SPYPARK- THE INNOVATIVE MOBILE APPLICATION FOR ONLINE PARKING RESERVATION

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Abstract - Parking has become quite challenging these days in crowded areas, like transportation hubs and shopping centers due to the increasing number of vehicles. Many parking lots still rely on the traditional system where drivers get a ticket upon entry, search for a spot, pay at a counter, and then scan the ticket QR code when leaving. This process can be time-consuming and frustrating during peak hours. To tackle this issue, we need a reservation system for parking that can effectively manage spaces. Such a system would allow drivers to reserve their parking spots in advance from anywhere offering them convenience and reducing the time spent searching for parking. This online parking reservation system also offers services like finding slots and sending advance notifications about available spaces to users' mobile devices. Reserving a parking spot through this application it not only helps reduce congestion in parking lots but also saves valuable time and money for drivers. Moreover, it would contribute towards promoting a more environmentally friendly approach to transportation. Furthermore, the proposed system would empower administrators by enabling them to add vehicles and remove ones as needed thereby enhancing control over the management of the parking lot. Considering that most transactions are now done digitally or with cashless methods than using cash adopting a digital parking system would prove more advantageous when compared to the current manual approach.

Keywords — Manual parking system, online reservation system, parking spot, convenience, time-saving, traffic congestion, clean environment, administrator control.

I. INTRODUCTION

Today, the increased number of vehicles creates challenges for parking systems. Parking in crowded areas, such as public transportation and galleria, can be difficult for drivers due to limited available space. Most parking lots still function using the traditional parking system, which requires drivers to obtain a ticket at the entrance, search for a vacant space, pay for the parking, and scan the paid ticket QR code at the exit. Drivers often must spend more time and effort finding a vacant parking spot, especially during festivals, vacations, and weekends. During these busy periods, it can be challenging for drivers to find a safe and available parking spot for their vehicles. To address this problem, online parking reservation systems have emerged as a promising solution. These systems allow drivers to reserve a parking spot in advance from any location, providing them with increased convenience and reducing the time spent searching for parking. Drivers can choose a specific place in parking lots based on the size of their vehicle. Once reserved, it will be unavailable to others. The benefit of this mobile application is that it reserves a specific parking place and uses a mobile application to notify consumers in advance of available parking spaces. This application will provide the users with a platform where they will be able to decide where and which parking slot to book for parking their vehicles. This innovation is set to revolutionize the way we park, making it more efficient and user-friendly[1].

The contribution of this research paper is summarized as:

I. Development of a mobile application designed for both users and administrators.

II. Empower users to easily book nearby available parking slots using the application.

III. Allow administrators to efficiently manage parking slots by adding and removing vehicles.

II. LITERATURE SURVEY

Online parking reservations are becoming increasingly popular to save time and reduce stress for drivers. A literature survey on this topic would likely cover research related to the benefits of online parking reservations, the factors that influence users' adoption of such services, and the design and implementation of online parking reservation systems.

'Rosalyn R. Porle and Nursyafiqah Nabilah Mohd Saiful' [1] suggested, that by enabling drivers to book parking slots in advance, the Android application for parking helps them save time and reduces congestion in parking lots. According to the survey, 85.7 percent of the participants found the app easy to use, while 14.3 percent found it average in terms of usability.

'Lai Tu et al' [2] proposed, that many contemporary parking lots now incorporate various IoT technologies, including license plate recognition and automatic entrance/exit control, to enhance the ease of drivers and parking lot supervisors, as well as to analyze parking flow patterns and predict occupancy based on historical data.

'Hongwei Wang and Wenbo He' [3] presented their idea, that finding a parking spot in metropolitan areas, particularly during peak traffic times, can be a challenging task for drivers. A Reservation-based Smart Parking System (RSPS) prototype has been developed, which enables drivers to efficiently locate and book unoccupied parking spaces. This cyber-physical system can be accessed by drivers through their communication devices

'Raji C.G. et al' [4] proposed, that despite significant research on the development of smart parking systems, several of these systems do not effectively tackle the problem of real-time identification of available parking spaces and automated parking fee collection. With the population and

economy expanding, the number of vehicles is also increasing[5].

'P. Sheelrani et al' [6] proposed, that the virtual AGV is a fully automatic parking system that is a result of theoretical research conducted to address the parking management issues prevalent in traditional parking lots, such as insufficient parking spaces, subpar service quality, and low user satisfaction. This system introduces a novel dynamic priority approach that efficiently resolves the deadlock conflicts responsible for the backlog of parking AGVs.

'Gayatri N. Hainalkar and Mousami S. Vanjale' [7] suggested that the rapid urban population growth has created a major parking problem in most major cities around the world. To address this issue, a Slot Allotment-based Intelligent Parking System has been implemented, allowing Android users to book parking slots in two modes: advanced and current booking.

'M. Karthi and Preethi Harris [8] proposed, that as cities move towards becoming smarter, a variety of smart applications are being developed. The IoT has been a significant technological and economic advancement in the information industry after the Internet. However, the inability to pre-book public parking spaces has led to a decline in the quality of urban mobility [9] [10][11].

III. PROPOSED METHODOLOGY

The proposed project aims to address the challenges of finding parking spaces in busy commercial areas by introducing an online parking reservation system[12]. This system will offer clients the convenience of reserving a parking spot via an application[13][14]. Users will be able to browse through parking spaces and book a spot, for a time slot. During that time the reserved space will be marked as yellow and exclusively allocated to the user. Moreover, our system will enable users to cancel their bookings and make payments online using credit cards, UPI, and other popular online payment methods[15]. After making a payment, users receive an email confirmation with a unique parking number. Overall, this smart parking booking system offers an easy and efficient solution for finding and reserving parking spaces in busy areas[16][17].

Admin-side functionality includes:

- Add new parking areas and spaces
- Modify parking rates
- Generate reports on occupancy and revenue
- Manage user accounts and transactions
- Notification for system updates and issues

User-side functionality includes**:**

- View parking history
- View parking rates
- Notification for booking confirmation and parking expiration.

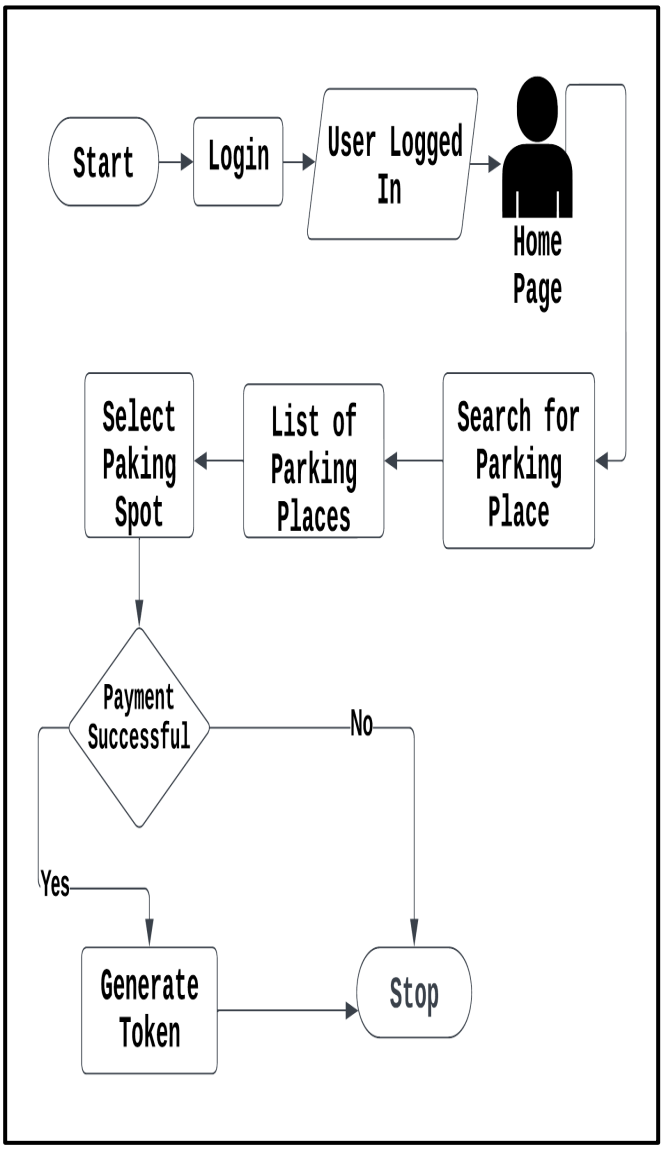

Figure 1: Spypark Architecture Diagram

In Figure.1, When users open the mobile application, Once logged in, users will be able to search for available parking spaces nearby or in a specific location [18]. They can filter the search results by distance, price, or other criteria to find the perfect parking spot for their needs [19][20]. When they find a parking spot they like, they can select it and proceed to the checkout page where they can confirm the details of their reservation, such as the date and time, duration, and price. They can then proceed to pay for their reservation using a secure payment gateway integrated into the mobile application [21][22]. They can also view their reservation details in their account section within the mobile application.

IV. IMPLEMENTATION

App components

They are the essential construction blocks of an Android app. Each component is an introduction point by which bureaucracy or a consumer can record your app. Some parts believe possible choice.

- Admin-side Login: The system is supervised by the admin, who manages all registered bookings.
- User-side login/registration: Initially, users must register themselves to log into the system.
- Parking areas: The system will provide users with parking areas at various locations.
- Payment gateway integration: The system integrates with a payment gateway to enable users to make payments online via credit card.
- Parking slot management: The system manages and allocates parking slots to users based on their bookings.
- Real-time updates: The parking system offers real-time information to users regarding the availability of parking spaces.
- Alerts and notifications: The system sends alerts and notifications to users regarding their bookings and any changes in availability.
- Data analytics and reporting: The system generates reports and performs data analytics to provide insights on parking usage and trends.
- Integrated map view: The system provides an integrated map view of parking areas and available parking slots, making it easier for users to find and book a slot.
- Security: The system incorporates security features to protect user data and prevent unauthorized access to the system.
- Email: When a user is successful in booking a parking spot at the desired parking spot, the system sends a confirmation email.
- Feedback: The system includes a feedback form, through which users can provide feedback to the system.

Steps and Flowchart

The steps for parking and reservation are as follows (Figure.2),

Step 1: The mobile app allows the user to specify the location where parking is required.

Step 2: The mobile app sends a request to the server to check parking availability once the user verifies their reservation at the parking slot.

Step 3: The parking map shows the vacant slots in the nearby parking areas, making it easy for users to locate available parking spaces along with the location of the user's current position for better navigation.

Step 4: In the parking map, users can view the available slots in nearby parking areas, they can select the desired slot and time, and proceed to payment.

Step 5: The payment system should be integrated into the mobile app for a seamless payment process.

Step 6: Once payment is confirmed, the reservation is authorized and the token number is generated for authentication purposes.

Step 7: A notification is sent to the parking management system to reserve the slot and mark it as booked.

Step 8: The user is notified via the mobile app and email of the reserved parking space details, including the slot number and location.

Step 9: If the user needs to cancel the reservation, they can do so within a certain time frame without penalty.

Step 10: Upon the vehicle's arrival at the parking slot, the user can confirm their reservation by providing the token number. Once verified, the system will automatically notify the parking management system to mark the slot as occupied.

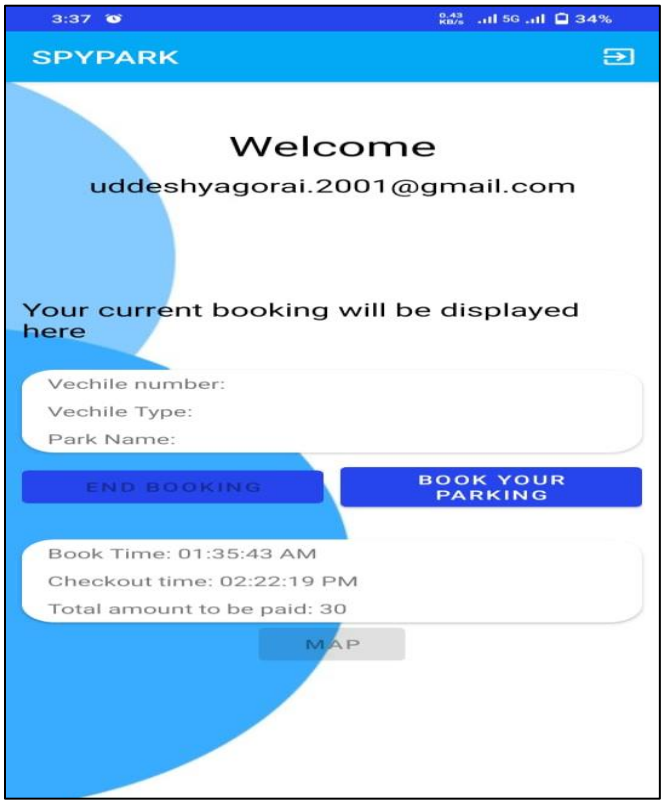

Figure. 2.1: Welcome Page

In Figure.2.1, The Welcome page displays the current parking booking of a user and typically shows the details of their reservation, such as the location, date, and time of their parking spot[23]. Users can access this information by logging into their account on the Spypark app. Once users decide to vacate the parking spot, they can click on end booking, and a summary of the parking time and amount to be paid is displayed. It also includes the vehicle number and vehicle type (2-wheeler, 3-wheeler, 4-wheeler).

Figure. 2.2: Parking Lots List

In Figure 2.2, The Spypark parking area section displays a list of available parking spots located near the user's current location. Users can filter the list based on their preferred criteria such as the desired parking spot, duration of the parking session, and personal convenience. The app may provide additional information such as parking rates, amenities, operating hours, and special instructions or regulations[24]. Once a parking area is selected, the app provides directions and any necessary parking instructions to the user. This feature saves time and effort for the user in finding a suitable parking spot and helps ensure a hassle-free parking experience[25].

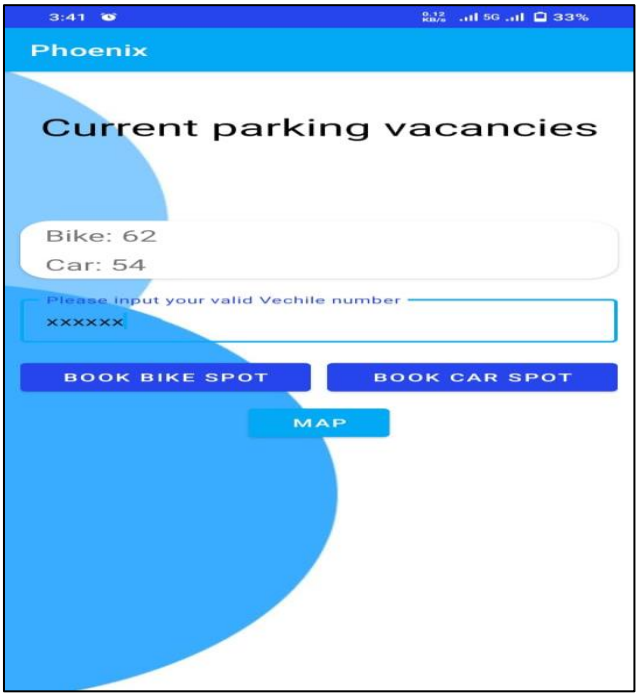

Figure. 2.3: Slot Booking Page

In Figure.2.3, After the user selects a specific parking spot, Spypark will display the number of bikes and cars that are currently booked. Users can then enter their vehicle number and choose a parking spot based on their preference. This feature allows users to conveniently select the most suitable parking spot for their vehicle and helps them save time by avoiding spots that are already booked.

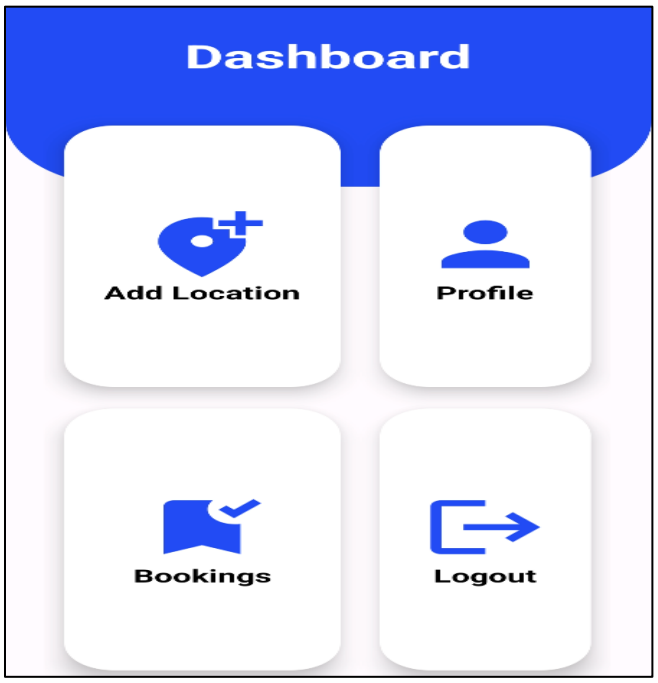

Figure. 2.4: Admin Dashboard

In Figure.2.4, The user interface allows admins to input parking slot addresses, manage their personal profiles, which encompass bank information, GST numbers, and other private data, and oversee the booking process. It also provides administrators with the necessary tools to effectively manage the booking system which involves monitoring and handling incoming booking requests, ensuring a smooth and efficient reservation process for users.

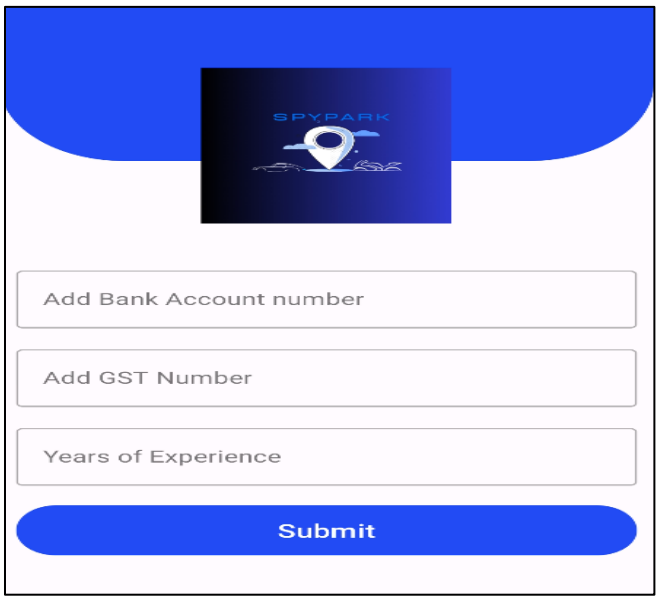

Figure. 2.5: Admin Details

In Figure 2.5, The admin's profile page has been designed to enable the secure and confidential entry of their personal information. This user interface has been developed with the utmost attention to data security, ensuring they can input their details with confidence in the protection of their data.

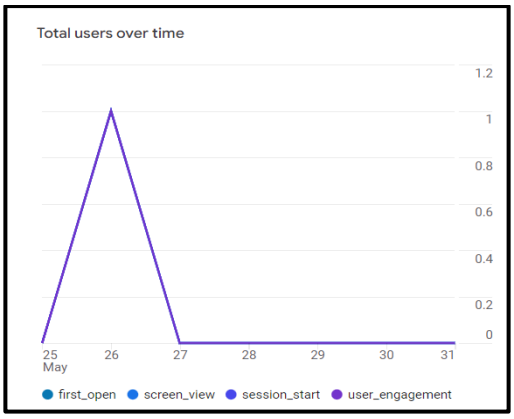

Figure. 3.1: Performance Validation Table

The Figure.3.1 depicts real-time usage data by users and Spypark's load time. This data is significant in assessing the performance and identifying potential areas for improvement. Analyzing real-time usage data provides insights into user behavior and usage patterns. The load time is a crucial factor in user experience, as a long load time can frustrate users and discourage them from using the app. By monitoring load time, developers can identify performance issues and work towards optimizing the performance. Overall, these Figureures offer valuable information that helps developers evaluate Spypark's performance and identify any potential areas for improvement. This way, the app can provide a seamless and efficient parking experience to its users.

V. CONCLUSION

The emergence of online parking reservation services has turned into a viable remedy for the ongoing issues related to conventional parking techniques. This technological advancement offers benefits, including time and cost savings well as unmatched convenience for drivers. However, it's important to acknowledge the obstacles that these systems face, such as connectivity issues, infrastructure limitations, and security risks. Despite these challenges, the future of parking reservation systems holds promise with the integration of navigation systems the introduction of smart parking solutions, and the widespread use of user-friendly mobile applications. These constantly evolving technologies not only enhance parking experiences but also significantly alleviate traffic congestion in urban areas. To effectively address parking issues a designed mobile application is essential. This application should include features, like user registration, real-time availability of parking spaces, reservation and payment mechanisms, timely alerts, and user feedback options. Such an application may further the transformation of urban transportation by carrying out in-depth market research, strategic planning, rigorous development and testing, a successful launch, and committed maintenance and support.

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