Real Time Weather Monitoring System Using lot

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Abstract: In Today's World, knowing live environmental condition is one of the biggest issues because there is an IoT of hurdles arrives when live environmental condition is measured. The proposed system will remove this problem since it monitors real-time weather conditions. In this proposed work we will monitor the live weather's parameter of the Gorakhpur Region. The proposed system will work on the client-server architecture model using IoT. The system is organized in Two-tier Architecture. Our proposed system contains a various sensor which will monitor the temperature of the region, humidity, Rain value and pressure of the system. The sensor captured data and send it to the node MCU controller. Arduino ide is used to upload the sensed data. The serial monitor has worked as a gateway between the sensor and the cloud. The data is pushed by the sensor on a serial monitor. The serial monitors an IP address. The HTTP protocol is used to view the data on the webserver. This paper displays the data on the webserver monitor the real-time data of weather using environmental parameter or sensor. Using a webserver, everyone can monitor the weather's condition from anywhere without depending on any application or website. The data is available publicly. With the help of this proposed system, we measure the weather condition of the Gorakhpur Region. After getting results from the various sensor, it is observed that our proposed model achieves better results in comparison with the standard weather parameter.

1 Introduction

Monitoring weather's condition plays an extensive role in every person's life. The impact of the environment's condition causes numerous challenges in various fields like agriculture, industry, constructions as well as more other fields. But the measured impact occurs mostly in agriculture and industry. As we all know, agriculture perform a crucial role in India's Economy. Almost Onefourth of India's economy is acquired from Agriculture. Over the recent year, smart agriculture was a debated topic in the world. In IoT [13,16], the smart word indicates that the use of minimum parameters produces a better result. It reduces the use of land, water, time as well and the uses of the new technology and science for the enhancement of crops. The security is one of the major issues [17,18] in IoT network, lot of security techniques are available but still many several possibilities to enhance the existing security.

In agriculture, Before the yield, the Farming process consists of several phases and in that weather plays the most extensive role. In Gorakhpur Region, the situation of rain mostly happens. It is situated near the border of India "Nepal" and Nepal is a hilly area due to which the rainy situation occurs mostly. Due to this situation, the farming problem occurs due to heavy rainfall. In this situation, an indication of weather's condition is an important aspect before sowing or reaping the crops. Hence in this situation, the monitoring of weather's condition [14,15] would help farmers with the help of a

weather monitoring system. S It will help the farmer before reaping and sowing. In Gorakhpur Region, the total geographical area of this region is around 3488.8 square km and cultivable land is 26428 hectares, In which the percentage of irrigated area is 76.5 %. The main crop of this region is Paddy. The total area is around 152655 hectares. The amount of water if became high then it will be a problem for farmers. Because in the sowing of paddy it needs water sufficiently but if the quantity of water will grow then it should be a problem for farmer. So, to remove this problem, if the weather's condition is known then it will be beneficial for them. The main objective of our system is to provide an indication of whether that would be beneficial for the farmers before sowing crops or reaping crops. In this paper, Section-II shows the literature review. Development of weather monitoring system is done in section III. Section IV describes the hardware parts of our system. Section V portrays the analysis of our experimental result in real-time. The next part will be the summary or conclusion parts of this research.

2 Literature Survey-

The author in [1], proposed a robust and affordable Automatic weather station. 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

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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

The author in [2], presents an IoT-based weather monitoring system. In this research, the environmental parameter can be retrieved through sensors. The author uses a different sensor to scale the various parameter like humidity, temperature, pressure, rain value & the LDR sensor is used. The system also calculates the dew point value from the temperature prototype. The temperature sensor can be used to measure the value of the particular area, room, or any place. With the help of the LDR sensor, the light intensity can be used as described by the author. The author in this used an additional functionality of the weather monitoring as SMS alert system based on the exceed the value of the sensing parameters as temperature, humidity, pressure, light intensity, and rain value. The author also adds an email and tweet post alerting system. The author in this system uses node MCU 8266, and various sensors.

In this paper [3], the author represents a low-cost live weather monitoring system using OLED display, in which the author displays the various fields where the IoT has produced innovative things in the system. The author described A new revolutionary system. Which measures the real-time Weather's condition. The monitoring weather situation is very much helpful for everyone either for farmer or industry or daily working people or for school as well. So, the author by developing a live weather monitoring system reduced the difficulty level for farmers and industry as well. In this paper, the author uses an OLED display that will display the weather conditions and In the proposed model, the author uses an ESP8266-EX microcontroller-based WeMos D1 board executed on Arduino, that retrieved the data from the cloud. WeMos D1 is a wifi module that is developed on ESP- 8266EX microcontroller. It has a 4MB flash memory. It one of the Excellent which is programmed with node MCU and Arduino ide. In this paper Author uses only two gadgets to measure the weather conditions i.e., Wemos and OLED, After the connection, it will store the data on the cloud for storing data a thingspeak website is used to display the data regarding weather. The system displays the data on OLED and thing speak cloud. The author's aim is to obtain live information on weather conditions on OLED display.

The author in [4], proposed a system that monitors and predicts the weather condition by which anyone can plan for our day-to-day life. This activity became helpful in every field either in agriculture or industry. So as to achieve monitoring and predicting weather info, the author uses 2 stages of the weather management system. In which they amalgamated the information from the sensors, bus mobility, and deep learning technology is used to allow a weather reporting system in stations and buses in real-time. Forecasting of weather is achieved through the friction model. Depending upon the sensing measurement from vehicles like buses, the work incorporates the strength of local information processing. The author talks about in stage-I, sensing of weather's condition, multilayer perception model and long-term memory are trained and then it will verify using temperature data, humidity, air pressure of test environment. In Stage-II, the training is applied to learn the time series of weather information. To get accurate data or not, to check the system performance, the author comparing the predicted weather data and actually obtained data from the environment Protection Administrator and central Baeuro of Taichung observation system that calculate the prediction of accuracy. The author finally talks about the proposed system has reliable performance on monitoring of weather. And this model also proposed a one-day weather forecast or prediction via the training model. So finally, the author demonstrates that this system presents a real-time weather monitoring and prediction system using bus information management. The author represents 4 basic components 1- Information management. 2- Interactive bus stop 3- Machine learning predictive model 4- weather information platform. In this, information shown via dynamic chart.

The author [5], implement an IoT-based weather monitoring system, in this research paper, the author describes that how with the help of IoT technology, the weather can be monitored. And which provide the info of climate-changing conditions. With the help of this project, people can be aware of the climate condition changes. It gives an accurate and efficient output and the algorithm as the swarm is used to implement for further improving the accuracy. So, in this project, the author aims to make a weather monitoring with the help of IoT. In this project, the hardware and software are used which makes it easy to implement. In the project, the author uses a different sensor to collect the information of the climate and stored it in the cloud. For this storage, the website www.thingspeak.com is commonly used for Internet of things projects. And from the cloud storage space, it extracts the whole weather data and uploads it to the android mobile application using an API key.

Tools which detect the rain drops, is called rain sensor. Once the plague reveals the raindrops on the strips and the voltage is considered from that. And there is no short circuit condition that occurs because water is a bad conductor and the sensor acts like variable resistance. Once a measurement of voltage is completed then the circuit takes the output. The voltage is measure through a potentiometer and to transfer analog signal to digital signal the system applies LM393 Comparator. The LED turns on when the power supply system is observed and there have no water drops on the sensor then the digital output is high. And the sensor also dictates when the sensor has moisture on the sensor plate the digital output is actively low. For measuring the humidity three sensors can be used as humidity sensing components, TC thermistors, and An IC at the back of sensors. For humidity measurement humidity component is used it has two electrodes. Node MCU is used as a controller. In IoT projects, the Node MCU is basically used. This programmed using Arduino IDE. The scripting language LUA is used for programming. NodeMCU runs on the ESP8266 WIFI module. This Android STUDIO is used it is developed by google developers. The aim of this application is to make processing easier.

Android studio is used to implement a common application to show the streaming of data from thing space. With this smartphone application, the weather condition can be monitored. Now after designing the application, it will display temperature, humidity, heat, and raindrops and is stored on the cloud. The author provided an API Key to bring in our data from the thingspeak website to the android device.

This paper [6] presents a paper, i.e. Design and implementation of weather monitoring and controlling system. In this project, the author emphasized that how the weather monitoring system works. According to the author, weather monitoring system plays a major in our daily life. Hence the collection of information of temporary changes of environment situation is crucial. In the industrial field, there have certain hazards available. In the earlier systems, the industry is totally dependent upon mechanical and electromechanical instruments. And it has some drawbacks of that system such as poor rigidity, human intervention is required and associated parallax errors, durability requires. Hence, to remove this drawback a remote monitoring system is needed and the principal goal of this system to produce a standalone modular weather monitoring system with the in-built facility of remote monitoring and communicating to capture & send the metrological parameter. Therefore, it is very much important to monitor the weather. In this research paper, the author implements an embedded system and plot a weather reporting and monitoring system which enables weather monitoring system. This type of system consists of a couple of sensors as gas, temperature, rain, humidity sensor, etc monitored. LPC1768 microcontroller (ARM9) is used as a core system as all the sensors are connected with this sensor and collected the information regarding weather as temperature, humidity, pressure, etc. After collecting all the data send it to the LABVIEW by applying serial communication. This module kept the details information in the excel sheet and that can get SMS in the mobile with the help of the Global System for Mobile communication model. The dense circuitry is developed around the LPC1768(ARM) microcontroller is used in this system. The program like embedded C using the IDE is used in this project. JTAG is used to loading programs into a microcontroller. The LABVIEW is a platform that develops the environment for a visual programming language from National Instrument. The name of the graphical is "G". Data transferring from hardware could be received in LABVIEW using a serial communication system. The reading shows the different data with the indication like metering etc. LABVIEW result from view on EXCEL FILE and locate the file into the folder and updating of the value can be displayed in the excel file. Hence, in this way, this system monitors the environmental parameter. The embedded controlled sensor has been demonstrated reliable themselves.

In paper [7], discusses the implementation of a weather monitoring system using a WFI module. The weather monitoring system performs the process through the connection of Wi-Fi. The system contains a transmitter section and receiving section. The transmitting section contains the Wi-Fi module, controller, various sensors. The receiving section contains the web server, router, website, etc. the working of the system is defined by the author as, multiple sensors such as sensor, pressure, humidity sensor reads the environmental temperature, pressure, humidity respectively. The rain gauge sensor uses the tipping bucket technique. In this technique, measure the no. of times, a calibrated bucket is exhausted from the rainwater. And in that water is filled to calibrated mark, and hence the emptied one tip is implied and multiplied by 0.02mm and that's the final amount of rain. The wind gauge is applied to sense the wind speed and wind direction. The signal conditioning is mandatory for getting the exact wind velocity value. Signal conditioning contains an optocoupler in the system and the output is shown to the Schmitt trigger, which is a bi-stable circuit. In this circuit when the input raises across a certain threshold, the output increases to a continuously increases maximum and decreases to the early 0 when the voltage input value falls down another threshold. Each sensor's output is accepted by the D1 controller and handled in a compulsory format. Those values are transmitted using Wi-Fi to the main server. All the values of sensed data are maintained on the main server and routed and show continuously on the website. The refreshing rate of 10 seconds. The database is created using the MySQL query language. A PHP scripting language is used to display the information on the website.

In this project [8], the author proposed, "A LOW-COST ZIGBEE BASED AUTOMATIC WIRELESS WEATHER STATION WITH GUI AND WEB HOSTING FACILITY". The author focuses on the current climate condition and conceptualized a model, in which a ZigBee wireless link is used. Because seeing the today's condition stirring the quality of human life and also affect the increasing population activity. In the current situation, the metrological parameter data collection is necessary rather than limited, and keep used

of the comprehensively monitoring system due to cost constraint and availability of human is just a drawback in the system. In this research paper, the author suggested and implemented a low-cost hardware module based on the Arduino Uno Board. With this board, it measures the metrological data, it includes the typical temperature, sensor, atmosphere, wind speed, wind direction and sends all the information to the GUI system which is running on a laptop through Zigbee wireless link. The GUI is a convenient and standalone application for the Windows operating system. It is implemented in the LABVIEW. The LABVIEW application graphically displays the current situation and logs the data that is accessible by MS excel. The system has a facility to host the same information on the webpage. This system has a mathematical model that is efficient in creating and generating a short-time local alert on weather parameters.

The system provides a real-time effect. The main objective of this model to detect the condition mapping, and weather forecasting most necessarily, it warns the people of its devastating effects. This would be very much helpful for landing the aircraft, cloud burst, healthcare effect, tornado, tsunami, navigational, and the shipborne effect.

In the paper [9], The author proposed an "An Intelligent weathering system using the internet of thing" research in which, with the help of machine learning algorithm and IoT technology, climate condition is measure and predicts the next upcoming condition. The author presents the system that is a very much cost-effective and efficient method for controlling the weather condition and sends it to the cloud so that the value is fetched and available on the internet and can be seen anywhere by connecting through the internet. There is a significant role of temperature, humidity, pressure in the system. also have a different area used in the system such as agriculture, logistics, etc. weather monitoring, and forecasting is important for the advancement of these industries. IoT technology used in the formation and development of this research, that is an advanced & efficient approach for connecting the sensor to the cloud that stored the real-time data and connects the whole world of things through a network. The thing might be anything as the sensor, electronic gadget, and automotive electronic equipment as well. The whole system deals with the monitoring and controlling the environmental condition like temperature, smoke, gas, wind, pressure relative humidity level, and many other gases with sensor transfer the data or information to the cloud platform and store the data on it. A machine learning prediction algorithm is used in this system. Machine learning is a branch of AI (Artificial Intelligent) which deals with analysing and predicting the given dataset. The collected data is analysed. The real-time data sent through the sensor can be reachable through the internet in the entire world. The methodology which is used by the author as node MCU microcontroller is used to gather the information from discrete sensor which is basically on the code dumped in Nodemcu, send the data to the specific cloud as Thingspeak is used for displaying both the data with web view and also application view. Each sensor is connected with nodeMCU. It transmits the sensed data from the cloud and data analysis is performed and shows the result in the resultant view on the website. Data is fetched from the cloud in the CSV file format. And after that for further processing, it includes the data from the cloud in R Studio, and then data is processed using various algorithms.

This paper [10], presents the "Embedded weather station with Remote wireless control". In this paper, the author elaborates on the importance of a weather monitoring system. The author describes that how the weather monitoring system works in now a day. It is very important to know the climate condition before going outside for any specific work. This paper describes what is the field where weather monitoring is important. The field like agriculture, military, entertainment, industries, etc. there is so various solution for monitoring the weather parameter. It describes the three solutions which are a solution for monitoring the weather. The first one, using a static weather station. The second one is based on the wireless sensor network, and the 3rd one is, using a low dimension weather station. In this research paper, the author represents a weather station made up of temperature, luminosity, pressure, humidity, sensor implanted with a microcontroller based on the board. The weather station is restrained with an SMS service of mobile phones.

The author [11] conceptualized the weather monitoring concept using Artificial intelligence. According to the author, weather forecasting is a statical method instead of using a binary decision concept. The intention of the author is to implement an intelligent weather prediction system. Since the system has a mandatory tool and this tool used to measure the maximum and minimum temperature, rainfall for a sampled period of the day and then analysed. The prediction is done on the basis of available data, which is achieved using machine learning Algorithms. The prediction and analysis are based on the linear regression which predicts the upcoming day's weather condition with better accuracy. The accuracy is achieved more than 90% is achieved with machine learning techniques. The recent research strikes that with the use of machine learning techniques the system achieved better accuracy and better performance. The machine learning technique is a branch of AI. It has proven that it is a robust technology in analysing and predicting. Machine learning performs an important role in various field as Industrial, agriculture, logistics, healthcare and etc. And where weather forecasting is an important area. In this paper, the result is verified with a multiclass classification algorithm using a logistic regression algorithm with ANN i.e., Artificial neural network. This paper also talks about the disadvantages of using ANN (artificial neural network), multiclassification. Because they did not provide any value to the nearest of the day, not the probability of the day that how the day is going to be. In this system, the support vector machine learning techniques can be used in prediction and it works on large data and provides the best result. But in this classification, there has presented some redundant data. And that must be escaped. The only power is to be taken by the system that gives the

best result is to update the data set in order, to reflect the accurate result. It performs well when the data set is in huge amounts. And provided over a seventh of the data is to be forecasted. This module assists in predicting and monitoring the weather condition with a better rate of accuracy in an effective manner.

In [12], the author talks about the real-time accessible system. The author proposed a method in this paper using IoT technology. In this research, the system deals with monitoring the weather and climate condition changes as UV radiation, pressure, temperature, humidity, and even carbon monoxide levels present in the air. It uses different sensors to collect the info and sent it to the web page to view and sensed data presents in the visual view. If the info is upload on the web server, then it can be accessed from anywhere in the world. The project consists of a mobile application that sends a notification for an alert system to provide warnings to people about drastic and sudden changes in weather. To forecasting the most complex weather, it cannot be done using a sensor only but we need an API that analyses the data is collected by the sensor and predict the accurate result. This API can be used to access the data anywhere, anytime with ease. And it also stores the data for further use. This system requires less maintenance because it uses fewer parts and has a compact design. The component doesn't consume more power .and it can also powered by a solar panel. The author said that if we compare it to another device that is available in the market is cheaper and more costeffective. This type of project used in the metrological department, aviation, weather station, marine industries,

3 Development of Weather monitoring System using Multi Sensors

The aim of this paper is to develop a Weather monitoring system which will observe the weather's situation and monitor live environmental parameter continuously through wi-fi. The weather monitoring system makes use of various sensors to measure the parameters.

Table 1. Multiple modes in weather monitoring System

Mode 1	If mode 1 presents, DHT11 i.e., temperature and pressure, if it is on, then it captures the			
	temperature value and represents it on the			
	webpage			
Mode 2	If mode 2 presents, BMP 180 i.e., it shows the			
	barometric pressure of the environment.			
Mode 3	If mode 3 present, the Rain sensor module i.e., it			
	shows the rain value of the environment.			

Table 2. Grouped sensor nodes under various modes.

Sensor node-1	Sensor node-2	Sensor node-3
DHT11 (Temperature and pressure sensor)	BMP 180 (Barometric pressure)	Raindrop sensor (Rain sensor)

A novel weather monitoring system using IoT is proposed. In this paper, the author presents 3 different sensors organized in different forms of bundles in the system. The model describes how the sensor is connected to the microcontroller node MCU. Sensors are connected with the node mcu8266 in the architecture. The system is arranged in this manner that data will automatically fetch from sensors and will upload while connecting with wi-fi and displays the data on the webpages. The proposed model uses three sensors meant to acquire temperature, pressure, humidity, raindrops which are shown with mode1, mode2, and mode3 in above table 1. The modes are described as Temperature and humidity (MODE-1), Barometric pressure (MODE-2), and Raindrop sensor (MODE-3) represents in table 2 as well. By consolidating table 1 and table 2 shows as-Mode 1 indicates as Sensor node 1 which contains 1 DHT11sensor for measuring the temperature and humidity of the environment. Mode 2, indicates sensor 2 which contains BMP 180 sensor for measuring the barometric pressure from the environment. And the last one is Mode 3, which indicates sensor 3 that contains a raindrop sensor, its name suggest it indicate, it is used to measure the raindrops from the environment. The proposed system is an effective weather monitoring system with less no. of sensors. It is reliable and also free and available publicly. we can use multiple sensors for weather monitoring like wind speed, wind direction, PIR sensor, and many more. But in our proposed model we are using three sensors to check the working of the system and reliability of the system. The proposed model measures the accurate value of the environmental condition

4 Hardware Illustration of the proposed system

Fig 1 represents the architecture diagram. With the help of this architecture, Every sensor is connected with node MCU pins. The power supply is given to the node MCU by USB which is connected with pc.

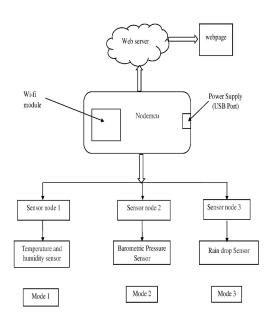


Fig 1.: The proposed model architecture of weather monitoring system.

4.1 Sensors, Gateway, and Data logging

4.1.1 Gateway or data collector: In our proposed system, nodeMCU works as a gateway of the model. From the connection of the system, data is sent to the local network and that will display on the web page of our pc.

4.1.2 Mode 1 Sensor (Temperature and humidity Sensor): DHT11 sensor allows us to measure both to temperature and humidity of our system. This sensor operates at 5V and utilizes a current of 2.5 mA. The sensor can consider temperature values from 0 degrees to 50 degrees. The humidity measures from 20%-90%. With an accuracy of +_ 1 degree and +-1 % as well. It uses 3 to 5V power and input/output.

- > It has 2.5 mA max current usage during conversion.
- > It is good for 20-80% humidity with an accuracy of 5%
- ➤ It is just good for)-50 degree Celsius.
- ➤ It has 4 pins with 0.1 spacing between them

4.1.3 Mode 2 Sensors (Barometric pressure)

BMP 180 is a digital barometric pressure sensor that measures the pressure of the environment. It follows BMP085 and brings many enhancements.

- ➤ It has ultra-low power consumption down to 3micro ampere
- ➤ It operates on 3 to 5V dc voltage
- The pressure-sensing rate of BMP 180 is 300-1100 hPa (9000-500m above the sea level)

- ➤ The operational range of BMP is -40 degrees to +85 degrees Celsius.
- ➤ This chip uses I2C 7- bit address 0X77.

4.1.4 Mode 3 Sensors (Raindrop sensor)

- The raindrop sensor is used to measure the detection of water beyond humidity sensor detects.
- Rain sensor detects water on its sensor board of raindrop sensor.
- The board act as a variable that will change from 100K Ohm.

5 Circuit Diagram

The circuit diagram of our proposed system is given below. The diagram represents the connection of the sensor and how the connection will be done.

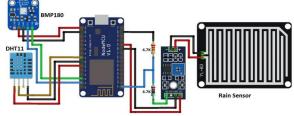


Fig.2. Circuit diagram of the weather monitoring system

The Dht11 sensor, BMP 180 sensor, rain sensor, all are connected with the node MCU pins and the power supply is done by USB cable to connect the hardware to the system. The prototype model is represented in the above images. All the connections should be done in the same manner then will get a proper result. The below tables show the pin connection for each sensor.

Table 3. Pin configuration between node MCU and DHT1

VCC	3V3
DATA	D5
GND	GND

Table 4. Pin Configuration between node MCU and BMP sensor

SDA	D2
SCL	D1
GND	GND
VIN	3V3

Table 5. Pin Configuration between node MCU and Rain sensor:

A0	GND	(including	with	4.7k
	registe	r)		

GND	GND
VCC	3V3

6 Flow chart of the proposed model

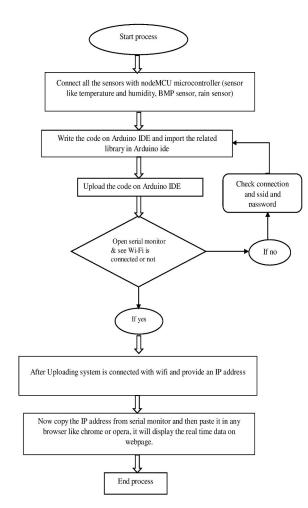


Fig.3. Flow chart of the proposed model

The flowchart describes the functioning of our proposed system. This proposed system is developed as a weather monitoring system for the Gorakhpur region. This system is comprising of only three sensors and display the result on the webpage using HTTP.

7 Working Process

After making all the connections as shown in fig.2. The power supply is provided to node MCU through a USB cable. Which is connected with our personal computer. We have written two code modules. The first one is to connect to the different sensors in Arduino code and the second code module is for the web page which is written in java script.

After providing connection to hardware. Then upload the code which we have written. But before uploading code, it needs to verify. So, Open Arduino ide then write code there and click on verify and wait for almost 1-2 min to complete verification and then choose an option to upload the code then it compiles successful and done uploading successfully. After that open the serial monitor. There, it shows that system is connected with Wi-Fi. When hardware connection is established, HTTP request starts processing, and then it will show an IP address on the serial monitor. Then copy the IP address and paste it on a web browser like chrome, internet explorer, opera, etc. You can select any browser and it will show the corresponding temperature value, humidity, pressure, and rain value. The result is showing below

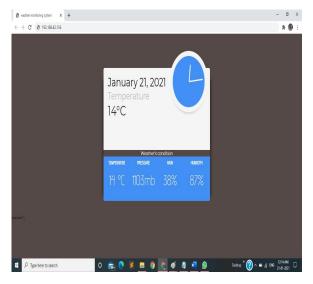


Fig.4. Final Result another web page

Hence, the above fig.4 shows the result on the webpage contains different parameters information from the weather. As the weather of Gorakhpur region is very cold and rain possibility is also very high. The temperature, pressure, and rain sensor have a different variation available.

8 Experimental Results and Analysis

The function of "weather monitoring system using IOT", the agenda of this system to design a system which keeps track of weather condition and simultaneously measuring environmental variables through the internet of things. Fig shows a prototype development for a weather monitoring system with some parameters. The developed weather monitoring system monitor different parameters like humidity, pressure rain value, etc. After making the connection as per in fig.2 the value from the temperature and humidity sensor, pressure sensor, and rain sensor value is observed on the webserver. Here we are storing observed data on the web server through HTTP requests on the webpage.

Table 6.: Experimental reading obtained at Kushinagar place (near Gorakhpur)

	Experimental result Date- 21 January 2021						
S. N.	Time	Weathe r	Temp eratur e value	Humi dity value	Pressure value	Rain value	
1.	9:00a m	Fog	14 °C	87%	1016mb ar	38 %	
2.	12:00 pm	Cloudy	13 °C	78%	1018mb ar	32%	
3.	2:00p m	Partiall y sunny	14 °C	72%	1019mb ar	34%	
4.	5:00p m	Fog	15 °C	73%	1018mb ar	39%	

In the above table, we have taken the weather information of Kushinagar nearby Gorakhpur. We have gathered sensor data on 21 January 2021 at different time slots. The sensed value is shown in table 6.

Table 7: Experimental reading obtained at Gorakhpur (MMMUT college)

	Experimental result								
	Date-25 Jan 2021								
S.	Tim	Weat	Temp	Humidi	Pressur	Rain			
N.	e	her	eratur	ty	e value	value			
			e	value					
			value						
	10a	Fog	12 °C	88%	1018mb	30 %			
1.	m				ar				
	11a	Fog	14° C	78%	1019mb	32%			
2.	m				ar				
	12:	Clou	16 °C	70%	1133mb	30%			
3.	30p	dy			ar				
	m								
	2p	Parti	15 °C	70%	101mba	28%			
4.	m	ally			r				
		sunn							
		У							

Here, we have **se**nsed the weather's information for MMMUT college. In this experiment, we measured the temperature, humidity, rain, and pressure value dated 25 January 2021. The above table 7 represents the sensed value with our proposed model for MMMUT location. Table 8: Experimental reading obtained at Gida Gorakhpur

Experimental result Date-25 Jan 2021							
S. N.	Time	weather	Temp eratur e value	Humi dity value	Pressure value	Rain value	
1.	8:30a m	Cloudy	11 ° C	78%	1019mb ar	29%	
2.	11:00a m	Cloudy	12° C	76%	1020mb ar	26%	
3.	2:30p m	Partially sunny	16 °C	66%	1016mb ar	30%	
4.	4:30p m	Sunny	15 °C	72%	1015mb ar	28%	

In table 8 we have measured the environment parameter with the help of different sensors for Gida Location Gorakhpur.

This experiment is developed using a prototype model of the environment. This has been developed within the Gorakhpur region in three different locations. The locations are Kushinagar, MMMUT college Gorakhpur and Gida Gorakhpur. Primarily we have tested in the Kushinagar region in the month of January and dated 21 Jan 2021. Secondly in MMMUT college Gorakhpur and then Gida Gorakhpur location. We have placed temperature and humidity sensors, pressure sensor, and rain sensor and start detecting the environment's parameters. When the reading obtained from sensors, we have tabulated all the readings captured through sensors according to their location, date, and time for analysis. The sensor's analysis is shown below.

8.1Temperature

As shown in table 6 we have first sensed temperature value at the Kushinagar location. On 21 January 2021, at time 9:00 am, we measure the minimum temperature as 7 and the maximum temperature is 21degree and found the average temperature is 14 degrees and the real-time temperature is 13 degrees. To analyse more, we have taken a temperature reading through the sensor at the different time slots. At 12pm, the average temperature or relative temperature is 13 degrees and the weather is cloudy. On the same day, at 2:00 pm, the average temperature value is 14degree and next time instance the average temperature value is 15 degrees. Hence at all the time, we have compared with real-time temperature value we found that temperature value is approximately accurate at Kushinagar place.

Like, Kushinagar place, On 25 January 2021, we have also measured temperature value at different time instance of MMMUT College Gorakhpur Location is shown in table 7 In the morning, at 10:00 am, we measured average temperature value is 12 degree and real-time temperature value is 12degree. At 11:am, the average temperature value captured value is 12degree and the real-time temperature is 13degree. Another time interval is 12:30 pm, captured average temperature value is 16degree but the real-time temperature is 15degree and at 2:00 pm, the observed average temperature value

is 15degree, and the available real-time temperature is 15degree. Hence in this way, we can say that at the MMMUT College Gorakhpur location the sensed temperature value is extremely nearer to the real-time temperature.

Same as the previous location, we have measured temperature value at Gida Location at multiple time instance on 26 January 2021 which is shown in table 8. Now we measure the temperature value at 8:30 am, the average temperature value is 11degree and the real-time temperature is 12degree. At 11:00 am, the relative captured temperature value is 12degree and the real-time temperature is 13degree. At 2:30 pm, the observed average temperature is 16degree and the actual temperature is 16degree and the last time instance, the sensed average temperature data is 15degree and the real-time observed temp is 15 degrees.

Hence with the above result, we can say that the observed result through our proposed model is sensed temperature data is closed by real-time data.

8.2 Humidity

As we have measured the temperature value of a particular location, in the same manner, we have measured the humidity value. Firstly, measure the humidity value of Kushinagar then MMMUT College Gorakhpur, and then Gida Gorakhpur location. In Kushinagar, the sensed humidity is 87 % and the humidity value in real-time is 89% at 9:00 am. Next, at 12:00pm, the average humidity percentage is 78% and the real-time humidity value is 77%. At 2:00 pm, the average humidity value in percentage is 72% and in realtime, the humidity value is 72%. And last time reading which we have measured i.e., at 5:00 pm, humidity value is 73% and real-time observed data is 74%. So, after taking the reading for Kushinagar, we have analysed that humidity value is almost accurate when compared to the real-time observed data through the internet.

Likewise, for MMMUT College and Gida Gorakhpur, the humidity value is sensed through our proposed model, dated on 25 Jan and 26 Jan 2021. We have seen that observed and real-time percentage value of humidity gives nearly accurate value. We have sensed reading for both locations with date and time is shown in table 7 and table 8.

8.3 Pressure

Pressure value of Kushinagar, MMMUT College Gorakhpur and Gida Gorakhpur is observed and is referred to in table 6, table and table. The first reading has been taken for the Kushinagar location and tabulated in table 6. The first reading is taken at 9:00 am and the average value of pressure is 1016mbar (millibar pressure unit) and the real-time pressure value is 1016mbar. Next, at 12:00pm, the average pressure value is 1018mbar and the average pressure value in real-time is 1018mbr. Next at 2:00 pm, the pressure value on average is 1019mbar and the real pressure value is 1017mbar. And at 5:00 pm, the average value of pressure is 1018 and the real-time pressure value is 1018mbr. Hence in this way, we have observed and compare with real-time pressure and we

have seen that the pressure value is very much similar to real-time obtained data for the Kushinagar location.

In the same manner, we have sensed pressure value for MMMUT College and Gida Gorakhpur location and we found that observed pressure is nearer to the real-time pressure value. The sensed pressure data is tabulated in table 7 and table 8.

8.4 Rain

Rain value is observed in percentage form. Like all the above parameters is measured, the rain sensor value is also measured. In the same way, the Rain value is measured and compared with real-time data and found that like other parameters it is also very much accurate. So first we measure for Kushinagar location and the date is 21 January 2021. The average rain value is 38% at 9:00 pm and the real value is 35%. Again, we measured at 12:00pm, the average rain value is 32% and the instantaneous value is 33%. We measure again at another time i.e., 2:00 pm then the rain value is 34% and at the same time, the real-time value is 33%. At 5:00 pm, the rain value is 39% and the rain value in real-time is 38%. These readings are obtained at the different time slots. On the basis of the above rain value data, we can say that it is almost similar to the real value. And we can say the possibility of rain is less.

Hence like the above location we have also analysed that the value of rain for MMMUT College and Gida location is also the same and almost gives accurate values of rain value. For these two locations, the readings are available in table 7 and table 8.

Hence with this experiment analysis, we can take an idea for our future planning. This will especially help in industry, agriculture, and various field. So, if we provide this facility to the farmer to do an experiment with this system then they will collect data with these sensors and make analysis and perform their action according to the gathered information of weather.

9 Conclusion

Devices that monitor weather's parameters with minimum cost in our proposed system. The proposed system works on the client-side architecture model. The proposed approach observed various environmental information using multiple sensors. The system which is designed has used less sensor than the existing model. The main aim of our proposed model is to make the system cost-effective, affordable. So that everyone can use it freely. In our proposed system, capturing multiple data from multiple sensors and send all the data to the webpage by HTTP request protocol on the webserver. Here, the proposed system performs working in the region of Gorakhpur. In this region, we have sensed the value for three locations i.e. Kushinagar, MMMUT College, and Gida Gorakhpur. Then we have arranged all the values in table form with respect to their data and time and done analysis. The proposed model is not only collecting data but also making decisions on the basis of observed data. It is very much helpful for farmers because it collects environmental data making an interpretation for the former. But it is also very important

for making another decision such as or industry work purpose, transportation. The accuracy of the proposed model nearly accurate with real data

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