# IOT Based Air Pollution Monitoring And Automatic Vehicle Controlling System

Dr. M. Parimala Devi, Manojprabhu G,Narmatha A,Navisha V, Ramachandran R
*Department of Electronics and Communication Engineering, Velalar CollegeofEngineeringAndTechnology, Thindal-638012,TamilNadu,India*

**Abstract - Air pollution is a significant and serious issue in contemporary megacities. Modern monitoring techniques include wireless sensor networks, including ones with mobile nodes. To assess the efficacy of these systems, expensive field tests or experiments using full-scale monitoring system models are typically performed. Expensive and time-consuming trials can, however, occasionally be avoided. In the research, we take into account a monitoring system that employs on-vehicle sensors. We present the corresponding strategy. The outcomes aid in the justification, management, and optimization of effective monitoring of air quality systems. Pollution levels across all mediums rapidly rise as society develops. When the population grows, there are more factories, vehicles, and fossil fuel usage, which results in significant air pollution. In 2012, air pollution caused around 7 million deaths worldwide, according to a report from the World Health Organization published in 2016. This number is substantially supported by the International Energy Agency. India, which has the second-largest population and the largest democracy in the world, is badly affected by air pollution. In India, 1.2 million premature deaths are due to air pollution. Industrial pollution accounts for 51% of India's total air pollution, followed by vehicle pollution (27%), and crop pollution (the remaining 15%).**

## I. INTRODUCTION

The challenge that modern megacities are dealing with is that there are more cars on the roads and that there are more dangerous contaminants in the air due to industrial activity. According to the World Health Organization, hazardous air contaminants cause around 7 million early deaths each year. According to UN experts, there are 5 billion people living in metropolitan areas. A considerable worsening of the situation will result from rapid urbanization and industrial growth. Despite the recent decades' focus on this significant issue and all the steps achieved, it remains crucial.

Air pollution is a major issue in many industrial cities. As a result, it is still crucial and necessary to identify air pollution as soon as possible. There are many technical methods used nowadays to measure air pollution. Typically, fixed stations with numerous sensors are used for pollution monitoring. This strategy restricts monitoring options. However, despite the fact that fixed stations enable highly accurate local measurements, they have a large installation cost. There are not many stations deployed. There aren't enough pollutant monitoring stations in other nations, either in Europe or Asia. [1] Finding pertinent data on pollutant distribution, behavior, and source localization is challenging in the current environment. The mathematical models currently available are not sufficiently developed for this purpose.

Transport has a big impact on the environment since it consumes a lot of energy and burns the majority of the world's petroleum. This contributes significantly to global warming by emitting carbon dioxide and causing air pollution, which includes nitrous oxide and particles. The rate of air pollution is decreased by regulating vehicle emissions. The detection and control of pollution are required. The next initiative will identify and manage pollutants. This initiative improves the efficiency and cleanliness of the transportation system .Here, IoT is used to both detect and manage pollution. The IoT is employed in this project to increase efficiency and provide a benefit for maintaining a dust-free transportation system.

Sensors that measure things like dust, temperature, humidity, and gas pick up on pollution that comes from car emissions. A controller is used to control the aforementioned sensors. The RFID reader is situated at the district or area boundary. If the sensor detects a high level of pollution, the RFID reader used here will send the driver a notification through GSM. When a driver disobeys an RFID message, the system sends them another message in which it warns them that they will be fined. If the level of pollution is low, and the RFID alerts the driver when they enter this region.

## II. LITERATURESURVEY

Markus lucking ,Nicolas kannengieber, Maurice kluges, Till riddle, Michael beige, (member ,ire), Ali sun year , and Wilhelm stork proposed “The Merits of a Decentralized Pollution-Monitoring System Based on Distributed Ledger Technology “The project suggests a software architecture for PMSs based on the long-range (LoRa) protocol and distributed ledger technology (DLT) for flexible, open, and cost-effective environment monitoring and data management. A thorough analysis of the requirements for PMSs was done in order to design the PMS. To properly build the PMS and satisfy the mentioned requirements, various consensus mechanisms (e.g., BFT-Smart and Raft) and digital signature schemes (e.g., ECDSA and EdDSA) were benchmarked. On the basis of this, a prototype PMS is designed, implemented, and field tested. The evaluation indicates the usability of the suggested software design for PMSs in settings other than air pollution and the efficacy of DLT-based PMSs that contain portable low-energy sensor nodes[1].

Vladimir Shako, Olga Okolona , proposed “On Modeling Air Pollution Detection With Internet of Vehicles”. This system takes into account a monitoring system in which sensors are mounted on moving objects. The corresponding strategy is provided. The outcomes support system management, rationalization, and optimization for effective air pollution monitoring. This restriction on monitoring options. However, despite the fact that fixed stations enable highly accurate local measurements, they have a large installation cost. There are not many stations deployed[2].

Soumya deep Sur, Rohit Ghosal, Rittik Mondal, proposed “Air Pollution Hotspot Identification and Pollution Level Prediction in the City ” In this study, we employ a variety of techniques and algorithms to identify air pollution hotspots and forecast pollution levels in a chosen region . The CPCB sensors in chosen city are used to obtain time-series AQI data. SVM is used to classify hotspots, and LSTM and PROPHET are used for time series analysis based on data samples of pollutants including PM2.5, PM10, CO, and NO. These models are used to forecast the pollution levels for a given day in the future[3]

## III.PROPOSEDSYSTEM

In this study, a combination technique that includes vehicle control systems that are dependent on the level of pollution and city-based pollution detection is proposed. The user receives a warning via GSM based on the degree of pollution that day. This system makes a significant contribution to the field of urban pollution control.

The project's goal is to use IoT to detect pollution and regulate vehicles in accordance with the degree of pollution, helping to reduce pollution.

Blink is a contemporary platform that allows users to create interfaces mostly for the Android and iPhone operating systems in order to track and monitor the necessary applications. A GSM and Wi-Fi network are used to transmit all sensor data to the Blink server.

The edge of a particularly polluted city has an RFID reader installed. The sensors are used to detect the city's pollution as well as other factors including dust, noise, temperature, and humidity. A notification such as "Pollution is high; you are restricted from entering the city" is provided to the user who is about to enter the city if the aforementioned parameters surpass the threshold. The user will receive a warning message if they disregard the message and enter the city in violation of guidelines. The notification "Pay the fine" will be displayed to the user if they break the regulations once again.

## IV.SYSTEMARCHITECTURE

*MODULE 1:ESP32 MICROCONROLLER***:** In this project, we used an ESP32 microcontroller. The robust chip of the ESP32 microcontroller has two processor cores. It is therefore quicker than the other controllers mentioned above. It is a low-cost, low-power microcontroller with an on-chip Bluetooth Low Energy (BLE) module, good deep sleep modes, and an integrated Wi-Fi module. 18 12-bit ADC channels and 2 8-bit DAC channels are supported. ESP32 processes all of the sensor data that comes in.

*SENSING UNIT*

Five sensors that are used to check air quality are part of the sensing unit.

*MODULE 2: RFID reader (Radio frequency identification reader):*A radio frequency identification (RFID) reader is a tool that extracts data from an RFID tag, which is used to track certain things. Data is transmitted from the tag to a reader using radio waves. In theory, RFID works similarly to bar codes.

*MODULE 3: DUST SENSOR (GP2Y1010AU0F):*We have chosen the dust sensor GP2Y1010AU0F, which is particularly effective at detecting small particles like dust and cigarette smoke. The basis for sensing is an optical phenomenon. The sensor picks up the light that dust in the air reflects. The output voltage pulse waveform makes it simple to distinguish between smoke and house dust. A low-power sensor, that is. It responds to values that are incredibly low. It answers in less than a second. An analog output is provided.

*MODULE 4: Temperature And Humidity Sensor (DHT11):*A digital temperature and humidity sensor with exceptionally low power, a low price, and a tiny size is called DHT11. It produces data digitally. With an accuracy of 1°C and 1%, it can measure temperature from 0 to 50 °C and humidity from 20 to 90%.

*MODULE 5: GAS SENSOR:* Gas sensors conductivity is more higher along with the gas concentration rising. This gas sensor has high sensitivity to Ammonia, Supplied and Benzes steam, also sensitive to smoke and other harmful gases. Working voltage : DC 5VWorking Current: 150Ma DOUT: TTL output A OUT: Analog output

*MODULE 6: Arduino IDE (Integrated Development Environment*)**:**The freely available software known as Arduino IDE makes it simple to develop codes and upload them to a board. It greatly simplifies the process of writing code. Since it is a cross-platform application, C and C++ codes can be created for Windows, macro's, and Linux.

*MODULE 7: Blink app:* For use with the Internet of Things, Blink was created. It can store data, visualize it, display sensor data, remotely operate hardware, and perform many other fascinating things.

## V.METHODOLOGY

Dust, temperature, humidity, and gas pollution brought on by car emissions are all detected by the sensors. The ESP32 controller manages the aforementioned sensors. Any district or area's border is marked by an RFID reader. The RFID reader employed here delivers a message to the driver through GSM whenever the sensor detects a high amount of pollution. When a driver disobeys an RFID-sent message, the RFID system sends them another message warning them that disobedience will result in a fine. When you enter this location, the RFID alerts the driver that the level of pollution is minimal. Additionally, we employ a noise sensor to detect the noise in this vicinity.

## VI.BLOCK DIAGRAM

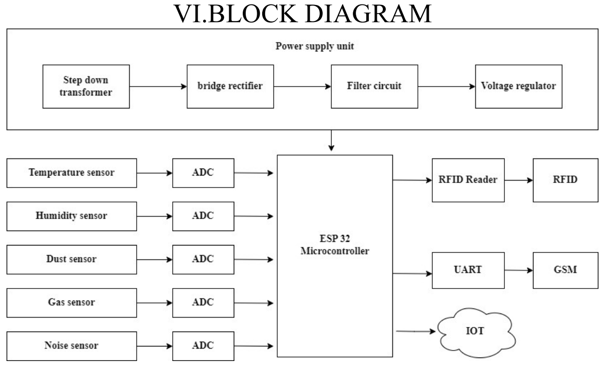


Fig.1. Block Diagram

## VII. Flow Diagram

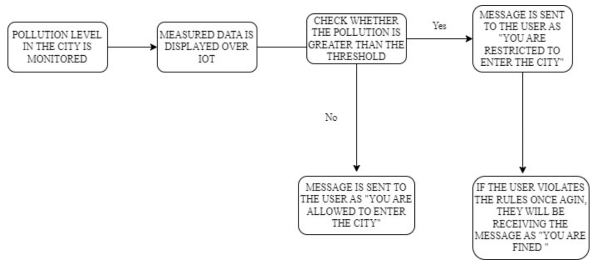


Fig.2. Flow Diagram

As shown in the flow diagram, the city's pollution is first monitored before the measured data is shown on IoT. The message "Pollution is low and you are permitted to enter the city" is displayed if the measured data is below the threshold. You are barred from entering the city if the measured data exceeds the threshold value, according to the message delivered to the user. The notice "You are fined" is sent if the user breaks the regulations once more.

## VIII. CONCLUSION AND RESULT

This paper presented the design and development of an IoT-based air pollution monitoring and vehicle control system for the green revolution. The hardware architecture and software implementation are discussed. The performance of the system is also verified using IoT technology. The smart, intelligent environmental system monitors the air pollution and controls the vehicle according to the pollution level. The system also sends the pollutant level data to the server for future analysis. The developed system is low-cost and simple to operate. The developed system provides better accuracy with low cost than the existing system.

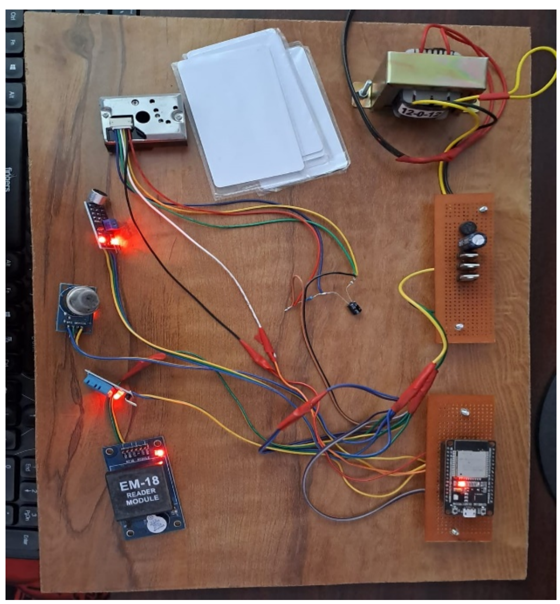


Fig.3.Hardware module

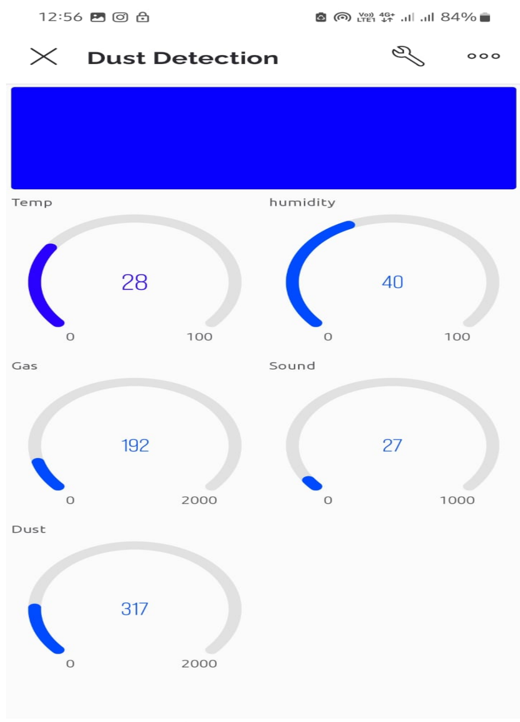


Fig.4. Measured data

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