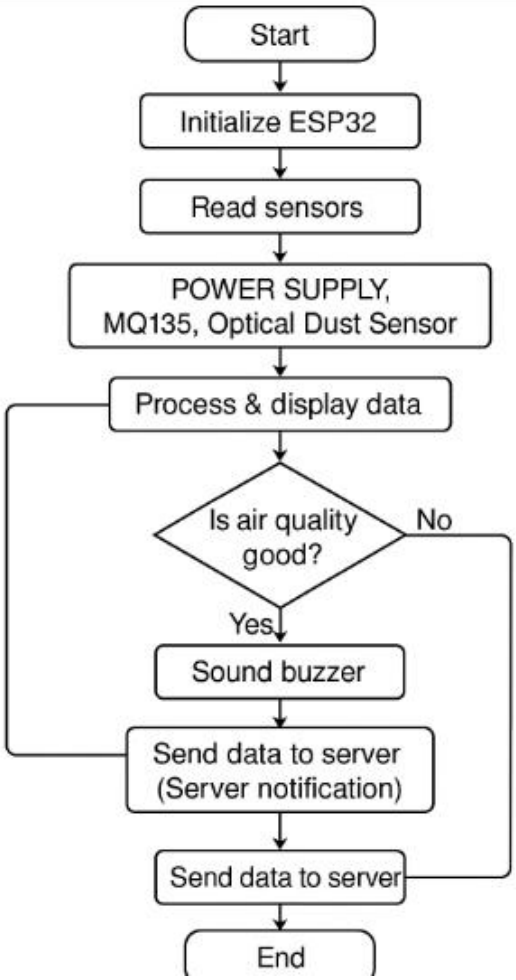
MQ135 Sensor
Function: Measures the concentration of gases and air quality. Sends analog or digital data to ESP32 for interpretation.

Optical Dust Sensor
Function: Detects dust particles in the air using optical sensing. Sends analog voltage corresponding to dust concentration to ESP32.

LCD (Liquid Crystal Display)
Function: Displays air quality parameters (e.g., gas levels, dust concentration, warnings). Receives display data from ESP32.

Buzzer
Function: Acts as an alert/alarm system if air pollution exceeds a certain threshold. Triggered by ESP32 based on sensor data.

ARCHITECTURE OF THE SYSTEM



RESULT: This air pollution monitoring system is built to monitor and measure air quality through a mobile app. This air quality monitoring system utilizes many sensors that sense gases, dust, or other pollutants in the atmosphere. Data collected from the sensors will be processed and transmitted to the mobile app that presents the user with a digital representation of air quality in real time. Users will have a manageable way of monitoring air pollution levels as well as visual aids, with graphs, to gauge air quality. It gives a way of denoting spikes in pollution, gives interpretation over time, and provides a resolved timeline for preventive outcomes; a very valuable system to anyone operating in individual, community, or government public and environmental sectors wanting healthier lifestyles. It enabled users to stay informed in their immediate environments and made an investment on subliminal eco-social behavior. The figures used in this paper facilitate the schematic representation of the system as to parts, connecting with (a connection type) of all sensor data from input to output, simplifying the complexity of pollution monitoring in an IoT-based solution and provides sustainable preemptive frameworks for planning environmental planning.

Conclusion: The Automatic Air management system is a step forward to contribute a solution to the biggest threat. The air monitoring system overcomes the problem of the highly-polluted areas which is a major issue. It supports the new technology and effectively supports the healthy life concept. This system has features for the people to monitor the amount of pollution on their mobile phones using the application. So, it becomes very reliable and efficient for the Municipal officials along with the Civilians to monitor environment. Letting civilians also involved in this process adds an extra value to it. As civilians are now equally aware and curious about their environment, this concept of IOT is beneficial for the welfare of the society. And it is implemented using the latest technology.

FUTURE SCOPE: Looking ahead, one significant improvement to this project would be to include a wireless network card or IoT communication modules such as GSM, LTE, or LoRa that can facilitate real-time data storage and transmission remotely, significantly improving the project. With this setup, the sensor readings from the microcontroller could be stored on a cloud server or database in real time, which would allow for historical data analysis and predictive modelling. Moreover, the system would be improved by integrating a wider range of gas sensors to enable the monitoring of harmful air pollutants more comprehensively (e.g. Nitrogen Dioxide (NO_2), Ammonia (NH_3) and Hydrogen Sulfide (H_2S)). This would make the model more amenable to applications in rapidly urbanizing areas and industrial zones, where pollution levels fluctuate and must be continuously monitored. The system's low cost, scalability, and real-time functionality makes this a promising solution for environmental agencies and governments wanting to protect public health. Overall, this model has a remarkable prospect of being an integral part of future smart city infrastructures.

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