Weather Monitoring System

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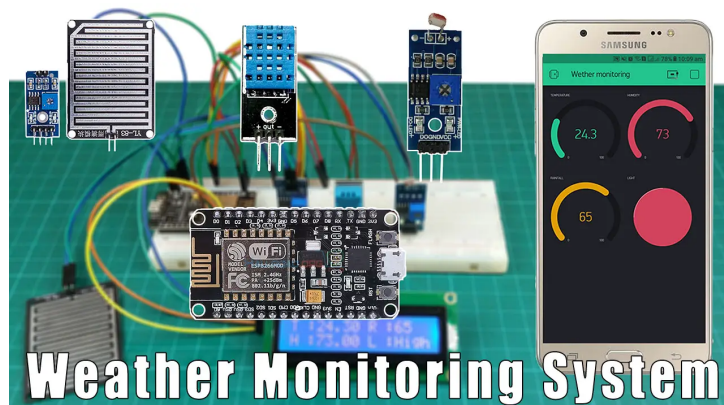
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Project Report

Figure 1: Illustrative Image for Project Report

Abstract

The Weather Monitoring System is an IoT-based project designed to monitor environmental parameters such as temperature, humidity, atmospheric pressure, altitude, and ambient light. Using sensors like DHT11, BMP180, and LDR interfaced with NodeMCU, the system displays the collected data on an LCD and can also transmit it to a cloud platform for remote monitoring. This system has applications in agriculture, home automation, environmental monitoring, and weather forecasting.

1 Introduction

Weather plays a crucial role in daily life and various industries. Monitoring weather parameters accurately is important for applications like agriculture, environmental studies, and smart homes. This project integrates commonly available sensors with a NodeMCU microcontroller to collect and display real-time weather data, and optionally transmit it to an IoT platform for remote access.

2 Objectives

- To monitor temperature and humidity using DHT11 sensor.

- To measure atmospheric pressure and altitude using BMP180 sensor.

- To detect ambient light using an LDR sensor.

- To display data on a 16x2 LCD.

- To transmit data to a cloud platform for IoT monitoring.

3 Applications

- Smart Agriculture: Helps farmers monitor climate conditions to optimize irrigation and crop care.

- Home Automation: Enables smart devices to respond to weather conditions.

- Environmental Monitoring: Provides data for pollution control and climate studies.

- Weather Forecasting: Basic monitoring of temperature, pressure, and humidity trends.

- Educational Purpose: Demonstrates practical IoT and sensor interfacing concepts.

4 Working Principle

The system works by interfacing sensors with the NodeMCU microcontroller:

- The DHT11 sensor measures temperature and humidity.

- The BMP180 sensor measures atmospheric pressure and calculates altitude.

- The LDR measures ambient light intensity.

The NodeMCU reads data from these sensors and displays it on a 16x2 LCD. For IoT functionality, the microcontroller can send this data to platforms like ThingSpeak via WiFi, allowing real-time remote monitoring.

5 System Overview

The system consists of three main parts:

1. **Sensors:** DHT11, BMP180, LDR

2. **Controller:** NodeMCU ESP8266

3. **Output:** 16x2 LCD and optional cloud platform

6 Circuit Diagram

The sensors and LCD are connected to NodeMCU as follows:

- DHT11 data pin → NodeMCU digital pin

- BMP180 → NodeMCU via I2C (SDA, SCL)

- LDR → Analog pin via voltage divider
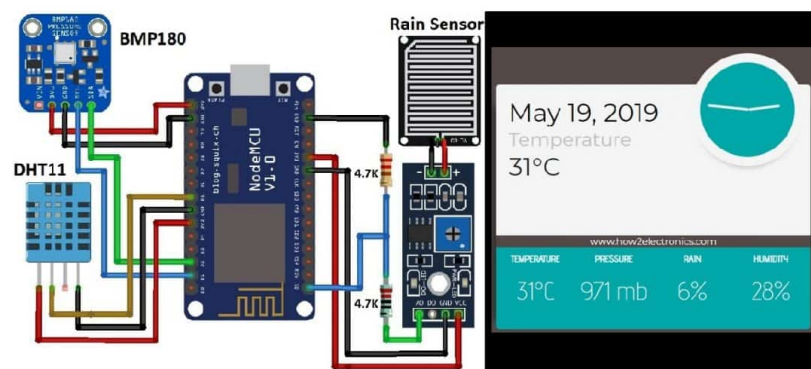
- LCD → NodeMCU via I2C

Figure 2: Circuit Diagram of the Weather Monitoring System

7 Components Description

7.1 DHT11 Sensor

A digital temperature and humidity sensor that provides accurate readings for basic environmental monitoring.

7.2 BMP180 Sensor

A barometric pressure sensor that can also calculate altitude based on pressure readings.

7.3 LDR (Light Dependent Resistor)

Detects the intensity of ambient light. Used for light monitoring applications.

7.4 NodeMCU ESP8266

A microcontroller with built-in WiFi support for IoT applications.

7.5 16x2 LCD with I2C

Displays sensor data in a human-readable format.

8 Results

The system displays real-time readings of temperature, humidity, pressure, altitude, and light intensity on the LCD. Optional IoT integration allows the same data to be monitored remotely via cloud platforms.
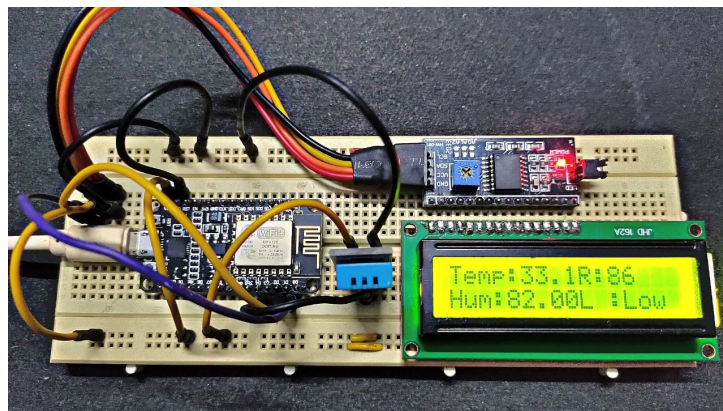

Figure 3: Data Display on 16x2 LCD

9   Conclusion

The Weather Monitoring System is a simple, cost-effective, and scalable IoT project. It provides real-time monitoring of environmental parameters, making it useful for smart agriculture, home automation, and environmental studies. The system can be expanded by adding more sensors to measure additional weather parameters.

10   References

1. https://www.arduino.cc/en/Reference/HomePage

2. https://thingspeak.com

3. Adafruit BMP085/BMP180 Sensor Documentation

4. DHT11 Sensor Datasheet

5. NodeMCU ESP8266 Documentation