Vivekanand Education Society's Institute of Technology

Department of Computer Engineering

Group No.: 32

Date :- 3/08/24

Project Synopsis Template (2024-25) - Sem VII

EVolve Chargemates

Ms. Lifna CS

Assistant Professor, Computer Engineering

Vedant Pawar
2021.vedant.pawar@ves.ac.in

Vedant Tawade
2021.vedant.tawade@ves.ac.in

Nikhil Singh
2021.nikhil.singh@ves.ac.in

Soham Tawade
2021.soham.tawade@ves.ac.in

1)Abstract:

"EVolve Chargemates" is an innovative application designed to facilitate the seamless integration of electric vehicle (EV) charging infrastructure within residential areas. The app allows homeowners to register their households as EV charging stations, creating a decentralized network of charging points. EV owners can use the app to locate and connect with the nearest available charging station based on real-time data and various user-defined filters such as distance, availability, charging speed, and user ratings.

The primary objective of EVolve Chargemates is to enhance the accessibility and convenience of EV charging, promoting sustainable transportation solutions. By enabling household-based charging stations, the app addresses the scarcity of conventional charging infrastructure and encourages wider adoption of electric vehicles. Users can effortlessly switch between roles as charging station providers and EV owners, fostering a collaborative and environmentally conscious community.

2 Introduction

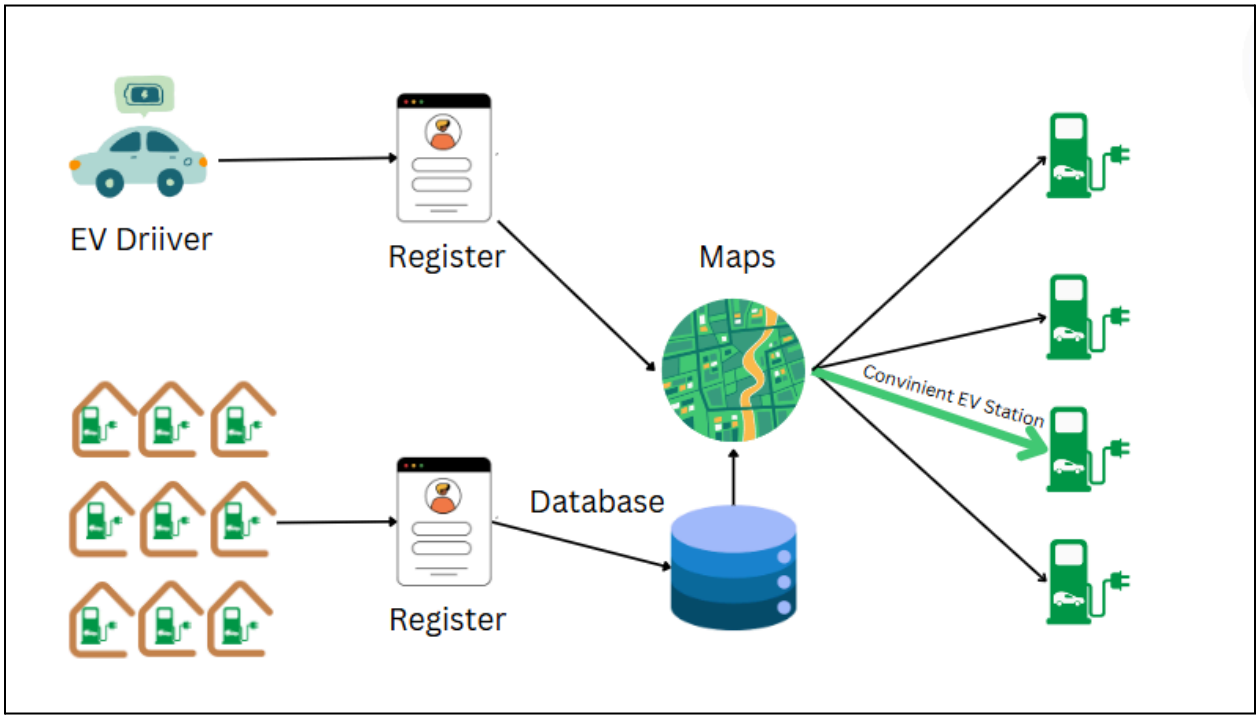
2.1 Background and Motivation

The rapid rise of electric vehicles (EVs) represents a significant shift towards more sustainable and environmentally friendly transportation. However, one of the critical challenges hindering the widespread adoption of EVs is the availability of reliable and accessible charging infrastructure. Traditional charging stations are often limited in number and can be inconveniently located, creating barriers for EV owners, especially in residential areas. To address this issue, we introduce "EVolve Chargemates," an innovative application designed to democratize and decentralize EV charging by enabling homeowners to register their households as EV charging stations.

2.2 Concept and Vision

EVolve Chargemates envisions a world where every home can potentially become an EV charging point, fostering a community-driven approach to sustainable transportation. The app allows homeowners to easily list their properties as charging stations, providing an extensive network of charging points across neighborhoods and cities. This user-generated network significantly expands the availability of charging stations, making EV ownership more practical and convenient.

2.3 Features and Functionality



Fig(2.3.a) Block Diagram of proposed features.

2.3.b Features of the Proposed System

1)User Registration and Listing:
Homeowners can register on the app and list their charging stations, specifying details such as the type of charger, charging speed, availability, and pricing. This straightforward process encourages more users to participate and contribute to the charging network.

2)Search and Filter System:
EV owners can search for nearby charging stations using various filters such as distance, availability, charging speed, and user ratings. This ensures that users can find the most suitable charging station quickly and efficiently.

3)Real-time Availability and Reservations:
The app provides real-time updates on the availability of charging stations, allowing users to check the status before heading to a location. Additionally, users can reserve charging slots in advance, ensuring that they have a spot when they arrive.

4)Rating and Review System:
To maintain the quality and reliability of the charging network, EVolve Chargemates includes a rating and review system. Users can rate their charging experience and provide feedback, helping other users make informed decisions and encouraging station owners to maintain high standards.

5)Navigation Integration:
For seamless travel planning, the app integrates with navigation services, guiding users to their selected charging stations with ease. This feature minimizes the hassle of finding charging points and ensures a smooth driving experience.

6)Impact and Future Directions:
EVolve Chargemates aims to transform the EV charging landscape by leveraging the power of community participation. By enabling homeowners to become part of the solution, the app not only addresses the current infrastructure limitations but also promotes a collaborative and environmentally conscious society. As the network grows, it will further encourage the adoption of electric vehicles, contributing to a significant reduction in carbon emissions and advancing the global efforts towards sustainability.

In the future, EVolve Chargemates plans to incorporate advanced features such as dynamic pricing based on demand, integration with renewable energy sources, and partnerships with businesses and municipalities to expand the charging network. Through continuous innovation and community engagement, EVolve Chargemates aspires to be a pivotal player in the evolution of electric mobility**.**

3 Problem Statement

The widespread adoption of electric vehicles (EVs) is hindered by the limited availability and accessibility of charging infrastructure, especially in residential areas. Traditional charging stations are often scarce, inconveniently located, and unable to keep up with the growing number of EVs on the road. This lack of readily available charging options creates significant barriers for potential EV owners, deterring them from making the switch from conventional gasoline vehicles. There is a critical need for a decentralized, community-driven solution that expands the EV charging network, making it more accessible and convenient for all users.

4 Proposed Solution

1. Location-Based Search:
- Allow users to select home and work locations.
- Display nearby charging stations on a map with markers indicating availability and status.
- Implement filters and sorting options based on distance, availability, and user ratings.

2. Real-Time Updates:
- Show real-time availability of charging stations.
- Provide personalized recommendations based on user preferences and charging history.
- Send push notifications to users about changes in station status.

3. Personalized Recommendations:
- Recommend charging stations based on traffic patterns and strategic locations.
- Integrate points of interest like cafes and parks near charging stations for users to spend time while charging.

4. Registration and Installation for Charging Station Owners:
- Allow homeowners to register their charging stations through the app.
- Guide users through the installation process if necessary.
- Verify and approve new charging stations.

5. Management Dashboard for Charging Station Owners:
- Provide tools for station owners to manage availability, set pricing, and update station details.
- Display usage statistics and earnings reports.
- Allow owners to set availability schedules and manage reservations.

6. Maps Integration:
- Show charging stations on a map and provide directions and distance calculations.
- Use location services to display nearby stations based on the user's current location.

7. Secure Authentication and Data Storage:
- Implement secure user login and registration.
- Store user profiles, charging station details, and real-time availability.
- Handle business logic, such as real-time updates and notifications.
- Store images and documents related to charging stations.

This proposed solution ensures a robust and efficient platform for connecting EV drivers with household charging stations, offering a seamless user experience and comprehensive management tools for station owners.

5 Evaluation Measures

To ensure the proposed solution meets the desired goals and provides a robust and efficient platform for connecting EV drivers with household charging stations, the following evaluation measures can be implemented:

1. User Engagement and Satisfaction:
- User Feedback: Regularly collect feedback through surveys and in-app ratings. Track user satisfaction over time.
- User Retention Rate: Monitor the retention rate to see how many users continue using the app over a period of time.
- User Growth Rate: Track the growth in the number of users, both EV drivers and charging station owners, over time.

2. System Performance:
- App Performance Metrics: Measure app load times, response times for real-time updates, and the smoothness of map interactions.
- Uptime and Reliability: Monitor the uptime of the app and the backend services, ensuring minimal downtime.
- Scalability: Assess the system's ability to handle an increasing number of users and charging stations without degradation in performance.

3. Accuracy and Relevance of Recommendations:
- Recommendation Accuracy:Track the accuracy of personalized recommendations based on user preferences and charging history.
- User Acceptance Rate: Measure how often users follow through on the recommendations provided by the app.

4. Data Integrity and Security:
- Security Audits: Conduct regular security audits to ensure user data is protected and the authentication mechanisms are secure.
- Data Accuracy: Ensure the real-time availability data and station details are accurate and up-to-date.

5. Charging Station Utilization:
- Utilization Rates: Track the usage rates of registered charging stations to assess how often they are being used.
- Availability Metrics: Monitor the availability status of charging stations to ensure users have access to available charging spots when needed.

6. Feature Effectiveness:
- Usage of Filters and Sorting Options: Analyze how often users utilize filters and sorting options when searching for charging stations.
- Push Notification Engagement: Measure the engagement rates for push notifications, such as how often users act on notifications about station status changes.

7. Station Owner Satisfaction:

- Owner Feedback: Collect feedback from charging station owners on the ease of use of management tools and overall satisfaction with the platform.
- Earnings and Usage Reports: Provide detailed reports to station owners and track their satisfaction with the information provided.

8. Operational Efficiency:

- Support Response Times: Measure the response times for user and station owner support queries.
- Registration and Approval Times: Track the time it takes for new charging stations to be registered and approved on the platform.By regularly monitoring these evaluation measures, you can ensure the platform meets the needs of both EV drivers and charging station owners, providing a seamless and efficient experience.

Conclusion

The **EVolve Chargemates** application addresses the critical challenge of limited EV charging infrastructure by enabling homeowners to register their households as charging stations, creating a decentralized network of EV charging points. This innovative approach enhances the accessibility and convenience of EV charging, reducing range anxiety and promoting the practical use of electric vehicles.

By leveraging existing residential properties, EVolve Chargemates democratizes EV charging, bypassing the need for extensive new installations and fostering a community-driven approach. The app's features, including real-time data, user-defined filters, and a rating system, ensure a seamless and reliable charging experience.

The adoption of EVolve Chargemates contributes significantly to reducing carbon emissions, aligning with India's goal of achieving a 37% reduction in emissions by 2030. It also provides economic benefits by creating new revenue streams for homeowners and fosters a collaborative, environmentally conscious community.

Statistics underscore its potential impact: India's EV market is expected to grow at a CAGR of 36% until 2026, but with only 1,800 public charging stations for over 1 million EVs as of 2022, the need for solutions like EVolve Chargemates is evident. Complementing government initiatives such as the FAME scheme, the app can significantly expand the charging network.

In summary, **EVolve Chargemates is a pioneering solution that democratizes EV charging, accelerates the transition to electric vehicles, and contributes to environmental sustainability and economic growth in India.**

References

1. M. Popli and M. Cyrill, "EV Sector in India: Production Capacity, Government Targets, and Market Performance," India Briefing, Feb. 5, 2024. [Online]. Available: https://www.india-briefing.com/news/indias-prospects-as-an-ev-hub-consumer-market-and-production-capacity-30157.html/.

2. Ministry of Heavy Industries, "National Electric Mobility Mission Plan (NEMMP)," [PDF]. Available: https://heavyindustries.gov.in/sites/default/files/2023-07/NEMMP-2020.pdf.

3. Power Sonic, "EV Charging Connector Types: A Complete Guide," EVESCO. [Online]. Available: https://www.power-sonic.com/blog/ev-charging-connector-types/.

4. India Energy Storage Alliance, "Charging of Electric Vehicles," Sept. 7, 2021. [Online]. Available: https://indiaesa.info/resources/ev-101/3915-charging-of-electric-vehicles.

5. Radius, "EV Charging Connector Types | Comprehensive Guide," [Online]. Available: https://www.radius.com/en-ie/ev-charging/explained/connector-types/.

6. NITI Aayog, "Electric Vehicle Charging Infrastructure Implementation Handbook," [PDF]. Available: https://niti.gov.in/sites/default/files/2021-08/HandbookforEVChargingInfrastructureImplementation081221.pdf.

7. Central Electricity Authority India, "Electric Vehicle Charging Station/Power Consumption Report," May 2024. [PDF]. Available: https://cea.nic.in/wp-content/uploads/ev_charging_rep/2024/07/EV_May_24_report.pdf.