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Implementation Of IoT-Based Climate Observation Network

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Abstract— This paper presents a state-of-the-art IoT-based climate surveillance network designed to oversee and manage localized weather conditions globally. Leveraging the power of the Internet of Things (IoT), the system connects various devices, including sensors, to create a comprehensive network. With a focus on monitoring environmental variables such as thermal conditions, relative humidity, and CO levels, the system utilizes sensors like humidity, temperature, rain, and atmospheric pressure sensors. The collected information is conveyed to a webpage, where it undergoes graphical representation represented for statistical analysis. This accessible and efficient system enables users worldwide to stay updated on real-time weather conditions.

Keywords— Arduino IDE, NODEMCU, LDR, BMP180, THINKSPEAK, MATLAB

I. Introduction

The Internet of Things (IoT) refers to the A system of linked gadgets that synergize. communicate and exchange data over the internet. These devices include Techno-gizmos equipment, creating a seamless global network. The versatility of IoT finds application in various domains, and one such innovative application is the IoT-based Climate Observation Network. Ot-based weather monitoring is a groundbreaking technology that utilizes sensors to collect real-time data on environmental parameters, ensuring a comprehensive understanding of localized weather conditions. The system employs sensors like humidity, temperature, rain, and atmospheric pressure sensors to monitor key factors influencing weather patterns. Humidity sensors measure the moisture content in the air, providing insights into atmospheric humidity levels. Temperature sensors gauge ambient temperature, a critical factor in understanding weather variations. Rain sensors detect precipitation, offering valuable data on rainfall patterns. Atmospheric pressure sensors measure the pressure exerted by the atmosphere, Fostering the growth and evolution analysis of weather changes.

2. Literature survey

Bagath et.al explains that **[1]** The IoT-based Weather Monitoring and Reporting System utilizes sensors like temperature, humidity, moisture, and rain level connected to an Arduino Uno. The wireless sensor network management model involves end devices routers, gateway nodes, and a monitoring centre for real-time data. Collections. routers, gateway nodes, and a monitoring center for real-time data collection. Arduino Uno measures weather parameters, displaying them on an LCD screen, and sends data to the internet via Wi-Fi. The methodology employs IoT techniques, creating a system that provides live weather reporting accessible on a specific website. Overall, the project achieves real-time weather monitoring through wireless sensor

Sharma et.al explains **[2]** that The proposed IoT Climate Observation Network in Gorakhpur collects environmental data from sensors in locations like Kushinagar and MMMUT College, aiming for cost-effectiveness and accessibility. Utilizing IoT technology, the methodology measures weather variables, presenting data on a web server through HTTP requests. Sensors record temperature, pressure, humidity, and rain values for further analysis. The system includes real-time alerts for sudden weather changes, catering to diverse industries and applications

Rahut et.al explains **[3]** that The study delivers an IoT-based Climate Observation Network offering real-time accessibility for a wide range of parameters. It monitors climate factors like temperature, humidity, wind speed, moisture, light intensity, UV radiation, and carbon monoxide levels. Utilizing a 4-tier model, it deploys sensors, collects data, and employs a web page for graphical statistics accessible globally. An accompanying app serves as an alert system for sudden weather changes. The study also incorporates an API for advanced data analysis and accurate weather forecasts.

Lakhara et.al explains **[4]** that The proposed Climate Observation Network employs a feedforward artificial neural network for accurate 24-hour wind power predictions, integrating NWP results for comparison. Utilizing Arduino and IoT technologies, it monitors Environmental conditions such as thermal and moisture levels, rain, and noise through various sensors, with data analyzed and visualized on a mobile app. The DHT11 sensor distinguishes between hot and cold weather, catering to applications like agriculture and event planning. The system ensures real-time monitoring, prediction, and visualization, reducing manual observations and offering potential for automated control in various tasks related to weather conditions.

Varun et.at explains **[5]** that The IoT-based Climate Observation Network combines hardware (Raspberry Pi and Arduino Mega) and sensors (DHT11, BH1750, MQ-135, BME-280, raindrop sensor) to measure temperature, humidity, pressure, light, air quality, and rainfall. Arduino boards are programmed using Arduino IDE and Node-RED. Data is stored in a local database (InfluxDB), and a web dashboard (HTML, CSS, JavaScript) provides real-time visualization. The system enables users to monitor and control environmental conditions, making it useful for agriculture, smart homes, and other applications requiring real-time weather data.

3. Methodology

Design of Hardware

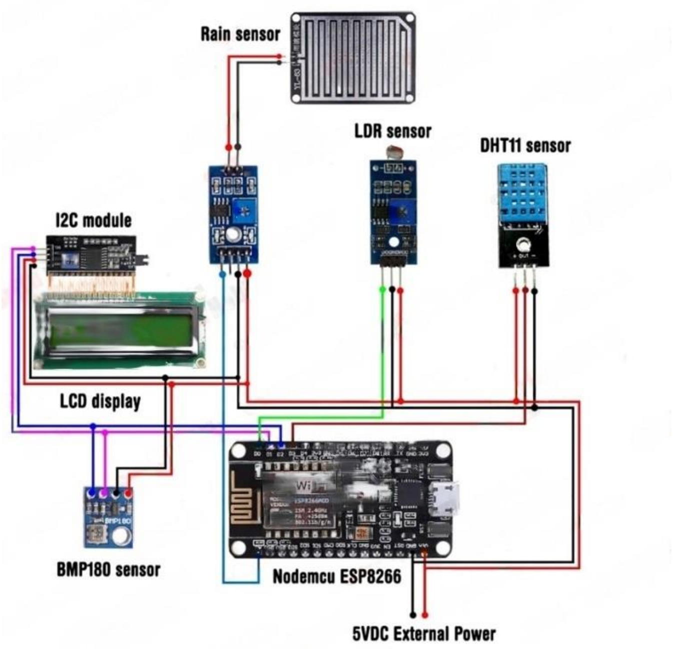

Fig 1. Schematic Diagram of Climate Observation Network

NodeMCU Board (esp8266): A versatile Wi-Fi-enabled development board built upon the framework of ESP8266 microcontroller, commonly used for IoT projects, offering easy connectivity and programming.

An LDR (Light Dependent Resistor): The mechanism functions as a detector type of resistor whose resistance changes based on the amount of light falling on it. Also known as a photoresistor, it exhibits a higher resistance in darkness and a lower resistance when exposed to light. This property makes it useful for applications like light-sensitive circuits, streetlights, and camera exposure control. LDRs are often used in conjunction with other components, such as transistors or operational amplifiers, to convert light variations into electrical impulses for subsequent analysis in electronic devices.

DHT11 Sensor: A basic digital temperature and humidity sensor, widely used in DIY projects and weather monitoring for measuring ambient conditions.
BMP180 Sensor: A barometric pressure and temperature sensor, ideal for altitude measurement, weather forecasting, and applications requiring atmospheric pressure data.
Rain Sensor: Detects raindrops or water presence, commonly used in weather stations, automated irrigation systems, and smart home projects for rain detection and water control.
ThingSpeak is an IoT platform that enables the collection, analysis, and visualization of sensor data.
ThingSpeak is a cloud-based platform designed for IoT applications, facilitating the acquisition and analysis of real-time sensor data. Developed by MathWorks, it simplifies the process of data collection, visualization,

and interaction with IoT devices.

Channel Creation: Users can create channels to organize and store sensor data. Each channel represents a unique set of data streams from sensors.

Field Configuration: Channels have customizable fields to accommodate different types of data such as temperature, humidity, etc. Each field can be named and assigned a data type.

Data Upload: Devices can send data to ThingSpeak channels using HTTP or MQTT protocols. This data is timestamped upon arrival, allowing for chronological analysis.

MATLAB Analysis: ThingSpeak supports MATLAB analytics, allowing users to perform advanced data analysis, signal processing, and visualization directly on the platform.

Visualization: ThingSpeak provides built-in tools for creating charts, gauges, and maps to visualize the acquired data. Users can customize these visualizations based on their specific needs.

React: The React feature triggers predefined actions based on specified conditions in the data. This enables automation and response mechanisms.

API Integration: ThingSpeak offers RESTful APIs, making it Adaptable across a plethora of programming language environments and platforms, facilitating seamless integration into custom applications

Power Supply: Ensure that the Arduino and display are powered appropriately. You may need a separate power supply for the display, depending on its requirements.

Working: The sensors (LDR, DHT11, BMP180, Rain Sensor) are connected to a microcontroller (Arduino)

The Arduino processes data from each sensor and converts analog signals to digital.

The microcontroller then sends the digital data to a central processing unit (e.g., Raspberry Pi) through a communication interface.

A web application dashboard, developed using Bylnk, fetches harvests insights from the database to craft compelling visual narratives it in real-time. Users can access the web dashboard to monitor weather conditions, including Radiant luminosity, thermal environment, moisture content, barometric pressure, and precipitation distribution.

4. RESULTS/OUTCOMES

The IoT-based Weather MonitoringSystem successfully monitored and recorded crucial environmental parameters,Integrating Thermometric Readings, Moisture Levels, Barometric Pressure, and Precipitation Metrics.. The system utilized components such as NodeMCU ESP8266, DHT11 sensor, BMP180 sensor, LCD Display with I2C Module, LDR Sensor, Rain sensor, and interfaced with ThingSpeak The information gathered from diverse sensor arrays was efficiently transmitted and displayed in real-time image processing. The readings for rainfall is taken by placing few drops of water droplets on the sensor and the readings are recorded.

Fig 2. The Graph of the Parameters reading

Time	Temp	Humidity	Pressure	Rainfall (Water drop)
17:02	32.75K	60gm^{-3}	912.78pa	100mm
17:30	32.5K	60 gm^{-3}	912.82pa	76mm
18:03	32.45K	59.5 gm^{-3}	912.85pa	50mm
18:30	32.25K	60.1 gm^{-3}	912.87pa	50mm

3.Table of the readings of Parameters

5. CONCLUSION

In conclusion, the integration of IoT technology with a comprehensive array of sensors demonstrated the effectiveness of the Climate Observation Network. The NodeMCU ESP8266 facilitated seamless connectivity, while sensors like DHT11, BMP180, and Rain sensor provided accurate readings. The LCD Display with I2C Module offered a user-friendly interface, and ThingSpeak enabled robust data visualization and analytics. The overall system, developed with Arduino IDE, showcased the potential for real-time environmental monitoring, offering valuable insights for diverse applications such as agriculture, urban planning, and disaster management. The successful implementation of this IoT-based system underscores its significance in advancing weather monitoring capabilities for improved decision-making and resource management.

6. REFERENCES

[1] Bhagat, Anita M., Ashwini G. Thakare, Kajal A. Molke, Neha S. Muneshwar, and Prof V. Choudhary. "IOT based weather monitoring and reporting system project." International Journal of Trend in Scientific Research and Development (IJTSRD) 3, no. 3 (2019): 1-3.

[2] Sharma, Puja, and Shiva Prakash. "Real time Climate Observation Network using IoT." In ITM Web of Conferences, vol. 40, p. 01006. EDP Sciences, 2021.

[3] Rahut, Yashaswi, Rimsha Afreen, Divya Kamini, and S. Sheebarani Gnanamalar. "Smart weather monitoring and real time alert system using IoT." International Research Journal of Engineering and Technology 5, no. 10 (2018): 848-854.

[4] Lakhara, Vaishnavi, Priya Kurade, Tejaswini Pawar, Arti Chougule, and Medha Asurlekar. "Real time Climate Observation Network implementation based on Internet of Things." In Proceedings of the 4th International Conference on Advances in Science & Technology (ICAST2021). 2021.

[5] Phutane, R. Varun. "IoT: Based Climate Observation Network." Journal for Research in Applied Science and Engineering Technology,(IJRASET) (2022): 2321-9653

[6] Deekshath, R., P. Dharanya, Ms KR Dimpil Kabadia, Mr G. Deepak Dinakaran, and S. Shanthini. "IoT based environmental monitoring system using arduino UNO and thingspeak." International Journal of Science Technology & Engineering 4, no. 9 (2018): 68-75

[7] Sharma, Abhay, and Shailendra Shukla. "IOT based Climate Observation Network using Arduino UNO." (2019).

[8] Chandana, L. Siri, and AJ Raja Sekhar. "Weather monitoring using wireless sensor networks based on IOT." Int. J. Sci. Res. Sci. Technol 4 (2018): 525-531.

[9]." Muslim, Muhammad Aziz, Raden Arief Setyawan, Achmad Basuki, Angger Abdul Razak, Fakhriy P. Hario, and Edward Fernando. "IOT based climate monitoring system In IOP Conference Series: Earth and Environmental Science, vol. 746, no. 1, p. 012044. IOP Publishing, 2021.

[10] Singh, Abhishek Kumar, Ashutosh Mishra, Mayank Awasthi, Shivakant Awasthi, and Amit Kumar Singh. "IoT live Climate Observation Network using NodeMCU Esp8266." International Research Journal of Modernization in Engineering Technology and Science (IRJETS) (2022).

[11] Poinwar, Hritika Srivastava1 Nikita Jamadar2 Sankalp, and Praful Katare4 Prof Avinash Ingole. "Review on Internet of Things (IOT) based Climate Observation Network."