

IoT Based Pollution Monitoring System by Using Raspberry Pi

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Abstract - The Pollution Monitoring System by using Raspberry Pi with a web application using HTML and PHP is designed to monitor pollution levels in the environment. The system collects data from different Sensors connected to the Raspberry Pi and sends it to a web application hosted on a WAMP server. The web application displays the real-time pollution data and allows users to set alerts for specific pollution levels. The system is built using various hardware components, such as the Raspberry Pi, sensors, and breadboard, and software tools like the Raspbian operating system, HTML/CSS for web application development, PHP programming language, MySQL database management system, and Apache web server.

Key Words: Raspberry pi, Internet of Things, Sound sensor, Temperature sensor, Gas sensor.

I. Introduction

Air pollution is a very growing problem in the world, and it poses a significant threat to public health and the environment. Therefore, there is a need to develop systems that can monitor pollution levels in real-time to provide accurate readings to the users. In this project, we have developed a pollution monitoring system using Raspberry Pi with a web application using HTML and PHP. The system collects data from different sensors connected to the Raspberry Pi and sends it to a web application hosted on a WAMP server. The web application displays the real-time pollution data and allows users to set alerts for specific pollution levels.

Air pollution is a very major and most impactful environmental issue that has a significant impact on human health, his ecosystems, and the economy. The rise in air pollution levels is primarily due to various human activities, including industrialization, transportation, and agriculture. Hence, there is a growing need for effective air pollution monitoring systems it can provide accurate and real-time data on air quality to enable authorities to take effective measures to mitigate the adverse impact on air pollution.

A sound that is loud to a level that is harmful to human/other animal ears causing disturbance is called noise.

Noise pollution is a major and very serious problem in all cities around the world. Noise is represent as undesirable sound. Environmental noise/sound consists of all the undesirable, unwanted sound in our communities except that which originates in the workstation. Environmental noise pollution, a form of air pollution, is a imminence to health and wellbeing. It is more severe and extended than ever before, and it will remain to increase in magnitude and severity because of population improvement.

In recent 20 years, the Internet of Things (IoT) has emerged as a promising solution to address these challenges. IoT-based air pollution monitoring systems can collect and analyze data on air quality in real-time, enabling authorities to make informed decisions on air pollution management. In this project, we aim to develop an IoT-based air pollution monitoring system using Raspberry Pi (Model 3 or above) and various sensors such as MQ5, MQ3, and LM30 to measure air quality parameters such as carbon monoxide, alcohol, and temperature.

The Raspberry Pi is a debit-card-sized computer that can be easily programmed to perform various tasks, including data collection and analysis. The air quality sensor modules (MQ5 and MQ3) and temperature sensor module (LM30) are low-cost and easy-to-use sensors that can be connected to the Raspberry Pi using a breadboard and jumper wires. The system will also incorporate a power supply to ensure uninterrupted operation.

The data collected by the air quality and temperature sensors and it will be transmitted to the Raspberry Pi, where it will be processed and analyzed using various software tools. We will also develop a web application using HTML, CSS, and PHP to provide a user-friendly interface for data visualization and analysis. The web application will allow users to view real-time data on air quality parameters and temperature and also enable them to set alerts and notifications based on predefined thresholds.

- **Aim:** The main aim of this project is to develop an affordable and easy-to-use air pollution monitoring system that can be used by a wide range of stakeholders, including policymakers, researchers, and the general public. The system will provide real-time data on air quality and temperature and help authorities to make informed decisions on air pollution management.

- **Objective:**

The main objectives of my project are as follows:

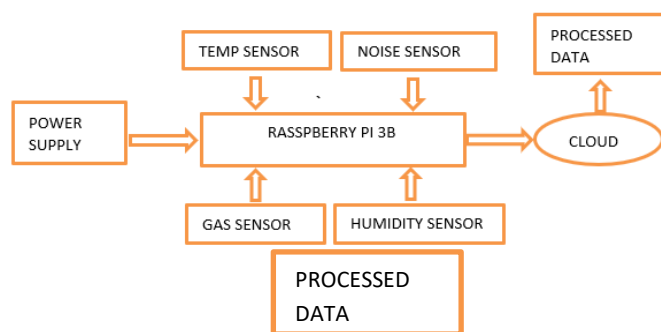
1. To design and develop an IoT-based air pollution monitoring system using Raspberry Pi (Model 3 or above), various sensors such as MQ5, MQ3, and LM30 to measure air quality parameters such as carbon monoxide, alcohol, and temperature.
2. To establish a reliable and accurate data collection system for air quality parameters and temperature using the selected sensors.
3. To process and analyze the collected data using various software tools such as Python, MySQL, and Apache web server.
4. To develop a user-friendly web application using HTML, CSS, and PHP that will provide a graphical representation of the data collected by the air quality and temperature sensors.
5. To an provide real-time data visualization of the air quality parameters and temperature through the developed web application.
6. To an enable users to set alerts and notifications based on predefined thresholds using the developed web application.
7. To find out the performance of the developed system based on the accuracy and reliability of the data collected and processed.
8. To demonstrate the applicability of the developed system by conducting field trials in a real-world scenario.

Overall, the main objective of my project is to develop an affordable and easy-to-use air pollution monitoring system that can provide real-time data on air quality and temperature, enable authorities to make informed decisions on air pollution management and facilitate the participation of the general public in environmental protection efforts.

II. Literature Review

Air pollution is the one of the most significant environmental concerns of our time, and it has become a critical issue for public health. To address this problem, many researchers and engineers have developed various systems that can monitor and control the pollution levels in the environment. The use of IoT devices and the Raspberry Pi in particular has emerged as a popular solution to this problem. Overall, the literature review demonstrated that pollution monitoring systems using Raspberry Pi with a web application using HTML and PHP are effective in monitoring pollution levels in real-time. The use of IoT devices and sensors allows the system to collect data and provide real-time feedback to the users. The web application provides a user-friendly interface for displaying the data and setting alerts for specific pollution levels. The literature review also highlighted the various components used in these systems, including the sensors, programming languages, and software stacks. The next section of the report will discuss the architecture and implementation of the pollution monitoring system using Raspberry Pi with a web application using HTML and PHP.

III. Proposed System Design



This block diagram gives the information regarding various parameters like Humidity, Pressure, Temperature, Noise and Gas are three basic components to build any POLLUTION MONITORING SYSTEM and to identify environmental conditions. We have previously arranged a POLLUTION MONITORING SYSTEM using Raspberry pi and this time we are finding the POLLUTION MONITORING SYSTEM with Raspberry Pi. The main objective of this project to prove the current Pressure parameters, Temperature and Humidity on the LCD as well as on the Internet server using Raspberry Pi, which makes it a Raspberry Pi POLLUTION MONITORING SYSTEM. This set-up we can install anywhere around the world and we can scan the weather conditions of that particular place from the anywhere in the world by using the internet, it does not show the current data but it can show graphs of the past values.

In this project i have used DHT11 Humidity sensor & temperature sensor for sensing the temperature and for measuring barometric pressure BM180 pressure sensor module is used. This percentage scale humidity meter & Celsius scale thermometer shows the humidity and ambient temperature through a barometric pressure is display & LCD displayed in millibar or hectopascal.

IV. Problem Statement

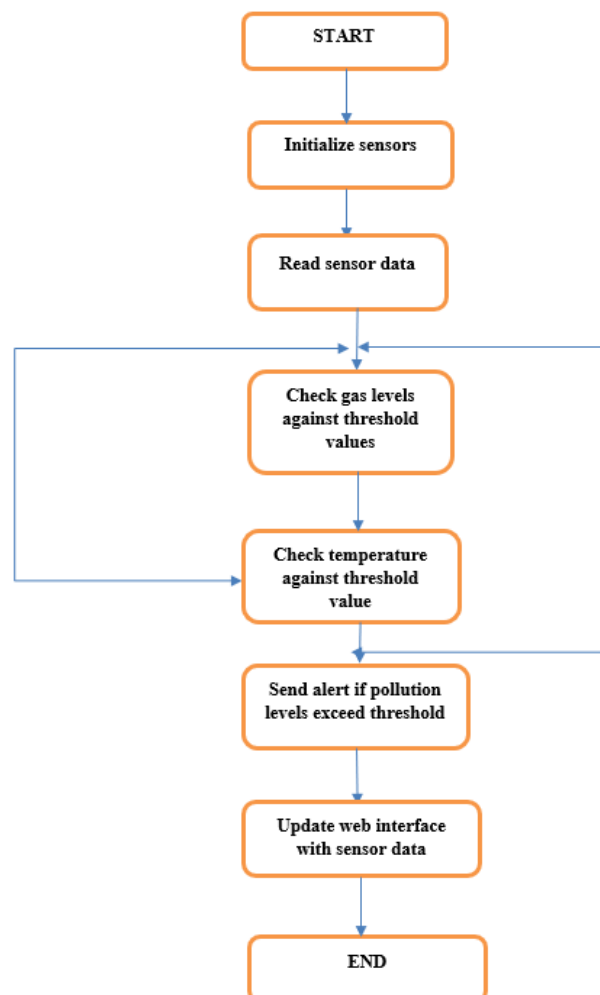
Air pollution is a very serious environmental problem it is directly affect on human health, ecosystems, and the economy. In recent 20 years, the level of air pollution has been increasing at an alarming rate due to various anthropogenic activities. Hence, there is a need for an effective air pollution

monitoring system that can provide accurate and real-time data on the air quality to enable the authorities to take appropriate measures to mitigate the adverse effects of air pollution.

Traditional air quality monitoring systems are often expensive and require skilled technicians to operate and maintain them. Moreover, they are usually fixed and cannot be easily moved to different locations. With the rapid advancement of technology, Internet of Things (IoT) has emerged as a promising solution to address these challenges. The IoT-based air pollution monitoring system can be used to collect and analyze data on air quality in real-time, enabling authorities to make informed decisions on air pollution management.

The main aim of this project is to create an air pollution monitoring system using Raspberry Pi and various sensors such as MQ-5, MQ-3, and LM30 to identify air quality parameters such as carbon monoxide, alcohol, and temperature. . The system will also incorporate a web application using HTML, CSS, and PHP to provide a user-friendly interface for data visualization and analysis. This project aims to address the need for an affordable and easy-to-use air pollution monitoring system that can be used by a wide range of stakeholders, including policymakers, researchers, and the general public.

V. Flow Chart



VI. Experimental Setup And Result Discussion

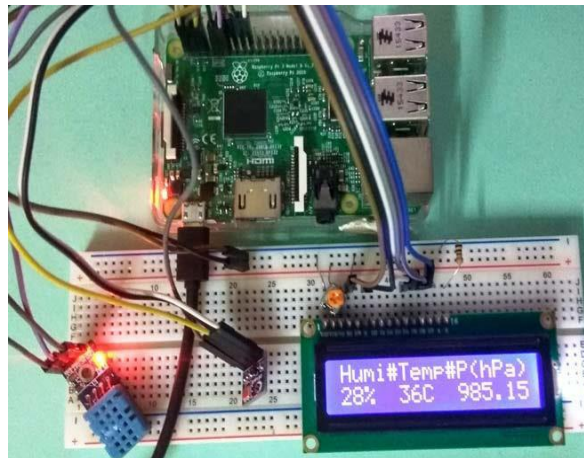
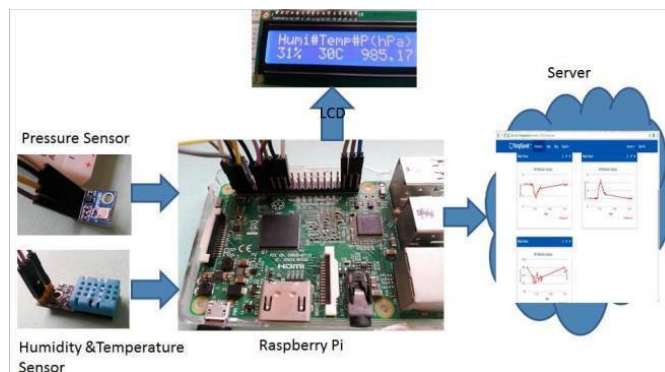


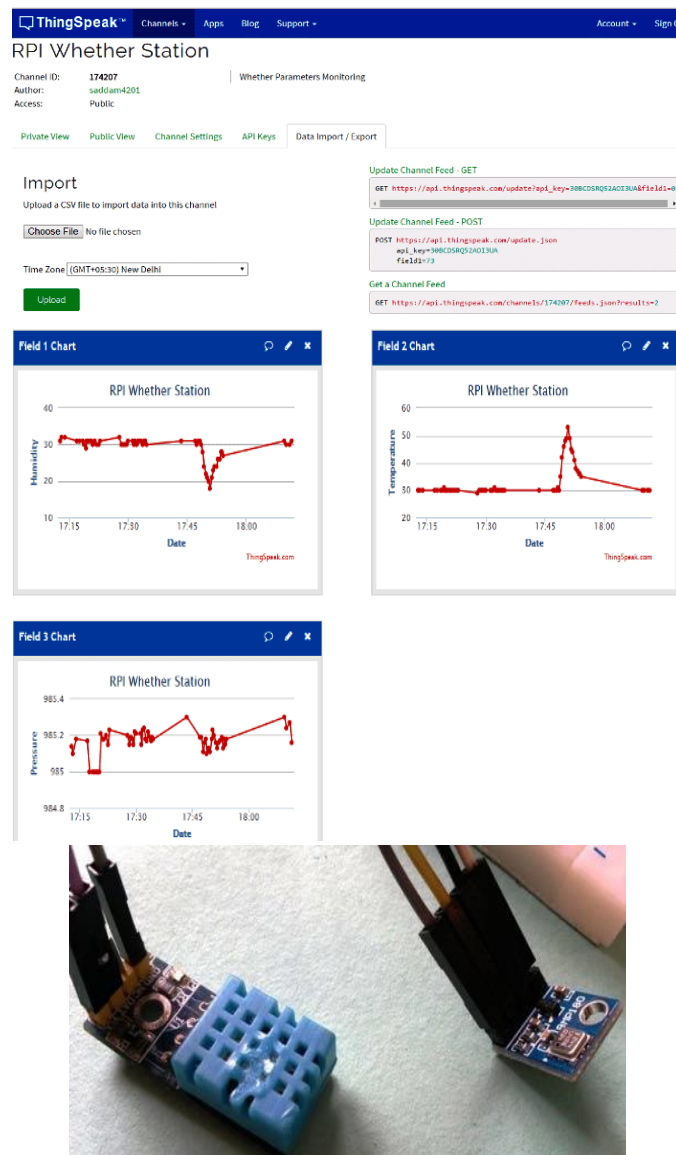
Fig: Hardware module of project

Working and Thing Speak Set-up:

In this IoT based system has four parts. First one is DHT11 sensor it is used for the Humidity, Temperature Data and BM180 sensor scale the atmospheric pressure. Second one is Raspberry Pi is measuring the BM180 pressure sensor's output by using I2C protocol & DHT11 sensor module's final output result by using single wire protocol extracts the, millibar (pressure), Celsius scale (temperature), sensors value into a suitable number in percentage humidity. Third one is, the values are sent to Thing Speak server by using fixed Wi-Fi of the Raspberry Pi 3. & finally, Thing Speak evaluation the data showing it in a graphical form. An LCD we can also use to show these values locally.



Thing Speak supply is a very good and effective tool used in the IoT based projects. By using Thing Speak website, we can control our data and monitor our system over the Internet, by using the webpages and channels provided by Thing Speak. Thing Speak is Collected the data from the sensors, ' Visualize and Analyze' the data and 'Acts' by produce a reaction. We have already discussed about sending data to Thing Speak in detail, you can find there. Here we are in brief explaining to use Thing Speak for this Raspberry Pi POLLUTION MONITORING SYSTEM.



VII. Conclusion

In conclusion, the pollution monitoring system using Raspberry Pi with a web application using HTML and PHP is a valuable tool for monitoring pollution levels in real-time. The system collects data from air quality and temperature sensors connected to the Raspberry Pi and sends it to a web application hosted on a WAMP server. The web application displays the real-time pollution data and allows users to set alerts for specific pollution levels. This system is very flexible & can be customized to meet the specific needs of the different environments. With future enhancements, the system can become an even more powerful tool for monitoring and controlling pollution levels.

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