

Weather Reporting And Streaming With Graph Using IOT

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ABSTRACT

Environmental monitoring plays a crucial role in applications such as smart homes, agriculture, industrial automation, and weather forecasting. Traditional monitoring systems often require manual observation and lack real-time accessibility. This paper presents the design and implementation of an IoT-based environment monitoring system using NodeMCU (ESP8266), DHT11 temperature and humidity sensor, Light Dependent Resistor (LDR), LCD display, and a buzzer for alert mechanisms. The system continuously monitors environmental parameters and uploads data to the ThingSpeak cloud platform for real-time visualization and remote access. A local LCD display provides immediate feedback, while a buzzer alert is triggered when humidity exceeds a predefined threshold. Experimental results demonstrate reliable real-time monitoring, cloud integration, and alert functionality, making the system suitable for smart home, agricultural, and industrial applications.

Keywords— Internet of Things (IoT), NodeMCU, DHT11, LDR, ThingSpeak, Environmental Monitoring, Smart Systems.

I. Introduction

Environmental monitoring has become increasingly important with the growth of smart technologies and automation systems. Parameters such as temperature, humidity, and light intensity directly influence human comfort, agricultural productivity, and industrial safety. Conventional monitoring methods rely on manual measurements or standalone systems, which limit real-time access and scalability. The Internet of Things (IoT) enables smart sensing, wireless communication, and cloud-based data analysis, making it possible to monitor environmental conditions remotely and efficiently. In this work, an IoT-based environment monitoring system is developed using NodeMCU (ESP8266), which integrates Wi-Fi connectivity for cloud communication. The system measures temperature, humidity, and light intensity, displays data locally, and uploads it to the ThingSpeak platform for real-time monitoring and historical data analysis.

II. Related Work

Several IoT-based weather and environmental monitoring systems have been reported in recent literature. Most systems utilize low-cost microcontrollers such as ESP8266 and ESP32 along with sensors like DHT11, DHT22, and BME280. Cloud platforms such as ThingSpeak, Firebase, and AWS IoT are commonly used for data storage and visualization. Studies show that while DHT11 is widely used due to its low cost and simplicity, it has lower accuracy compared to DHT22 and BME sensors. LDRs are frequently used for basic light intensity measurement, although calibration is necessary for precise lux-level readings. Previous works also highlight limitations related to cloud upload rate limits and alert robustness.

This work addresses these aspects by implementing threshold-based alerting, optimized upload intervals, and a combined local and remote monitoring approach.

The main contributions of this work include:

- Real-time environmental data acquisition using low-cost sensors.
- Cloud-based data visualization using ThingSpeak.
- Local display and buzzer-based alert mechanism.
- A scalable and cost-effective IoT monitoring architecture.

III. System Architecture

The overall system architecture is shown in Fig. 1. The system consists of the following main components:

NodeMCU (ESP8266): Acts as the main controller and provides Wi-Fi connectivity.

DHT11 Sensor: Measures temperature and humidity.

LDR (Light Dependent Resistor): Measures ambient light intensity.

16×2 LCD Display: Displays real-time sensor readings locally.

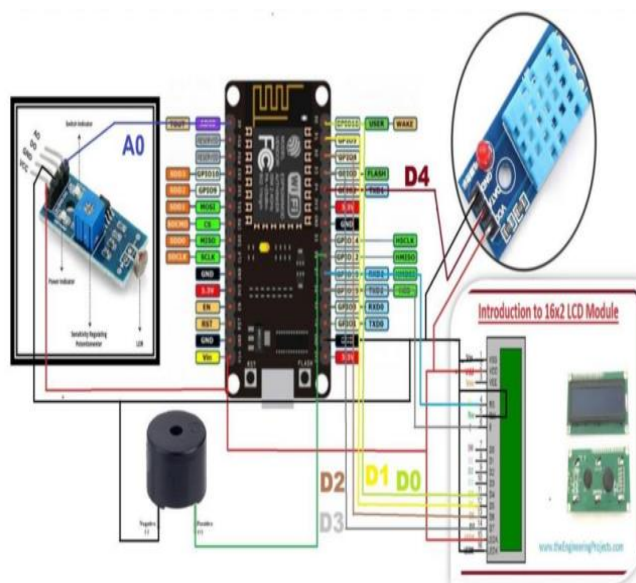
Buzzer: Provides audible alert when humidity exceeds threshold.

ThingSpeak Cloud Platform: Stores and visualizes sensor data remotely.

Working Principle

The NodeMCU reads sensor data at regular intervals. The temperature, humidity, and LDR values are displayed on the LCD. If humidity exceeds 70%, the buzzer is activated.

The data is transmitted via Wi-Fi to the ThingSpeak cloud, where it is visualized in graphical form for remote monitoring.



IV. Hardware Implementation

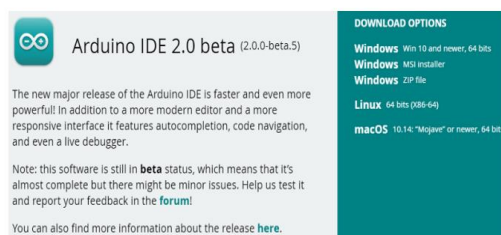
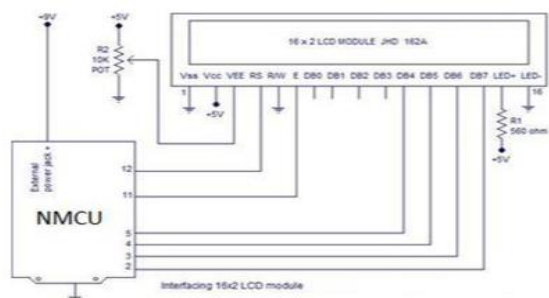
A. Hardware Components

- NodeMCU (ESP8266)
- DHT11 Temperature and Humidity Sensor
- LDR with voltage divider
- 16×2 LCD Display
- Buzzer
- Power supply and connecting components

B. Software Implementation

The system is programmed using Arduino IDE. The ESP8266 WiFi library, DHT sensor library, and Liquid-crystal library are used. The firmware performs the following tasks:

- Initializes sensors and peripherals.
- Connects to Wi-Fi network.
- Reads temperature, humidity, and LDR values.
- Displays values on LCD.
- Activates buzzer when humidity > 70%.
- Uploads data to ThingSpeak using HTTP POST requests.



V. Experimental Results and Discussion

The system was tested under various environmental conditions. The following observations were recorded:

Temperature and Humidity:

The DHT11 sensor provided stable readings. Typical indoor measurements showed temperatures around 28–30°C and humidity levels between 60–75%.

Light Intensity:

The LDR successfully detected changes in ambient light. Analog values ranged from 0 to 1023, with a threshold of 500 used to differentiate between bright and dark conditions.

Buzzer Alert:

The buzzer was activated correctly when humidity exceeded 70%, providing immediate notification.

Cloud Integration:

Data was successfully uploaded to ThingSpeak and visualized in real-time graphs for temperature, humidity, LDR values, and buzzer status.

The results confirm that the system operates reliably and is suitable for continuous environmental monitoring.

VI. Applications

The proposed system can be applied in various domains, including:

- Smart home automation
- Greenhouse and agricultural monitoring
- Industrial environment monitoring
- Educational and research projects
- Small-scale weather stations
- Smart city environmental sensing

VII. Conclusion

This paper presented an IoT-based environment monitoring and weather reporting system using NodeMCU, DHT11, LDR, LCD, and ThingSpeak cloud platform. The system provides real-time local and remote monitoring, along with an alert mechanism for high humidity conditions. The implementation is low-cost, scalable, and energy-efficient.

VIII Future Work

Replacing DHT11 with higher accuracy sensors (DHT22/BME280).

- Mobile app integration for notifications.
- Adding more sensors (pressure, gas, soil moisture).
- AI-based data analytics and prediction.
- Actuator-based automation for smart control systems.

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