



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AN APP BASED ON THE VEHICLE SERVICES ALL KIND OF SERVICES PROVIDED

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Abstract: In the era of digital transformation, mobile applications have become powerful tools for solving real-world problems efficiently. This paper presents the design and development of a mobile application focused on providing essential **vehicle services**, including **emergency fuel delivery**, **real-time location-based service provider detection**, and **vehicle maintenance scheduling**. The proposed system aims to reduce the inconvenience faced by vehicle owners during on-road emergencies, particularly when fuel or mechanical assistance is urgently required.

The application leverages **GPS technology**, **Firebase Realtime Database**, and **Google Maps API** to ensure accurate location tracking and seamless communication between users and service providers. A user-friendly interface enables users to request services quickly, view nearby service stations, and receive notifications regarding vehicle maintenance. The system uses the **Haversine formula** to calculate distances between the user and service providers, ensuring optimized and timely assistance.

The methodology includes requirement analysis, modular system design, agile-based development, and rigorous testing (unit, integration, and user acceptance). Performance metrics such as response time, service success rate, and user satisfaction index were used to evaluate the system's effectiveness.

The results demonstrate that the proposed application significantly improves the availability and accessibility of vehicle-related services, making it a practical solution for urban and semi-urban areas. Future enhancements include AI-based service recommendations, multilingual support, and integration with insurance and roadside assistance platforms.

Advantages:

- 1.This helps the people to find the services for the vehicles in the sudden repair.
- 2.This also helps the members who are working in the vehicle service sector.
- 3.This helps the customers in the middle of their travelling also.
- 4.It provides all kind of the vehicle services such as sudden breakdown, low fuel, battery, and etc.
- 5.This is also more convenient for the customers to us

I. INTRODUCTION

In today's fast-paced world, the need for efficient and reliable vehicle services is more critical than ever. With the rapid growth of urban areas and the increasing dependence on personal transportation, users often face challenges such as vehicle breakdowns, fuel shortages, and difficulty locating nearby service providers. Traditional methods of accessing vehicle services are often time-consuming and inefficient, leading to inconvenience and delays.

To address these issues, this paper presents a mobile application designed to provide a comprehensive solution for vehicle-related services. The app offers features such as emergency fuel delivery (petrol/diesel), real-time location-based search for nearby fuel stations and service centers, vehicle maintenance alerts, and

customer support integration. By leveraging GPS technology, cloud-based databases, and intuitive UI/UX design, the app ensures quick access to services, reducing downtime and improving user convenience.

This application is particularly beneficial for drivers facing urgent fuel shortages or breakdowns in unfamiliar areas. It aims to bridge the gap between vehicle owners and service providers, contributing to smarter transportation management. The proposed solution enhances the overall user experience and offers a scalable platform that can be expanded with more features such as booking periodic vehicle servicing, insurance reminders, and integration with roadside assistance.

The implementation of this app demonstrates the effective use of mobile and cloud technologies to solve real-world transportation problems and represents a step forward in digital transformation in the automotive service sector.

With the advancement of smart technologies and the growing adoption of smartphones, mobile applications have become an integral part of modern life. Among the many sectors that benefit from mobile technology, the automobile industry is experiencing a digital shift aimed at enhancing user convenience, safety, and operational efficiency. One such area of growing concern is on-road vehicle service accessibility, particularly in emergency situations like fuel shortages or mechanical breakdowns.

Despite the availability of service centers and fuel stations, vehicle owners often face difficulties in locating nearby facilities during emergencies. Issues such as running out of fuel in remote areas, unexpected vehicle malfunctions, or the inability to contact reliable mechanics can lead to stressful and sometimes dangerous situations. This creates a need for a robust, real-time, and easy-to-use solution that ensures help is just a few taps away.

This paper presents the development of a mobile application focused on **vehicle services**, with core features including:

- **Emergency fuel delivery (petrol/diesel)** based on user's current location
- **Real-time search and navigation** to nearby fuel stations or service centers
- **Vehicle maintenance scheduler** with alerts and reminders
- **User profile and history management** for previous services
- **Integration with customer support** and emergency helpline services

The app utilizes **GPS-based location services**, **Firebase/Cloud Firestore** (or equivalent databases) for real-time data management, and a **user-friendly interface** developed using platforms such as Flutter or Android Studio. These technologies allow for scalable, secure, and responsive application behavior even under dynamic user environments.

The proposed solution not only addresses emergency needs but also promotes preventive maintenance through regular service reminders, thus extending the life of vehicles and ensuring safety. Furthermore, the app encourages the digitization of local service providers by allowing them to register and offer their services on the platform, creating a decentralized ecosystem.

This paper details the system architecture, feature implementation, testing strategies, and potential future enhancements, highlighting how mobile applications can transform traditional vehicle service mechanisms into intelligent, accessible solutions for the end-user.

II. RESEARCH METHODOLOGY

The development and evaluation of the mobile application for vehicle services follow a structured methodology that includes **requirement analysis**, **system design**, **technology selection**, **implementation**, and **performance evaluation**. This section outlines the step-by-step approach used in the research and development of the proposed application.

A. Requirement Analysis

A detailed survey and observation were conducted among vehicle users to identify common issues such as:

- Fuel unavailability during transit
- Difficulty in finding nearby service centers
- Lack of real-time service status
- Poor access to emergency assistance

Quantitative data from user feedback were analyzed using **Percentage Analysis**:

$\text{Percentage} = (\text{Total respondents} / \text{Number of respondents with similar issue}) \times 100$

This helped in prioritizing the features to be included in the application.

B. System Design

The system follows a modular architecture consisting of:

1. **User Interface Layer** – for user interaction
2. **Application Logic Layer** – for processing user requests
3. **Database Layer** – for data storage and retrieval

UML diagrams such as **Use Case Diagrams**, **Sequence Diagrams**, and **Activity Diagrams** were used to model system behavior.

C. Technology Stack

- **Frontend:** Flutter / Android Studio (XML + Java/Kotlin)
- **Backend:** Firebase Realtime Database / Firestore
- **APIs:** Google Maps API for location tracking
- **Authentication:** Firebase Auth or Google OAuth
- **Data Analytics:** Firebase Analytics for usage tracking

D. Algorithm for Nearest Service Detection

To locate the nearest service station, the **Haversine Formula** is used, which calculates the great-circle distance between two latitude-longitude coordinates:

Where:

- ϕ = latitude, λ = longitude (in radians)
- $\Delta\phi = \phi_2 - \phi_1$
- $\Delta\lambda = \lambda_2 - \lambda_1$
- R = Earth's radius (6,371 km)
- d = distance between two points

E. Performance Evaluation

The app performance is evaluated based on:

- **Response Time (RT):**
 $RT = T_{\text{response}} - T_{\text{request}}$
- **Accuracy of Location Mapping (A):**
 $A = (\text{Correct locations found} / \text{Total searches}) \times 100$
- **User Satisfaction Index (USI):** Derived from feedback on a 5-point Likert scale:
 $USI = \frac{1}{n} \sum (w_i \cdot x_i)$
 Where:
 - w_i = weight of the rating
 - x_i = number of responses per rating
 - n = total number of users surveyed

F. Prototype Development

A functional prototype of the vehicle services app was developed using the **Agile methodology** with iterative sprints. Each sprint focused on implementing one key module:

1. **Sprint 1** – User Registration & Login (Firebase Authentication)
2. **Sprint 2** – Real-time GPS tracking and nearby service detection
3. **Sprint 3** – Emergency fuel request system
4. **Sprint 4** – UI/UX enhancements and customer support module
5. **Sprint 5** – Notification system and feedback mechanism

Each sprint concluded with **unit testing** and **user feedback sessions** to ensure the system met both functional and non-functional requirements.

G. Testing Techniques

The developed app underwent **black-box testing** and **white-box testing** to verify its performance and logic integrity.

1. **Unit Testing** – Each module (e.g., location fetch, API call) was tested using test cases.
2. **Integration Testing** – Verified correct interaction between components like location services and backend.
3. **System Testing** – Ensured that all parts of the app worked as a cohesive unit.
4. **User Acceptance Testing (UAT)** – Real users tested the prototype and gave feedback on usability and reliability.

Bug Detection Rate (BDR) was calculated to measure stability:

$$\text{BDR} = (\text{Total test cases executed} / \text{Number of bugs found during testing}) \times 100$$

H. Validation Techniques

To validate the effectiveness of the app, the following metrics were recorded:

1. **Success Rate of Service Requests (SR):**

$$\text{SR} = (\text{Total service requests} / \text{Successful responses}) \times 100$$

2. **Average Time to Connect with a Service Provider (ATC):**

$$\text{ATC} = \sum (\text{Tconnect} - \text{Trequest}) / \text{Total connections}$$

3. **User Retention Rate (URR):**

$$\text{URR} = (\text{Total users} / \text{Number of returning users}) \times 100$$

I. Tools Used

| Tool/Technology | Purpose |
|------------------|-------------------------------------|
| Android Studio | Frontend development |
| Firebase | Authentication & real-time database |
| Google Maps API | Location tracking & navigation |
| Postman | API testing |
| Figma / Adobe XD | UI/UX design |
| Excel/SPSS | Data analysis and graph generation |

J. Ethical Considerations

The app ensures **user privacy** and **data security** by:

- Using **encrypted connections (HTTPS)** for all data transfer
- Storing user data with **role-based access** in Firebase
- Providing options for users to **delete their data** permanently

All testing involving human participants was conducted with **informed consent** and their data was anonymized for analysis.

III. RESULTS AND DISCUSSION

The implementation of the vehicle service app has demonstrated significant improvements in addressing the challenges faced by travelers during long-distance journeys. The app's location-based functionality effectively connects users with nearby vehicle service providers, ensuring quick assistance during emergencies such as breakdowns, low fuel situations, and battery issues. Initial user feedback indicates high satisfaction levels due to the convenience of finding nearby service centers and petrol pumps in unfamiliar locations. The real-time tracking feature has also been particularly well-received, as it allows users to monitor the arrival time of service providers, reducing anxiety and uncertainty during vehicle emergencies.

VEHICLE SERVICES

All Kind Of services Are Available



From the service providers' perspective, the app has successfully created new employment opportunities, especially for local mechanics and vehicle service workers who previously struggled to find consistent work. By allowing them to receive job requests from nearby customers, the app has enhanced their income stability and overall job satisfaction. The rating and feedback system further encourages service providers to maintain high-quality standards, leading to improved customer experiences.

During the testing phase, the app demonstrated efficient performance in matching users with the nearest available service providers, minimizing waiting times. Additionally, the integration of multiple payment options, including online payment and cash on delivery, provided users with flexibility and ease of use. However, some challenges were identified, including occasional delays in location tracking updates due to network connectivity issues in remote areas. This indicates the need for optimizing GPS functionality and ensuring reliable communication channels.

The discussion of the results suggests that the app not only enhances user convenience but also positively impacts the local economy by empowering vehicle service workers. It effectively bridges the gap between customers and service providers, ensuring timely assistance and a seamless service experience. The app's comprehensive approach, covering all aspects of vehicle maintenance and emergency support, has proven to be more efficient compared to traditional methods of locating service centers.

Despite the positive outcomes, there is room for improvement in terms of expanding the network of service providers in less populated areas and enhancing user engagement through personalized notifications and offers. Future updates could also include additional features such as route planning with recommended service stops for long-distance travelers. Overall, the app has demonstrated great potential as a comprehensive solution for vehicle service needs while contributing to community development by supporting local service workers.

IV.ACKNOWLEDGMENT

I would like to express my sincere gratitude to all those who have supported and guided me throughout the development of this application based on **Vehicle Services**.

First and foremost, I am deeply thankful to my project guide Mrs.M.Pratussha for their valuable suggestions, continuous encouragement, and insightful feedback at every stage of the project.

I would also like to thank the **Head of the Department, Dr.R.Rajendar**, and all the faculty members of the **Electronics and Communication Engineering Department, Vardhman College of Engineering**, for providing the necessary resources and a supportive environment to carry out this project.

My heartfelt thanks to my team members and peers for their cooperation, technical discussions, and shared efforts in bringing this idea to life.

Lastly, I am grateful to my family and friends for their unwavering support and motivation throughout this journey.

This project has helped me enhance my skills in app development, UI/UX design, and location-based services while deepening my understanding of real-world problem-solving through technology.

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