International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 04 | April - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Android-based Application for Smart Parking System

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Abstract - Urban congestion and inefficient parking usage remain significant issues in modern smart cities. This paper proposes an integrated smart parking solution that combines IoT-based real-time parking space detection with a user-friendly Android application for reservation and navigation. Building upon previous works on connected parking infrastructure and mobile booking platforms, the proposed system enhances urban mobility through dynamic slot management, real-time data sharing, and an interactive user interface. This system aims to reduce traffic, save fuel, and optimize urban parking resources through technological convergence.

Key Words: reservation, navigation, convergence.

1.INTRODUCTION

As urban populations grow, cities face increasing challenges in managing traffic congestion and limited parking availability. Smart parking systems have emerged as a key component of smart city initiatives, aiming to streamline vehicle parking, reduce environmental impact, and improve driver convenience.

Two recent efforts in this space—the Connected Parking for Smart Cities prototype and the Android based Booking Application for Smart Parking—highlight complementary strengths. a mobile application that enables slot reservation and navigation.

This paper proposes a unified architecture that bridges these two approaches, delivering a comprehensive smart parking system.an Android app that allows users to view availability, reserve slots, and navigate to them. This synergy aims to optimize parking infrastructure usage and contribute to sustainable urban development.

2. MOTIVATION

Traditional parking systems face challenges such as inefficiencies, congestion, long waiting times, and environmental impacts from vehicles searching for parking spaces. Android-based smart parking systems offer an advanced solution by enabling automated vehicle identification, seamless access control, and efficient payment processes.

The motivation lies in optimizing space utilization, enhancing security, reducing delays, and providing a user-friendly experience. Integration with technologies which supports sustainable traffic management and urban development.

3. SYSTEM ARCHITECTURE

For Users Panel

- User authentication (Login/Register)
- Vehicle management (Add/Remove vehicles)
- Real-time parking slot availability
- Slot booking with Razorpay payment integration
- View booking history
- Unpark vehicles with automatic overtime charges
- Google Maps integration for location navigation

For Admin Panel

Location management (Add/Edit/Remove parking locations)

- Slot management (Reserve/Make Available)
- Set parking rates
- Monitor booking status
- Add Google Maps links for locations

Backend Services

Firebase provides backend services including:

- **Firebase Authentication:** For secure user authentication.
- **Firebase Firestore:** For real-time database operations.
- **Firebase Cloud Functions:** For backend logic and operations.

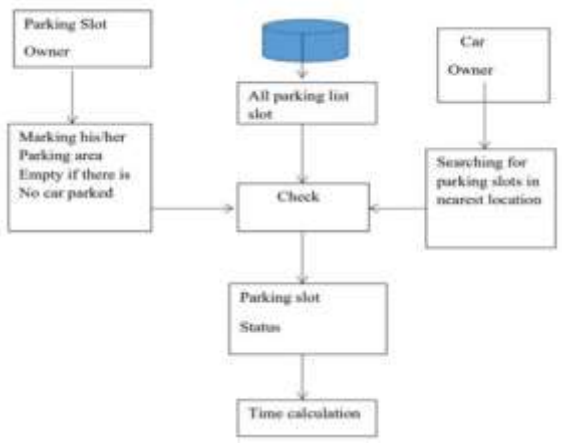

Fig 1-System Architecture

4. RESULTS & DISCUSSION

The system was evaluated based on functionality, usability, and performance. Key findings include:

Functionality: All features, including real-time slot availability, booking, and payment, functioned as intended.

Usability:User feedback indicated a positive experience with the application's interface and ease of use.

Performance: The application demonstrated efficient performance with minimal latency in slot updates and payment processing.

Fig 2-login page

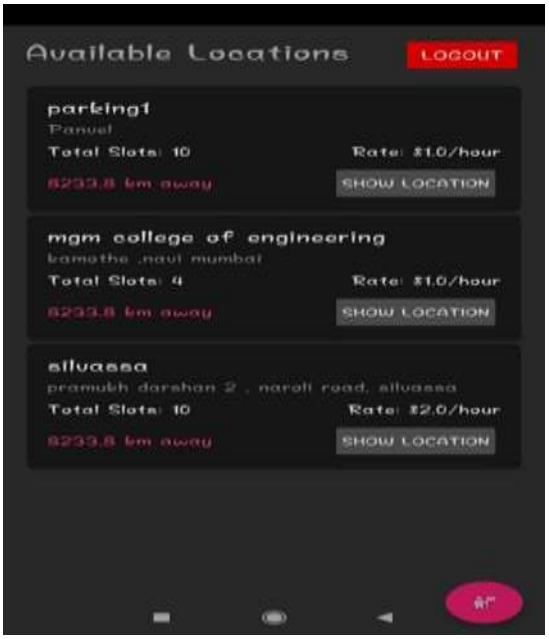

Fig 3- Available location

Fig 4- google map

Fig 5- payment processing

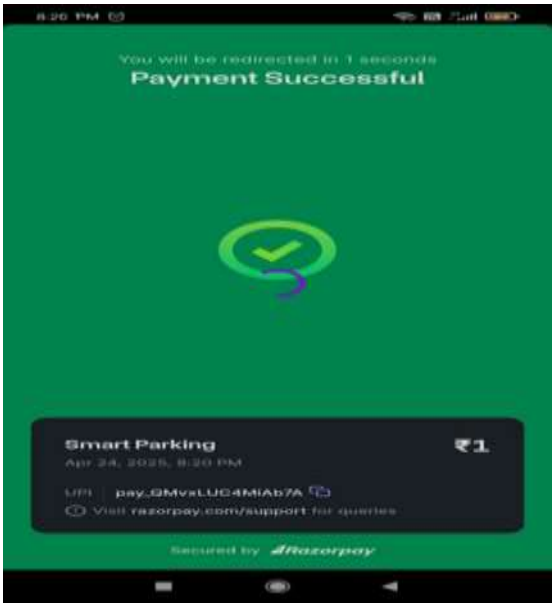

Fig 6 - payment successful

5. CONCLUSIONS

This integrated smart parking solution mobile application to deliver real-time, user-friendly, and efficient parking services in urban environments. It builds upon and improves earlier systems by synchronizing booking features and navigation.

Thus, we proposed and implemented an app-based parking system which facilitates the user to book a parking slot in order to ensure consistency. At last, the online payment option eliminates the need for human intervention and making the system automated in real sense. Also, the proposed system is very economical and easy to implement as it does not involve any expensive hardware or devices.

6. FUTURE SCOPE

The proposed Smart Parking System demonstrates strong potential for further enhancements and scalability. With evolving technologies and urban mobility demands ,the system can be extended in the following ways:

We are further going to make an IoT Model to enhanced our project and further going to connect with our android application to make fully functional project.

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