

Weather Reporting System using IOT

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Abstract: In this paper, we present the development and implementation of an IoT-based weather reporting system utilizing the ESP32 microcontroller. The system is designed to read data from various sensors measuring temperature, humidity, methane, and carbon monoxide in the environment [1]. The collected data is then transmitted to the Thing Speak IoT server for storage and analysis. Additionally, the system displays real-time readings on a 20x4 LCD display for local monitoring purposes. We discuss the hardware setup, sensor integration, software architecture, and data transmission protocol employed in the system. The IoT Based Weather Reporting System offers a cost-effective and efficient solution for environmental monitoring, suitable for various applications including agriculture, industrial safety, and urban planning.

Keywords: IoT, ESP32, weather reporting, Thing Speak, sensors, environmental monitoring.

I. INTRODUCTION

Safety plays very important role in our life. The "Weather reporting System" project addresses the critical need for real-time monitoring and assessment of air quality in both indoor and outdoor environments. With the increasing concern over air pollution and its adverse effects on human health and the environment, there is a growing demand for reliable and accessible systems to track weather parameters effectively. Everyone knows that weather monitoring is not a single device, it is a combination of many sensors and other gadgets [2]. This project utilizes the ESP32 microcontroller, renowned for its versatility and robust capabilities, as the cornerstone of the monitoring system. Coupled with a suite of sensors including MQ2, MQ4, DHT11, Rain sensor, and a 16x2 LCD display, the system offers a comprehensive solution for measuring key weather parameters or weather quality indicators such as Gas concentration, humidity, and temperature. The integrations of multiple sensors enable a holistic assessment of environment condition, providing users with valuable insights into the weather where they leave. By using the power of technology, the system facilitates data transmission to the Thing speaks platform, allowing for remote monitoring and analysis from anywhere with internet connectivity.

In this introduction, we outline the objectives and significance of the project, emphasizing its potential impact on environmental health, public awareness, and sustainable development. By empowering individuals and communities with access to real-time weather quality data, this project seeks to foster informed decision-making and proactive measures to combat air pollution and promote a healthier, more sustainable future.

II. LITERATURE REVIEW

Weather reporting system based on the Internet of Things (IoT) becomes very easy for human interrupted devices to identify, process and communicate with them. The system incorporates various sensors to measure air quality parameters and utilizes IoT technology for data transmission and remote monitoring. The study provides insights into the architecture, sensor selection, and data processing techniques employed in air quality monitoring systems [1]. The IOT Based Weather Reporting system is proposed to get live reporting of weather conditions on agriculture used region. It must monitor temperature, humidity, wind, light and rain level. This system will monitor the changes of environment condition. It highlights the importance of such systems in assessing air quality and addressing environmental health concerns [2]. The Components that primarily from the backbone of IoT are sensors/devices, connectivity, data processing and user interface. Collection of data by sensors from weather marks the beginning of the IoT Process. Collected all data sent to process system by a variety of methods like WIFI, Bluetooth [3]. Plot the graph and display the monitoring data or parameters on the display.

III. OBJECTIVES

The main aim of this project is to originate electronic device that can capture and store humidity and all parameters of weather and after that send data to website for analysis. Here we are using Microcontroller as simple brain of the system. When we use the microcontroller we need WI-FI to build internet connection. Then all sensors can detect all parameters at a certain location, must be integrated into system. The sensor continuously monitors the temperature changes and send data to microcontroller. The microcontroller transfers the data for storage [2].

IV. METHODOLOGY

We have designed the system for checking the weather/environment conditions using an IoT. The objective of this project is to check the conditions of environment or weather like Temperature, Humidity, Rain from anywhere around the world using IOT based application. The hardware we have used is Rain sensor, MQ2 sensor, MQ4 sensor, DHT11 sensor & Rain sensor. The software which is Thing Speak. Things speak is an Internet of Things platform that allows users to collect the data from sensors or device in Real-Time. It's often used for monitoring various environmental conditions, such as temperature, humidity, and air quality.

4.1 BLOCK DIAGRAM

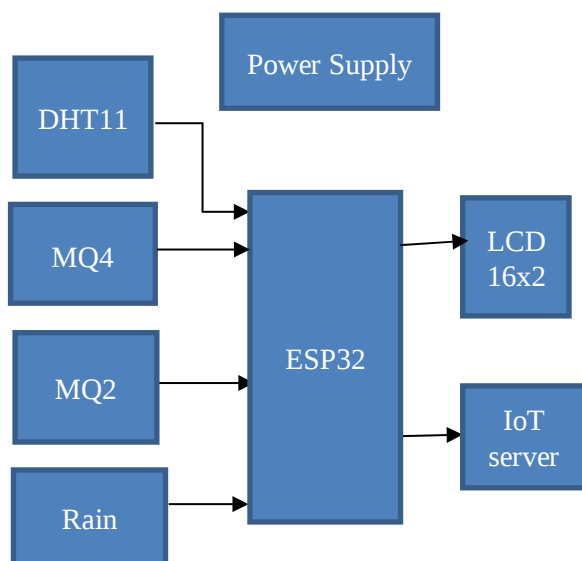


Fig 1: System Block Diagram

The block diagram of the Weather reporting system provides a visual representation of the system's architecture and functional components. It illustrates the interactions between hardware and software elements, displaying how data flows through the system and how different modules interact with each other to achieve the system's objectives. The block diagram consists of a ESP32 microcontroller, Rain sensor, MQ2 sensor, MQ4 & DHT11 sensor along with LCD display and power supply. ESP32 Microcontroller control the overall operation of the system, interacts with sensor for data acquisition. Communicates with the LCD display for real time data visualization and utilizes WI-FI connectivity for data transmission.

MQ2 sensor is used to sensing the concentration of gas in the weather like LPG, Propane, CH₄, hydrogen, alcohol, smoke & carbon monoxide. DHT11 sensor is commonly used as a digital temperature and humidity sensor module. It accurately measures the temperature and humidity in surrounding weather. The Rain sensor can accurately measure the rainfall in the atmosphere. It measures rainfall into real time basis. Power supply is used to provide stable DC power to ESP32 microcontroller and sensor. 16x2 LCD display module for visualizing real-time weather monitoring metrics and system status. For the communication we have WI-FI module and MQTT protocol which enables communication with the Thing speak IoT platform for data transmission and visualization.

4.2 FLOW CHART

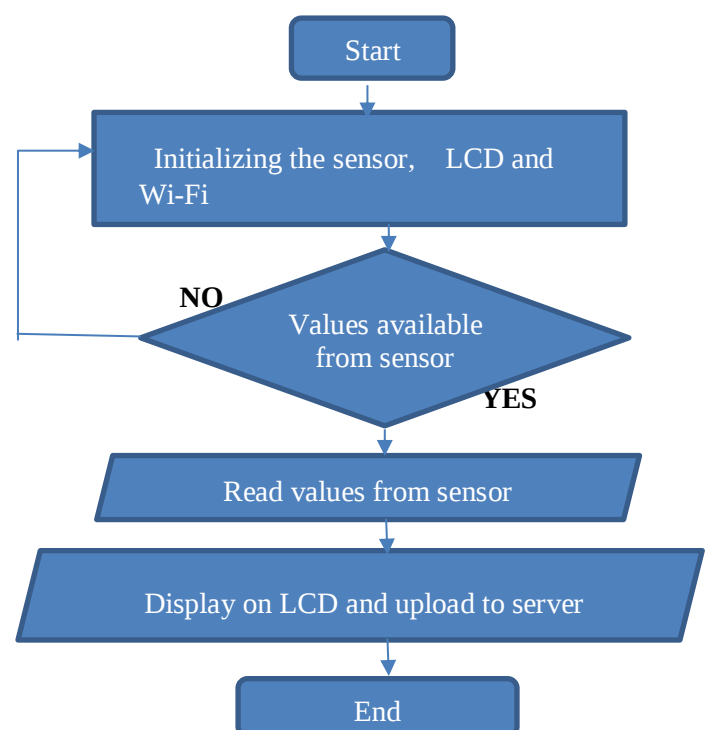


Fig 2: Flow Chart

4.3 CIRCUIT DIAGRAM

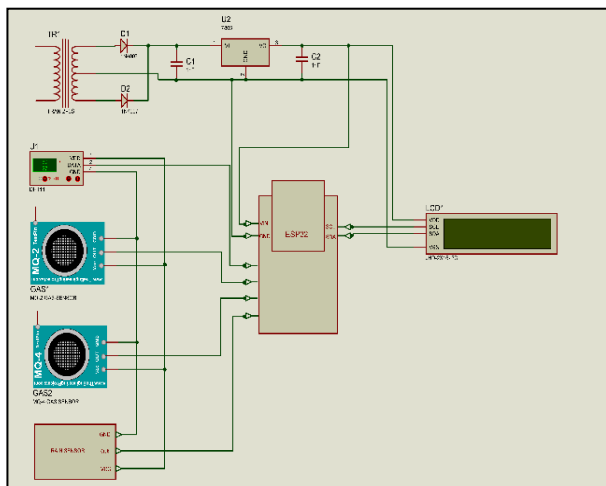


Fig 3: Circuit Diagram

The circuit diagram of Weather Reporting system shows the exact interaction of system. The sensors measure weather parameters using sensors and the data is collected by the ESP32 microcontroller.

The microcontroller processes the sensor data and sends it to the LCD display for real-time visualization. Simultaneously, the microcontroller establishes a Wi-Fi connection and transmits the data to the Thing Speak IoT platform using the MQTT protocol.

The data is stored and visualized on the Thing Speak platform, allowing users to monitor air quality remotely and analyze historical trends.

V. RESULT ANALYSIS

The experimentation phase serves to validate the design assumptions, identify potential areas for improvement, and ensure that the Weather monitoring system meets the requirements of accuracy, efficiency, and user satisfaction in the context of sustainable urban mobility. Continuous monitoring and refinement based on experimental findings contribute to the ongoing enhancement of the system's performance and effectiveness.

5.1 Experimental analysis along with results:



Fig 4: Hardware Setup

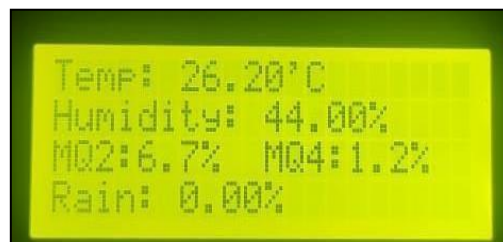
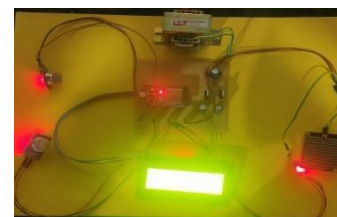
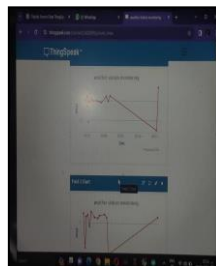


Fig 5: Results

VI. CONCLUSION

In conclusion, the Weather reporting system utilizing ESP32 microcontroller and various sensors presents a versatile and impactful solution for real-time monitoring of air quality parameters. Through the integration of multiple sensors, including MQ2, MQ4, DHT11, Rain sensor, and a 16x2 LCD display, the system offers comprehensive data collection and visualization capabilities, empowering users with valuable insights into environmental conditions.

The project leverages the capabilities of IoT technology, enabling remote accessibility to air quality data via Wi-Fi connectivity and platforms like Thing Speak. This remote accessibility fosters greater awareness, engagement, and proactive measures towards improving air quality and mitigating pollution.

The system's applications span across diverse sectors, including urban planning, industrial monitoring, healthcare, education, environmental research, and community engagement. Its cost-effectiveness, scalability, and educational value make it accessible to a wide range of users, from city authorities and industries to educational institutions and community organizations.

Overall, the Weather reporting system represents a significant step towards achieving cleaner and healthier environments, promoting environmental sustainability, and fostering greater awareness and stewardship of our planet's resources. Through continued development, deployment, and advocacy, this project holds the potential to make a tangible and lasting impact on public health, environmental conservation, and community well-being.

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