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IoT-Based Data Logging System using Cloud

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Abstract

The shift from the digital to the smart era is ongoing due to the ongoing advancements in information technology. IoT is being incorporated into government business operations. Remote data monitoring and measuring systems are essential for the business sector. Data gathering in the manufacturing of electronic systems requires the usage of data loggers. Data loggers, which are gadgets that record different data like temperature and humidity, are employed for this purpose. To collect data from the data logger, create a framework. The program is made to collect data continuously and in real time without interfering with normal business operations. Sensor data is gathered and sent to the system for further processing.

Keywords: *Internet of Things, Real Time System, Web-based Application, Visualization & Analysis, Cloud Storage, Security & Privacy*

I. Introduction

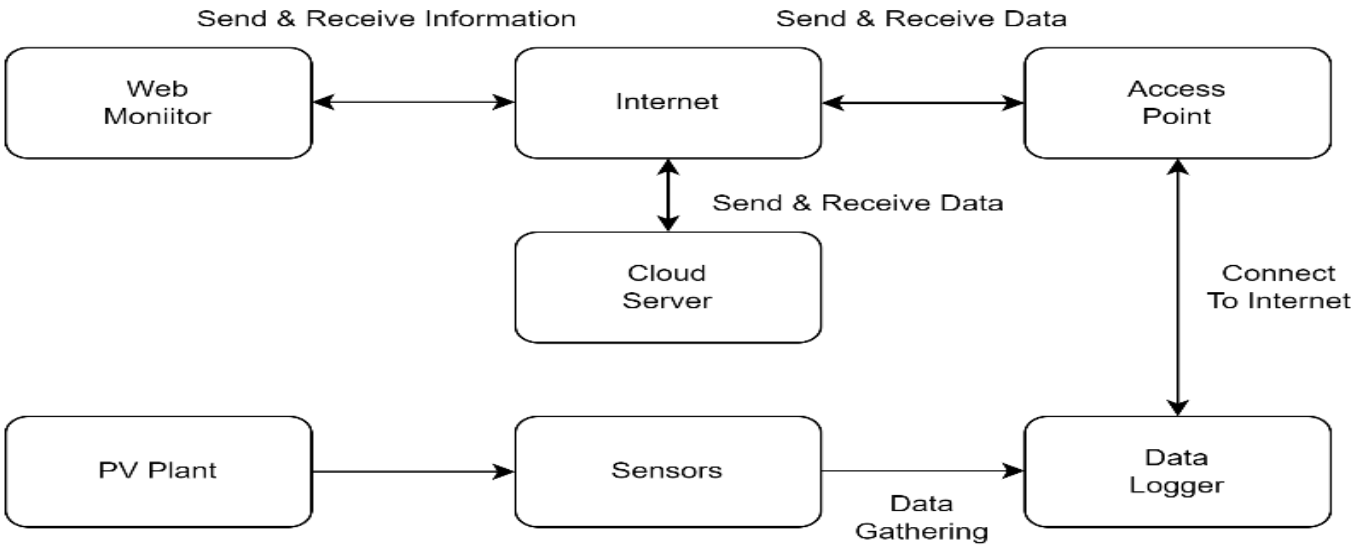
One modern technology that has a significant influence on numerous businesses is the Internet of Things. Tracking critical variables, including temperature, humidity, voltage, current, and wind, requires real-time data monitoring. Through the usage of IoT devices, worldwide data can now be accessed and transmitted seamlessly, enabling communication between computers and machines during processing activities. Wireless data transmission improves device comfort and lowers communication expenses related to power lines. A visit to the location may be unpleasant due to certain restrictions, including security issues, expensive admission costs, inclement weather, and potentially harmful fauna. A wireless surveillance system that is effective, efficient, and requires little maintenance must be put in place. Using today's technology, automatic monitoring can be used to overcome the above problems. By creating a real-time monitoring system, the need for on-site manual installation and maintenance can be reduced, thus reducing the project and cost. Current research includes the development of remote real-time monitoring of sensor equipment, supported by web-based data collection to facilitate user data access and analysis through various machine learning algorithms.

II. Project Objective

- Capture and visualize real-time data.
- Different dashboards for admin and operator.
- To analyse the data using a machine learning algorithm.
- To achieve security for data transmission.
- Device health monitoring.

III. Proposed System

The designed real-time remote data monitoring system has been conceptualized to provide a comprehensive solution for diverse monitoring needs by integrating Internet of Things (IoT) technology, cloud infrastructure, machine-learning algorithms, and a user-friendly web-based interface.



The configuration of the system is carefully designed to ensure scalability, dependability, and user-friendly accessibility while effectively capturing, transmitting, and analyzing environmental data in real-time. In order to record important environmental characteristics, including temperature, humidity, voltage, current, and wind conditions, sensors are carefully placed. To enable wireless connection and data transfer to a centralized cloud infrastructure, these sensors are connected to IoT-enabled devices. The purpose of using cloud storage services such as AWS S3 or Azure Blob Storage is to safely store unprocessed sensor data. Additionally, for efficient data administration and structure that permits quick retrieval and analysis, a cloud database (such as MongoDB or MySQL) is used. To provide accurate and timely information, real-time processing is applied to the sensor data. Patterns and abnormalities are found using clustering machine learning methods and K-Nearest Neighbor. With the help of modern web technologies like React js, the web-based data gathering interface gives users easy access to both historical and current data. With the information gleaned from the data, users are able to monitor environmental conditions, identify trends, and make well-informed judgments. All of the needs of both technical and non-technical users are met by this interface.

IV. Methodology:

Launching a real-time remote data monitoring system, along with a web-based data collection interface and machine learning analysis, requires first acknowledging the significant role that IoT plays in modern technological contexts. IoT allows for the seamless real-time monitoring of a range of environmental characteristics, such as temperature, humidity, voltage, current, and wind conditions, in contrast to traditional wired systems. This significantly reduces costs while enabling wireless communication and worldwide accessibility. Common obstacles to regular on-site human visits include wildlife hazards, high costs, challenging weather, and safety issues. This emphasizes the necessity for a wireless monitoring system that is effective, easy to use, and requires little upkeep. An unmanned real-time monitoring system can be set up to effectively handle the aforementioned issues by leveraging technical advancements. This system's implementation lowers labor and project costs while also reducing human participation. The main goal of this project is to put in place a complete real-time remote data monitoring system that has sensors to collect data, wireless connectivity to transmit data to a cloud-based infrastructure, and machine learning algorithms integrated for in-depth data analysis. Through an intuitive web-based interface, this methodology aims to give consumers easy access to both historical and current data, promoting data comprehension and decision-making. To maintain data integrity and confidentiality, stringent security measures like data encryption, access restriction, and regular assessments are also implemented. Ongoing performance monitoring and optimization efforts guarantee the monitoring system's efficacy and dependability, while user education and ongoing support guarantee its seamless adoption and use. Frequent evaluations and feedback systems help to update and strengthen the system, guaranteeing that it is in line with changing user needs and technical developments. By doing this, businesses may design a real-time monitoring system that is effective and adaptable to their particular requirements.

V. Literature Survey:

[1] This study introduces a system that is developed to oversee the voltage of electrical devices, as well as the self-current, self-voltage, surrounding temperature, and humidity. This monitoring system helps users to observe the status of the device from any location. A singular microcontroller unit governs the electronic functions. The data acquisition will be transmitted via a GSM module to a remote monitoring database to offer real-time data to the user.

[2] This study suggests that the k-nearest neighbor classification is a straightforward and comprehensible classification technique. Various data mining methods such as classification, prediction, clustering, and outlier analysis can be applied for data analysis; the k-nearest neighbor algorithm is used to uncover concealed patterns within extensive data to convert the obtained information into practical knowledge for temperature and humidity classification and prediction. Combining the k-NN with clustering would enhance the precision of temperature and humidity.

[3] This study recommends certain techniques for designing embedded real-time data acquisition and classification. The system has two primary components: an embedded system and a web-based application. An embedded system has four key units: processor, sensors, actuators, and communication.

The web-based application is utilized for visualizing data and configuring system parameters. This application is structured to visualize data sent from the microcontroller and scrutinize the algorithms' performance in both the microcontroller and web browser. [4]
The device discussed in this paper is a crucial feature that could be integrated to augment the system's capabilities. This module is designed for wireless monitoring. A sequence of trials has verified that the module operated as per the specifications.
[5] This study proposes a GSM modem as a modem type that accepts a SIM card and functions on a subscription from a mobile operator, akin to a cell phone from the mobile operator's standpoint; a GSM modem resembles a cell phone. Once connected to a computer, the computer initializes the GSM modem to communicate over the mobile network.
[6] This study advocates for real-time data logging of a process variable as being paramount in process dynamics. Process variables, such as temperature and humidity, fluctuate over time in specific circumstances, and this fluctuation should be logged to enable control actions at a defined set point.

VI. Conclusion

For businesses in a variety of industries, the creation of a real-time remote data logging system combined with a web-based data collection interface and machine-learning analysis offers substantial advantages. The finest information for making decisions is obtained by implementing IoT technology, cloud infrastructure, and advanced analytics to efficiently measure environmental parameters, including temperature, humidity, voltage, and current. Organizations can create a scalable and reliable monitoring system that meets their unique requirements by following the project plan methodically. This enables stakeholders to readily access both historical and real-time data for ongoing development. While the user-friendly web interface and machine learning analysis offer enterprises invaluable insights, strict security measures guarantee the confidentiality, integrity, and privacy of sensitive data, inspiring confidence in users. Maintaining effectiveness, adjusting to changing demands and technology, and promoting efficiency and growth within organizations all depend on ongoing evaluation and improvement.

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