International Journal of Research in Engineering, Science and Management
Volume 9, Issue 3, March 2026
www.ijresm.com | E-ISSN: 2581-5792 | RESAIM Publishing | www.resaim.com

Smart Parking System with Real Time Slot Allocation

C. Radhiya Devi[1], S. Sukrithi[1*]
[1]*Dr. N. G. P. Arts and Science College, Coimbatore, India*

***Abstract*: The rapid growth of urbanization and the increasing number of vehicles on the road have led to significant challenges in managing parking spaces efficiently. Traditional parking systems often cause traffic congestion, fuel wastage, environmental pollution and driver frustration due to the lack of real-time information about available parking spots. To address these issues, this project proposes a Smart Parking System for Real-Time Spot Allocation, which utilizes modern technologies such as the Internet of Things (IoT), cloud computing, mobile applications, and real-time data processing to optimize parking management. The proposed system is designed to monitor parking slot availability in real time using sensors installed in individual parking spaces. These sensors detect the presence or absence of vehicles and transmit the data to a centralized cloud server through a wireless communication network. The collected data is continuously updated and processed to determine available parking slots instantly. Users can access this information through a dedicated mobile application or web interface, where they can view nearby parking areas, check slot availability, reserve a spot in advance and receive navigation guidance to the allocated space.**

***Keywords*: Smart Parking System, Slot Allocation.**

1. Introduction

Parking management has become a major challenge in urban areas due to rapid urbanization, increasing vehicle ownership, and limited parking spaces. Traditional parking systems rely heavily on manual monitoring, which leads to traffic congestion, time wastage, fuel consumption and inefficient utilization of available parking slots.

The Smart Parking System: Real-Time Slot Allocation is designed to overcome these issues by integrating modern technologies such as Internet of Things (IoT), cloud computing, and web-based applications. The system automatically detects vehicle presence using sensors and updates parking slot availability in real time. Users can view available slots, book parking spaces online and make secure digital payments through a user-friendly interface.

The system consists of multiple modules including user management, slot management, booking and payment processing, IoT-based monitoring, and an administrator dashboard. Real-time data communication ensures that parking information is always accurate and up to date.

This project aims to improve parking efficiency, reduce traffic congestion, minimize manual intervention and enhance user convenience. The proposed system can be implemented in shopping malls, hospitals, airports, educational institutions and smart city infrastructures.

2. Literature Survey

K. Shaheen, S. Rodier: "Smart Parking Management Systems and Technologies". This study explains how smart parking reduces traffic congestion using real-time data. The authors highlight the use of sensors and mobile apps to guide drivers to available parking slots. It also discusses environmental benefits like reduced fuel consumption.

M. Idris, Y. Leng: "Car Park Management System Using Wireless Sensor Networks". This paper focuses on using wireless sensor networks (WSN) to detect parking availability. It explains how sensors are installed in parking slots and connected to a central system for monitoring.

S. V. Srikanth, P. Pramod: "Design and Implementation of Smart Parking System Using IoT". The authors propose an IoT-based parking system where sensors send real-time data to cloud servers. Users can check slot availability through a mobile application.

R. Yusnita, N. Fariza: "Intelligent Parking Space Detection System Based on Image Processing". This research introduces image processing techniques using cameras to detect empty parking spaces. It reduces dependency on physical sensors and improves accuracy.

A. Khanna, R. Anand: "IoT Based Smart Parking System". This paper discusses integrating IoT devices with cloud computing for efficient parking management. It highlights real-time monitoring, booking, and automated billing.

J. Benson, T. O'Donovan: "Car-Park Management Using Smart Sensors". This study explains how smart sensors can improve parking efficiency and reduce manual intervention. It also discusses scalability for large parking areas.

3. Proposed Work

The proposed work focuses on developing a Smart Parking System for real-time slot allocation that helps drivers easily find available parking spaces. The system uses sensors, a database, and a software interface to monitor parking slots and manage parking operations automatically.

First, the user registers and logs into the system using their

*Corresponding author: sukrithis24@gmail.com

details such as vehicle number and contact information. After logging in, the system checks the availability of parking slots in real time. Sensors or monitoring software detect whether a parking slot is free or occupied.

When a vehicle enters the parking area, the system automatically assigns an available slot to the vehicle. The parking slot status changes from available to occupied, and the vehicle information along with entry time is stored in the database.

The system also calculates the parking duration when the vehicle exits the parking area. Based on the parking duration, the parking fee is automatically calculated. The user can then complete the payment through an online payment system.

After successful payment, the system generates a digital receipt that contains the vehicle number, parking slot number, parking duration, and payment details. The administrator can monitor all parking activities through the admin dashboard and manage parking slots efficiently.

A. System Architecture

The system architecture of the Smart Parking System consists of several components such as user interface, sensors or cameras, server, and database. These components work together to manage parking operations effectively.

The user interacts with the system through a mobile application or web interface to check slot availability and manage parking services. Sensors or cameras installed in the parking area detect the presence of vehicles and send real-time data to the central server.

The server processes the data received from sensors and updates the status of each parking slot in the database. The system then allocates available parking slots to incoming vehicles automatically.

The database stores important information such as slot ID, vehicle number, entry time, exit time, and payment details. The payment module calculates the parking charges based on the parking duration and processes the payment securely.

The administrator can access the system through an admin dashboard to monitor parking slot status, manage parking charges, and generate reports.

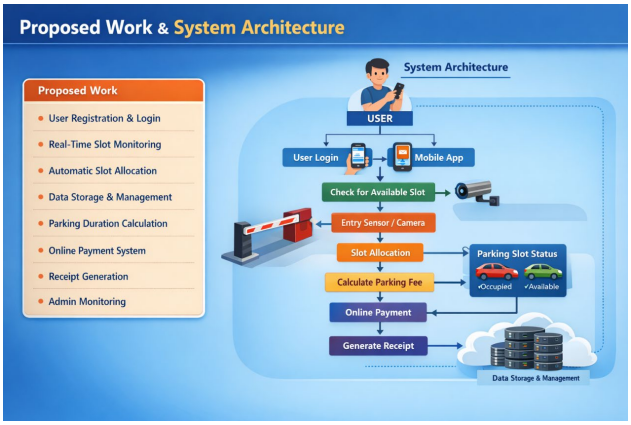

Fig. 1. Proposed architecture

4. Methodology

Data description explains the type of data used in the system and how the data is stored and managed in the database. In the Smart Parking System, different types of data are collected and processed to manage parking operations efficiently.

A. User Data

This data contains information about the users who access the parking system. It includes details such as user ID, user name, contact number, and vehicle number. This information is used for user identification and authentication.

B. Parking Slot Data

Parking slot data contains information about each parking space available in the parking area. This includes slot ID, slot location, and slot status (Available or Occupied). The system continuously updates the slot status based on vehicle detection.

C. Vehicle Entry Data

When a vehicle enters the parking area, the system records the vehicle number, entry time, and assigned parking slot. This information helps the system track the vehicle during the parking period.

D. Vehicle Exit Data

When a vehicle leaves the parking area, the system records the exit time. This data is used to calculate the total parking duration and determine the parking fee.

E. Payment Data

The system stores payment information such as payment ID, parking fee amount, payment method, and payment status. This helps in maintaining proper payment records and generating receipts.

F. Admin Data

Administrator data includes details required for managing the parking system such as admin ID, login credentials, and system management records. The admin can monitor parking slots and manage system operations.

5. Conclusion

The Smart Parking System for Real-Time Slot Allocation successfully addresses the challenges of traditional parking management by integrating IoT technology, cloud computing, and web-based applications. The system enables automatic detection of vehicle presence, real-time slot status updates, and efficient parking allocation through a centralized platform. By implementing user-friendly booking interfaces, secure online payment processing, and an administrator dashboard for monitoring and reporting, the system ensures transparency, accuracy, and operational efficiency. The use of real-time data communication reduces traffic congestion, minimizes manual effort, and improves overall user convenience.

Through proper system design, modular development, testing, and deployment, the Smart Parking System demonstrates scalability, reliability, and security. It can be further extended for smart city applications and large-scale

commercial parking facilities. In conclusion, the project provides a modern, automated, and efficient solution for managing parking spaces, ensuring better resource utilization and enhanced user experience.

References

[1] S. Y. C. Hong, C. C. Kang, J. D. Tan, and M. Ariannejad, "Smart parking system using IoT sensors," *Journal of Engineering Technology and Applied Physics*, vol. 5, no. 1, pp. 63–69, 2023.

[2] A. Pawar, A. Pawar, A. Pawar, G. Pawar, and A. Chaudhari, "An elaborative study of smart parking systems," *International Journal of Engineering Research & Technology (IJERT)*, vol. 10, no. 10, 2021.

[3] G. J. Bannur, A. M. Bharadwaj, A. J. Lobo, I. Kaushik, and K. B. Nath, "Smart parking guidance system," *International Journal of Engineering Research & Technology (IJERT)*, 2022.

[4] S. S. Basty, R. Kiwad, S. Vittal, and M. M. Ullah, "RFID-based smart parking system," *International Journal of Engineering Research & Technology*, vol. 11, no. 7, 2022.

[5] M. Z. Abidin and R. Pulungan, "A systematic review of machine-vision-based smart parking systems," *Scientific Journal of Informatics*, 2020.

[6] H. Kaur and J. Malhotra, "A review of smart parking system based on Internet of Things," *International Journal of Intelligent Systems and Applications in Engineering*, 2018.

[7] M. Balfaqih, W. Jabbar, M. Khayyat, and R. Hassan, "Design and development of smart parking system based on fog computing and IoT," *Electronics*, vol. 10, no. 24, 2021.

[8] M. Ozkaya and A. Turunc, "A reference architecture for smart car parking management systems," *IEEE Systems Journal*, vol. 13, no. 2, 2025.

[9] M. T. Kumar, G. Sudheer, V. Harish, and J. Bharadwaj, "An efficient smart car parking system based on IoT concept," *International Journal of Mechanical Engineering and Technology (IJMET)*, 2018.

[10] S. B., K. S. Keerthiprasad, M. D. C., R. Gowda, and B. L. Manohara, "Review on smart parking system," *International Journal for Research in Applied Science & Engineering Technology*, 2023.