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GreenGuard: Emission Monitoring System over cloud for Metro city

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Abstract: ***The objective of this paper is to monitor air pollution on roads and track a vehicle which causes pollution. In order to solve this problem, many countries and regions have already presented a series of emissions standards, meanwhile some methods have been developed, including update motor engine or improving the quality of the gasoline. However, these actions have not brought about striking effect as we expect. In this system, Radio frequency identification (RFID) technology as a low-cost and mature wireless communication method is adopted to collect and transmit emissions information of vehicles and Internet of Things (IoT) concept is proposed. Moreover, The RFID devices need to be installed on the traffic lights so that reliable reading of emissions signals from a vehicle can be interrogated when the vehicles stop in front of the red light. By applying the system, it is possible to smoothly realize a green traffic network.***
Keywords: Inspection system design, Internet of things, Radio frequency identification.

I. INTRODUCTION

In recent years, pollution has had a direct influence on human health. To rising levels of noise and air pollution, people are more susceptible to different health issues [1]. Growing industrialization and urbanization are the main contributors to noise and air pollution. The primary factors that harm both human health and the environment [2]. Monitoring and limiting such emissions are crucial. Monitoring contamination using traditional methods was time-consuming and ineffective [3]. With the development of technology, quick and effective pollution monitoring has been developed in the Internet of Things (IoT) [4, 5]. With the aid of many sensors, it allows data exchange between the internet, electrical and electronic appliances, and people. IoT is successful because it is affordable, effective, and feasible [6]. Pollutants from cars, vehicles, and buses are causing an increase in environmental issues, which is why asthma attacks and respiratory illnesses are on the rise. The only traffic is responsible for 50% of the carbon monoxide in the air [7] According to data statistics, India is at the top of the list of nations with pollution-related transience in 2016, with 2.51 million people dying ahead of time due to illnesses connected to air, water, and other kinds of pollution [8,9]. The Lancet investigation found that air pollution, followed by water pollution (1.76 million) and industrial pollution (0.83 million), were the main causes of 6.49 million catastrophes in 2016. Examples of air pollutants include volatile organic compounds (VOCs), oxides of carbon, nitrogen, and Sulphur, as well as other contaminants [10, 11]. Delhi, India's capital, is widely regarded as one of the world's most polluted cities [12]. Air pollution disrupts the maintenance of normal air quality and causes various problems for animals, plants, and humans. When external substances such as CO and CO2 enter the air, it leads to air pollution. Poor air quality can cause eye, nose, and throat irritation, shortness of breath, and other respiratory, heart, and cardiovascular diseases [13, 14]. To overcome the problem, the model has been proposed to reduce BC emissions and mitigate climate change by proposing an IoT model that estimates his current CO2 levels and performs historical analysis of the measurements. This will help drive investment in healthier towns and purifier kinds of energy.

II. LITERATURE REVIEW

Rahul B. Pendor and P. P Tasgaonkar [15] proposed the design and implementation of a low-cost, dependable Internet of things framework that includes an array of RFID sensors for real-time vehicle tracking as it travels from one place to another on a rising expressway. When compared to image processing-based systems, the RFID sensor network's unique detecting capacity makes it a preferable choice. The velocity of the vehicle is approximated in the real-time environment using Euler's techniques employing real-time stamps from an array of RFID sensor networks. As a core controller, an Arduino platform with an Ethernet connection can be utilised, and the resulting data can be viewed on the internet utilising cloud computing.

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D. Kavitha, T. G. Deepika, A. Devapriya, and N. Divya Bharathi [16] proposed a technique that could help to prevent accidents caused by a variety of circumstances. This system employs a number of sensors, including an alcohol sensor, a speed detection sensor, a seat belt sensor, and an eye blink sensor. The sensors will be used to detect them and will be updated on a regular basis on a website. When any of the accident-causing conditions are likely to occur, the engine slows down and eventually stops. The owner is also notified, and he will take appropriate action. The site is updated frequently. This website is safe from cross-site request forgery attacks. The SHA-1 and SALT algorithms protect against this attack. The SHA-1 hash function is a cryptographic hash algorithm that is used to encrypt data. Private travel agencies who want to keep track of their vehicles can benefit from this system.

Monika Jain, Praveen Kumar, Priya Singh, Chhavi Narayan Arora, and Ankita Sharma [17] proposed a gadget that would identify rash driving on highways and warn traffic authorities if a violation occurred. Many gadgets to detect reckless driving on highways have been developed in the past. The majority of the options necessitate human concentration and a significant amount of effort, making them challenging to apply. In this study, we will create a system for detecting and alerting unsafe vehicle driving tendencies associated with rash driving early on. An IR transmitter, an IR receiver, a control circuit, and a buzzer are all required for the full setup. The speed limit is determined by the police, who employ a method that takes into account the traffic at the time. The control circuit calculates the time it takes the vehicle to drive from one set point to the next and shows it on seven segment displays. A buzzer also sounds whenever the car exceeds the speed limit, alerting the police.

Pratiksha Bhuta, Karan Desai, and Archita Keni [18] proposed a system that would make driving a vehicle safer than it is now. This is implemented using Arduino. We derived the driver's condition in a realtime environment, and we propose detecting alcohol using an alcohol detector connected to an Arduino, so that when the level of alcohol reaches a permissible limit, the vehicle ignition system will turn off, and the GPS module will record the vehicle's current position. In addition, the GSM module will transmit a distress message to police or family members automatically.

Akande Noah Oluwatobi [19] proposed a system that would allow them to monitor, collect, and analyse real-time position data on commuter vehicles, as well as transmit this data to transit control centres and passengers. This information allows an agency to make better, more informed judgments while also responding to situations more quickly. Passengers gain from increased on-time performance and less time spent waiting at bus stops. GPS-based AVLS for bus transit is presented in this paper. As the InVehicle-Unit (IVU), it employs GPS hardware, GSM/GPRS hardware, and a microprocessor to provide a web-based platform, a mobile application platform, and an SMS-based platform for communication.

Nilam Jadhav, Sai Nichal, Madhuri Patil, and Amruta Patil [20] proposed a system for tracking and positioning any vehicle using the GPS and the Global System for Mobile Communications (GSM). This system continuously controls and monitors the status of the vehicle, which is only possible because the GPS tracking device sends the frequency massage to the GPS. The rising density of vehicles on the road has become an issue for traffic control in recent years. With the use of our Android applications, people will be able to monitor and track their automobiles for safety concerns. We employed a manual attendance system for a few years, which was not only time demanding but also yielded inaccurate results. As a result, an automated time and attendance monitoring system offers numerous advantages to an organisation. Binod Chandra Shrestha, Prakash Parajuli, Sachin Kafle, Prakash Bist, and Ram Kumar Puri [21] suggested a system for vehicle monitoring that is an IoT-based android application. When a vehicle passes through the tollbooths, the system is designed with characteristics that allow the tollbooths to record vehicle information. The tollbooths are made up of a hardware integration of NodeMCU, GPS Module, and RFID reader that takes data from car tags and sends it to the cloud, which is constantly monitored by the government. The government may view the logs of automobiles as they pass through toll booths using an Android application. If the driver is unlawful or untrustworthy, the government has the authority to report him. It will immediately inform the user of the report's status. Any reported vehicle can be tracked by the authorities. The government will get detailed analytics on vehicles passing via various toll-booths thanks to illustrative mathematical modelling. Users will be able to see information about their vehicles. The government will notify them of their vehicle's tax as well as the progress of their report. Users will be able to get the closest check-post distance from their position using the Haversine algorithm, making it easier to catch the culprit. Users may see their most recent checked location, which is done using the Linear Search Modeling algorithm. Users will be able to get directions to local locations using location assistance. Our database services are provided by Firebase. The system is designed as an android application (*.apk) with hardware integration that may be used to supplement existing traditional transportation services. R.S. Nikam, S.R. Somase, A.R. Thorat, and K.P. Gaikwad [22] proposed a system that uses GPS and GSM to identify accidents and send messages. The vibration sensor is employed as an input in this system, and the Arduino analyses the related response. If an accident occurs, the sensors' readings surpass the threshold, and the system responds appropriately. The SMS is sent to the authorities, who will provide prompt assistance to those who have been involved in an accident. The embedded strategy described yields a positive result

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III.SYSTEM DESIGN

The proposed system may be placed at all traffic junctions, which is a convenient point to place it. The control unit is the central unit from where information goes to the governing authorities through the website and many more sensors. Raspberry Pi is the central unit of the system. The board have Wi-Fi connectivity. Figure 1(a) shows the block diagram of the Transmitter Unit which is placed in vehicle and Figure 1(b) shows the block diagram of Receiver Unit which will be at Admin end. Gas Sensor, Temperature Sensor, and Vibration sensor are used to monitor the vehicle. The WIFI module is used to communicate with the vehicle unit. There is an RFID reader in receiver unit, which reads the RFID tag of the vehicles at the junction. Figure shows the overview of the control unit. It includes the circuit board used with different components.

The active RFID the active RFID tag is designed to collect the emissions data from the vehicle exhaust system. Although active RFID tag has a lifetime which is limited by the onboard power source, it is not an issue for WINS because there is already a power supply in every vehicle. In a typical vehicle exhaust system, there are usually to built-in nitrogen & gas, temperature sensors installed on the exhaust system. Therefore, the value is collected as the emissions data. In particular, the three sensors in the exhaust system of an automobile, the one is settled before the catalytic converter and the other one after it to evaluate if the catalytic converter works well. To collect emissions data from the downstream sensor better, an analog-to-digital converter (ADC) is also designed to connect RFID tag. It is a device that uses sampling to convert a continuous quantity into a digital number and has been widely used for signal conversion problems. With ADC, the voltage signal (values) being outputted from the lambda sensors is first converted into digital signal, and then stored in the RFID tag directly via the wires.

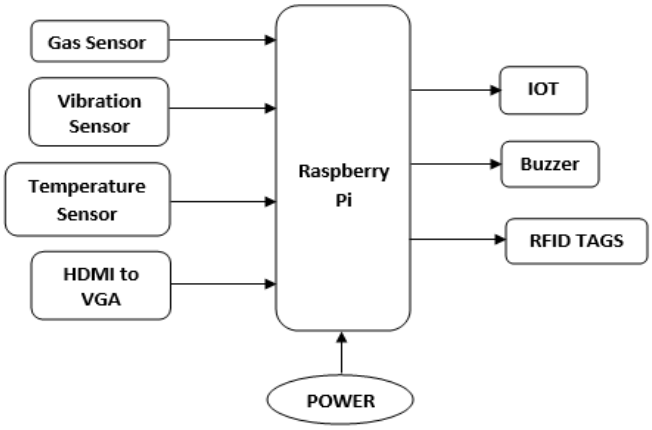

Fig 1. (a) Transmitter Block Diagram

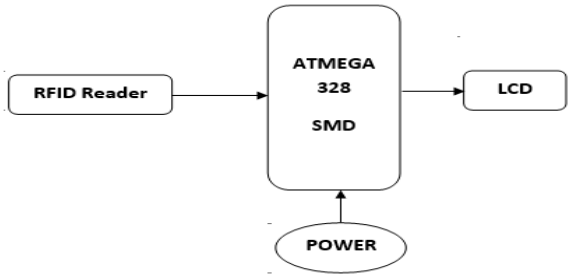

Fig 1. (b) Receiver Block Diagram

IV.CONCLUSIONS

In conclusion, GreenGuard: Emission Monitoring System over cloud for Metro city offers an innovative and efficient approach to track and monitor vehicle emissions in real-time. The system leverages RFID technology for easy vehicle identification and integrates Raspberry Pi to process data, manage communication, and provide valuable insights. By incorporating sensors for emission detection, the system can automatically detect and record emission levels, allowing for timely and accurate monitoring.

This requires highly reliable networks and low power sensors and equipment's. Once this is done, systems for monitoring and controlling, as in this paper, may be easily integrated into the infrastructure of the city and citizens will learn to use these systems.

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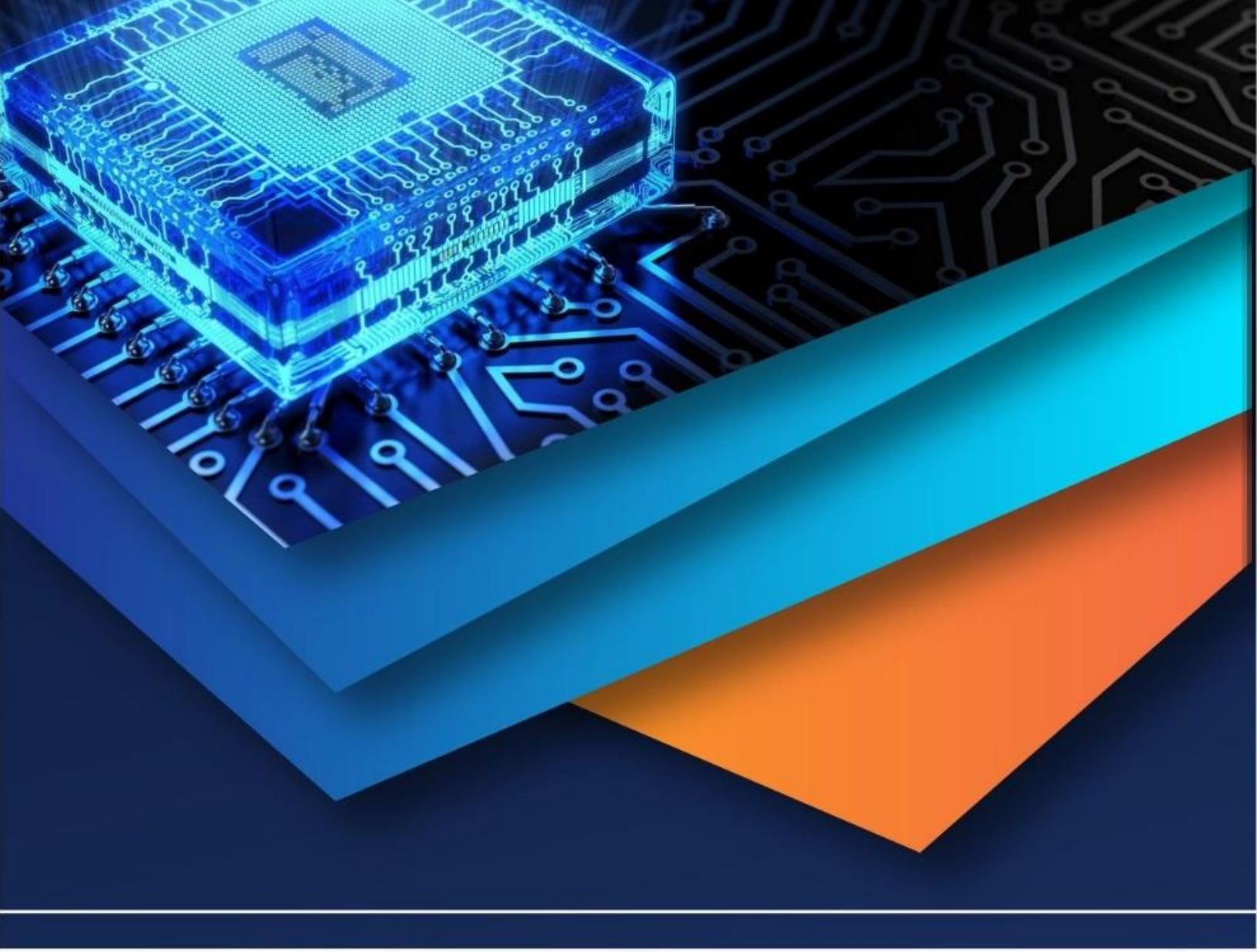

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