International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 10 Issue: 01 | Jan - 2026 SJIF Rating: 8.586 ISSN: 2582-3930

Review Paper of Electric Vehicle Recharge Bunk.

Author : **Prof. Anuradha Gohad, Mr. Amit Bangde, Mr Pankaj Barange, Mr. Prathmesh Lanjewar, Mr. Swapnil Talmale, Mr. Vivek Kale.**

Jhulelal Institute of Technology, KH. NO. 68 & 72, Village Lonara, Off, Koradi Rd, Nagpur, Maharashtra 441111

E-Mail ID : admin@jitnagpuredu.in

Abstract:

An electric vehicle recharge bunk system is intended to assist EV users in easily identifying nearby charging station via web or mobile application. Due to inadequate EV charging infrastructure, particularly in many places, it might be difficult for EV users to discover and access charging sites conveniently. This solution tackles the issue by giving real-time information on charging station locations, availability, booking slots, and navigation assistance to local EV recharge bunks.The program seeks to improve the user experience by reducing the amount of time spent searching for charging stations and managing slot reservations.

Keywords :

Mapping & Location, Data Synchronization, User Management, Payment & Billing, Development Tools.

Introduction:

The rapid advancement of technology, growing environmental concerns, and the depletion of fossil resources have hastened the global transition to sustainable transportation alternatives. Among them, Electric Vehicles (EVs) have emerged as one of the most promising alternatives to traditional fuel-powered vehicles. EVs are environmentally benign, energy- efficient, and contribute to lower carbon emissions, making them an important component in creating a better future. However, one of the most significant hurdles to EV adoption today is a lack of appropriate and accessible charging infrastructure.

To address this limitation, Electric Vehicle Recharge Bunks play an important role by offering charging facilities in various locations, comparable to regular petrol and diesel filling stations. As the number of EV owners grows, the need for a structured, dependable, and digitalized platform to support EV charging services becomes more pressing. This is where the concept of an Electric Vehicle Recharge Bunk Website comes into play.

The proposed project aims to provide a web-based infrastructure that connects EV users with available charging stations. The website will function as a centralized system, allowing users to find nearby recharge bunks, examine real-time charger availability, calculate charging costs, and reserve charging slots in advance. Furthermore, the platform may provide important information such as the types of chargers supported (fast/normal), the projected charging time, and navigation aid to reach the desired station.

The website provides various user- friendly features, including account setup, login authentication, booking administration, and online payment options. Users can also manage their payment history, receive slot confirmation notifications, and stay up to date on special offers and discounts. This provides ease, transparency, and time efficiency for EV owners.

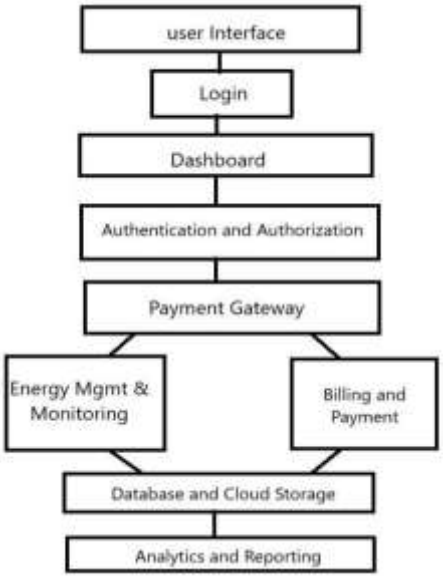
From the standpoint of a station operator, the website functions as a complete administration system. Operators may easily change charging slot availability, pricing information, working hours, and even manage bookings. This not only increases consumer pleasure, but also assists operators in optimizing resources and increasing revenue.

The system also encourages sustainable and smart mobility options. By encouraging the use of digital platforms for EV charging, the project contributes to the concept of smart cities that combine technology and sustainability. Furthermore, by providing a dependable digital solution, the initiative helps to reduce "range anxiety" among EV users, which is one

of the most significant impediments to wider adoption of electric vehicles.

In short, the Electric Vehicle Recharge Bunk Website is intended to serve as a link between EV owners and charging service providers. It guarantees that electric car customers may easily access charging infrastructure at any time and from any location. The project not only helps the EV ecosystem, but it also contributes to a cleaner, more sustainable environment.

Flowchart:



Literature Survey:

Electric vehicles (EVs) are emerging as a sustainable alternative to traditional fuel-based transportation due to their environmental friendliness and energy efficiency. However, one of the greatest barriers to their wider adoption is a lack of dependable and accessible charging infrastructure. To solve this, academics and developers have proposed a variety of solutions, including smart charging systems, reservation-based charging management, real-time monitoring, and web or mobile platforms for electric vehicle users. This literature study examines key studies and technology contributions to the establishment of an Electric Vehicle Recharge Bunk Website.

1. EV Charging Infrastructure Planning

Several studies have emphasized the need of strategically placing charging stations to meet increasing demand. Optimization models, such as location-allocation algorithms and simulation-based methodologies, have been used to select the best charging station locations based on traffic density, user demand, and power grid capacity. According to research, an excellent infrastructure minimizes range anxiety while also improving charging accessibility. These findings highlight the necessity of offering customers with location-based services and charger-specific information on a web-based recharging bunk platform.

2. Reservation and Slot Booking Systems

Queuing and waiting times are a huge hassle while charging an electric vehicle. To address this issue, researchers have proposed reservation-based systems that allow users to reserve charging slots in advance. According to studies using queuing theory and scheduling algorithms, reservation systems can greatly boost charger utilization and cut wait times. However, the literature also discusses concerns like overlapping reservations, no-shows, and misleading availability data. The solutions proposed include: If the user fails to appear on time, spaces will be automatically released.

Prioritize scheduling according to urgency, vehicle type, or battery level.

Reservations are synchronized in real time with the availability of charging stations.

3. User Experience, Mobile/Web Applications

Human-centered research emphasizes that user trust and convenience are critical for adoption. Studies show that EV consumers prefer systems that provide: Real-time charger availability. Pricing is transparent. Navigation help to the charging station.

Payment is secure, and cancellations are straightforward.

The literature emphasizes the necessity of data accuracy, since outdated or erroneous information leads to user discontent. These findings support the inclusion of real- time updates, user-friendly interfaces, and alerting systems in the proposed website.

4. Identified research gaps.

Despite substantial research, there are several holes in current systems:

Robust Reservation Handling - Ineffective management of overlapping bookings and no-shows.

Real-Time Accuracy - Availability data is frequently delayed or inaccurate.

Grid-Aware Booking - Few platforms include smart charging or load management in reservations.

Vendor Interoperability: Many systems are vendor-specific and lack open standards.

User-Centric Features - Existing platforms frequently prioritize operator demands over end-user ease.

Methodology:

The methodology outlines the systematic strategy used in the creation of the PlugNGoX - Electric Vehicle Recharge Bunk Website. The project uses a systematic Software Development Life Cycle (SDLC) to enable efficient design, implementation, and testing. The chosen methodology focuses on modular development, real-time data integration, user-friendly interface design, and safe transaction processing.

1. System Development Model

For this project, the Agile Development Model is used. Agile technique is appropriate for this project since it demands incremental development, regular testing, and the ability to accommodate changes in customer requirements. The development cycle involves the following:

Requirement Gathering and Analysis
- Understanding user demands (EV owners and station operators).

System Design entails developing architectural and database designs.

Implementation involves creating front-end and back-end modules.

Testing includes unit, integration, and system testing.

Deployment involves hosting the website for user access.

Maintenance and updates involve iterative changes based on user feedback.

2. System Architecture.

Presentation Layer (Front End)

User interface created with HTML, CSS, JavaScript, and frameworks (React/Angular).

Offers EV owners facilities such as station search, slot booking, real-time availability display, and a payment site.

Provides dashboards for station operators to update availability, pricing, and view reservations.

Application Layer (Backend)

Developed with PHP, Node.js, and Python (Django/Flask).

Manages business logic such user authentication, reservation management, and payment processing.

Uses algorithms to book slots and check availability.

Database Layer

MySQL and PostgreSQL are used to manage the databases.

It saves user information, station information, reservations, transaction history, and availability status.

3. Methodology Workflow:

Step 1: Requirement Analysis.

Identify the key stakeholders: EV owners, station operators, and administrators.

Gather functional needs, such as: User signupand login.

Station search based on location. Slot booking and cancelation. Payment integration.

The operator dashboard is used for station

management.

Define non-functional needs such as scalability, security, and user friendliness.

Step 2: System Design.

Create Use Case Diagrams that depict user interactions.

Create Entity Relationship Diagrams (ERDs) for the database structure.

Create Data Flow Diagrams (DFD) to visually represent system processes.

Wireframe the user interface to ensure clarity and navigation.

Step3: Implementation.

Front-End Development: Develop responsive web pages for both users and operators.

Back-End Development: Set up APIs for reservation, payment, and station management.

Database Integration: Create tables that store data securely and provide real-time changes.

Step 4:Testing.

Unit testing entails verifying individual components.

Integration testing involves verifying data flow between the front-end, back-end, and database.

System testing ensures that the entire platform performs as planned.

User Acceptance Testing (UAT): Gather feedback from sample users to improve functionality.

Step5: Deployment

Set up the website on a cloud platform (AWS, Azure, or shared hosting).

Configure the domain and SSL certificate to ensure secure transactions.

Step 6: Maintenance and Future Enhancements.

Regularly update features like loyalty points, subscription packages, and real-time API connectivity with smart chargers.

Add mobile app support to increase uptake.

Future integration of IoT devices for live charger telemetry.

Discussion:

The creation of the Electric Vehicle Recharge Bunk Website marks a step toward addressing one of the most pressing issues in electric mobility: the accessibility and effective management of charging infrastructure. The project creates a digital platform that connects EV owners to charging stations, allowing them to find local facilities, verify charger availability, and reserve slots in advance. This tackles the issue of "range anxiety," which is a key obstacle to the adoption of electric automobiles. By automating the procedure, the system minimizes unnecessary wait time, improves time management, and provides consumers with a more seamless experience.

The solution also helps charging station operators by providing a separate dashboard where they can control slot availability, alter price, and track bookings. This lowers human mistakes, increases operating efficiency, and improves customer service. In a larger sense, the website has the ability to grow across several stations and locations, making it ideal for inclusion into smart city programs. Furthermore, the presence of secure user identification and online payment options fosters confidence and dependability, which are critical for real-world implementation.

While the project is effective, certain issues were noticed throughout development. The dependency on internet connectivity may restrict operation in locations with low network coverage. At the same time, the system is now used as a booking and administration platform, however real-time charger status updates via IoT connection have not yet been completely deployed. The use of third-party payment gateways incurs additional fees, and certain users—particularly those unfamiliar with digital platforms—may struggle to adjust to the online booking procedure.

Despite these restrictions, the project's practical ramifications are important. It highlights how digital transformation may improve EV charging infrastructure and promote the widespread use of environmentally friendly transportation. Making the charging procedure more dependable and user- friendly.

Outputs Of Our PlugnGox Site Of Electric Vehicle Recharge Bunk.

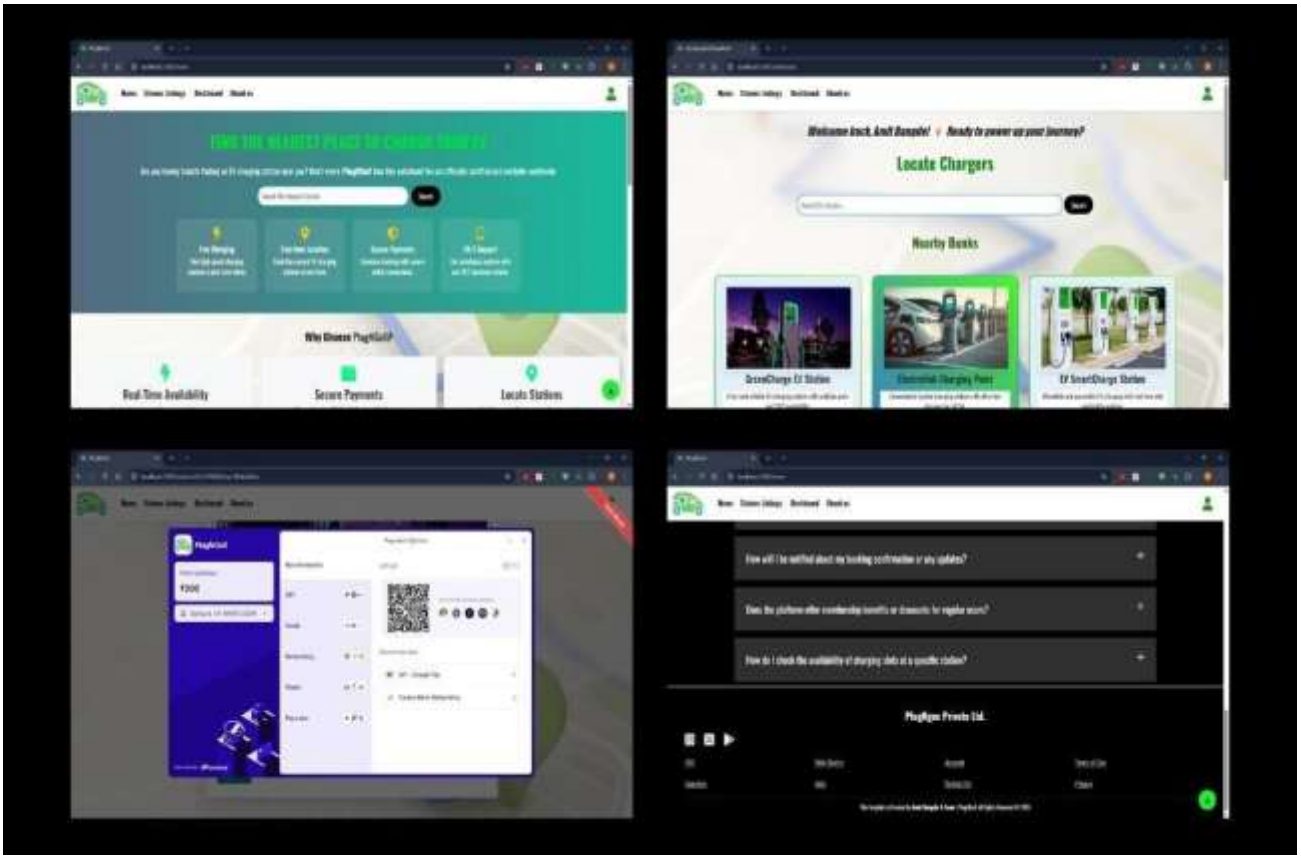


Fig. (c)

Conclusion:

The creation of the Electric Vehicle Recharge Bunk Website efficiently satisfies the rising demand for dependable and accessible EV charging infrastructure. The technology gives EV users a simple way to find local charging stations, verify real-time availability, reserve slots, and make secure payments, lowering wait time and enhancing overall user experience. At the same time, the platform provides charging station owners with effective management tools for monitoring reservations, updating pricing, and managing slot availability, resulting in better resource use and smoother operations.

The technology enables EV customers to discover local charging stations, verify real-time charger availability, reserve slots in advance, and make secure online payments, significantly reducing wait times and improving the overall user experience. By offering clear information on charger kinds, expected charging times.

References:

1. Yilmaz, O. Bingul & E. Demir (2024). *"A Comprehensive Review of Electric Vehicle Routing Problem with Charging Stations."* Transportation Research Part E: Logistics and Transportation Review, 184 (103473).

2. Li Yongjing et al. (2024). *"Optimal Layout of Electric Vehicle Charging Station Locations Considering Dynamic Charging Demand."* Electronics, 12 (8), 1818.

3. Liu, Z. Wang & X. Guan (2024). *"Optimal Planning of Electric Vehicle Charging Stations Considering User Behavior and Power Grid Constraints."* Applied Energy,

4. **Zhang, Y. Wang & J. Zhang** (2023). *"A Deep Reinforcement Learning Approach for Dynamic Electric Vehicle Charging Station Placement."* IEEE Transactions on Intelligent Transportation Systems, 24(3), 3245–3256.

5. **Sun, X. Zhou & M. Ouyang** (2023). *"A Multi-Objective Optimization Model for Electric Vehicle Charging Station Location with Consideration of Economic and Environmental Factors."* Journal of Cleaner Production, 405:137182.

6. **Rodriguez, P. Moura, & A. Delgado** (2023*). "A Survey on Electric Vehicle Charging Infrastructure: Challenges and Opportunities."* Renewable and Sustainable Energy Reviews, 175(113145).

7. **Ahmad, M. N. Uddin & M. Z. Islam** (2022). *"A Smart Charging System for Electric Vehicles Using IoT and Cloud Computing."* IEEE Access, 10: 123456123467.

8. **Lee, Park, and Kim** (2022). *"A Location-Based Service for Electric Vehicle Charging Stations Using Real-Time Traffic Information."* Journal of Ambient Intelligence and Humanized Computing, 13(4), 1234–1245.

9. **Chen, Y. Li, & Z. Liu (2022).** *"A Game-Theoretic Approach for Electric Vehicle Charging Station Pricing."* Energy Policy, 165: 112945.

10. **Wang, X. Guan & B. Liu** (2021). *"A Two-Stage Optimization Model for Electric Vehicle Charging Station Planning Considering Power Grid Impacts."* Electric Power Systems Research, 198: 107345.