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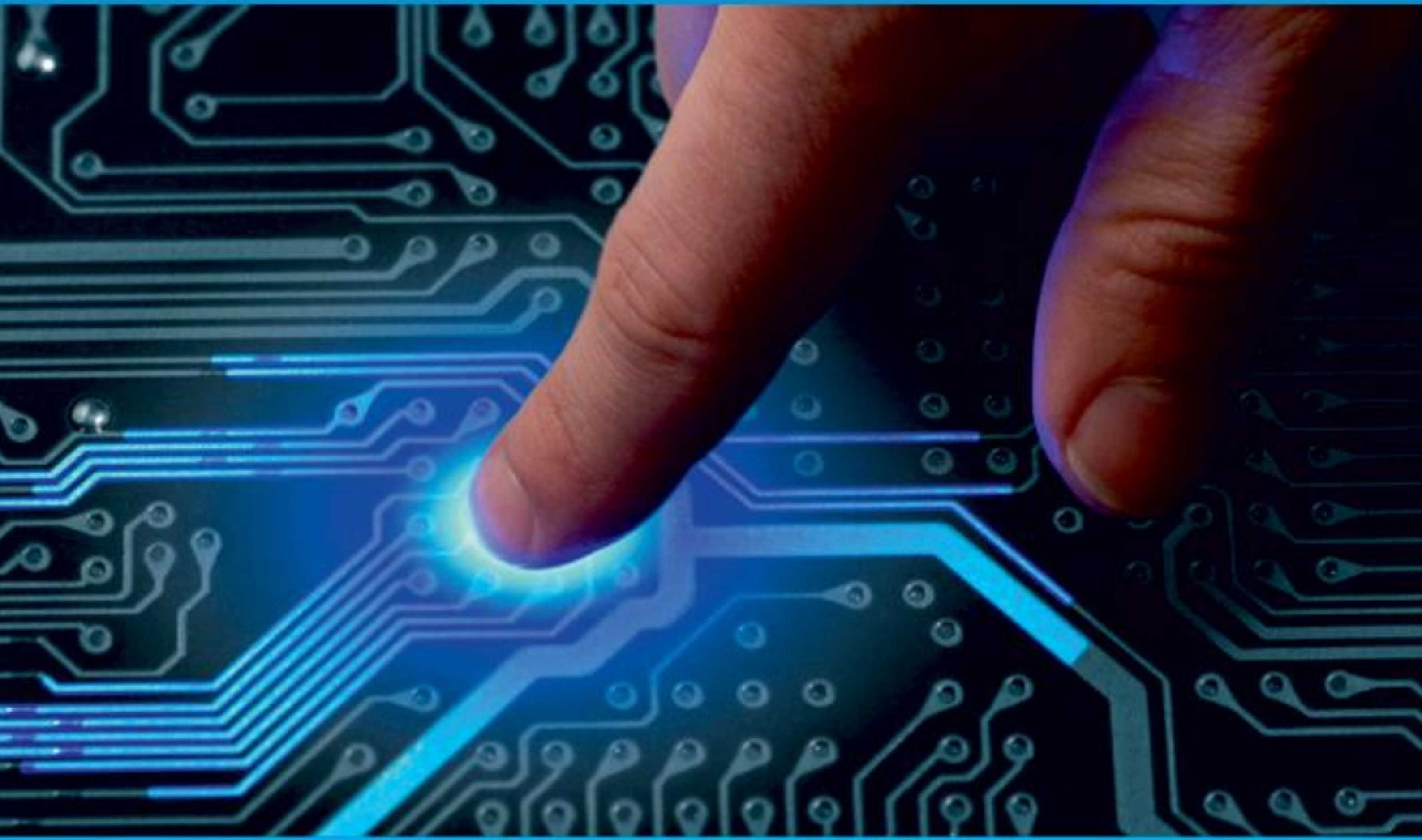

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Quantum Nexus App Based Data logger

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ABSTRACT: The Indian government's Indian Meteorological Department (IMD) is in charge of meteorological observations, weather forecasting, and seismology. In the paper, a new method of creating an app-based data logger for the IMD is proposed. A web based app data logger is a kind of data logger that accesses sensor data wirelessly via cloud technology, providing a convenient way to collect, store and perform data analysis eliminating the need for manual data retrieval and compilation from multiple systems making it useful for monitoring, researching and reporting. All loggers are set with the same sampling and measurement methodologies, not withstanding these variations. The web app data logger can be used to record observations or measurements in a methodical manner. Data loggers are very essential for monitoring and storing data collected from weather stations, since there is uncertainty in weather conditions every time. App based data loggers (ABDL) are very convenient to track daily weather information without needing to manually retrieve it. The paper describes the app based data logger system developed and tested using NodeMCU Esp8266 and Firebase that measures the outcome of (DHT11)temperature and humidity, and(YL-83) rain sensing component.

KEYWORDS: App based data logger (ABDL) ESP8266, NodeMCU, DHT11 (temperature and humidity), YL-83(rain sensing component.

I. INTRODUCTION

In the domain of meteorology, accurate and real-time data is very essential, especially in India which is a geographically diverse country. In the paper web-based data logger designed for the Indian Meteorological Department (IMD) is presented, which aims to provide accurate and real time data of temperature, humidity, and rainfall. The DHT11 sensor along with the YL83 rain sensor module integrates with NodeMCU ESP8266 to collect data and further uses Firebase, a real-time database, to store the data which is effortlessly transmitted to a web interface. The recorded data helps IMD officials to study, visualize and analyse the historical trends and patterns for accurate forecasting and also helps to access the information instantly. The proposed solution improves the capabilities for weather monitoring as well as it also sets a preceding use for IoT technologies in the world of meteorology.

Data loggers are of various types such as traditional, computer-based, web-based, wireless, and standalone. One of the most often used data management tools, data loggers give businesses a great deal of flexibility in the timing and method of data collection and storage. It can also display huge datasets from one or more sources of input. As opposed to manual data entry or haphazard observation, using a data logger gives the user a greater understanding of the inputs being recorded as well as how and why they could vary over time. Applications for web-based data recorders include environmental monitoring, geotechnical instrumentation and observations, and systematic measurement. Data loggers allow an organization to closely monitor the environment in a particular region by recording and transmitting exact temperature, humidity, and pressure readings. The proposed design is cost effective, accurate and an improvised version as compared to traditional data loggers. Section II describes the different literature survey used for app based data logger. Section III provides the methodology and proposed diagram. Simulation and Results is discussed in Section IV. Section V provides the conclusion of the paper.

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II. LITERATURE SURVEY

Positioning of LoRa technology [1] to enhance weather monitoring systems is proposed in this work. The paper discusses combination of LoRa technology with weather monitoring and emphasized the possible assistance.

The reviews follows an intelligent and protected real-time environment monitoring system for healthcare using IoT and cloud computing and also solar powered weather forecasting which is cost effective and efficient. The proposed work shows significance of real-time monitoring [2-3] in healthcare situations and proposed complete result.

A very diverse concept of solar based weather forecasting system is anticipated by Bharathy S et al [4] using IOT skills. Solar sheets are mounted for recognizing and collecting data here. This device utilizes solar current for working.

S. S. Hasan et al. [5] proposed an IoT-based air quality and weather monitoring system with an Android application. The paper highlighted the importance of monitoring air quality alongside weather conditions and proposed a practical solution. Akshath, M et al. [6] anticipated an IoT-based weather monitoring system aiming on recent computer intelligence. This paper highlighted use of IoT devices for real-time data grouping and study.

In this century IoT is ruling this generation. Hence there are various research held using IoT. Using IoT deep learning-based weather monitoring, disaster warning system and cost effective weather detection system [9-12].

A low cost Internet of things weather station is presented by Dushyant Kumar et al [13] in this paper. A weather station with different environmental parameters is built. Here data is stored in a cloud. It can be connected to any device like cell phone or laptop.

With deep learning techniques using IoT upgraded weather forecasting and disaster system is discussed. Cloud-based weather monitoring system is becoming popular as cloud stores data which is collected. Chaganti et al. [15] the paper emphasized use of cloud computing for data storing and analysis in weather monitoring usages.

TABLE 1: Comparison of Traditional and App Based data logger:

PARAMETERS	TRADITIONAL DATA LOGGER	APP BASED DATA LOGGER
USER INTERFACE	They often have limited or no graphical user interface, requiring users to interpret data post-retrieval.	It provide a user-friendly interface on smartphones, allowing users to interact with and visualize data in real-time.
CONNECTIVITY	It may lack connectivity options or rely on wired connections for data retrieval.	Often used for wireless technologies like Bluetooth & Wi-Fi for seamless records transfer and real time updates.
INTEGRATION	It might have limited integration capabilities, making data transfer.	It offer integration with other apps or cloud platforms, facilitating data sharing and analysis across different systems.
CUSTOMIZATION	They may have fixed or limited parameters, requiring manual adjustments or settings.	They often offer dynamic parameter customization through the app, allowing users to modify logging settings remotely.
ALERT AND NOTIFICATIONS	Traditional data loggers lack this feature, requiring users to manually check data for any anomalies.	App-based data loggers can send alerts and notifications based on preset conditions, keeping users informed of important changes.

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III. METHODOLOGY

The objective of the proposed work is to log temperature, humidity, and rain data through sensors, which is then displayed through a web app. Fig. 1 presents proposed block diagram of app based data logger.

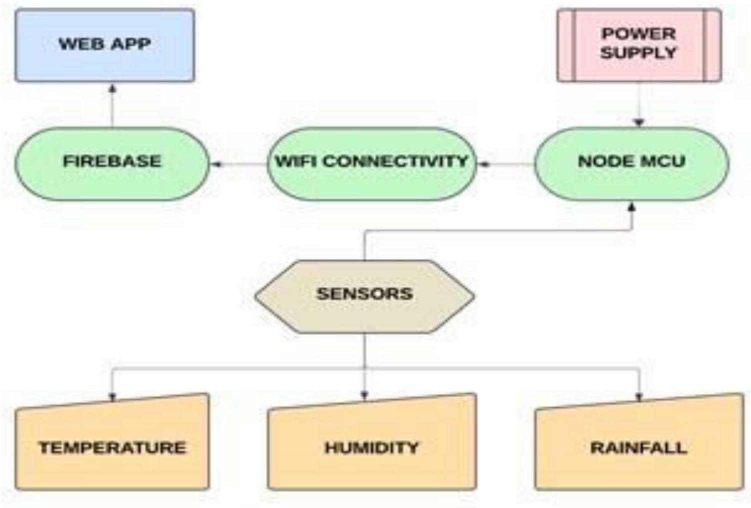

Fig 1 Block Diagram

3.1 Data logger System:

The system involves NodeMCU Esp8266 Wi-Fi chip as data processor. DHT11 (temperature and humidity sensor) is used for temperature and humidity measurement, while the YL-83 Rain sensor module is employed for detecting rainfall. Analog input is given through the sensors to the NodeMCU, and digital output will be received as output. There are five stages of creating the app-based data logger, incorporating both the DHT11 and YL-83 Rain sensing component for comprehensive environmental monitoring.

3.2 NodeMCU ESP8266:

NodeMCU is a development board and firmware designed for Internet of Things (IoT) projects. It uses Lua programming and is built on the Esp8266 Wi-Fi chip. This board makes it easy to create IoT applications or to control other wireless devices, due to its open-source nature and user-friendly design. It can be encoded with help of the Arduino software and allows you to connect to Wi-Fi networks easily

3.3 DHT11 Temperature and Humidity sensor:

Temperature and humidity that DHT11 sensor measures are proportionate to the digital output that it produces. DHT11 sensor's technology offers great long-term steadiness, rapid response times, and high consistency. It is a profitable temperature and humidity sensor which uses capacitive humidity sensor and thermistor to calculate the surrounding air, providing digital output for both temperature and humidity stages. It is commonly used in environmental conditions monitoring systems. The DHT11 consists of three pins- GND, D0, and VCC.
Characteristics –
Supply voltage - +5V, 2. Running supply current of 0.5mA, 3. Supply current (stand-by) -100uA type, 4. Ranges of temperature varies 0 / +50° ±2°C, 5. Ranges of humidity is 20-90

3.4 YL-83 Rain sensor:

The YL-83 Rain sensing component is sensor device used to detect the presence and intensity of rainfall. It usually consists of a circuit board with conductive traces, and when raindrops fall on its surface, these traces become conductive, causing a change in the electrical resistance. The variation in resistance can be calculated and interpreted by microcontroller to decide the level of rainfall.. In case of analog output, value changes according to the intensity of rain. If water droplets on sensor pad grow, the resistance rises and hence, output voltage gets decreased and viceversa.The rain sensor module is essential for providing the rain performance, making it suitable in weather monitoring systems, irrigation control, and other applications where rainfall data is essential. The YL-83 Rain sensing component consists of four pins- Gnd, A0, D0, and Vcc.

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Characteristics-

1. Supply voltage: 5 V, 2. 1 digital output, 3. 1 analog output, 4. Sensitivity is adaptable with potentiometer, 5. Digital output current load: 100 mA max.

3.5 LM2596 Step-Down Converter:

The LM2596 step-down converter is used to adjust the voltage supplied to the NodeMCU, ensuring that it receives a stable voltage within its operating range. This is important for the proper functioning of the NodeMCU and the sensors. The LM2596 converter is known for its high efficiency, which is vital for a battery-powered project as it helps to conserve energy and prolong the battery life. The LM2596 converter is compatible with a wide range of input voltages, making it suitable for use with the 3.7-volt rechargeable batteries.

3.6 Switch:

The switch allows you to physically control the power supply to the NodeMCU & other components. This is useful for turning the system on and off, conserving energy when the system is not in use. The switch provides a safety feature, allowing you to quickly disconnect the power supply in case of an emergency or when maintenance is required.

3.7 Firebase

Firebase is creation of google that assist users to construct their apps certainly. It helps users to construct the apps quicker and in safe way. Very less programming is required on the firebase side that makes it handy to use its attributes more proficiently. Cloud storage is offered here. It uses NoSQL for the database for the storing data.

Firebase is a platform that offers extensive range of features to help users build fine quality mobile and web applications. One of its important features is the Real-time Database, which provides real-time synchronization across all clients. This means that any alterations done to database is directly updated on associated devices, making it ultimate for applications that require real time updates.

Firebase also provides confirmation services, allowing users to integrate secure user verification into applications using email/password, Google, Facebook, or other providers. This helps developers ensure that only authorized users can access their application and data. Fire store offers powerful querying, offline data support, and real-time synchronization, making it easy to build responsive applications that work online and offline.

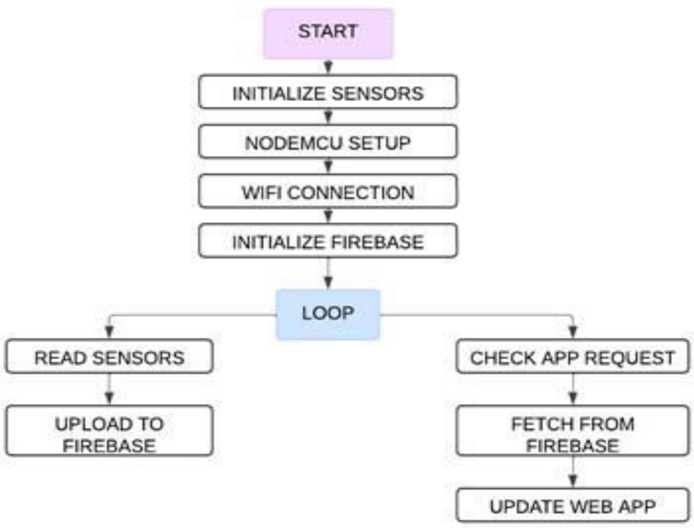

Fig 2 Flowchart

3.8 Sensor Processing

Arduino IDE software was used for coding the Node MCU Esp8266. Arduino.h, ESP8266WiFi.h, Firebase-ESP-Client.h, Wire.h, DHT.h, NTPClient.h, WiFiUdp.h are some of the header files that are used for the processing of

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DHT11 (temperature and humidity) sensor module and YL-83 Rain sensing component with the Node Mcu Esp8266. After sensor processing firebase parameters are also interfaced in the code to obtain real time data.

3.9 Hardware Prototype

For the hardware implementation a Node Mcu Esp8266, DHT11 (temperature and humidity) sensor, YL83 Rain sensing component are used. The data logger is portable and can be easily carried anywhere. In case of DHT11 sensor – Gnd, Vcc, D0 pins are connected to the Gnd, Vin, D5 pins of the ESP8266 module. For YL-83 rain sensing component – A0, Gnd, Vcc pins are attached to the A0, Gnd, Vin pins of the ESP8266.The Vcc pin of DHT11 and YL83 Rain sensor module are connected in common with the Vin of the Node Mcu Esp8266. The system is finally provided with external power supply for efficient working of the setup. Figure indicates the anticipated hardware design.

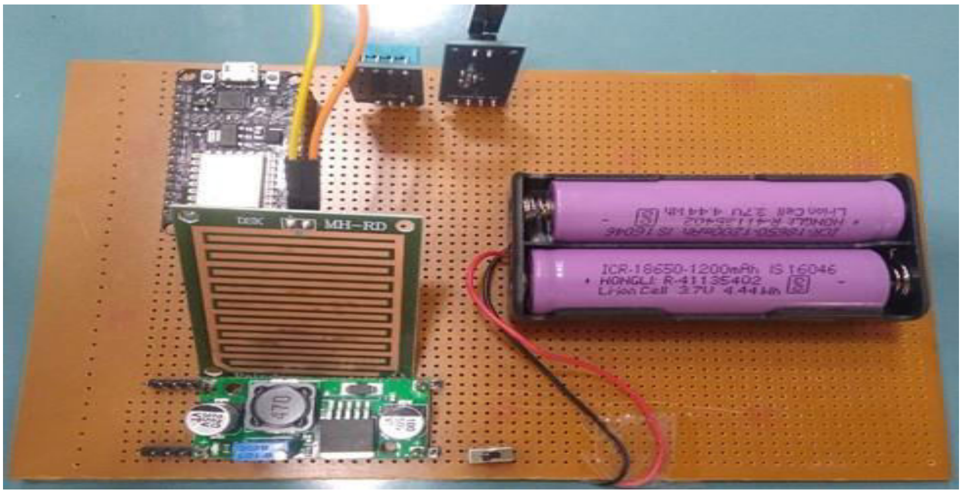

Fig 3 Hardware Prototype

3.10 Algorithm

Following are steps of executing process is as follows:

Step 1: Hardware Setup: Connect the NodeMCU with the DHT11 sensor and YL83 Rain sensing component to display temperature, humidity and rainfall readings as shown in Fig 2.
Step 2: NodeMCU Programming: Use Arduino IDE to program the NodeMCU to read data from sensors at regular intervals and transfer to Firebase Real-time Database.
Step 3: Firebase Configuration: Set up Firebase Real-time Database and configure it to receive and store the sensor data from the NodeMCU.
Step 4: Web App Development: Develop a web application using HTML, CSS, and JavaScript to interface with Firebase. Use Firebase JavaScript SDK to retrieve real-time sensor data and display it in a user-friendly format, including temperature, humidity, and rainfall trends over time.
Step 5: Testing and Debugging: Test the entire system to ensure the NodeMCU is transmitting data correctly to Firebase and that the web application is displaying the data accurately. Debug any issues related to sensor readings, Wi-Fi connectivity, or Firebase integration.

3.11 Aspect of the system

The unique aspects of the system are:
1. The system is cost effective and uncomplicated.
2. The prototype is small in size and can be easily carried anywhere.
3. Interactive graphs helps to visualize data trends over time that update dynamically.
4. Displays and logs temperature, humidity, and rainfall data in real-time on theweb interface along with timestamps.
5. User authentication provides security and helps securely access real-time database.

The applications of App based data logger (ABDL) are: App based data logger (ABDL) is very essential for environmental monitoring like monitoring temperature, humidity, and rainfall in outdoor environments for agriculture, weather forecasting, or research purposes. Data logger can also be used to integrate to monitor indoor environmental

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conditions for home automation systems. Environmental conditions can be monitored in industrial areas to ensure optimal working conditions for machinery and equipment. Data loggers can be made more efficient and reliable to monitor environmental conditions in disaster-prone areas to provide early warnings and manage emergency response activities.

IV. SIMULATION AND RESULTS

Results are shown below from the Firebase app displaying temperature, humidity and rainfall

4.1 Sensor Data Acquisition

NodeMCU ESP8266 is the main Microcontroller serving as the core of the project, is programmed to interface with the DHT11 sensor. DHT temperature & humidity sensor provides correct environmental readings. NodeMCU reads data from the sensor at regular intervals. To initiate this process, Arduino IDE is used. The NodeMCU programming is the foundation for the data acquisition process, ensuring a consistent and timely capture of temperature & humidity information from DHT11 sensor along with timestamps. The data is crucial for real-time monitoring and is transmitted to the Firebase Real time Database for further analysis and visualization in the web application.

4.2 Node MCU and Firebase Integration:

NodeMCU establishes a protected and secure Wi-Fi connection, increasing the ESP8266's capabilities. Using the Firebase JavaScript SDK, the NodeMCU transmits the collected sensor data to the Real-time Database. Firebase Real-time Database acts core pillar for storing and managing the collected sensor data. The database is formatted to efficiently organize information, allowing for easy retrieval and data analysis. The real-time Firebase ensures to make changes and data updates are instantly reflected in the database, providing a dynamic dataset for the web application. The Firebase platform ensures that data is transmitted reliably and in real-time.

4.3 Real Time Database

The web application is integrated to receive realtime updates from the Firebase Real time Database. JavaScript functions are implemented to handle asynchronous data updates, ensuring that the user interface displays the most sensor readings. The real-time feature enhances the application's usability, providing users with instant access to the recent environmental conditions.

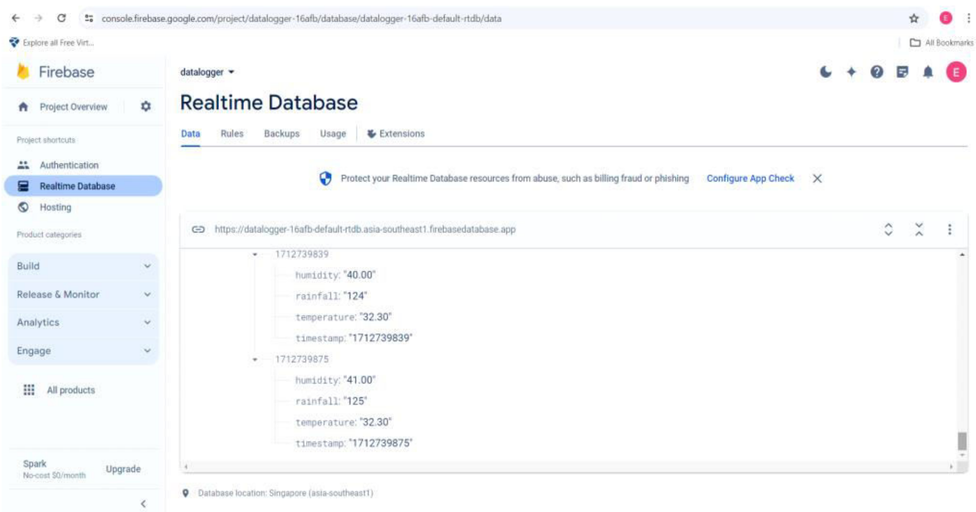

Fig 4 Real Time Database

4.4 Firebase Authentication:

For improved security and user-specific features, Firebase Authentication can be implemented. This feature allows users to log in securely, providing personalized settings and access controls. With authentication, the web application can offer a more customized experience, ensuring that only authorized users can interact with and modify certain aspects of the data

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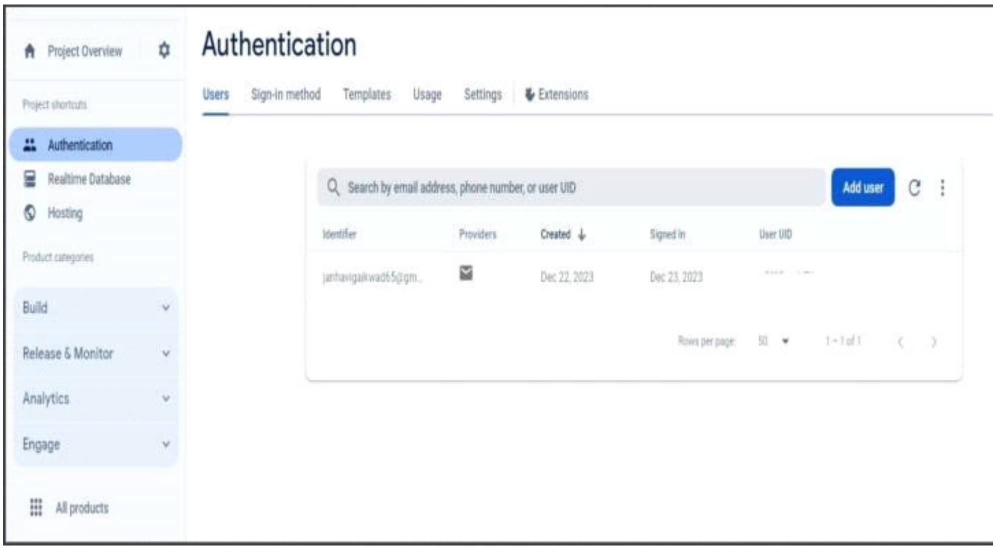

Fig 5 Fire Base Authentication

4.5 Web Application Development:

The web application is developed using standard web technologies that includes HTML, CSS, and JavaScript. HTML issued for structuring the webpage content, CSS for styling and layout, and JavaScript for dynamic updates and user interactions. The application offers to deliver an integrated & visually appealing user interface for monitoring temperature and humidity trends over time by displaying cards, gauges, graph and data logging with date and time. Graphs and charts are employed to visualize the temperature and humidity data trends, ensuring that users can easily interpret and analyse the information.

Results are shown below from the Firebase app displaying temperature, humidity and rainfall

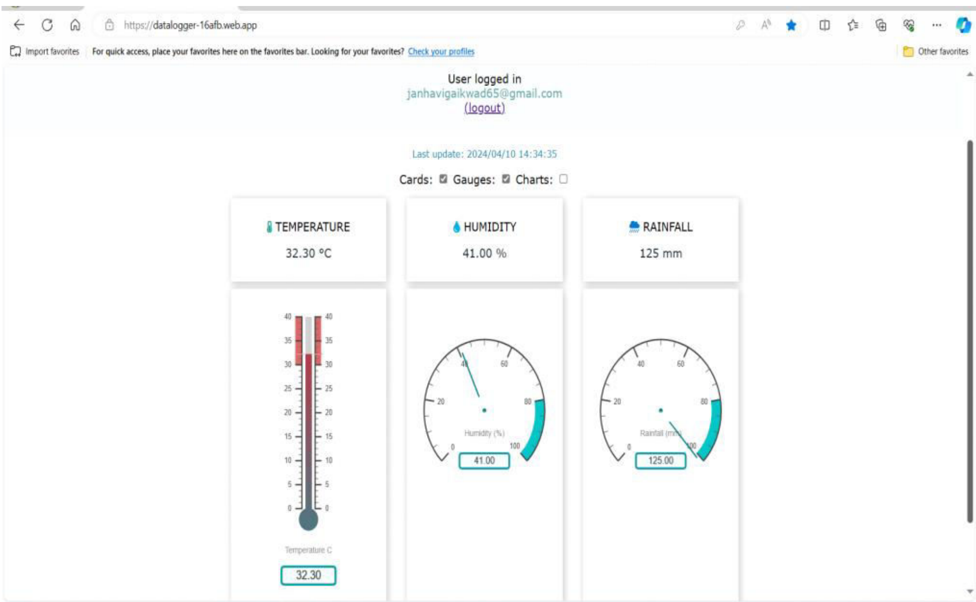

Fig 6 Firebase data logger app

The web application for temperature and humidity data logging with a dynamic graph which is responsive to the number of readings, is designed to provide users with an interactive and visually informative experience. The JavaScript file, 'app.js,' plays a crucial role in dynamic creation & update of graph. Using the Chart.js library, the script initializes a line chart. The chart is configured to represent both temperature and humidity readings, each having its own dataset with corresponding labels. The script allows representing the data over the x axis, correlating with the

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amount of readings, while the y axis denotes the actual temperature and humidity values. The graph is sourced from the Real time Database readings.

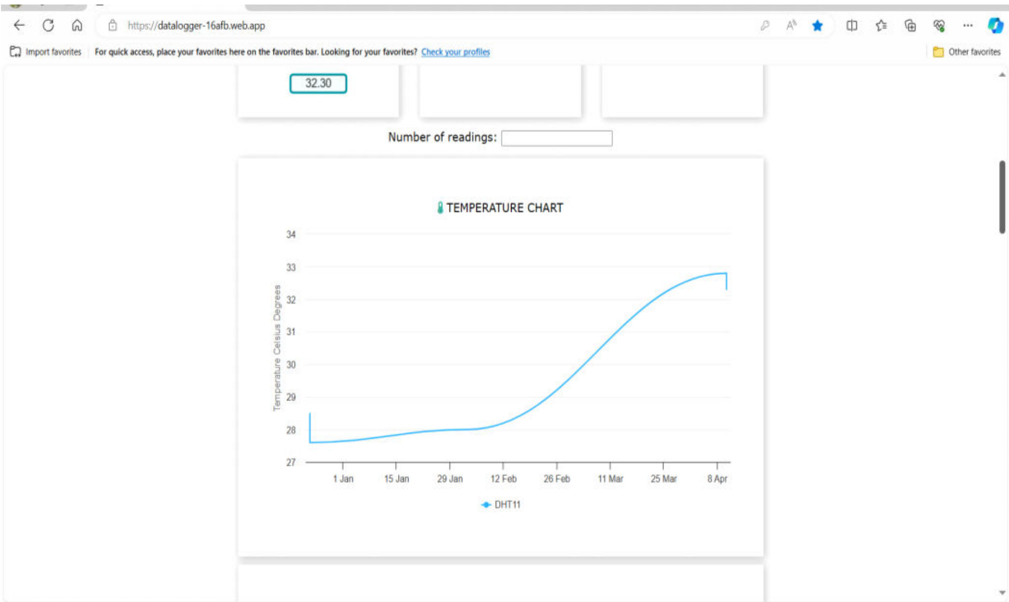

Fig 7 Fire Base data logger app (Temperature Graph)

Fig 8 Fire Base data logger app (Humidity Graph)

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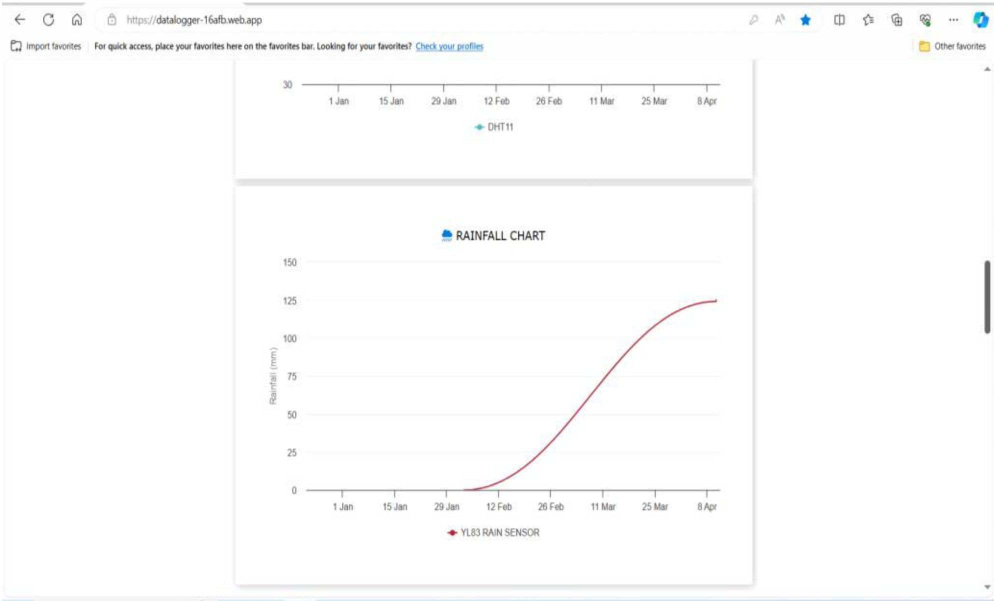
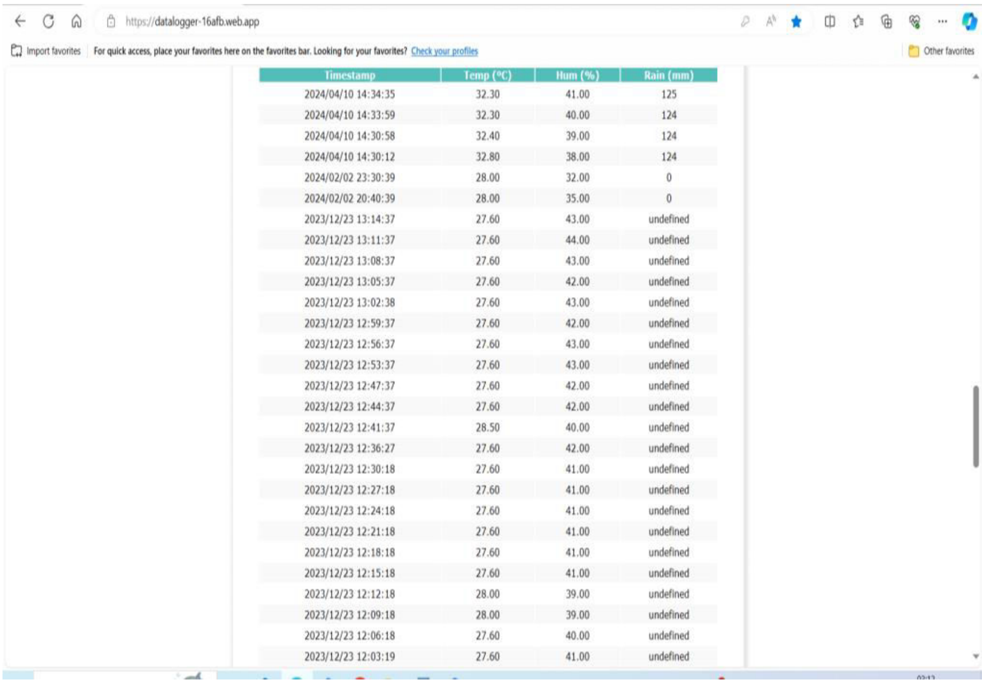


Fig 9 Fire Base data logger app (Rainfall Graph)

For a data logger recording temperature and humidity readings, the integration of timestamp, date, and time information provides crucial context to the collected data. Each entry in the data log is enhanced with a timestamp, representing the exact moment when a particular reading was captured.

The timestamp is typically expressed as a UNIX timestamp. Alongside the timestamp, the data structure includes the corresponding temperature and humidity values. This information is crucial for various applications, such as trend analysis, identifying patterns, and correlating environmental changes with specific times of the day or external events.



Timestamp	Temp (°C)	Hum (%)	Rain (mm)
2024/04/10 14:34:35	32.30	41.00	125
2024/04/10 14:33:59	32.30	40.00	124
2024/04/10 14:30:58	32.40	39.00	124
2024/04/10 14:30:12	32.80	38.00	124
2024/02/02 23:30:39	28.00	32.00	0
2024/02/02 20:40:39	28.00	35.00	0
2023/12/23 13:14:37	27.60	43.00	undefined
2023/12/23 13:11:37	27.60	44.00	undefined
2023/12/23 13:08:37	27.60	43.00	undefined
2023/12/23 13:05:37	27.60	42.00	undefined
2023/12/23 13:02:38	27.60	43.00	undefined
2023/12/23 12:59:37	27.60	42.00	undefined
2023/12/23 12:56:37	27.60	43.00	undefined
2023/12/23 12:53:37	27.60	43.00	undefined
2023/12/23 12:47:37	27.60	42.00	undefined
2023/12/23 12:44:37	27.60	42.00	undefined
2023/12/23 12:41:37	28.50	40.00	undefined
2023/12/23 12:36:27	27.60	42.00	undefined
2023/12/23 12:30:18	27.60	41.00	undefined
2023/12/23 12:27:18	27.60	41.00	undefined
2023/12/23 12:24:18	27.60	41.00	undefined
2023/12/23 12:21:18	27.60	41.00	undefined
2023/12/23 12:18:18	27.60	41.00	undefined
2023/12/23 12:15:18	27.60	41.00	undefined
2023/12/23 12:12:18	28.00	39.00	undefined
2023/12/23 12:09:18	28.00	39.00	undefined
2023/12/23 12:06:18	27.60	40.00	undefined
2023/12/23 12:03:19	27.60	41.00	undefined

Fig 10 Fire Base data logger app Time stamp

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V. CONCLUSION

The proposed design hence proves to be a cost effective, accurate and improvised version for the Indian Meteorological Department compared to the traditional data loggers. The web based data logger delivers an efficient and accessible way out for observing and recording data. The system detects temperature, humidity and rainfall in real-time system and the readings are further displayed on the web app for future use. This system is suitable for data logging in weather forecasting and pollution control. The data logger monitor senses the changes in the environment and stores the real time data which in result helps the officials to study the historical trends by visualizing and analysing the data and predict the accurate forecast. The system is also best suited for remote locations where setting up a traditional data logger is impossible. Hence the implementation, simulation and evaluation of data logger system is done.

REFERENCES

1. Lakshmi, A. Jaya, Gunti Kishore, V. Koushik, and Thota Dilip Kumar. "Deploying LoRa Technology to Enhance Weather Monitoring system." In 2023 2nd International Conference on Automation, Computing and Renewable Systems (ICACRS), pp. 329-333. IEEE, 2023.
2. Shetty, Shashank. "An Intelligent and Secure Real-Time Environment Monitoring System for Healthcare Using IoT and Cloud Computing with the Mobile Application Support." In Image Based Computing for Food and Health Analytics: Requirements, Challenges, Solutions and Practices: IBCFHA, pp. 83-95. Cham: Springer International Publishing, 2023.
3. Fahim, Mohamed, Abderrahim El Mhouti, Tarik Boudaa, and Abdeslam Jakimi. "Modeling and implementation of a low-cost IoT-smart weather monitoring station and air quality assessment based on fuzzy inference model and MQTT protocol." Modeling Earth Systems and Environment (2023)
4. Bharathy, S., Harsha Vardhan US, and B. Rahul. "Solar Powered Efficient Weather Forecasting Using IOT Technology." In 2022 1st International Conference on Computational Science and Technology (ICCST), pp. 682-685. IEEE, 2022.
5. Haq, S. S. Hasan, M. Z. Rahman, D. Das and A. Ullah, "IoT Based Air Quality and Weather Monitoring System with Android Application," 2022 International Conference on Innovations in Science, Engineering and Technology (ICISET), Chittagong, Bangladesh, 2022
6. Akshath, M. J., L. Amrutha, and Praveen S. Yarali. "IoT-Based Weather Monitoring System." In International Conference on Computational Intelligence in Machine Learning, pp. 703-707. Singapore: Springer Nature Singapore, 2022.
7. Dwivedi, Chandra Kant. "IoT and Deep Learning-Based Weather Monitoring and Disaster Warning System." In Proceedings of International Conference on Computational Intelligence: ICCI 2021, pp. 309-319. Singapore: Springer Nature Singapore, 2022.
8. Al-Furati, Israa S., Fatemah K. Al-Assfor, and Atheel K. Abdul Zahra. "Design and Implementation of a Low-Cost Weather Stations Meter." In Proceedings of Seventh International Congress on Information and Communication Technology: ICICT 2022, London, Volume 3, pp. 167-175. Singapore: Springer Nature Singapore, 2022.
9. Mabrouki, Jamal, Mourade Azrour, Driss Dhiba, Yousef Farhaoui, and Souad El Hajjaji. "IoT-based data logger for weather monitoring using arduino-based wireless sensor networks with remote graphical application and alerts." Big Data Mining and Analytics 4, no. 1 (2021)
10. Cui, Jianye, Jian Huang, Youchun Li, and Yingwei Zhu. "Design of Weather Monitoring and Forecasting System Based on Computer Distributed Network." In International conference on Smart Technologies and Systems for Internet of Things, pp. 176-186. Singapore: Springer Nature Singapore, 2021.
11. F. Firouzi, K. Chakrabarty, and S. Nassif, Intelligent Internet of Things: From Device to Fog and Cloud. 7 Cham,Germany: Springer International Publishing, 2020.
12. H. Theuss, S. Kolb, M. Eberl, and R. Schaller, Miniaturized photoacoustic gas sensor for CO2, in Sensor Systems Simulations: From Concept to Solution, W. van Driel, O. Pyper, and C. Schumann, eds. Cham, Germany: Springer International Publishing, 2020.
13. Singh, Dushyant Kumar, Himani Jerath, and P. Raja. "Low Cost IoT Enabled Weather Station." In 2020 International Conference on Computation, Automation and Knowledge Management (ICCAKM), pp. 31-37. IEEE, 2020.
14. Reddy, Yeddula Aravind Kumar, K. Suganthi, Paluru Mohan Kumar, Afjal Ali Khan, and K. Sai Pavan. "LoRa—pollution and weather monitoring system." In Artificial Intelligence and Evolutionary Computations in Engineering Systems, pp. 377-387. Springer Singapore, 2020.
15. Chaganti, Sai Yeshwanth, Ipseeta Nanda, and Koteswara Rao Pandi. "Cloud-based weather monitoring system." In Advances in Data Science and Management: Proceedings of ICDSM 2019, pp. 235-245. Springer Singapore, 2020.
16. Vanmathi, C., and R. Mangayarkarasi. "Real time weather monitoring using internet of things." In 2020 International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE), pp. 1-6. IEEE, 2020.

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