



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

“Plug & Go EV Station”

Mrs. P. R. Patil

Srushti Koshti, Nachiket Bejagamwar, Amruta Patil, Gayatri Patil, Siddhi Raut Department of Computer Science and Engineering
D Y Patil College of Engineering and Technology, Kolhapur, India

Abstract: Electric vehicles (EVs) are becoming increasingly popular due to rising fuel costs and environmental concerns. However, the lack of a seamless charging experience remains a major hurdle in their widespread adoption. This paper presents "Plug & Go," a mobile application designed to streamline the EV charging process by providing real-time charging station availability, seamless payment integration, and user-friendly navigation. By leveraging modern software development approaches, including Agile methodology and cloud-based services, Plug & Go enhances user convenience and promotes sustainable transportation.

1. Introduction

1.1 Current Scenario

The growing popularity of EVs is driven by environmental consciousness, government incentives, and advancements in battery technology. However, many EV owners struggle with locating available charging stations, navigating complex payment systems, and managing charging sessions effectively. This disjointed experience discourages potential users from adopting EVs.

1.2 Problem Statement

Design and develop an Android application named “Plug & Go EV Station” to enable EV owners to locate available charging stations, manage their charging sessions, and handle payments efficiently, reducing wait times and enhancing user convenience.

1.3 Objectives

1. Provide real-time data on charging station availability.
2. Implement a secure and seamless payment system.
3. Ensure collaborations with charging providers for wider accessibility.
4. Deliver up-to-date pricing and compatibility information.
5. Enable users to save preferred charging locations and payment methods.

2. Requirement Analysis and Literature Survey

2.1 Research Contributions

- Study real-world charging habits and peak usage times.
- Implement AI-based routing for optimal station selection based on real-time conditions.

2.2 Literature Review

Study	Methodology	Drawbacks
ML-Based Forecasting for EV Demand	Machine learning algorithms for demand prediction	Grid scalability issues
IoT-Based Slot Locator	Real-time slot booking via IoT	Data security concerns
EV Charging Station Challenges	Study of charging infrastructures	Lacks user-centric payment solutions
International Charging Standards	Global interoperability study	No discussion on regional challenges
Grid Integration for EVs	Fast-charging and renewable energy focus	Lacks real-time booking systems

2.3 Life Cycle Model

The Agile Model was selected due to the dynamic nature of the project, allowing continuous user feedback, iterative enhancements, and smooth integration of APIs like **Google Maps, AWS IoT, and Stripe Payment Gateway**.

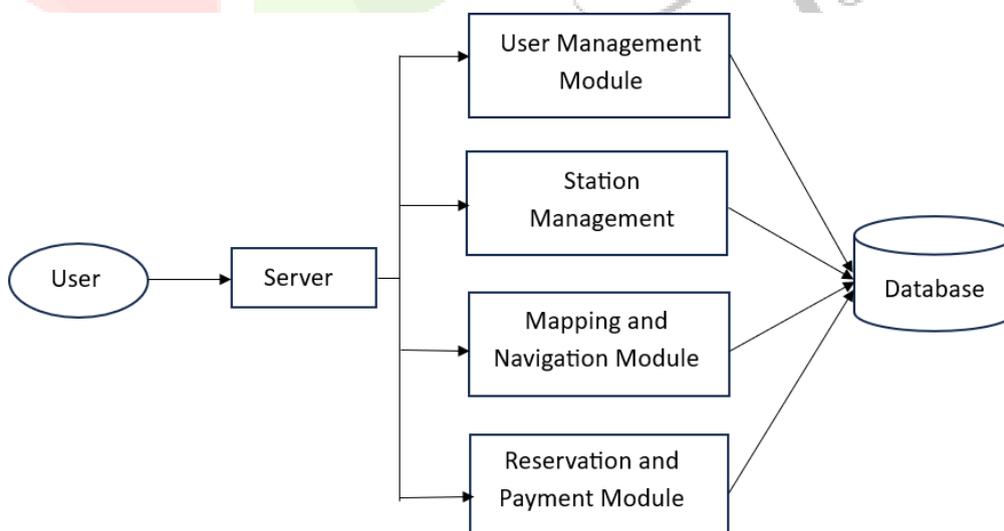
3. System Structure and Design

3.1 System Structure

Proposed system consists of:

- **User Interface:** Allows users to search, book, and pay for charging stations.
- **Backend Server:** Manages data storage, authentication, and real-time updates.
- **Database:** Stores user profiles, station details, and payment records.

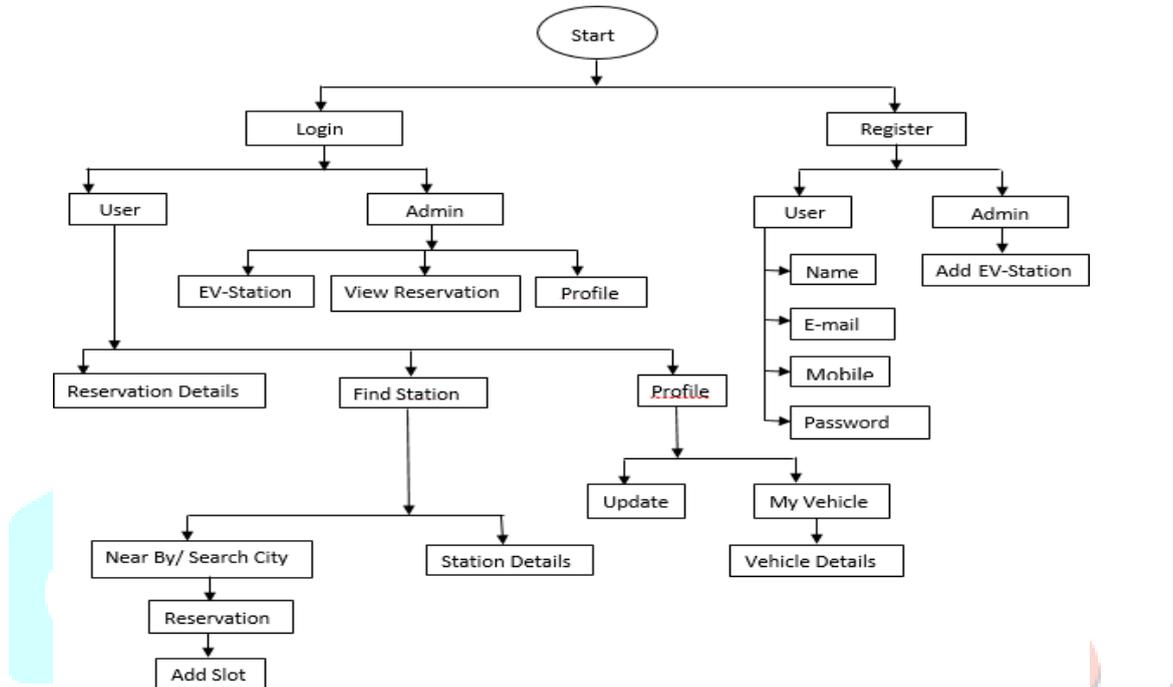
3.2 Block Diagram



3.3 Workflow

The workflow of the Plug & Go system follows these steps:

1. **User Login & Authentication:** Secure login with email verification.
2. **Station Search & Selection:** Users browse available charging stations.
3. **Slot Reservation:** Users book a charging slot in real-time.
4. **Payment Processing:** Secure payment is completed via integrated gateways.
5. **Charging Session Management:** Users monitor and control charging.
6. **Session Completion & Feedback:** Users receive notifications and provide feedback.



3.4 Flowchart & Modular Structure

- **Authentication Module:** Secure login, email verification, and password recovery.
- **Station Management:** Real-time updates, station availability, and pricing.
- **Reservation & Payment:** Slot booking and secure transaction processing.
- **Mapping & Navigation:** Google Maps integration for optimized routes.

4. Implementation & Technologies Used

4.1 Frontend Development

- **Languages & Frameworks:** React Native, Bootstrap, JavaScript
- **Features:** Responsive design, station filters, and real-time updates

4.2 Backend Development

- **Languages:** PHP, Java
- **Database:** MySQL for storing user and station data
- **Security:** Encrypted transactions & role-based access

4.3 Payment Integration

- **Methods:** UPI, Credit/Debit Card
- **Payment Gateway:** Razorpay8 API for secure transaction

5. Testing & Results

5.1 Test Cases

Test Case	Expected Result	Status
User Registration/Login	Successful login/signup	Pass
Searching Nearby Stations	Displays available charging stations	Pass
Slot Reservation	Successfully reserves a charging slot	Pass
Payment Processing	Secure transaction completion	Pass
Real-Time Notifications	Alerts for available slots and updates	Pass

6. Conclusion

Plug & Go is a comprehensive solution designed to simplify the EV charging experience by integrating station discovery, session management, and secure payments into a single platform. The system provides real-time updates on charging station availability, ensuring users can quickly locate an open station, reducing wait times and enhancing convenience. Users can seamlessly initiate, monitor, and control their charging sessions through the app, making the entire process hassle-free. Its user-friendly interface, built on advanced UX/UI principles, makes it accessible to all EV owners, regardless of technical expertise. The app's scalable backend infrastructure guarantees optimal performance as the user base grows, maintaining reliability and efficiency. Additionally, real-time notifications keep users updated on charging status, station availability, and payment confirmations, providing complete control and peace of mind. By addressing the key challenges of EV charging, Plug & Go enhances the overall user experience, promotes EV adoption, and contributes to a more sustainable future.

References

- Dr. Sarat Kumar Sahoo is a Professor at the Department of Electrical Engineering, Parala Maharaja Engineering College, Berhampur, Odisha, India.(2024), "Electric Vehicle Charging Stations"
- Ashish Kumar Karmaker, Md Alamgir Hossain, Hemanshu Roy Pota, Ahmet Onen, and Jaesung Jung (2023), "Energy Management System for Hybrid Renewable Energy-Based Electric Vehicle Charging Station," published in IEEE Access, vol. 11, pp. 27793-27805.
- K. V. Suhaskrishnan, V. Sruthy, and P. K. Preetha (2022), "Smart Grid Compatible Universal Electric Vehicle Charging Outlet to Boost India's EV Penetration Rate," presented at the 2022 IEEE 19th India Council International Conference (INDICON).
- Omar N. Nezamuddin, Clayton L. Nicholas, and Euzeli Cipriano dos Santos (2022), "The Problem of Electric Vehicle Charging: State-of-the-Art and an Innovative Solution," published in IEEE Transactions on Intelligent Transportation Systems, vol. 23, no. 5, pp. 4663-4673.
- Sakib Shahriarl, A. R. Al-Alil, (Life Senior Member, IEEE), Ahmed H. Osman2, (Senior Member, IEEE), Salam Dhoul, (Member, IEEE), and Mais Nijim3, (Member, IEEE) (2021), "Machine Learning-Based Forecasting for EV Charging Demand"
- Miss. Jyoti M. Kharade, Mr. Saurabh P. Jadhav (2020), "IoT Based Charging Slot Locator at Charging Station"