Weather Monitoring System using ESP8266
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DOI: NA

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Internet of Things (IoT) is an optimized and efficient solution for connecting and exchanging data with other devices over the Internet. As IoT interact and communicate with each other, the human effort that saves time is minimized. IoT technology is used in the framework proposed in this article. This system basically is the solution for monitoring various parameters like heat index, soil moisture, temperature, and humidity. Using IoT and respective sensors, the above-mentioned parameters are measured. The weather analysis is made available on the desktop through the website. The user will be able to access the updates through the website where he/she can view the information in the form of statistics.

Keywords: IOT, ESP8266, Weather, Temperature, Soil moisture, Humidity, Heat index

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How to Cite this Article

Conflict of Interest
NA
Funding
Nil
Ethical Approval
Yes
Plagiarism Turnitin
13%
Note
NA

Manuscript Received 2021-01-02
Review Round 1 2021-01-08
Review Round 2 2021-01-15
Review Round 3 2021-01-25
Accepted 2021-01-25

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Introduction

IoT offers a forum that enables us to connect devices and control them with big data technology, which provides us with efficiency in performance, economic benefits and hence minimizes the need for human involvement which in turn saves time and reduces the possibility of errors. This project is IoT-based and measures parameters such as the heat index, soil moisture, temperature, and humidity. The purpose of this project is to provide weather analysis in a better and efficient way. The respective sensors are directly connected to ESP8266 and it calculates all the mentioned parameters. Using IoT techniques, it sends these measured parameters to the Internet. After constant time intervals, the process of sending data to the web is repeated using the ESP8266 Wi-Fi module. The weather statistics can be viewed on our created website. On a web server, the project connects and stores the data. Hence live reporting of weather conditions can be monitored. Due to the increasing need for development in the agricultural sector, this project is ideal and compatible for the same. This system can also be used in medical fields to study the effect of weather on patient’s health.

Literature survey

1. An Intelligent Weather Monitoring System using Internet of Things[1]

In this paper, the authors have mentioned how their given system deals with controlling and monitoring the weather parameters such as temperature and relative humidity level, pressure, smoke, and various other gases with the help of sensors. The sensors used are DHT11 for temperature and relative humidity level, BMP180 to calculate the pressure, and MQ135 for measuring various gases. This project uses NodeMCU which is an open-source software and hardware development environment that helps to prototype IoT products. Arduino IDE is being used as the interface between the microcontroller board and the computer. This project also uses R studio which is open-source software and ThingSpeak which is an analytics platform that provides services from MathWorks for IoT devices. The collected data is sent to the cloud server and then is plotted in a graphical format.

The use of Linear and Multiple Regression is done in this project. An intelligent prediction, that is, prediction about the future weather analysis is also been done.


The principal base platform for the project is Raspberry Pi. The atmosphere parameters measured are humidity and temperature with the help of DHT11 sensor, pressure with BMP180 sensor, and rain parameter by using a rainwater sensor. It is important to pass these parameters to the gadgets and these to the MySQL server to store the values. These values are later used as input datasets for implementing Machine Learning algorithms. The prominent algorithms which are used in this project are the Decision tree algorithm and the Time series analysis algorithm (ARIMA). Wi-Fi is used as the mechanism by which the data is sent to the server from the Raspberry Pi. Through this process, the user can see the collected data in the MySQL server and download the data and apply Machine Learning Techniques. The author mentions increasing efficiency by trying to attain the most precise method that could analyze the weather in real-time in the future scope of this project.


This paper discusses about how with the help of the internet of things (IoT) and the advancement in various sensors, environment monitoring has transformed into a smart environment monitoring (SEM) system. The author discusses about monitoring of air quality which includes humidity, temperature, dust and carbon dioxide. Air quality characterization is done using heterogeneous sensors and machine learning based predictive models. Water quality is monitored using extreme learning DSA-ELM model for classification. Monitoring of radiation pollution is also being carried out. This paper helps one understand how the emerging development in IoT, sensor technology and machine learning techniques make monitoring of environment an advanced and reliable system.
4. Design of Weather Monitoring System Using Arduino Based Database Implementation

This project combines control systems and data collection techniques to create a database system to produce the collected data, depending on the attributes used. On the basis of the sensors used to create the device, the key attributes are chosen. This leads to the creation of an efficient project on the weather stations. Temperature, Humidity, and Wind speed data parameters are measured and stored with the help of sensors. The collected data can be interpreted in two possible ways. It can be recognized in a direct and indirect way. Direct due to periodic data read and indirect due to data storage as a real database system. The key challenge of this work is real database creation technology, which offers an opportunity to mine the data previously recorded data. In addition, the complete framework tracks and regulates locations on the basis of the frequent change in climate conditions to preserve the proposed locations in desired weather situations.

Proposed methodology

1. Proposed Methodology

The proposed system deals with measuring and analyzing different weather parameters and providing the desired output. The parameters which will be measured are temperature, humidity, soil moisture, and heat index. These factors are most suitable to be used in the agricultural sector. In order to monitor these factors, we collect and analyze data from the respective sensors. The weather monitoring system consists of sensors such as the DHT11 sensor for temperature and relative humidity levels. Also, soil-moisture and heat index sensors are connected to get the respective data. The data is collected by controllers or ESP8266 from these sensors. Thereupon, this data is sent to Arduino IDE by using the serial connection, and further, it is uploaded on ThingSpeak to analyze the working data of IOT. The uploaded data is made visible on the website provided by us. The user can effortlessly view and monitor the weather parameters in a statistical manner.

2. Hardware Components

- ESP8266: The ESP8266 Wi-Fi Module is a self-contained SOC with an integrated TCP/IP protocol stack that can give access to your Wi-Fi network to any microcontroller. It is capable of hosting an application from another application processor or unloading all Wi-Fi networking activities.
- DHT11 Sensor: DHT11 measures the temperature and humidity digitally and by using a capacitive humidity sensor and a thermal resistor calculates the parameters of the air.
- Soil Moisture Sensor Module: It detects the moisture of the soil and calculates the volumetric water content within the soil and provides us with the desired output.
- Breadboard: A breadboard is used to build and connect circuits with electrical components with the help of wires.

3. Software Components

- Arduino IDE: Arduino IDE is a text editor that connects to the hardware of Arduino and Genuino to import programs and share data with them.
- ThingSpeak: ThingSpeak is a platform for IoT analytics that helps us to collect, visualize, and examine real-time data in the cloud. You can upload data from your devices to ThingSpeak, generate instant live data simulation, and send updates.

4. Block Diagram

![Block Diagram]

Result and Discussion

The output obtained is displayed in a very simple
And easy to read format to avoid any possible confusions. Fig-2 shows the acquired output for temperature, soil moisture, humidity and heat index.

Fig-2: Output

Fig-3 shows the statistical format for better analysis of the weather parameters. The graphical form can be used to understand the pattern of weather for research purposes.

**Conclusion**

As IoT is emerging and renewing the idea of technology, it has become an important aspect in the development of automation, science, and machinery. Similarly, the traditional weather monitoring systems which used to be time-intensive, taking hours to visit the location and checking the soil moisture and other factors manually, unknown fluctuations in humidity and temperature causing the growth of pests, have now evolved into a better system with the help of IoT. With the help of IoT, real-time analysis of weather parameters such as humidity, temperature, heat index as well as soil moisture is just minutes away. An efficient and effortless way to monitor the environment is presented in this paper.

**Reference**


