VHELP: VEHICLE SUPPORT SYSTEM WITH REAL-TIME TRACKING

Project Reference No.: *49S_BE_1361*

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Keywords:
Real-Time Tracking, GPS-Based System, Roadside Assistance, MERN Stack, Location-Based Services.

Introduction:

1. VHelp (Vehicle Support System with Real-Time Tracking) is a full-stack web application designed to help travelers during highway emergencies such as vehicle breakdowns and fuel shortages. It provides a centralized platform that connects users with nearby mechanics, petrol bunks, and towing services using live GPS location.
2. The system displays service providers based on proximity, ensuring quick access to help. Users can also adjust the search radius if no nearby services are available. Service providers can register their details, including experience, charges, and location. When a user sends a request, providers receive real-time notifications.
3. Once accepted, users can track the provider's live location along with the estimated time of arrival (ETA). The platform also allows users to upload vehicle images for better issue understanding. It is built using the MERN stack for scalability and efficient performance. Real-time communication is handled using WebSockets, and maps are integrated using LeafletJS. The system includes role-based authentication for secure access. Overall, VHelp enhances safety, reduces response time, and provides reliable roadside assistance. assistance.

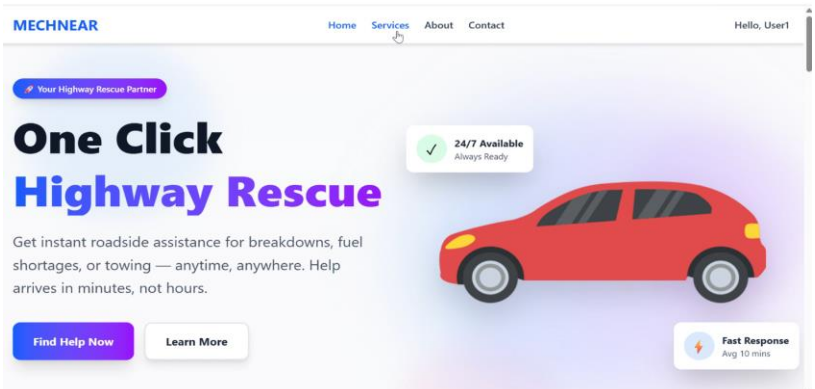

Figure 1: Home Page Interface of VHELP

Objectives:

1. To develop a web-based platform for providing quick and reliable roadside assistance during vehicle emergencies.
2. To enable users to find nearby mechanics, petrol bunks, and towing services using real-time GPS location.
3. To provide real-time tracking of service providers along with estimated time of arrival (ETA) for better transparency.
4. To facilitate direct communication between users and service providers and allow features like vehicle image upload for improved service quality.

Methodology:

1. The VHELP system is developed using a three-tier architecture (frontend, backend, database) to ensure scalability and performance.
2. The Frontend is built with React.js, offering a responsive interface, map visualization using Leaflet.js, and communication via REST APIs.
3. The Backend uses Node.js and Express.js to manage business logic, authentication, service requests, and provider matching, with JWT-based role authentication for users, providers, and admins.
4. MongoDB is used as the database, supporting geospatial queries to locate nearby services efficiently. The system uses GPS for user location detection and allows automatic radius expansion if no providers are found. Service requests are stored and sent to providers in real time, and upon acceptance, ETA is calculated and live tracking is enabled using WebSockets (Socket.io). It also supports vehicle image uploads and includes an admin module for provider verification, ensuring safety and reliability.

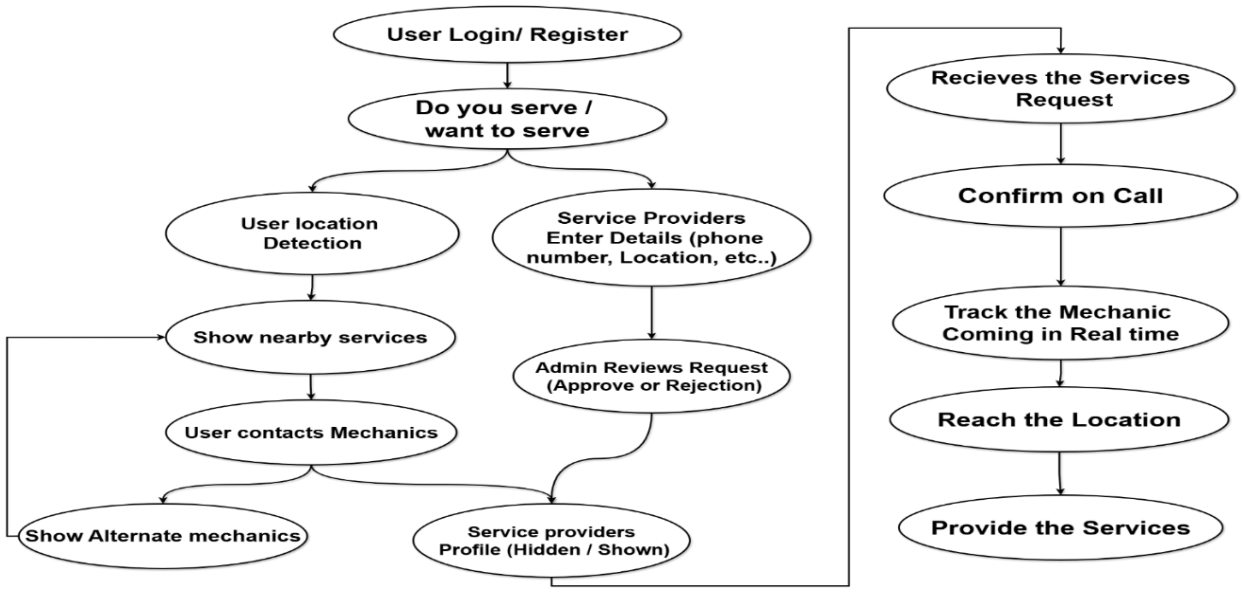

Figure 2: VHELP System Workflow Diagram (User–Service Provider Interaction Flow)

The VHELP system was successfully developed to provide real-time and reliable roadside assistance. It accurately detects user location and identifies nearby service providers, with dynamic radius expansion ensuring help is always available. The system supports quick request handling, real-time tracking, and accurate ETA, improving transparency and user

trust. An admin module verifies service providers, enhancing safety and reliability. Performance testing showed stable operation with fast response times, and user feedback confirmed ease of use and effectiveness. Overall, VHELP reduces response time, improves safety, and offers a scalable solution for real-world highway emergencies.

conclusion Vhelp: vehicle support system with real-time tracking provides quick roadside help for vehicle problems and fuel needs. Using real-time location, it connects users with nearby mechanics, towing services, and petrol bunks, shows arrival time, allows live tracking, and direct communication between users and service providers.

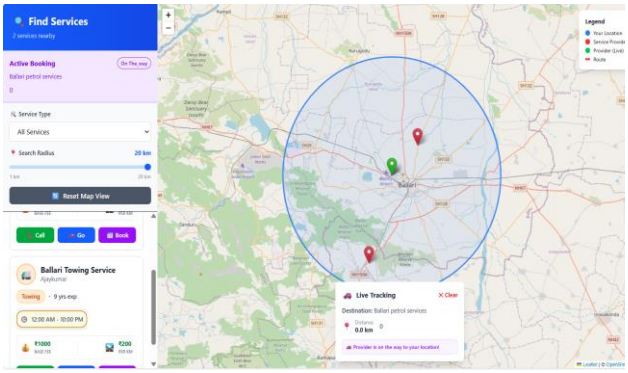

Figure 3: Real-Time Service Locator Interface (Map-Based Provider Tracking System)

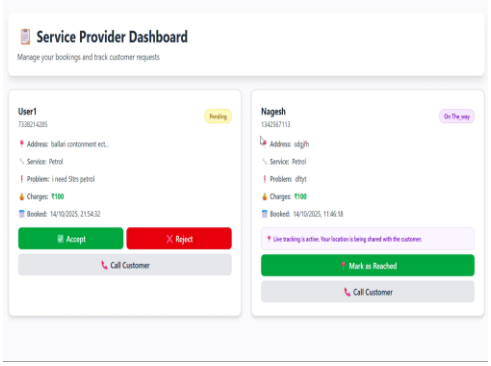

Figure 4: Service Provider Dashboard (Request Management & Live Tracking Interface)

Working Model vs Simulation/Study:

The VHELP project is developed as a working web-based application rather than a simulation or purely theoretical study. It includes a functional frontend, backend, and database integration, allowing real-time interaction between users, service providers, and administrators. The system supports live location detection, service provider search, request handling, and real-time tracking features. It has been tested in a practical environment using browsers and devices, demonstrating its real-world applicability as a deployable solution for roadside assistance.

Project Outcome & Industry Relevance:

1. The VHELP system provides a practical solution for real-time roadside assistance by integrating GPS, real-time tracking, and web technologies. It significantly contributes to society by improving safety for travellers, especially on highways and in remote areas where immediate help is difficult to access.
2. The system reduces response time during emergencies, minimizes risks caused by vehicle breakdowns, and lowers dependency on unsafe or unreliable manual methods. It helps prevent accidents and enhances confidence among users by providing verified service providers and live tracking.
3. From an industry perspective, VHELP can be applied in transportation, logistics, emergency services, and smart city infrastructure. It can be adopted by automobile service companies and government agencies to improve public safety and service efficiency.

4. Technically, the project demonstrates the use of modern tools like the MERN stack, REST APIs, WebSockets, and geospatial queries. Overall, VHELP offers a scalable, socially impactful solution with strong potential for real-world deployment and future enhancements.

Project Outcomes and Learnings:

1. Developed a fully functional real-time roadside assistance platform connecting users with nearby service providers.
2. Successfully implemented GPS-based location services and geospatial queries for accurate service discovery.
3. Achieved real-time tracking and communication using WebSockets for improved transparency and efficiency.
4. Gained practical experience in full-stack development using the MERN stack (React.js, Node.js, Express.js, MongoDB).
5. Learned secure authentication using JWT and efficient database management techniques.
6. Improved understanding of system design, debugging, and performance optimization.
7. Enhanced teamwork, problem-solving skills, and ability to develop scalable real-world applications.

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Future Scope:

The future scope of this project includes:

1. Develop mobile applications (Android & iOS) for better accessibility.
2. Integrate with government/emergency services for wider reach and reliability.
3. Implement AI-based ETA prediction and route optimization.