International Journal for Modern Trends in Science and Technology
Volume 10, Issue 02, pages 86-92.
ISSN: 2455-3778 online
Available online at: http://www.ijmtst.com/vol10issue02.html
DOI: https://doi.org/10.46501/IJMTST1002012

IoT- Based Weather Reporting System to Find Dynamic Climatic Parameters

D Lavanya | B Sivaiah | P Sarath Kumar | V Narendra Reddy | K Bala Harsha Vardhan Sai

Department of CSE – Data Science, Chalapathi Institute of Technology, Guntur-522016, A.P, India.

To Cite this Article
D Lavanya, B Sivaiah, P Sarath Kumar, V Narendra Reddy and K Bala Harsha Vardhan Sai, IoT- Based Weather Reporting System to Find Dynamic Climatic Parameters, International Journal for Modern Trends in Science and Technology, 2024, 10(02), pages. 86-92. https://doi.org/10.46501/IJMTST1002012

Article Info
Received: 28 January 2024; Accepted: 15 February 2024; Published: 17 February 2024.

ABSTRACT

Now-a-days many weather reporting applications are available which gives us information about climatic changes that are going to take place by which man can be aware of present and future climatic changes. Most of the weather reporting applications extracts the data from accurate weather system. Here we are building our own weather reporting system which would give us information about present temperature, humidity etc.

We can setup this in our home and get time to time changes in climate which would help us in planning our daily work easily. Like It would be helpful for a farmer in this agricultural activity by which he can protect his crops climatic changes. It would help in transportation giving information of weather conditions etc.

Weather monitoring plays a crucial role in various applications, and this project introduces an "IoT-based Weather Reporting System" using DHT11, a rain sensor, and Thing Speak for real-time reporting of dynamic climatic parameters. The system aims to monitor temperature, humidity, and rainfall using sensors, and transmit the data to Thing Speak for cloud storage and analysis. This integration of sensors and a cloud platform provides an intelligent solution for dynamic weather parameter reporting.

Keywords: DHT11Sensor, Rain Sensor, Thing Speak Integration, Real-Time weather Monitoring.

1. INTRODUCTION

Here we introduce a smart weather reporting system over the Internet. Our introduced system allows for weather parameter reporting over the Internet. It allows the people to directly check the weather states online without the need of a weather forecasting agency. System uses temperature, humidity as well as rain with humidity sensor to monitor weather and provide live reporting of the weather statistics.

The system constantly monitors temperature using temperature sensor, humidity using humidity sensor and also for rain. Weather monitoring system deals with detecting and gathering various weather parameters at different locations which can be analysed or used for weather forecasting. The aim of this system is achieved by technologies such as Internet of Things (IOT) and Cloud.

The idea of internet of things is to connect a device to the internet and to other required connected devices. Using Internet the information from the IOT device can easily be transferred to the cloud and then from the cloud to the end user. Weather Monitoring is an essential practical implementation of the concept of Internet of Things, it involves sensing and recording various weather parameters and using them for alerts, sending notifications, adjusting appliances accordingly and also for long term analysis.

Also we will try to identify and display trends in parameters using graphical representation. The devices used for this purpose are used to collect, organize and display information. It is expected that the internet of things is going to transform the world by monitoring and controlling the phenomenon of environment by using sensors/devices which are able to capture, process and transmit weather parameters. Cloud is availability of computer system resources like data storage, computing power without direct active management of user.

The data captured is transmitted to the cloud so that the data could be further displayed. Besides this, the system consists of components such as Arduino UNO board which is a microcontroller board consisting of 14 digital pins, a USB connection and everything used to support microcontroller; DHT11 is Temperature and humidity sensor which is used for detecting these mentioned parameters; WIFI module is used to convert the data collected from the sensors and then send it to the web server.

So, in this way weather conditions of any location can be monitored from any remote location in the world. The system constantly transmits this data to the micro controller which now processes this data and keeps on transmitting it to the online web server over a wifi connection.

After receiving the data from wireless sensor network, gateway node extracts data after analyzing and packaging them into Ethernet format data, sends them to the server. Less formally, any device that runs server software.

2. LITERATURE REVIEW

In this paper, the author elaborates how the weather prediction system is becoming a crucial challenge in every Weather extreme event that causes an adverse effect of the system on lives and property as well. Hence the accuracy of weather data is being one of the critical challenges to enhance the weather prediction skills and build up the resilience to effect of detrimental weather report condition.

The author describes that Uganda and various other developing countries have looked challenges in developing timely & accurate weather data due to scarce weathers observation. The scarce weather monitoring is a part of the high cost of developing automatic weather situations. The restricted funding is available to national meteorological services of the respective countries.

In this proposed system the author firstly takes care of the problems and then applies them. The author proposed an Automatic weather monitoring Station based on a wireless sensor network. The planning of the author is to develop three generations of Automatic weather stations or AWS prototypes.

In this research, the author evaluates the 1st-generation AWS prototype to improve the 2nd generation depending upon the need and generation. The author provides a suggestion to improve the nonfunctional requirement such a power consumption, data accuracy, reliability, and data transmission in order to have an Automatic Weather Station.

The non-functional requirement collapsed with cost reduction in order to produce a robust and affordable Automatic Weather Station (AWS) Therefore the proposed work, like developing countries like Uganda will be able to acquire the AWS in suitable quantities. So that it can improve the weather forecasting, presents an IoT-based weather monitoring system.

3. EXISTING SYSTEM

Traditional weather reporting system may rely on fixed weather stations with limited coverage and data updating capabilities. Monitoring dynamic climatic parameters in real-time requires an automated and connected system. An IoT-based solution is needed to provide continuous updates on changing weather conditions.

Data from ground-based weather stations, satellites, and other sensors are integrated to provide a comprehensive understanding of atmospheric conditions. Meteorological agencies use this information to generate weather forecasts, issue warnings, and monitor climate patterns

The evolution of weather reporting has seen advancements in technology, such as the utilization of remote sensing instruments and sophisticated computer models. These models simulate atmospheric processes, helping meteorologists make more accurate predictions. Additionally, artificial intelligence plays a role in data analysis, pattern recognition, and improving the overall efficiency of forecasting systems

Real-time data transmission and communication networks ensure that timely information reaches the public, allowing for preparedness in the face of changing weather conditions. Continuous research and development further refine forecasting techniques, contributing to the ongoing enhancement of weather reporting systems worldwide.

4. PROPOSED SYSTEM

The proposed "IoT-Based Weather Reporting SystemTo Find Dynamic Climatic Parameters" addresses the limitations of traditional systems by introducing the following key features:

Key Features

4.1.1 DHT11 Sensors:

Measures temperature and humidity for dynamic weather parameter monitoring.

Microcontroller Unit (MCU):

It utilizes a microcontroller for data processing and communication with Thing speak.

Rain Sensor:

Detects rainfall and provides real-time updates on precipitation. .

Thing Speak Integration:

Sends data to ThingSpeak for cloud storage and real-time reporting..

Real-Time Weather Monitoring:

It provids continuous updates on dynamic climatic parameters for accurate weather reporting.

4.2 Required componentsused forthis project:

4.2.1 NodeMCUESP8266

4.2.2 DHT11 sensor

4.2.3rainSensor

4.2.4 Thing speak Integration

4.2.1 NodeMCUESP8266:

The NodeMCU ESP8266 development board comes with the ESP-12E module containing the ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

Figure 1: NodeMCUESP8266

NodeMCU is an open-source firmware for which open-source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). Strictly speaking, the term "NodeMCU" refers to the firmware rather than the associated development kits.Both the firmware and prototyping board designs are open source.

4.2.2 DHT11 SENSOR:

The DHT11 is a basic,low-cost,digital temperature and humidity sensor. Inside it has a capacitive humidity surrounding air, and spits out a digital signal on the data pin.

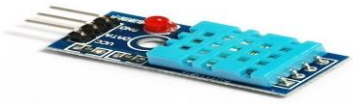

Figure 2:DTH1 Sensor

A.4.2.3RAIN SENSOR:

A rain sensor element is a switching device which is turned on by rainfall.The rain detector is an electronic device that generates a signal with its sensor which will detect the rain and make an alert.

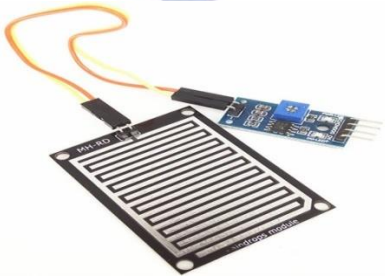

Figure 3: Rain Sensor

4.2.4 *THING SPEAK INTEGRATION:*

ThingSpeak "is an IOT analytics platform service that allows you to aggregate, visualize and analyze live data stream in the cloud.ThingSpeak provides instant visualizes of data posted byYour devices to Thing SPeak.

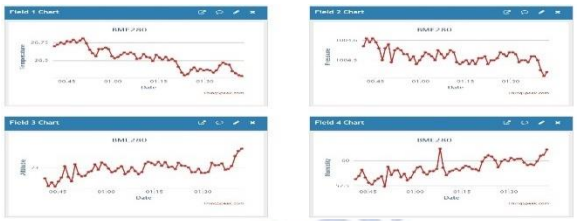

Figure 4: Thing SPeak Integration

5. RESEARCH METHODOLOGY

5.1 CircuitDiagram:

This project concentrates on ThingSpeak, an Internet of Things platform for displaying sensor data. The cycle is broken into two areas: both software and hardware development Hardware development includes the creation of the circuit and the prototype. In the interim, the IOT coding, schematic, circuit re-enactment, and information securing are all important for the product.

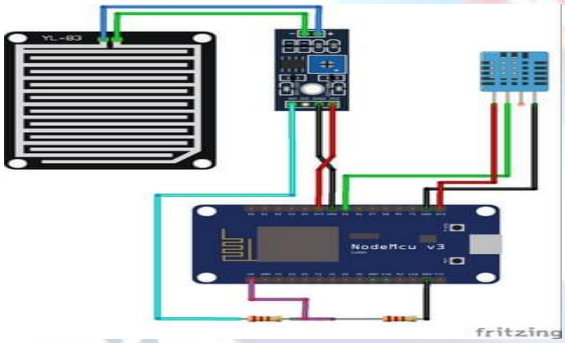

Figure 5: Circuit Diagram: Interfacing Rain Sensor with Node MCU ESP8266

The framework will really desire to demonstrate the atmospheric condition by assessing the current climate using sensor esteem data. The ESP32 microcontroller and Wemos client will manage all of the data, receiving sensor data from the ESP32 and displaying it on an OLED screen.

Moreover, the system will be accessible through the ThingSpeak channel, which has been designed to allow users to check 3 the data online, as well as an Android application named Blynk, which will display the sensor data.

The collected data will be analyzed and compared with the information provided by JabatanMeteorologiMalaysia to ensure that the data is accurate and reflects the current weather conditions. With the help of the Internet of Things (IoT), users will be able to access the system wirelessly and online without requiring manual verification

Figure 6: AD8266 kitwith 3.3V VCC&Connect its GNDto GND

5.2 Flowchart:

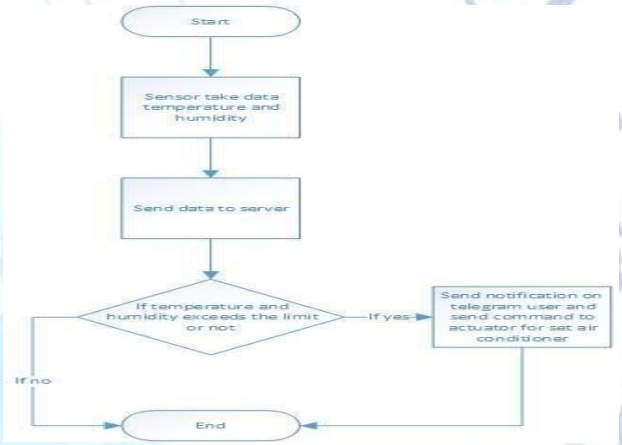

Figure 7: process of DHT 11 Sensor

6. RESULTS & DISCUSSION

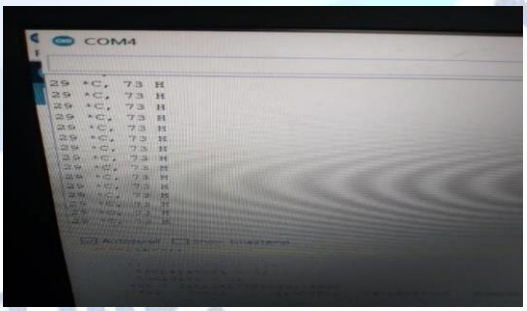

Figure 7: Temperature ,Humidity,Rain fall Rate

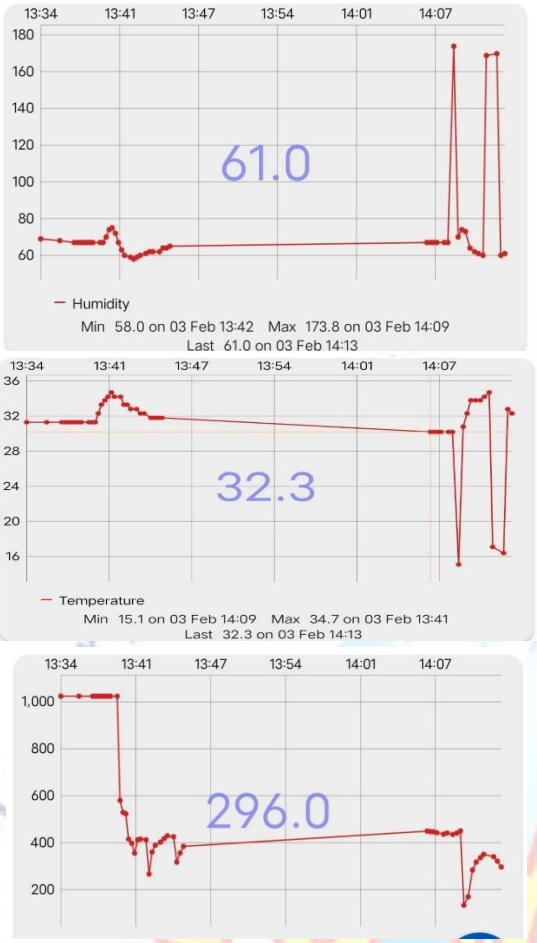

Figure 8: Real Time Experimental Results

7. CONCLUSIONS:

By keeping the weather station in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to use the sensor devices in the environment for collecting the data and analysis. By using sensor devices in the environment, we can bring the environment into real life. Then the collected data and analysis results will be available to the user through the Wi-Fi. The smart way to monitor the environment an efficient, low-cost embedded system is presented in this paper.

It also sent the sensor parameters to the cloud. This data will be helpful for future analysis and it can be easily shared to other users also. This model can be expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low-cost solution for continuous monitoring of environment

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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