An Overview of the Development of an IOT-based Weather Reporting System

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ABSTRACT
In this article, suggested an IOT-based weather reporting system. because of the abrupt fluctuations in the weather today, weather forecasting is unpredictable. The project's objective is to identify, capture, and show several weather parameters like temperature, humidity, and air pressure. This system uses wireless sensors to check and keep track of meteorological factors. The outputs are displayed by the system using the blynk app.

Keywords
IOT, Arduino, cloud server, DHT11 temperature and humidity sensor, LCD display, MQ135 air quality sensor, rain sensor

1. INTRODUCTION
Human life is significantly influenced by the climate. The ecology and air quality have been significantly impacted by the enormous growth of industry and motor traffic. The satellite-based weather reporting system provides the current situation, which does not accurately reflect each location's situation. The mistake in the weather forecasting system at the precise site can be reduced by creating a controlling local weather reporting system with a Node MCU microcontroller. Despite the fact that it is a limited resource, irrigation in agriculture wastes 50% of the water that is used. In order to improve the calibration of energy simulation systems, the building industry offers significant potential for energy savings. Accurate meteorological data for the precise site where the building will be constructed. Technology utilization in agriculture is crucial for boosting output and lowering the need for additional labor. A portion of the research is to support farmers and develop technology and systems that help increase agricultural production. Wi-Fi, the internet of things, weather monitoring, sensors for soil moisture, clouds, temperature, and humidity. This article proposes the use of the Internet of Things (IoT) to construct a weather monitoring system. It is suggested to use a Raspberry Pi to monitor accessible particle pollutants such as PM2.5, PM10, temperature, humidity, and Air Quality Index (AQI). The proposed weather station is intended to track many aspects of Babylon City's environment, including CO2, CO, and CH4 concentrations, humidity, temperature, and light levels. These components are measured, analyzed, and then transmitted to a web application for authorized users anywhere in the globe to watch. Sensors, an Arduino, and an ESP8622 Node MCU Wi-Fi module make up the system. The Node MCU is used as a module to connect to the server and show the output when the sensors detect climatic changes and feed this information as data into the Arduino. The server is an open source server where the data may be shown in a dashboard where all the different feeds can be combined, as well as in various feeds. The Arduino UNO board, a microcontroller board with 14 digital pins, a USB port, and everything else needed to support the microcontroller are among the system's components. The DHT11 temperature and humidity sensor is used to collect the aforementioned parameters, and the WIFI module is used to convert the data collected by the sensors. This allows for the monitoring of weather conditions at any area from a distance. The required outcomes are organized and shown on a web page that has access to the cloud. A +5 V power supply is constantly outputted by one pin of the precipitation sensor circuit to one trace of the sensing pad, and a return power supply is received by a different pin from a different trace of the sensing pad. Weather forecasts will be more accurate if wireless monitoring principles are used. Environmental parameters must be remotely monitored for many industrial, agricultural, and other processes.

2. WEATHER REPORTING SYSYTEM
A typical weather monitoring system is made up of a number of sensors that may measure things like pH, pressure, temperature, humidity, etc. A central controller, which oversees the operation and receives data from the sensors, is connected to all of the sensors. The ESP32 Wi-Fi wireless network connectivity is then used to transfer the obtained data to the Thing Talk IOT platform. The sensors are connected to the ESP32, which serves as the system's controller and gathers all the data. On the Thing Talk IoT website, this system automatically updates the temperature, humidity, pressure, rain, air quality, and weather conditions. This information is also displayed on the weather station's display

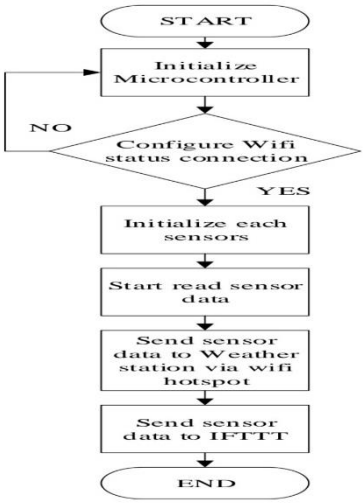

Figure 1: Control unit flowchart

A Wi-Fi system model is used in the wireless weather station's monitoring system. A Wemos D1 small microcontroller, which connects to Wi-Fi, manages this and uses live sensor data to show it on the OLED screen. To collect flawless data, this communication simulates the client-server protocol or the master-slave network protocol. If there is a problem with the data that was collected, the buzzer will be turned on for safety reasons. The user receives the message or warning via the Blynk app.

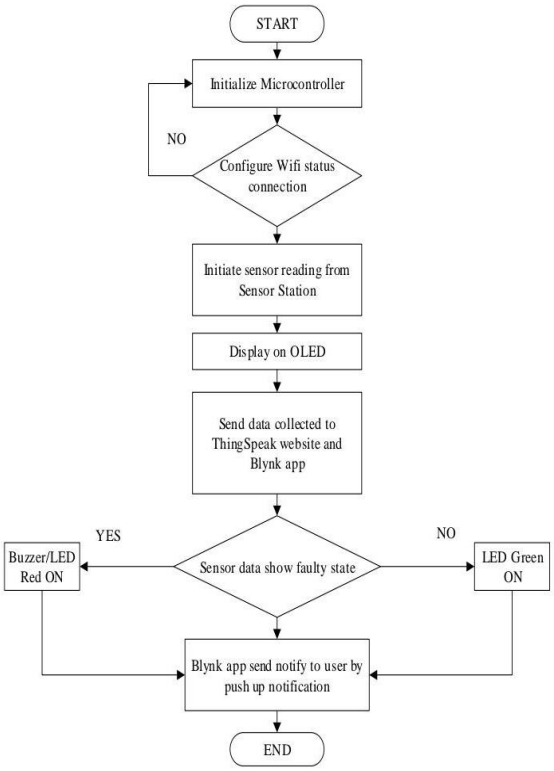

Figure 2: Monitoring unit flowchart

3. LITERATURE REVIEW

A weather reporting system employing IOT was created by Dr. Ashpin Pabi, Muneendra D., and Ramanath Reddy N.[1] to aid in the continuous measurement of weather data. It demonstrates the air quality, pollution, and a safe environment. To measure the quality parameters, the sensors are coupled with the Node MCU. A rain card and a control module make up the rain sensor, which measures the amount of precipitation. It includes microcontrollers like the Arduino and 8051. The open-source software Node MCU (Node Microcontroller Unit) is used in the hardware development industry. Furthermore, it is a free and open source IOT platform. The meteorological parameters, such as temperature and humidity, are shown on the LCD.

A system for monitoring the weather using IOT proposed by Arsheen Shaikh, Shruti Yangal, and Afsheen Shaikh [2]. This work involves employing appropriate sensors to monitor and show meteorological variables including temperature, humidity, wind speed, wetness, and carbon monoxide (CO) in the air. These sensors transmit data to the website, which is then used to create the graph. Sending and receiving sensor data is accomplished using an integrated TCP/IP protocol stack. The gathered data is uploaded to the website so that visitors can access there. Sensors, an Arduino UNO board, and a WIFI module that transmits data to cloud computing services make up the system. The user can see the data on a webpage. Notifications of sensor faults and system errors are sent to the user.

An IOT-based approach for creating a weather monitoring system by A F Pauzi and M Z Hasan [3]. The primary objective is to create Thing Speak, an IoT platform that will be used to gather data from the sensors. By examining the sensor data, the system will be able to present the weather conditions. All of the data will be controlled by the ESP32 microcontroller. A client called Wemos will receive the sensor data from the ESP32 and show it on an OLED screen. This information is also shown on the Thing Talk channel, which was created to enable online user authentication. The statistics and the weather at the moment are accurately reported.

An IOT and cloud-based weather monitoring system is displayed in this research [4]. An object is linked to the Internet using the Internet of Things (IoT). The hardware for the system comprises of an Arduino UNO board, a microcontroller board with 14 digital pins, a USB connector, and all the necessary components to support a microcontroller. The information gathered from the sensors is converted and sent to the web server using a WIFI module. A microcontroller board called Arduino/Genuino Uno is based on the ATMEGA328P. Arduino IDE is the primary programming tool for the microcontroller board. C++ and C are the programming languages used in this.

In this paper [5], provided a method for tracking and reporting meteorological systems. To measure the environmental conditions, four different sensors—soil moisture sensors, humidity sensors, rain sensors, and temperature sensors—are used. The sensors are connected to an internal ADC in the Arduino UNO (analogue to digital converter). Then, these parameters are sent to the Internet using IOT techniques. The procedure of Wi-Fi data transfer is repeated after a predetermined amount of time. The user must then go a particular website to get this weather data. The project connects to and stores the data on a web server. The user consequently obtains a real-time weather forecast. Internet or Wi-Fi

The Raspberry Pi serves as a server for tracking and showing air quality index, PM 2.5, and PM 10 concentrations (AQI). In this work, the author discusses IoT-based weather monitoring systems for effective analysis [6]. The network connectivity of IoT devices has considerably decreased power consumption, robustness, and data access connectivity through the network. The IoT research community has devoted a lot of time to studying the subject of weather monitoring systems as modules. A new weather monitoring system is made using a Raspberry Pi and several sensors. This document goes into great detail on how the data was implemented and visualized for intranet or internet weather data like temperature.

Mahmoud Shaker Nasr and Walla Y.Y. Alebady created and use an intelligent weather station based on IOT [7] because of pollution, the weather has become exceedingly unpredictable. IOT technologies were used in the development of this system. The main components of this system are wireless server network (WSN) and Ethernet. The suggested approach offers a low-power approach for establishing a weather station. The weather station is made up of the sensor node, the gateway node, the alert node, the database, and the web application. The W5100 Ethernet Shield facilitates communication between the sensor node and the gateway node. The sensors transmit data to the database through the global WAN. The alarm node's connecting components include an Arduino GSM Shield, buzzer, LED, and microcontroller (mega-2560).

Reference talks about[8], existing concept can be expanded to cities and companies for information concerning contamination. The model will offer a professional and outstanding service to safeguard public health from contamination as a low-cost alternative for routine weather and environmental monitoring. This foundation gives us a lot of room for improvement. As the system's global component, we can add a few other sensors and connect them to the satellite. Other sensors, such as CO2, pressure, and oxygen sensors, should be used to monitor other biological boundaries. The military, routes, and planes that can be used in this end-to-end system are immensely varied. It can also be done in hospitals or other therapeutic settings for the assessment and investigation of Effects of Weather.

The study [9] clearly depicts a system that can track weather readings via wireless and IOT.. Sensors will interact with hotspot Wi-Fi and its surroundings to enhance wireless connectivity. The device may show sensor data that was obtained using the Blynk app. It is accessible through both the App Store and Google Play Store.

Reference [10] talks about, low-cost automatic Zigbee-based wireless weather station with a graphical user interface and a web-hosting capability [10]. Because the status of the globe impacts both the activity of the expanding population and the quality of human life, the author emphasizes the current state of the climate in his conceptual model, which makes use of a ZigBee wireless network. Due to financial limitations and a lack of human resources, the system is only able to deploy a partial monitoring system at this time. Data collecting on metrological parameters is not only relevant but also necessary under the current circumstances. An inexpensive hardware module based on the Arduino Uno has been suggested and used by the author.

[11] Describes the creation of a smartphone app and an IOT-based smart weather station. Crop productivity can be improved through weather monitoring, which is advantageous for agriculture. The suggested system processes all sensor activities using a Raspberry Pi 3. IEEE 802.11 b/g wireless technology is used by this system (Wi-Fi in general). The system updates the data on the website after frequently checking the weather. Also maintain the weather conditions of a certain spot that may be detected and readily checked anywhere in the world by updating the data on the website. To determine wind direction and speed, precipitation, temperature, humidity, and light, the system uses circuits and sensors.

An Arduino-based weather monitoring system proposed by Arun Prakash,et.al [12]. The system includes three sensors that measure different weather data. The data gathered by the sensors is fed into the Arduino microcontroller and is afterwards saved in a text file. The readings are also shown on an on-board LCD for convenience. To ascertain local weather conditions and track weather patterns, all of these readings can be analyzed. One major agricultural application of LDR is determining light intensity. The visual maps can also be published on websites so that anyone, anywhere can access it. The information, which includes observed weather variables, can also be utilized to study patterns.

The paper [13] discusses about a real-time accessible system. In this study describes a technology that makes advantage of the IoT. The studies equipment tracks changes in UV radiation, pressure, temperature, humidity, and even the atmosphere's carbon monoxide concentration. The data is gathered using a variety of sensors and delivered to a website where it is visually presented. When data is uploaded to a web server, it can be accessed from anywhere in the world. The concept comprises a mobile app that notifies users of an alert system to warn them of sudden and significant weather changes.

In this study [14] suggests a "Intelligent Weather System using the Internet of Things," in which climate variables are tracked and machine learning algorithms and IoT technology are utilized to forecast the impending circumstances. The author outlines a method for controlling the weather that is both very affordable and successful. Data is transferred to the cloud, where it is accessible from any location with an Internet connection and is made available online. Air pressure, humidity, and temperature all have a significant impact on the system. The method is also applied in other fields including logistics and agriculture. Many industries' growth depends on reliable weather observation and forecasting.

4. CONCLUSION

Monitoring the weather using a weather station enables the environment to defend itself (i.e., create a smart environment). the environment's sensing equipment must be used for data gathering and processing in order to do this. In the suggested method, weather parameters are monitored using inexpensive equipment. the client architecture model serves as the foundation for how the proposed system operates. Many sensors were employed in the suggested strategy to observe diverse environmental data. The system has created makes use of fewer sensors than the model that was previously in use. The fundamental objective of the suggested approach is to make the system affordable, efficient, and available to everyone. The approach is to gather information from numerous sensors and send it to a website.

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