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Online Garage Management System: A Mobile Application Using Flutter

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Abstract: *The paper focuses on developing an Online Garage Management System, designed to enhance the efficiency of garage operations and improve customer experiences. With a user friendly mobile platform, it allows customers to locate nearby garages, book services, and track their vehicle's status in real-time. Garage operators can manage appointments, inventory, and service records while receiving alerts for vehicle maintenance. Built using Flutter for a seamless cross-platform interface, the system ensures real-time data synchronization, communication through Firebase. This solution addresses the challenges of rising vehicle numbers and manual record-keeping, offering a modern, automated approach to streamline garage operations and reduce customer wait times. Future developments aim to include predictive vehicle health diagnostics and advanced payment methods. The system's overall goal is to increase transparency and operational efficiency, benefiting both garage operators and vehicle users.*

Keywords: Garage, Flutter, Dart, Fire-Base, UI/UX, Service Management, Inventory, Map API, etc.

I. INTRODUCTION

In today's developing era, the number of vehicles is increasing almost all over the world. So providing efficient service to each vehicle user is a challenging task for garages in the future. Vehicle users have to stand in queue to get service. Using this application the user can locate the nearby active garages / mechanics and communicate with them to get service in need. It is a mobile platform with administrators, principals, receptionists, and supervisors as users. The admin will provide other users access to particular modules. The users must log in and control the system's activity. The supervisor should be able to examine the garage's inventory of vehicle spares. Users can see which cars are presently being maintained and which ones need to be alerted for servicing. The user will also be able to record the hours spent at the mechanic shop.

The device can also look for car spare components that the garage has to provide. The user interface was created using Flutter. It has a user-friendly online interface. Mobile applications are having a progressively more significant role in our day-to-day lives. Ever since November 2016, there has been more network traffic made by mobile devices (48.19%) compared to desktops or laptops (47%). To dispense it to most of the users, a mobile application needs to familiarize itself with two independent platforms which are Android and iOS.Flutter is a cross-platform framework that targets developing high-performance mobile applications. Flutter was publicly released in 2016 by Google. Firebase provides tools for tracking analytics, reporting and fixing app crashes, and creating marketing and product experiments.

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II. SCHEDULING AND ALGORITHMIC APPROACHES

To ensure seamless and real-time coordination between users, garage operators, and administrative processes, Online Garage Management Systemadopts a highly optimized, event-driven architecture. The scheduling mechanism is divided into modular tasks, each handled asynchronously through Flutter's non-blocking architecture and Firebase's real-time data synchronization.

1. **Appointment Scheduling Algorithm:**
   - A token-based scheduling mechanism is used to assign service slots dynamically.
   - Requests are queued and assigned based on garage availability, service type, and estimated duration.

2. **Inventory Synchronization and Billing Logic:**
   - Real-time billing is handled by aggregating service actions per session.c

3. **Reactive Interface Updates:**
   - UI components follow a reactive pattern, automatically updating with Firestore snapshot listeners.
   - Customer and garage dashboards reflect live service status, parts used, and technician notes.

III. LITERATURE REVIEW

Table 1: Literature Survey Table

Sr. No.	Authors	Title	Journal/ Conference	Volume/ Issue	Year
1	Er. Swati Ganar, Gulhasan Siddiquee, Attaullah Khan, Soyab Anwar	E-Garage Management System	IOSR Journal of Engineering (IOSRJEN)	38-41	April 2019
2	Ambika Patidar, Sharayu Dosalwar, Tanishq Varshney	An Effective Garage Management System Web Application for Customer Service	International Journal of Computer Application	Vol. 183, No. 31	2021
3	Mr. Harshavardhan P, Mr. Yashas S Gowda, Mr. Balaram M	Garage Management System	International Research Journal of Modernization in Engineering Technology and Science	Vol. 5, Issue 7	July 2023
4	Manoj Kumar, Dayanand Kumar	Manoj Kumar, Dayanand Kumar	IJSRD - International Journal for Scientific Research & Development	Vol. 10, Issue 1	2022

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5	Shrivatsa Hebbar, Vinodraj, Pawankumar Shetty, Ashwin Bhat, Sangeetha Harikantra	An Efficient Web Application For Customer Service For Garage Control Systems	International Journal of Creative Research Thoughts (IJCRT)	Vol. 10, Issue 7	July 2022
6	Sonali Pawar, Maruf Shaikh, Sneha Shejwal, Ayush Kumar Kamble, Laxman Gore	GARAGE MANAGEMENT APPLICATION	International Research Journal of Modernization in Engineering Technology and Science	Vol. 4, Issue 5	May 2022
7	Aakanksha Tashildar, Nisha Shah, Rushabh Gala, Trishul Giri, Pranali Chavhan	Application Development Using Flutter	International Research Journal of Modernization in Engineering Technology andScience	Vol. 2, Issue 8	August 2020
8	Pankaj Chougale, Vaibhav Yadav, Dr. Anil Gaikwad	Firebase - Overview and Usage	International Research Journal of Modernization in Engineering Technology and Science	Vol. 3, Issue 12	Dec 2021
9	Shivam Jadaun, Rajeev Kumar Singh, Rohit Kumar, Krishna Kant Agarwal	Analysis of Cross Platform Application Development Over Multiple Devices using Flutter & Dart	International Journal of Recent Technology and Engineering (IJRTE)	Vol. 12, Issue 1	May 2023
10	Thomas C. G., A. Jayanthila Devi	A Study and Overview of the Mobile App Development Industry	International Journal of Applied Engineering and Management Letters	Vol. 5, No. 1	June 2021

IV. PROPOSED SYSTEM DESIGN

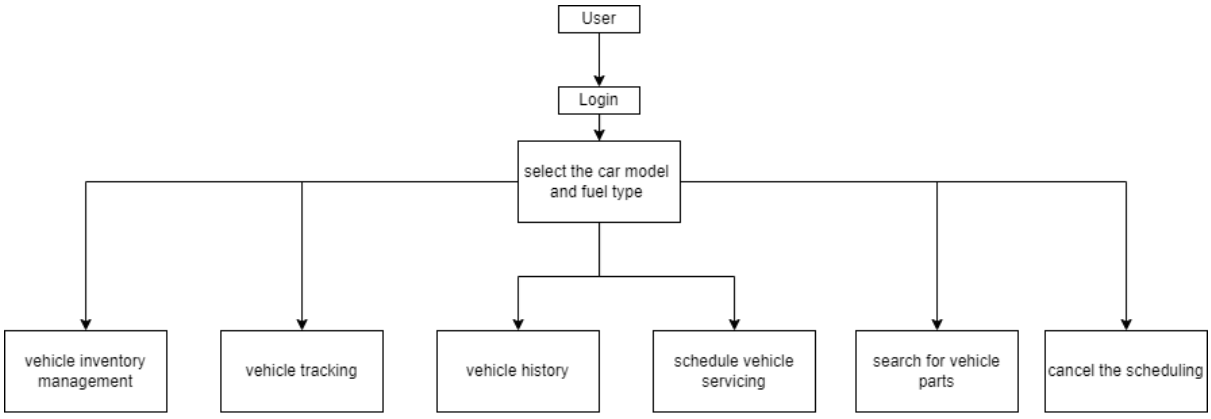

Figure 1: User Architecture

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The flowchart represents a car service management system where:

1. User logs into the system.
2. After logging in, the user selects the car model and fuel type to specify their vehicle.
3. Based on this selection, the user can:
   - Manage vehicle inventory.
   - Track the vehicle's location.
   - View vehicle history.
   - Schedule vehicle servicing.
   - Search for vehicle parts.
   - Cancel scheduled services if needed.

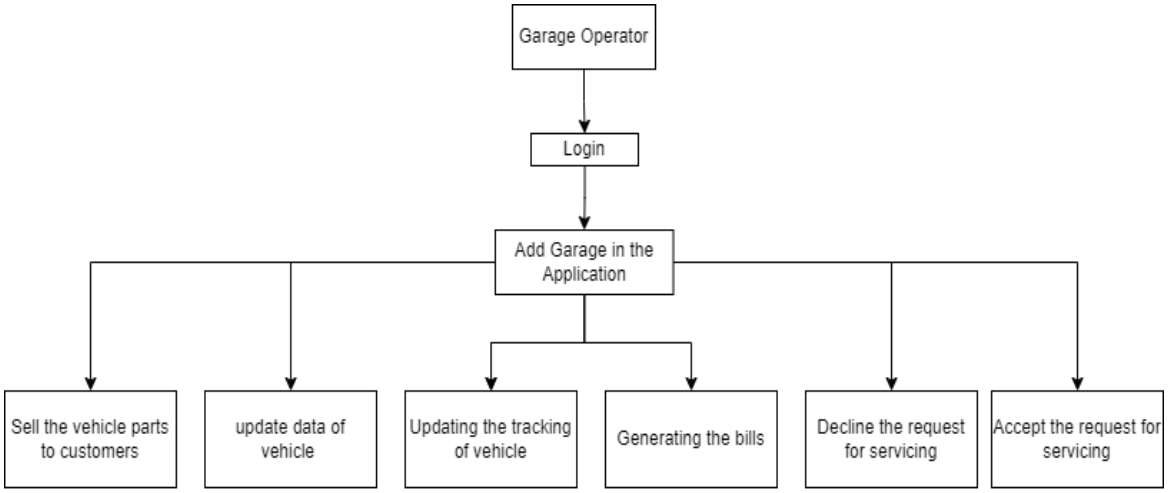

Figure 2: Garage Operator Architecture

The flowchart outlines the process flow for a Garage Operator within a car service management system:

1. Garage Operator logs into the system.
2. After logging in, the operator can add the garage to the application to manage services.
3. The operator then has several options:
   - Sell vehicle parts to customers.
   - Update vehicle data to keep information current.
   - Update vehicle tracking to monitor the vehicle's location or status.
   - Generate bills for services rendered.
   - Decline or accept requests for servicing based on availability or other criteria.

V. SOFTWARE REQUIREMENTS SPECIFICATION

- **Functional Requirements:**
  - Real-time booking and cancellation
  - Inventory and customer service logs

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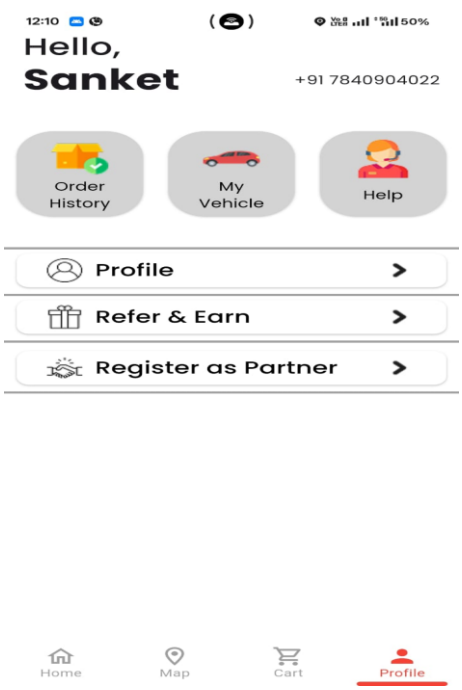
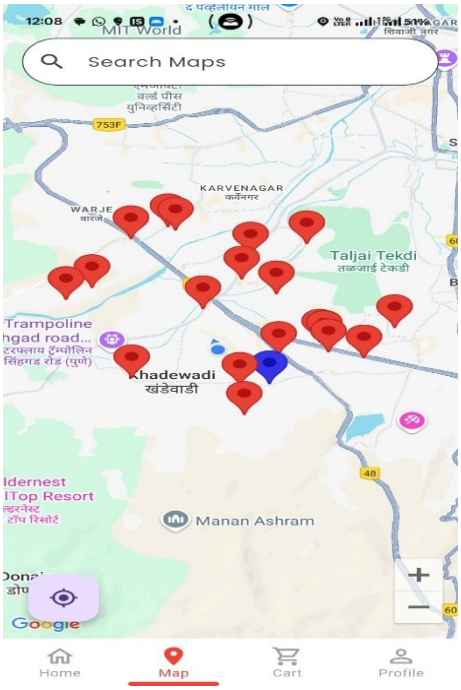
- **Non-Functional Requirements:**
  - Responsive and cross-platform UI
  - Data encryption and security with Firebase Auth
  - Real-time responsiveness and fault tolerance
- **Tools & Tech Stack:**
  - Frontend: Flutter + Dart
  - Backend: Firebase Auth, Firestore, Cloud Functions
  - Map: Google Maps API
  - Message: Twilio API

VI. COMPARISON WITH EXISTING SYSTEMS

Feature	GarageX	Manual Systems	Basic Apps
Real-time Booking	Yes	No	Partial
Inventory Management	Yes	No	Partial
Map Integration	Yes	No	Rare
Feedback System	Yes	No	Yes
Data Security	High (Firebase)	Low	Moderate
Notification Alerts	Yes	No	Partial
Multi-user Support	Yes	No	Moderate

VII. UI AND DEMONSTRATION





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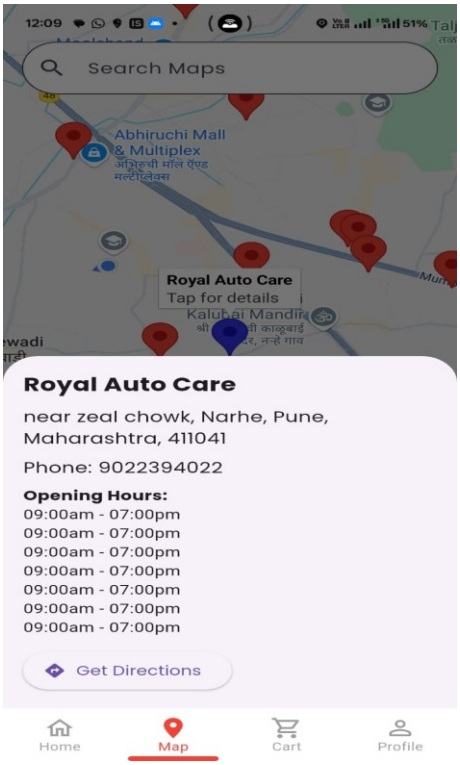

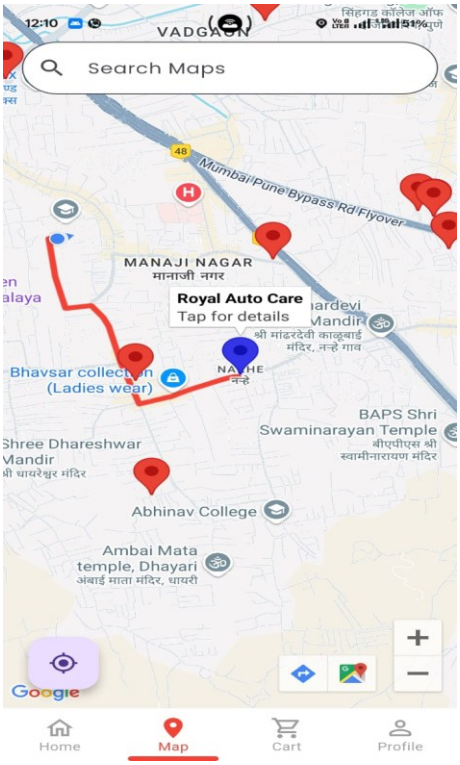

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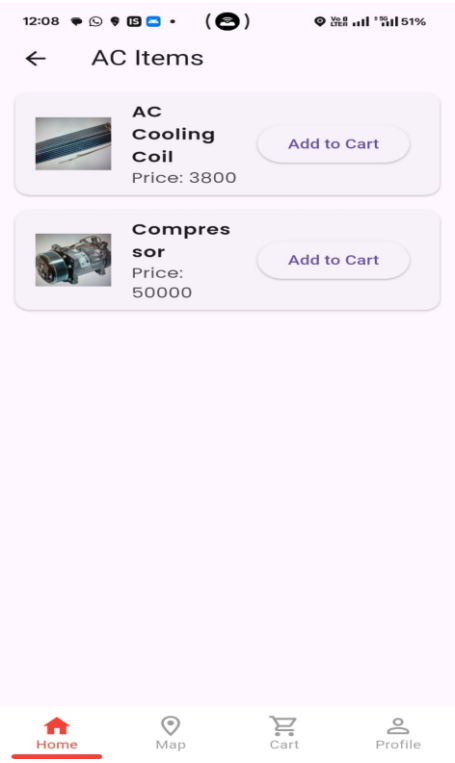

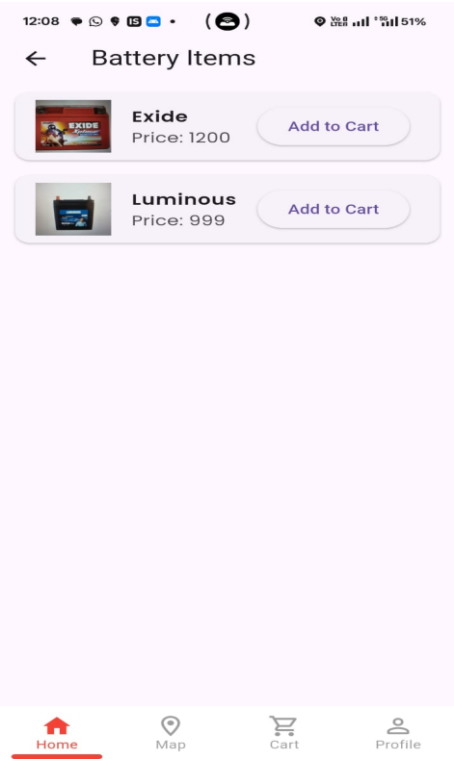

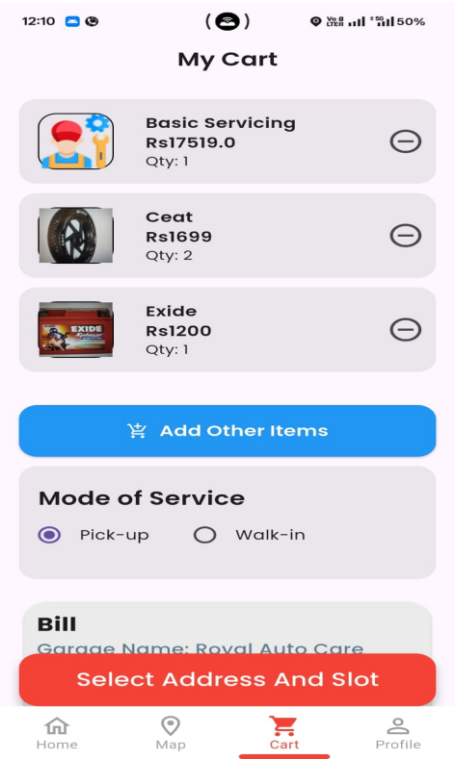

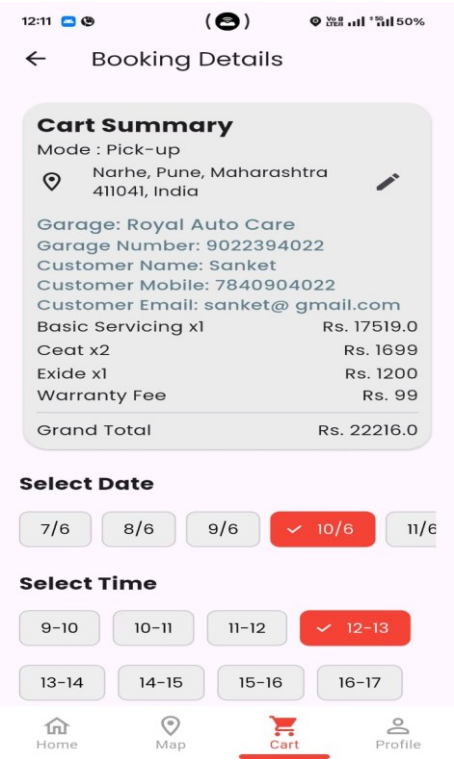

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VIII. CONCLUSION AND FUTURE WORK

Online Garage Management System revolutionizes traditional garage management by offering a fast, secure, and scalable mobile solution. Its robust architecture, built with Flutter and Firebase, delivers seamless user experience and operational transparency. Future developments may include AI-based predictive servicing, vehicle health monitoring via IoT, and UPI-integrated payments. The platform's flexibility ensures it remains adaptable to the evolving demands of the automotive service ecosystem. Dedicated application may be build for partners (Garages) to make working easier and efficient.

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