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Application Based Whether Monitoring System Using Internet of Things (IoT)

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Abstract: The paper proposes creating a real-time weather monitoring system in a specific location and making the data available anywhere in the world. The technology underlying this is known as the Internet of Things (IoT). Which is a sophisticated and efficient method of connecting things to the internet and connecting the entire world of things in a network. The framework continuously monitors temperature and humidity with a DHT11 sensor, rainfall intensity with a rainfall sensor, and weather conditions such as cloudiness or sunshine with an LDR sensor. The framework continuously sends this information to the microcontroller, which currently forms it and sends it to the online web server via a Wi-Fi connection. The data updated by the implemented system is available on the internet from anywhere in the world.
Keywords: Internet of Things (IoT), Embedded computing system, ESP8266, DHT11 sensor, LDR sensor, Rainfall sensor.

I. INTRODUCTION

Nowadays, an efficient monitoring system is essential for weather monitoring and access, as well as data collection for research publications. This study presents a weather monitoring system implementation based on the Internet of Things (IoT). A new application is built utilizing this technique to determine weather reports using multiple sensors. The primary goal of this project is to develop and execute a resourceful monitoring system in which the required parameters are remotely monitored over the internet, data acquired from sensors is recorded, and the predictable trend or data is projected on the web browser. This article goes into great depth about the implementation and data visualization on the obtained data. The inbuilt sensors in this application can detect temperature, humidity, rainfall, and overcast or sunny weather.

Puja Sharma et al in 2021 [1] have indicated in their paper that proposed a system, which monitors real-time weather condition such as the temperature, humidity, rainfall, and pressure based on Gorakhpur region of India using number of sensors. Their system will use an IoT client-server architecture model and monitors real-time weather data using an environmental parameter. Girija C et al in 2018 [2] have proposed a weather monitoring using IoT technology that uses electronic components and equipment. The system uses sensors to monitor and manage environmental factors such as temperature, relative humidity, and CO level, and then sends the information to a web page to plot the sensor data as graphical statistics. Iswanto in his proposed system [3] said that weather knowledge is essential before engaging in any activity, particularly those directly related to nature, such as agricultural operations. The system was developed using optocoupler speed sensors, LM35 temperature sensors, and LDR sensor intensities as a measure of the sun, all of which were acquired by an ATmega8535 microprocessor. Ragini D. Khadse et al in 2015 [4], depicts a low-cost live weather monitoring system with an OLED display, in which the author employs an OLED display to indicate the weather conditions and the suggested concept employs an ESP8266-EX microcontroller-based WeMos D1 board running on Arduino to retrieve data from the cloud. Ravi Kishore and et al in 2016 [5], depicts the system also provides wireless connectivity using the Bluetooth communication standard. The weather system is comprised of an embedded system for the production of multimedia applications based on the PIC32 microcontroller, with development carried out utilizing the SPIES methodology for embedded system construction. E. Cruz and et al in 2015,[6] designed a weather system, which is made up of an embedded system for creating multimedia applications based on the PIC32 microcontroller, with development using the SPIES approach for embedded system architecture. The creation of a portable gadget capable of measuring temperature, relative humidity, pressure, and altitude. Lay Nandar Soe an et al in 2014 [7], deals with the design, development and implementation of system where the microcontroller scans the sensors, calibrates and compensates their data and communicates the resulting information to the transmitter. This resulting information are displayed on the LCD that is temperature (oC), humidity (%), pressure (KPa) and wind speed (MH). M. Prasanna and et al [8] in 2019 had presented a study called "An Intelligent Weathering System Using the Internet of Things," in which climatic conditions are measured and predicted using a machine learning algorithm and IoT technologies. Temperature, humidity, and pressure all play important roles in the system.

Knowing the current state of the environment is one of today's most difficult tasks since assessing the current state of the environment poses a variety of IoT challenges. The suggested system will address this issue since it monitors the weather in real time. Our suggested system incorporates a number of sensors that will measure the temperature of the sunshine, humidity, and rainfall. It will use IoT to work on a client-server architectural approach. The data recorded by the sensor was received by the node MCU controller. The serial monitors an IP address. This protocol-based data may be seen on the Blynk online dashboard or in a Blynk mobile application based on IoT. This study uses environmental characteristics or sensors to monitor and show weather data in real time on a website or mobile application. Anyone may monitor the weather from anywhere by using a webserver or mobile application, rather than depending on a website. In our system, we have created an application-based weather monitoring system that uses the Internet of Things (IoT) to monitor temperature, humidity, rainfall intensity, and sunny or cloudy weather all in one low-cost and user-friendly system.

II. GENERAL COMPONENTS

1) *ESP8266 Node MCU*: The ESP8266 Node MCU is a low-cost microcontroller with a Wi-Fi microchip with a and built-in TCP/IP networking software. It is a small module that enables microcontrollers to connect to a Wi-Fi network and create simple TCP/IP connections using Hayes-style instructions. ESP8266 can be used to create a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functionality from another application processor. It offers a 5v to 12v input power rating via the Vin pin. This Wi-Fi module will allow us to monitor weather parameters using a smartphone app.[9]
2) *DHT 11*: The DHT 11 is being deployed here to sense temperature and humidity sensor. As soon as DHT detects the signal, it sends out an 80-microsecond low-voltage-level response signal. The DHT program then adjusts the Data Single-bus voltage level from low to high and maintains it for 80-microsecond to prepare the DHT for data transmission. It has an array of three pins, which are Vcc, output and GND. The typical operating voltage of DHT 11 is 5v DC and Sampling period at intervals should not be no less than 1 second. It works with temperature sensor accuracy of ±2°C and humidity sensing accuracy of ±5% RH.[10]
3) *Rain Sensor*: The purpose of rain sensor in our project is to detect the amount of rainfall. When a raindrop falls through this sensor board, it may be utilized as a switch, as well as to gauge the intensity of the rain. This module comes with a rain board and a separate control board for convenience, a power indicator LED, and adjustable sensitivity via a potentiometer. The analogue output is used to detect drops in rainfall amount. When connected to a 5V power supply, the LED will illuminate when there is no rain drop on the induction board and the DO output is high. When a small amount of water is dropped and the DO output is low, the switch indicator will illuminate. Brush away the water droplets, and when restored to its original state, it produces a high level of output.[11]
4) *LDR Sensor*: In our project, to detect the presence of sunlight, LDR sensor has been used. Light dependent resistor (LDR) has resistance which is inversely dependent on the amount of light falling on its sensitive surface. An active semiconductor layer is being placed upon an insulating substrate incase of a standard photoresistor configuration.. To achieve the required level of conductivity, the semiconductor is typically lightly doped. After that, contacts are placed on either side of the exposed area. Features like quick response, reliable performance and good characteristic of spectrum makes it suitable to use it in our project. It has approximately 2 to 6 kilo ohms of photo resistance and 0.15 mega ohms of darkness resistance.[12]

III. CIRCUIT DIAGRAM

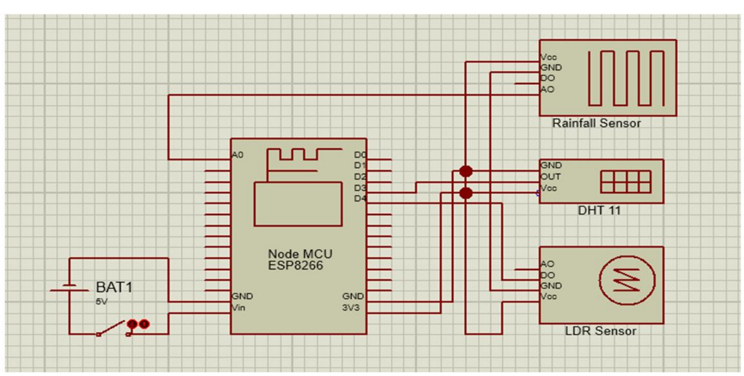

Fig. 1. Main circuit diagram of our system

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Here, we have connected anode of DC battery with Vin pin of Node MCU and cathode with GND pin. All the Vcc pins of the sensors are connected to 3.3-volt pin of Node MCU and GND with GND pins respectively. The analog output of rainfall sensor is connected to A0 pin of Node MCU and D3 and D4 are connected to digital output of DHT 11 and LDR sensor respectively.

IV. MODEL LAYOUT

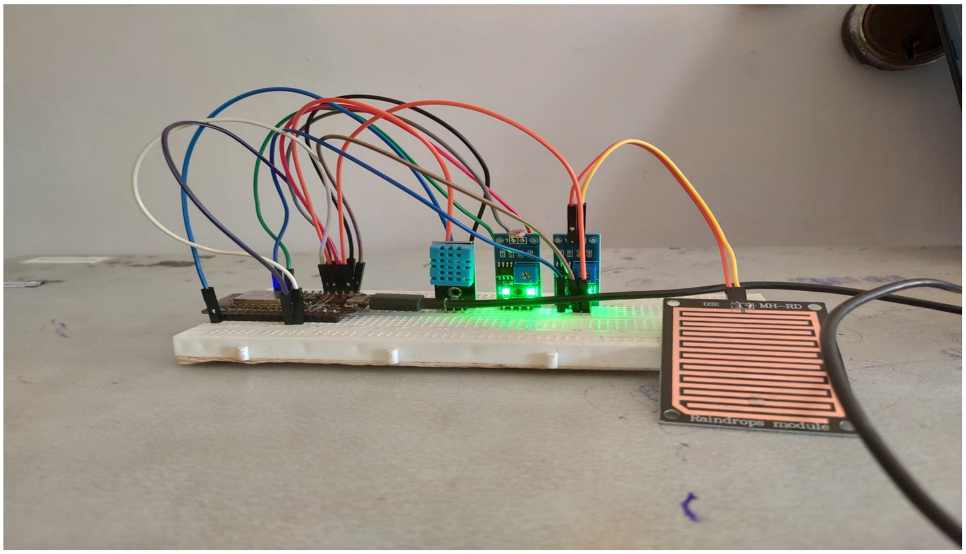

Fig. 2. Main model layout of our system

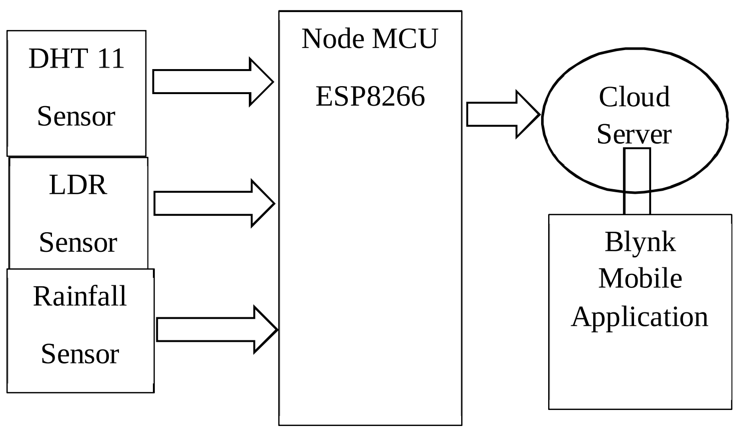

Fig. 3. Block diagram of our system

V. METHODOLOGY

The purpose of this study is to create a weather monitoring system with several sensors. Wi-Fi will be used by the system to continually monitor live environmental factors including the weather. The weather monitoring system uses a range of sensors to measure the various factors. The Node MCU ESP8266 serves as a microcontroller and is equipped with2.4GHz Wi-Fi connection. The suggested gadget maintains and monitors the state of the place using an ESP8266 node MCU microcontroller when the remotely managed NET PI network system is implemented. As an AP access point, the ESP8266 is connected to the network through a Wi-Fi (router) station. The DHT 11 is a sensor that measures temperature and humidity. It uses a thermistor and a capacitive humidity sensor to detect the air around it before spewing out a digital signal on the data pin. Although it is very simple to operate, data collection needs precise scheduling. An LDR is a variable resistor that is controlled by light. The resistance of the LDR diminishes as the intensity of the light shines on it. It features an analogue output that connects to the A0 pin of Node MCU. In this case, the LDR sensor detects the presence of sunlight rather than its intensity.

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The model depicts the link between the sensor and the microcontroller node MCU. The sensors are attached to the node mcu8266 in the design. When the system connects to the internet, data from sensors is immediately downloaded, uploaded, and presented on webservers. Gauge 1 and Gauge 2 on the Blynk App show temperature and humidity, respectively, while Gauge 3 and Gauge 4 on the LED indication reflect a full building. Check the system's functionality and reliability. The suggested model properly measures the environmental situation.

VI. FINAL RESULT

In the end, we can see that our Blynk mobile app shows three gauges and an LED indicator. The first three gauges show the temperature, humidity, and rainfall intensity, while the LED indicator shows whether the day is sunny or cloudy.

Fig. 4.1. First observation

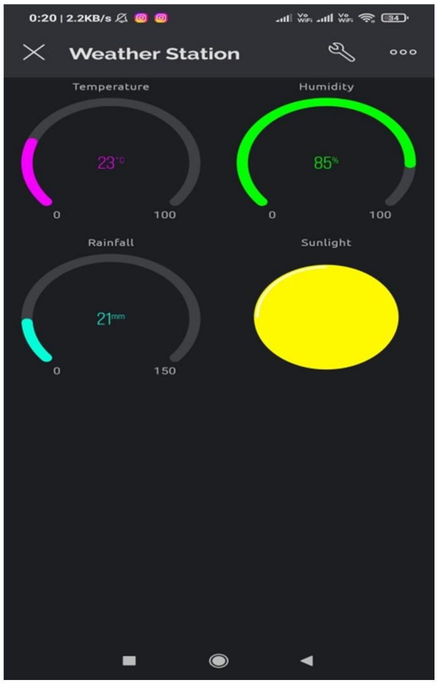

Fig. 4.2. Second observation

VII. CONCLUSION AND FUTURE SCOPE

Essentially, our model is made up of several sensors like DHT 11, Rain sensor and LDR sensor. Our model collects data from environments using these sensors, and this data is processed by a microcontroller (ESP8266), and we collect this data with the help of the blink app, which is an open-source Internet of Things (IOT) application and API for storing and retrieving data from things via the HTTP protocol over the Internet or a Local Area Network.

In the future, we may include this model into a fire alarm system that can detect fires using smoke and other sensors. Clients can be notified through SMS of the temperature/humidity/smoke parameters and alerted. Accordingly, we may compile a big quantity of data from the device and develop an algorithm capable of predicting rain and humidity.

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