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IoT Based Wireless Electric Vehicles Charging System

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ABSTRACT

Reducing the availability of non-renewable sources and transitioning to renewable energy, such as solar power, is a crucial step toward a sustainable future. This shift can help decrease our dependence on fossil fuels and mitigate the environmental impact of energy production. Governments, businesses, and individuals are increasingly investing in renewable energy technologies like solar panels to harness the power of sunlight and reduce carbon emissions. In this project, the concept being discussed involves the wireless transmission of electric power using renewable energy sources, specifically solar panels. The global population growth and increased vehicle usage contribute to air pollution and environmental concerns. Electric vehicle charging stations play a vital role in mitigating this issue by promoting the adoption of electric vehicles (EVs.)

Keywords: Power Supply, Charging Cable, Connector, Control Panel, User interface.

I. INTRODUCTION

This project involves building an IoT-based system for wirelessly charging electric vehicles. We will establish two charging stations equipped with copper coils where electric cars can park for charging. To keep track of the charging process, we will create a website that can be accessed with a unique ID and password. Through the website, we can monitor how many cars are currently parked at the charging stations and check how long each vehicle has been charging and their time completion and also display money payment transactions. This setup offers a convenient and efficient way to manage electric vehicle charging, allowing station owners to keep tabs on the usage and ensure a smooth experience for EV owners. It combines wireless charging technology with online monitoring for better control and accessibility. The IoT-based Wireless EV Charging System is a new solution that uses wireless charging and IoT technology to create a smart charging network for electric vehicles. It gets rid of cords and plugs, making charging easier. 2 By connecting to smart grids, it helps manage energy use and reduces carbon emissions. This system can grow as more electric vehicles hit the road, and it provides useful data to make decisions and improve efficiency. Overall, it's a great way to modernize transportation and make it more environmentally friendly.

II. LITERATURE SURVEY

As per paper [1] "Wireless Charging System for Electric Vehicles" by Muhammad, Amjad, Muhammad Farooq-i-Azam, Qiang Ni, and Mianxiong Don presents a pioneering approach to electric vehicle charging, leveraging wireless technology for sustainable transportation solutions.

As per paper [2] "Why we need battery swapping Technology" authored by Vallera A.M, Nunes P.M, and Brito M.C, explores the necessity for battery swapping technology to enhance electric vehicle usability and sustainability, highlighting its potential to revolutionize energy storage and transportation infrastructure.

In paper [3], "Electric Vehicle Charging via Hybrid Power Sources" by Eltoumi et al., the Authorsexamine the feasibility and offer recommendations for using hybrid power sources, aiding sustainable transportation initiatives.

In paper [4], The project presents a single-phase wireless power transfer system with high-frequency AC link converter in the secondary, designed for three-phase applications, authored by Ali Reza Jafari, Amir Babaki, and Ali Zakerian.

As per paper [5], "On the Asymptotic Behavior and Parameter Estimation of a Double Sided LCC Compensated Wireless Power Transfer System" by Feng-Rung Hu and JiaSheng Hu, the project investigates the asymptotic behavior and parameter estimation techniques for a double sided LCC compensated wireless power transfer system. Real-time face detection and recognition achieved through Viola-Jones method. Software captures images, stores in database. Automated system detects person using three-phase methodology. [14]

According to paper [6], "Wireless Power Transfer using Domino Resonator for 110 kV Power Grid Online Monitoring Equipment" authored by Qu J, He L, Tang N, and Lee CK, the project focuses on utilizing wireless power transfer technology with a domino resonator for online monitoring equipment in 110 kV power grids. Pharmaceutical innovation faces challenges. Research merges quantum computing and machine learning to revolutionize drug discovery, simulation, and safety assessment for expedited progress. [13]

As per paper [7], Authors Mou X, Zhao R, and Gladwi presents the topic "Vehicle-to-Vehicle Charging System: Fundamentals and Design Comparison" for exploring the fundamental principles and comparing various designs in the context of vehicle-to-vehicle charging systems.

According to paper [8], "A Comprehensive Review of Wireless Charging Technologies for Electric Vehicle" authored by Aqueel Ahmad and Mohammad Saad Alam, the study provides a thorough overview of wireless charging technologies for electric vehicles.

In paper [9], "Optimizing the Energy Transfer with High System Efficiency in Dynamic Inductive Charging of EVs," authors KarakitsiosIoannis, PalaiogiannisFoivos, Markou Achilleas, and Hatziargyriou Nikos explore methods to optimize energy transfer and achieve high system efficiency in dynamic inductive charging of electric vehicles.

In paper [10], "Economic analysis on the use of wired and wireless recharging systems" by M. Longo, D. Zaninelli, G. Cipriani, the Authors examine thewired and wireless recharging systems offer viable and cost-effective solutions for various sectors, contributing to the advancement of sustainable energy practices.

Advancement in IOT technology helps us to use sensors technology in day to day life applications [11].

III. LIMITATIONS OF EXISTING WORK

By the comparative study of the proposed system, we have been recognized following limitations of the system as:

- Limited Grid Capacity
- Compatibility Issues
- Lack of Standardization

IV. PROBLEM STATEMENT

To design and develop semi-autonomous smart charging system for Electric Vehicles where in it can charge and display money payment transactions for an Electric vehicle with minimal user's interference with the help of IoT. To design an Android app that conveys the current State of Charge of the battery, alerts the user whenever the State of Charge goes beyond a threshold value, displays nearby charging stations and money transaction history of the whenever requested by the user.

V. PROPOSED SYSTEM

Here, in this section we have cover the detailed information of proposed system. Here we will see objectives of proposed system along with architecture, hardware and software requirements, applications.

A. Architecture

Following Figure represents Architecture of our proposed system

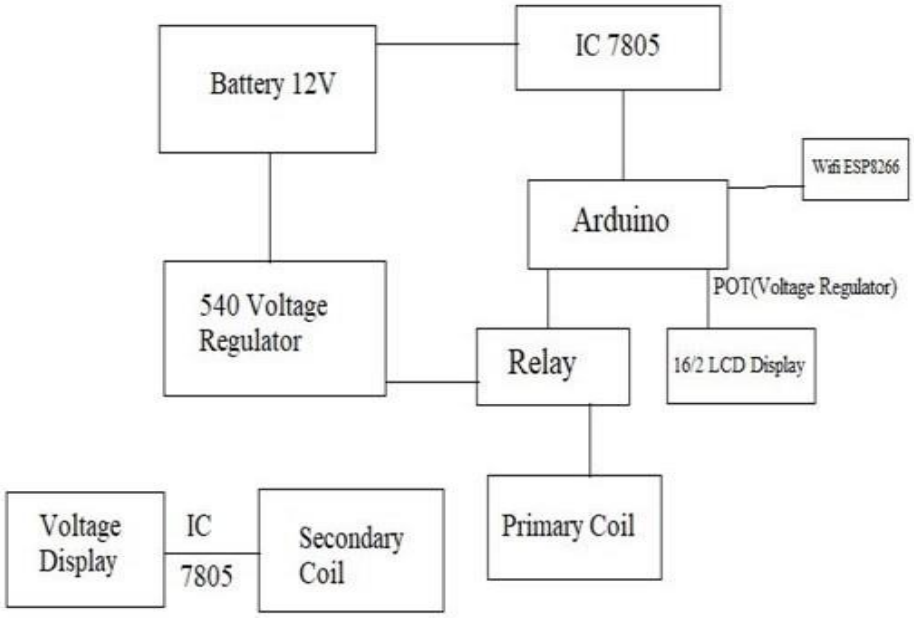

Figure 1: Architecture of EV Charging System

B. Architecture Description

The architecture includes a 12-volt battery regulated by an IC 7805, powering an Arduino microcontroller managing system functions and interacting with a relay for high voltage control. A 16x2 LCD display provides a user interface. Primary and secondary coils enable wireless charging. Sensor displays offer real-time data feedback,

while a WiFi ESP8266 module enables internet connectivity for remote monitoring and control. This setup encompasses wireless charging, data monitoring, and remote accessibility.

C. Objective

Following are objectives of our proposed system:

- Develop wireless charging infrastructure using IoT technology.
- Establish seamless communication between charging station, EV, and central management system.
- Implement secure and transparent billing mechanisms for users.

VI. PROPOSED SYSTEM

Here are the hardware and software requirements of our project:

- Operating System: Windows11
- Mobile Applications
- Payment and Billing Systems
- Programming language-C
- IDE-Arduino
- Battery 12Volt
- 16/2 LCD Display
- Integrated Circuit 7805
- Relay
- Arduino
- Wi-Fi ESP8266
- Voltage Regulation

VII. RESULT DISCUSSION

Here this section covers the result of implemented project.

Figure 2: Login Page

The login page enables secure access for users to monitor and manage electric vehicle charging, enhancing system security and efficiency.

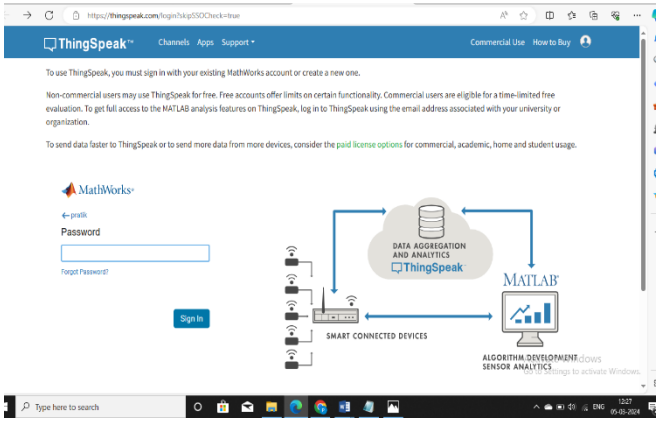

Figure 3: Login Page

The password page ensures secure access to the EV charging system, enhancing user Authentication and safeguarding sensitive data during operations.

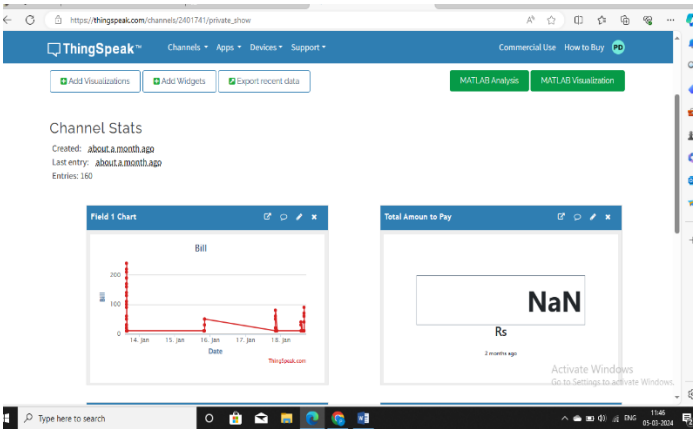

Figure 4: About Page

The channel status provides real-time updates on electric vehicle charging availability, while indicating when it was created and the timing of the last entry, ensuring efficient management of entries within the EV charging system.

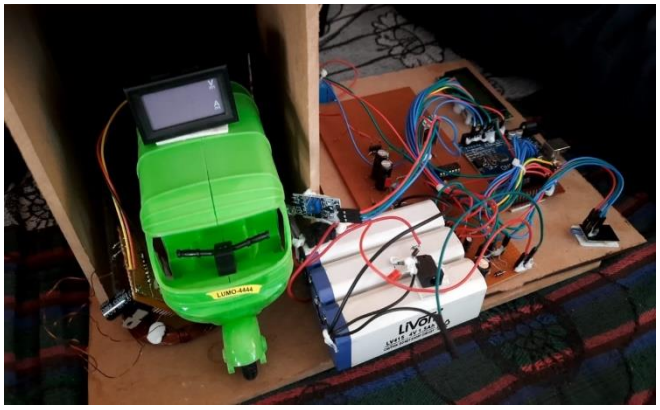

Figure 5: Hardware kit

This is the hardware kit of our IoT-based wireless EV charging system comprises essential components such as Arduino, Relay, IC7805, Voltage Display, 12V Battery, Voltage Regulator, WiFi-ESP8266, LCD, Copper Coils, etc.,

enabling seamless and efficient electric vehicle charging. It incorporates real-time sensor feedback and charging status display, ensuring user friendly and sustainable transportation solutions.

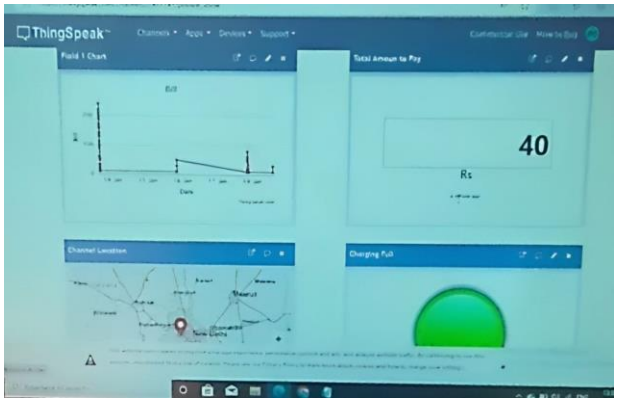

Figure 6: Final Page

Here is the comprehensive outcome of the EV-Charging System, featuring fully charged vehicles along with their complete details, billing information, and precise locations, ensuring a seamless and transparent charging experience for users.

Overview Of Proposed System

The IoT-based EV charging system integrates IoT technology for real-time monitoring and enhanced user experience, emphasizing sustainability and regulatory compliance. With scalable deployment and robust security measures, it addresses the increasing demand for convenient, eco-friendly charging solutions.

VIII. CONCLUSION

The conclusion regarding an electric vehicle charging system is that it offers efficient and convenient charging solutions for electric vehicles (EVs). This means that such systems are designed to effectively and conveniently provide the necessary electricity to charge EVs, making it easier and more practical for users to keep their electric vehicles powered up. Indeed, the statement emphasizes that electric vehicle charging systems offer multiple benefits.

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