IoT Based Air and Noise Pollution Monitoring System in Urban and Rural Areas

S. Soniya[1], A. R. Sindhu[2], G. S. Manasa[3], D. N. Mohan[4]

[1,2,3]B.E. Student, Department of Information Science & Engineering, Nagarjuna College of Engineering and Technology, Bengaluru, India

[4]Assistant Professor, Department of Information Science & Engineering, Nagarjuna College of Engineering and Technology, Bengaluru, India

Abstract: **The main environmental and public issues today are air pollution and noise pollution. According to the World Health Organization (WHO), air and noise pollution are important risk factors for a variety of health conditions, including skin and eye infections, nose irritation, sore throat, and headache. It can also cause serious illnesses such as heart disease, lung cancer, and difficulty breathing. India is the fourth largest carbon dioxide emitter in the world, and it is important to understand the country's current emissions and possible emissions. Therefore, one of the main reasons is the increase in cars, which eventually leads to an increase in air and noise pollution, because the unit area of cars is the main source of environmental pollution. The main goal of our project is to monitor the noise and air level of the vehicle using various sensors, GSM / GPRS and cloud servers. Using cloud servers, we will update the information and keep people informed about pollution levels.**

Keywords: **Arduino Uno, LM393, MQ135, GPRS, Cloud.**

1. Introduction

It turns out that India's environmental pollution is a serious problem in the 21st century. The main source of pollution in India is cars. The Indian government has developed many regulations to control environmental pollution caused by vehicle emissions, but most of them have not been successful. It is necessary to monitor air and noise pollution levels to ensure a healthy and safe environment. Carbon monoxide gas in the atmosphere reduces the blood's ability to carry oxygen; hydrocarbons in the atmosphere can affect the heart, brain, kidneys and bone marrow. Nitric oxide can affect the lungs and cause breathing problems. In an era of urbanization due to the rapid growth of motor vehicles, it is difficult to inspect all vehicles. Examining all these vehicles requires a lot of manpower. To easily monitor all vehicles, we have developed an air and noise pollution monitoring system called IoT, through which we can easily monitor all vehicles. With the rapid growth of infrastructure and industrial plants, environmental issues have greatly affected the demand for intelligent monitoring systems. The project proposes an embedded system using a wireless sensor network that provides a framework for collecting sensor data anywhere using the Internet of Things. In the proposed system, sensors and active RFID are used together to monitor IoT based vehicle pollution.

2. Related work

First, L. Ezhilarasi et al. A monitoring technology using a Zigbee wireless sensor network has been proposed to monitor various environmental parameters. It uses RFID to store and retrieve data by electromagnetic transmission to RF integrated circuits. The WSN gateway method is used to conveniently collect data anytime, anywhere. [1]. Mahantesh B Dalawai et al. Their paper used a GPRS/GSM module and a web server to effectively monitor various pollution levels. In this module, smoke and noise sensors will upload data to a server or cloud at every moment so that the level of pollution can be monitored using the internet [2].

Dr. A Sumithra and others. The concept of a smart city is proposed. Technology and communications are the foundation of this smart city. Various sensors and modules have also been used to monitor various environmental parameters. The system uses air and sound sensors to monitor the data and then uploads the data as digital data to a cloud server. The cloud storage manager analyzes the data and notifies accordingly. [3]

Giovanni B. Fioccola et al. An Arduino-based air pollution monitoring system Polluino has been proposed. Data is then uploaded to a cloud-based platform that manages data from sensors [4].

Somansh Kumar et al. The idea of a real-time air quality monitoring system was proposed, which includes P.M. 2.5, carbon dioxide [5].

3. Sensors and modules used

A. Smoke sensor MQ135

To monitor the air pollution and to determine the air quality index, a gas sensor, MQ135 is used. It efficiently detects the smoke and CO_2 level in air. This sensor is chosen for its wide detecting scope, fast response, high sensitivity, stable and long life and lastly, a simple drive circuit. It is used in air quality monitoring devices in buildings and homes.

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Fig. 1. Smoke sensor MQ 135

B. Noise sensor LM393

The LM393 sound detection sensor is used to measure sound intensity to monitor sound pollution in the area. When the sensor detects sound, it processes the output signal voltage, which is sent to Arduino Uno, which again performs the necessary processing required to monitor the parameters.

Fig. 2. Noise Sensor LM393

C. Arduino UNO

Arduino consists of a physically programmable circuit board (commonly called a microcontroller) and software or IDE (Integrated Development Environment) running on your computer to write and upload computer code to the physical board.

Fig. 3. Arduino Uno

D. RFID

RFID tags are a tracking system that use smart barcodes to identify items. RFID is the abbreviation of "Radio Frequency Identification", so RFID tags use radio frequency technology. These radio waves transmit data from the tag to a reader, which then transmits the information to an RFID computer program. RFID tags are often used for goods, but can also be used to track vehicles, pets, and even patients with Alzheimer's disease. RFID tags can also be called RFID chips.

Fig. 4. RFID tag

E. GSM/GPRS

A GSM module or GPRS module is a chip or circuit that will be used to establish communication between a mobile device or computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is crucial here. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem functionality.
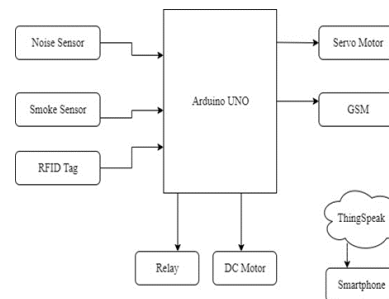

Fig. 5. GSM

4. Methodology

Fig. 6. System architecture

The architecture consists of Arduino Uno, which is the core of the entire project that controls the entire system. To monitor noise levels, noise sensors are used. To monitor smoke levels, a smoke sensor is used.

To indicate information to a person, an LCD (Liquid Crystal Display) is used. When Wi-Fi is connected to the Internet, the Arduino Uno connected to the sensor helps to update the value obtained from the sensor to the cloud. All these collected values can be viewed through our android application.
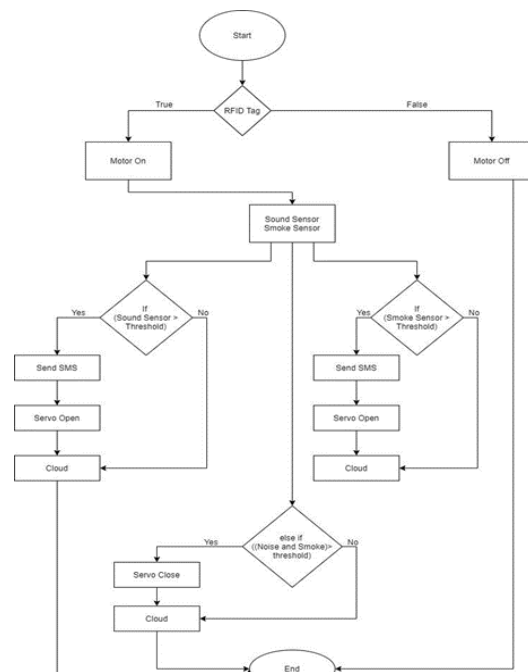

Fig. 7. Data flow diagram

Initially our system starts with a touch of RFID card. If the card is valid LED displays a message saying that the tag is valid, if the tag is not valid then the beep sound alarms for a period of time. Noise sensor and smoke sensors are embedded in our system to detect the level of noise and smoke, with the help of IoT the values are updated to the cloud.

5. Conclusion

A smart way to monitor the environmental parameters using various modules. The concept of IoT helps to improve the quality of air and monitor the level of noise. The IoT Based Air and Noise pollution monitoring system is designed to employing the new principle of controlling the air pollution and noise pollution level with the help of noise sensor and smoke sensor range. Within a moderate range it gives indication to corresponding person as a message and if it reaches above moderate it is considered as vehicle is not in good condition, and it will not allow the vehicle to enter in city limit.

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