READY TO DRIVE SAFETY SENSING SYSTEM FOR ELECTRIC VEHICLE USING IOT

Guide:J.Swapna

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Abstract - The integration of Internet of Things (IoT) technology in electric vehicles (EVs)has paved the way for enhanced safety features and driving experience Project focuses on the development of a ready-to-drive safety sensing electric vehicle utilizing IoT advancements. The core objective is to design a comprehensive system that integrates various IoT sensors and devices to monitor and improve the safety aspects of EVs. Key components of the system include sensors for monitoring environmental conditions, such as temperature, humidity, and air quality, to ensure optimal driving conditions for passengers and the vehicle itself. Furthermore, the integration of IoT technology enables remote monitoring and control of the EV's vital parameters, including battery status, charging levels, and overall performance. This not only enhances the convenience for users but also contributes to the longevity and efficiency of the vehicle. The cornerstone of IoT Guard is its cloud-based analytics platform, which processes the vast amount of sensor data collected from the EV in real-time. Utilizing machine learning algorithms, the platform identifies *patterns indicative of* impending safety risks, enabling proactive intervention to prevent accidents.

Keywords—Bitcoin, Prediction, Long Short Term Memory, Recurrent Neural Network, Support Vector Machine.

I. INTRODUCTION

In response to this imperative, the project ”Ready-toSafety Sensing System for Electric Vehicle using IoT” aims to leverage the power of Internet of Things (IoT) technology to enhance the safety features and driving experience of electric vehicles. With the proliferation of IoT-enabled devices and sensors, there exists a unique opportunity to create a comprehensive safety sensing system that monitors and responds to potential hazards in real-time. The primary objective of this project is to develop a sophisticated safety sensing system that integrates seamlessly with electric vehicles, providing drivers with enhanced situational awareness and proactive assistance in navigating challenging road conditions. By leveraging IoT sensors deployed both within and around the vehicle, the system will continuously monitor environmental factors such as temperature, humidity, air quality, and road conditions, as well as detect potential obstacles, pedestrians, and other vehicles.

Aim of the project:

The aim of the project is to develop a comprehensive and integrated system that leverages IoT (Internet of Things) technology to enhance the safety aspects of electric vehicles (EVs) and provide a seamless driving experience. The primary objectives of the project include: Real-time Monitoring: Implementing IoT sensors and devices to continuously monitor various parameters both inside and outside the electric vehicle, such as temperature, humidity, air quality, road conditions, and vehicle performance metrics Remote Monitoring and Control: Enabling remote monitoring and control of the electric vehicle's vital parameters, such as battery status, charging levels, and vehicle diagnostics, through IoT connectivity. This feature enhances convenience for the user and facilitates proactive maintenance and troubleshooting.

The contributions of this work include:

In this work, an Ready to Drive Safety Sensing Electric Vehicle is proposed, offering several significant contributions to the field of energy management and maintenance. First and foremost, the system provides real-time monitoring capabilities, allowing users to continuously track battery parameters such as voltage, current, temperature, and state of charge (SOC). This real-time data acquisition is facilitated by the integration of various sensors and IoT modules, which ensures timely and accurate information delivery to users through a user-friendly interface.

II. Related Work

In recent years, the surge in interest and investment in digital currencies has prompted extensive research into predicting cryptocurrency prices using machine learning techniques. A variety of methodologies and models have been proposed, aiming to exploit the inherent patterns and dynamics of cryptocurrency markets for informed investment decision-making. This section provides an overview of relevant literature in this domain, highlighting key findings and methodologies from a selection of referenced papers.

Chen et al.[1] explore the implementation of IoT technology in battery management systems specifically designed for renewable energy applications. This study is particularly relevant for those looking into the application of IoT in enhancing the efficiency and reliability of renewable energy systems. The insights into data analytics and predictive maintenance can be valuable for developing more advanced and robust battery management solutions.

Kumar et al. [2] investigate the application of IoT technology to monitor and enhance the performance of electric vehicle (EV) batteries. This study is highly relevant for researchers and practitioners focused on improving the performance and reliability of EV batteries through IoT technology. The insights into system architecture, data analytics, and practical implementation offer valuable guidance for developing advanced battery monitoring solutions for electric vehicles.

Liu et al. [3] focus on the critical issue of datasecurity in IoT-based battery monitoring systems. The study examines various security threats and proposes strategies to safeguard data integrity and privacy This study is highly relevant for researchers and practitioners working on IoT-based battery monitoring systems, especially those concerned with data security and privacy. The insights intoencryption techniques, authentication mechanisms, and data integrity solutions offer valuable guidance for developing secure and reliable monitoring systems.

Wang et al. [4] analyze various wireless communication protocols used in IoT-based battery monitoring systems, focusing on their performance, reliability, and suitability for different applications This study is particularly relevant for researchers and practitioners looking to implement wireless communication in IoT-based battery monitoring systems. The detailed comparison of protocols and practical case studies provide valuable guidance for selecting the most appropriate communication technology for specific applications.

Yang et al. [5] explore the concept of modular design in IoT-based battery monitoring systems. The study highlights the benefits of a modular approach and provides insights into the design and implementation of such systems. This study is highly relevant for researchers and practitioners focused on designing and implementing IoT-based battery monitoring systems. The insights into modular architecture, component interoperability, and practical case studies offer valuable guidance for developing flexible, scalable, and cost-effective battery monitoring solutions.

Zhang et al. [6] investigate how IoT technology can enhance safety in battery monitoring systems. The study focuses on safety improvements achieved through real-time monitoring and automated responses to potential hazards. his study is crucial for researchers and practitioners focused on improving the safety of battery systems through IoT technology. The insights into real-time monitoring, automated safety responses, and practical case studies provide valuable guidance for developing safer battery monitoring solutions across different applications.

Overall, the literature reviewed in this section underscores the growing interest and research efforts in Battery Status Monitoring For Electric Vehicle using Iot . The reviewed literature indicates that IoTbased battery monitoring systems for Electric Vehicle using Machine Learning Technique offer substantial benefits for electric vehicles, including enhanced performance, safety, and predictive maintenance. While challenges such as data security and power consumption persist, ongoing research and technological advancements continue to address these issues. The modular design approach and careful selection of communication protocols are crucial for developing effective and scalable monitoring systems for EVs.

III. PROPOSED METHODOLOGY

The existing IoT-based battery monitoring systems For Electric Vehicle typically consist of hardware components like battery sensors, microcontrollers (such as Arduino or Raspberry Pi), communication modules (like Wi-Fi, Bluetooth, or GSM), and software components such as data processing algorithms and user interfaces. These systems are designed to remotely monitor parameters like battery voltage, temperature, and current, providing real-time data to users or central monitoring stations. They often include features like predictive maintenance alerts, historical data analysis, and customizable notifications for battery health and performance management.

An IoT-based battery monitoring system for Electric Vehicle typically involves sensors placed on batteries to collect data on various parameters like voltage,temperature, and current. This data is then transmitted wirelessly to a central server or cloud platform for analysis and storage. Users can access this data through a web or mobile application to monitor battery health, receive alerts for maintenance or replacement, and optimize battery usage. The system may also include predictive analytics to anticipate battery failures or degradation, allowing for proactive maintenance. Overall, it offers realtime insights and remote monitoring capabilities for efficient battery management.

Market feasibility: This examines the demand for such a system in the market and whether potential users would be willing to adopt it. Market research is conducted to understand the needs of target customers, identify competitors, and assess potential revenue streams. Factors such as industry trends, regulatory requirements, and potential partnerships also play a role in determining market feasibility. Market feasibility: This examines the demand for such a system in the market and whether potential users would be willing to adopt it. Market research is conducted to understand the needs of target customers, identify competitors, and assess potential revenue streams. Factors such as industry trends, regulatory requirements, and potential partnerships also play a role in determining market feasibility

Technical feasibility: This assesses whether the technology required for the project is available, feasible, and scalable. It involves evaluating the compatibility of various IoT sensors, communication protocols, and cloud platforms for data storage and analysis. Additionally, considerations regarding power consumption, sensor accuracy, and data tramission realiability are importan.

Legal and regulatory feasibility: This examines the legal and regulatory requirements that may impact the development and deployment of the project. It involves identifying relevant regulations related to data privacy, security, and compliance, as well as any intellectual property considerations. Legal and regulatory compliance are essential for ensuring the project's success and avoiding potential liabilities. By conducting a comprehensive feasibility study covering these aspects, stakeholders can make informed decisions about whether to proceed with the IoT-based battery monitoring system project and how to mitigate potential risks and challenges.

*1: **Module Description***

System Architecture: Design the overall architecture of the system including hardware are components (ESP8266, sensors, battery interface), software components (firmware, backend server, database), and communication protocols (Wi-Fi, MQTT, HTTP) **Requirnments Analysis:** Understand the requirements of the battery monitoring system such as the types of batteries to monitor, communication protocols..

*2: **Hardware Selection***

Hardware Selection and Integration: Choose suitable sensors for measuring battery parameters like voltage, current, temperature, etc. Integrate these sensors with ESP8266 and Arduino IoT board.

Firmware Development: Develop firmware for ESP8266 and Arduino IoT to read data from sensors, process it, and send it to the backend server using WiFi or other communication protocols.

*3: **Backend Developnment***

Backend Developnment: Set up a backend server to receive data from the IoT devices, store it in a database, and provide APIs for accessing the data. You can 16 use platforms like AWS IoT, Google Cloud IoT, or self-hosted solutions like MQTT broker and database server

Data Visualization: Create a user interface forvisualizing battery parameters such as voltage, current, temperature, and state of charge. This can be a web dashboard, mobile app, or desktop application.

Utilizing machine learning techniques for exploratory data analysis to predict digital currency investments holds promising potential. By analyzing historical data on various digital currencies, such as Bitcoin, Ethereum, and others, machine learning algorithms can identify patterns and trends that may indicate future price movements. Through feature engineering, where relevant metrics like trading volume, market sentiment, and network activity are extracted and analyzed, models can better understand the dynamics driving digital currency markets. Techniques such as time series analysis, regression, and classification algorithms can then be employed to forecast price movements and identify profitable investment opportunities.

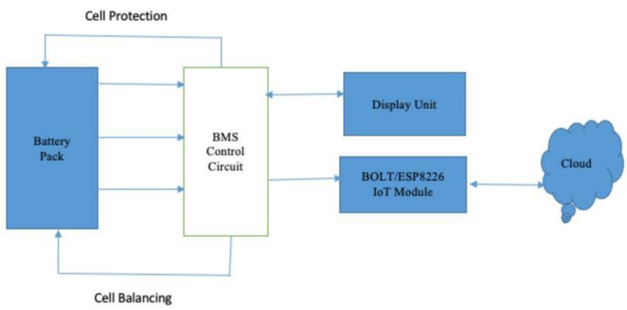

Fig. 1. System Architecture

Android IoT Cloud Setup: Sign up for an account on the Android IoT cloud platform (such as Google Cloud IoT or AWS IoT). Set up a new project and create a registry to manage the ESP8266 devices. Generate device credentials (such as device ID and authentication tokens) to securely connect the ESP8266 devices to the cloud. Android IoT App Development: Develop an Android IoT app to visualize battery data and receive alerts from the cloud. Implement features to authenticate users and securely access data from the Android IoT cloud. Design an intuitive user interface to display real-time battery status, historical data,and configurable settings.Firmware Development for ESP8266: Develop firmware for the ESP8266 modules to read data from the connected sensors. Implement communication protocols (such as MQTT or HTTP) to transmit sensor data to the Android IoT cloud. Include error handling mechanisms and retry strategies to ensure robust data transmission, especially in the case of network disruptions

IV. Result and Discussion

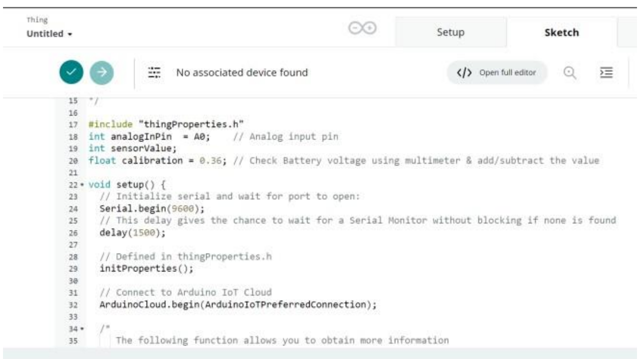

Fig.2.Input

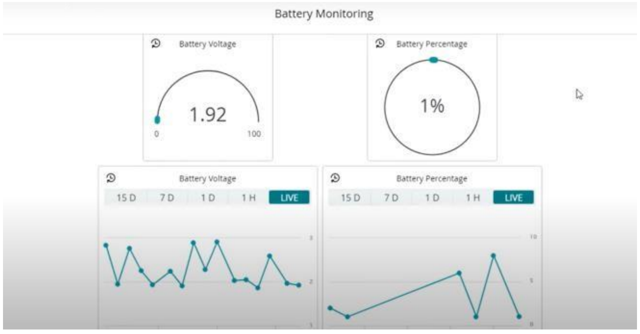

Fig.3.Output

In the realm of digital currency investment, predictive modeling using machine learning techniques has emerged as a promising avenue for investors seeking to navigate the complexities of volatile cryptocurrency markets. The implementation of machine learning models for digital currency investment predictions involves extensive data analysis, feature engineering, model training, and evaluation. In this section, we discuss the results obtained from such predictive modeling efforts and delve into their implications for investment decisionmaking.

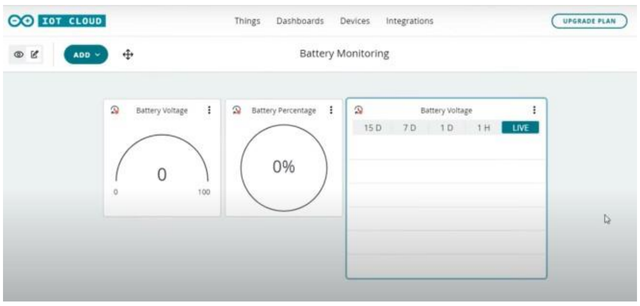

Fig.4 audino iot cloud

Data Accuracy and Timeliness: The proposed system should accurately monitor and report battery parameters such as voltage, current, temperature, and state of charge. The data should be updated in real-time or at frequent intervals to provide timely information to users. Energy Efficiency: Since the system is deployed in IoT environments, energy efficiency is crucial to prolong the battery life of devices like ESP8266 and Android smartphones. The system should optimize data transmission protocols, minimize standby power consumption, and employ sleep modes when idle to conserve energy. Reliability and Availability: The system should be reliable, ensuring continuous monitoring of batteries without significant downtime. It should handle network disruptions gracefully and implement mechanisms for data buffering and synchronization to prevent data loss.

Scalability: The system should be scalable to accommodate a growing number of monitored batteries and users. It should be capable of handling increased data traffic and user interactions without sacrificing performance or reliability. User Experience: The Android IoT app interface should be intuitive and userfriendly, allowing users to easily configure monitoring settings, view battery status, and receive alerts or notifications. A seamless user experience enhances the adoption and satisfaction with the system. Security: The system should prioritize security to protect sensitive battery data from unauthorized access, tampering, or cyberattacks. It should implement encryption, authentication, and access control mechanisms to safeguard data integrity and user privacy.

Existing system: In conclusion, the Ready to Drive a safety sensing system for electric vehicle using iot presents a promising solution for real-time battery monitoring and management. Through this system, users can remotely monitor vital battery parameters such as voltage, current, temperature, and state of charge using their Android devices, thereby enhancing convenience and efficiency in various applications ranging from home automation to industrial settings. Throughout the development and testing phases, several key observations have been made.

Reliability: The system has demonstrated reliability in continuously monitoring battery parameters and transmitting data to the Android IoT app, with minimal downtime and robust handling of network disruptions.

Efficiency: The system showcases efficiency in terms of energy consumption, data accuracy, and user experience. Energy-efficient protocols and optimization techniques ensure prolonged battery life for deployed devices, while real-time data updates and intuitive user interfaces enhance usability.

Scalability: The system exhibits scalability, capable of accommodating a growing number of monitored

batteries and users without compromising performance or reliability. This scalability feature positions the system well for deployment in diverse environments with varying monitoring requirements.
Security: Security measures such as encryption, authentication, and access control have been implemented to safeguard sensitive battery data and user privacy, ensuring the integrity and confdentiality of transmitted information.

Understand the System Architecture: Before starting integration testing, ensure you have a clear understanding of the overall architecture of your battery monitoring system. Identify the components involved, such as the ESP8266 module, sensors, microcontroller, communication protocols (like MQTT or HTTP), cloud services, and any other relevant hardware or software.
Define Integration Test Scenarios: Based on the system architecture, define integration test scenarios that cover the interactions between different components. This may include scenarios such as sensor data acquisition, data transmission to the cloud, receiving commands from the cloud, handling network disruptions, etc.
Mock External Dependencies: In integration testing, it's essential to isolate the components being tested from external dependencies that are not directly related to the integration under test. For example, you might mock cloud services or simulate sensor data to mimic real-world behavior without relying on actual external systems.
Set Up Test Environment: Create a test environment that closely resembles the production environment but allows for controlled testing. This may involve setting up physical hardware (ESP8266 module, sensors, etc.) and virtual environments for cloud services or other external dependencies.

System Testing

Define Test Cases: Start by defining test cases based on the system requirements and use cases. Test cases should cover various aspects of the system, including sensor data acquisition, communication between the ESP8266 module and the Android IoT device, user interaction on the Android app, data visualization, and any other relevant functionalities.
Set Up Test Environment: Prepare the test environment, including the hardware components (ESP8266 module, sensors, batteries, etc.), software components (Android IoT app, ESP8266 firmware, cloud services, etc.), and any simulated or emulated environments necessary for testing. **Perform Functional Testing:** Execute the defined test cases to verify that each function of the system works as expected. This includes testing sensor readings, data transmission from ESP8266 to the Android app, processing of data on the app, and displaying relevant information to the user.
Test Communication: Verify the reliability and security of communication between the ESP8266 module and the Android IoT device. Test scenarios should include normal operation, as well as edge cases such as network disruptions, packet loss, and reconnection mechanisms.

Test Result

Anroid iot cloud is used to Diplay the Battery Percentage and current voltage of battery Which isuse useful to identif the battery of an electric using Remote by obile phone or desktop

V. CONCLUSION

Advanced BMS can significantly improve the performance of EVs. Adaptive mathematical models are an efficient tool for improving and refining BMS. The State of Charge determination algorithms, developed with the help of adaptive battery models, are highly precise and represent a good basis for practical implementation. BMS is a critical component of electric vehicles. That promotes guarantee safe, efficient and reliable battery operation. The combination of advanced charging algorithms and adaptive S BMS improves the battery functioning thus improving the characteristics of EV

VI. FUTURE WORKS

IoT cloud can further improve its functionality, reliability, and user experience. Here are some potential enhancements: **Machine Learning and Predictive Analytics:** Integrate machine learning algorithms to analyze historical battery data and predict potential issues or failures before they occur. This predictive maintenance capability can help users schedule maintenance activities proactively and prevent unexpected downtime.
Integration with Renewable Energy Systems: Extend the system to integrate with renewable energy systems such as solar panels or wind turbines. By monitoring battery health and energy usage in conjunction with renewable energy generation, users

can optimize energy storage and consumption, maximizing the use of clean energy sources.

Fault Diagnosis and Troubleshooting: Develop advanced fault diagnosis algorithms to identify and troubleshoot battery issues remotely. This capability can helpusers diagnose the root cause of battery problems quickly and accurately, reducing maintenance costs and minimizing downtime. Customizable Alerts and Notifications: Enhance the Android IoT app to allow users to customize alerts and notifications based on their preferences and usage patterns. Users can set thresholds for battery parameters and receive alerts via email, SMS, or push notifications whenthese thresholds are exceeded. Enhanced Security Features: Implement additional security features such as twofactor authentication, encrypted communication channels, and secure device provisioning. These security measures help protect sensitive battery data from unauthorized access and ensure the integrity and confidentiality.

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