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PumpIt – CNG Gas Booking and Availability System

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Abstract— **With the growing popularity of CNG as an alternative fuel, managing the refuelling process has become critical, especially in urban areas where queues and waiting times can be extensive. One of the major problems faced by the lakhs of people in India, who use CNG Vehicles is standing in the long queues for an average of 40-45 minutes to fill the Gas. This inconvenience deters many potential buyers from opting for CNG cars.**
The CNG Gas Booking and Availability System will be a web-based application designed to address the challenges of long queues and time wastage at CNG stations in India. The project aims to provide a convenient and efficient solution for customers to book CNG gas appointments online, reducing their waiting time and enhancing the overall customer experience. By leveraging location-based services and real-time data, users can access information about the availability of gas at various stations and make informed decisions while scheduling their appointments. The system also includes an admin panel for CNG station management, allowing pump owner to update gas prices and time slot. Through the implementation of this online gas booking system, the project aims to streamline the CNG gas booking process, improve operational efficiency, and enhance customer satisfaction.

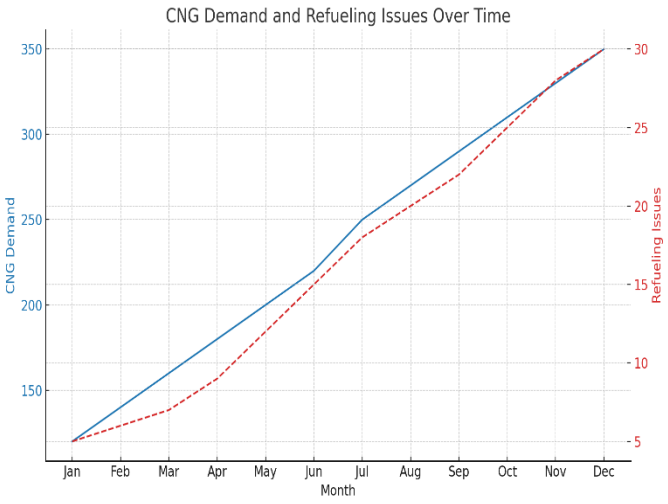
Keywords— **CNG Booking System, Web-based Application, Online CNG Refill Booking, Vehicle Refuelling, Real-time Slot Management, Queue Management.**

I. INTRODUCTION

The "PumpIt - CNG Gas Booking and Availability System" project aims to revolutionize the way customers interact with CNG stations in India. The current system often leads to long queues and significant time wastage for customers, causing frustration and inconvenience. By implementing an online booking system, customers can easily schedule their CNG gas appointments from the comfort of their homes, reducing their waiting time at the stations.
The project focuses on providing a user-friendly web-based platform that allows customers to select their preferred CNG pump, view available time slots, and book appointments accordingly. It also includes map integration. Users can fetch pumps from a pump list by selecting a city and the respective main area, clicking on a pump in the list will take the user to the Pump Details page, where detailed information about the pump is displayed. This page also offers options for checking the pump's location on the map and finding the route to the pump from the user's location.
Furthermore, the project includes an administrative panel to facilitate efficient management of CNG stations. Pump owners have the capability to update gas prices, manage appointment slots, and monitor the overall operation of the system. By automating the appointment booking process, the project aims to enhance operational efficiency, optimize resource allocation, and improve customer satisfaction.
Overall, this project offers a comprehensive solution to address the challenges associated with manual queue management, providing a seamless and convenient experience for both customers and stations.

II. PROBLEM STATEMENT

The existing CNG refuelling process faces several challenges, including poorly managed queues and extended waiting times, which lead to inconvenience and loss of time for vehicle owners. Resulting in heavy crowding at CNG stations and difficulties at peak hours. While CNG is widely valued for being both environmentally friendly and affordable, such problems reduce its overall ease of use and create a negative experience for users.



CNG demand over time.
The number of refueling issues

As the demand for CNG increases, it seems to correlate with more refueling problems, highlighting the potential challenges in keeping up with demand.

To overcome these difficulties, there is a clear need for an online booking solution.

This study aims to introduce an Online Appointment Booking System for CNG stations to simplify the refuelling process, manage crowds, helps to reduce waiting times, and increase user satisfaction.

III. PROPOSED SYSTEM

The proposed system aims to simplify the process of booking CNG refills, providing a smooth and efficient experience for both vehicle owners and pump operators. It offers an easy-to-use interface where users can register, log in, and book refuelling slots, while pump owners can manage station operations and appointments effectively through a dedicated dashboard.

To begin, new users complete a registration form with essential details such as username, password, vehicle information, and location. The system verifies the provided information, and upon successful validation, stores the user data securely in the database. In parallel, pump owners can also register their CNG stations by submitting details like station name, address, and available services, which are similarly verified and saved within the system.

Once registered, users log in and are presented with a list of available CNG stations. To refine the search, users can select their city, allowing the system to filter stations based on location. After choosing a preferred station, users are shown available time slots for refuelling. They can then select a suitable time, proceed to the payment page, and complete the booking process. Upon successful payment, the system provides a confirmation along with payment status, and all booking details are securely stored for future reference.

The system also allows users to view and manage their booking history. Through their dashboard, users can track previous bookings, as well as cancel or reschedule upcoming appointments as needed. Additionally, users can access features to view station locations on a map and get directions from their current location.

For pump owners and administrators, a dedicated admin panel provides full control over station management. Through this dashboard, they can manage station details, monitor bookings, adjust available time slots, and oversee user activity. All updates and changes are reflected in real-time and securely stored in the database to ensure smooth and reliable operation.

By integrating these features, the proposed system aims to reduce waiting times, manage crowding, and improve the overall refuelling experience for both users and station operators.

IV. SYSTEM ARCHITECTURE AND DESIGN

An Entity-Relationship Diagram (ERD) for the Proposed System is the entities and their relationships within the system

Here's a simplified use case diagram:

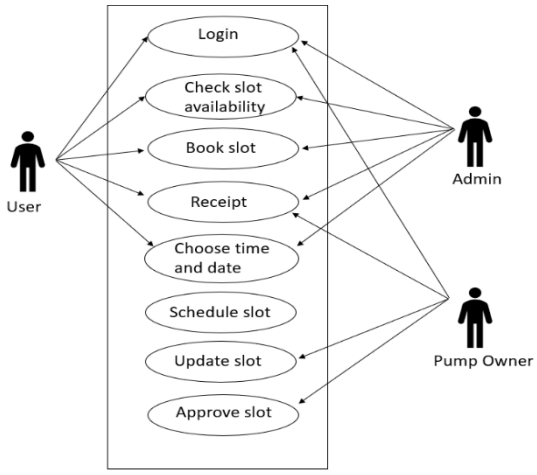
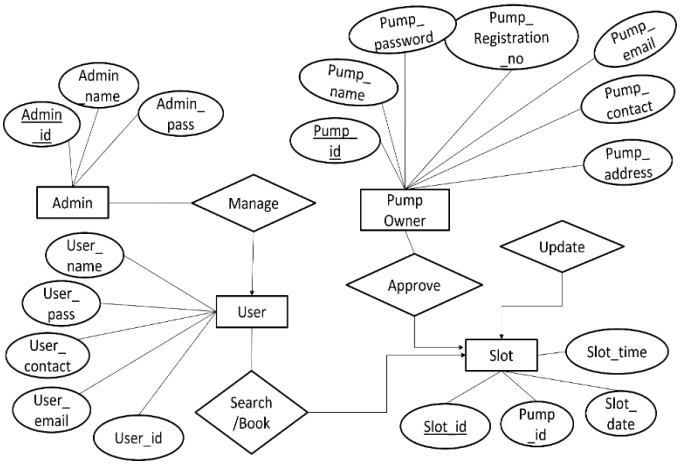


Fig-2: Use Case Diagram

Fig-1: Entity Relationship Diagram



This is Flowchart for the proposed system:

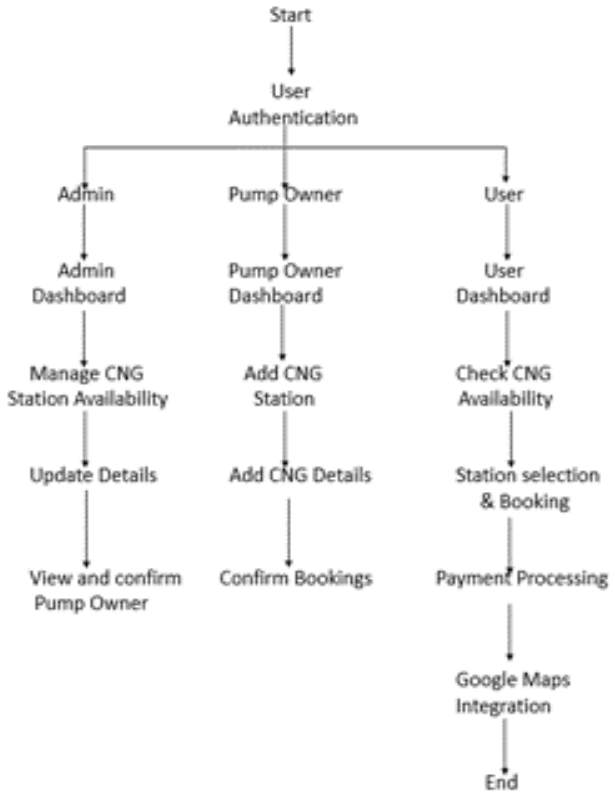


Fig-3: Flowchart

V. LITERATURE SURVEY

A web-based platform that streamlines CNG fuel booking by reducing long queues through online reservations and real-time data integration. The system includes an admin panel for managing fuel prices and station operations, ensuring better resource allocation and customer satisfaction. Additionally, by incorporating weather forecasting models, the platform can predict fuel demand fluctuations based on temperature variations, optimizing fuel station operations and reducing shortages.[1]

This paper enhances the refuelling process with a mobile-based application that maintains virtual queues and enables users to book appointments, minimizing wait times. It incorporates sentiment analysis using the Naïve Bayes algorithm to analyse user feedback and improve service quality. The study also highlights the impact of weather conditions on service efficiency, suggesting that integrating weather-based predictive models could further optimize the appointment scheduling process.[2]

This Paper offers a versatile online appointment booking platform for various industries, utilizing technologies like Ionic SDK, Node.js, and Firebase for seamless scheduling. It supports location-based services, real-time availability tracking, and an interactive chat interface, improving user-business interactions. The study also emphasizes the importance of weather data in scheduling, proposing the use of numerical weather prediction models to adjust booking slots dynamically for outdoor services, enhancing operational efficiency and customer convenience.[3]

CONCLUSION

The CNG Gas Booking and Availability System simplifies the refuelling process by enabling real-time booking, queue monitoring, and efficient station management. It reduces waiting times for customers while improving operational efficiency for station operators. This system enhances convenience, optimizes resources, and supports sustainable fuel usage.

ACKNOWLEDGEMENT

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