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
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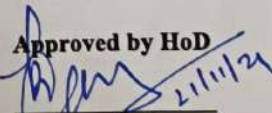This is to certify that the above statement made by the candidates is correct to the best of my knowledge and belief.
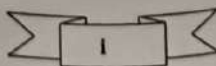
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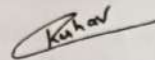Centre for Internet of Things
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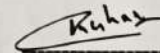**Assistant Professor**
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Parkyspot- IoT Based Real Time Parking System

Minor Project Report

Submitted for the partial fulfilment of the degree of

Bachelor of Technology

In

Centre for Internet of Things

Submitted By

Keshav Singh Rathore

0901EO221035

UNDER THE SUPERVISION AND GUIDANCE OF

Dr. Kaushal Pratap Sengar

Assistant Professor

Centre for Internet of Things

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ABSTRACT

Efficient parking management is a growing challenge in urban areas, leading to time wastage, increased traffic congestion, and environmental concerns. Parkyspot is a smart parking system designed to streamline the parking process by providing real-time availability, reservation, and booking functionalities for parking slots. Leveraging Internet of Things (IoT) technology, the system integrates IR sensors, ESP32 microcontrollers, and LEDs to monitor and display parking slot statuses (available, occupied, or reserved).The Parkyspot platform features a user-friendly web interface built using HTML, Tailwind CSS, and JavaScript, supported by a MongoDB database for real-time data handling. Users can locate nearby parking areas, view slot statuses, and book slots with ease. Confirmed bookings generate QR codes, enhancing security and simplifying parking entry. This project successfully demonstrates how IoT and web technologies can create scalable, efficient, and user-centric solutions to modern urban challenges. Parkyspot contributes to the goals of digital transformation, sustainability, and convenience, paving the way for smart city innovations. Future developments could include mobile app integration, payment gateways, and AI-powered predictive analytics to further enhance functionality and user experience.

ACKNOWLEDGEMENT

Table of Contents

ACRONYMS

XML	Extensible Markup Language
API	Application Programming Interface
IR	Infrared
JSON	JavaScript Object Notation
HTML	Hypertext Markup language
CSS	Cascading Style Sheets
AJAX	Asynchronous JavaScript and XML
JS	JavaScript

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1 Overview

Parkyspot aims to redefine urban parking management by integrating cutting-edge technology into the parking experience. The platform serves as a seamless solution for users to find, book, and manage parking slots in real time. By providing a comprehensive system for monitoring parking slot availability using sensors and a user-friendly interface for booking, Parkyspot eliminates the traditional hassle of searching for parking spaces, saving time and reducing traffic congestion.

The system utilizes IR sensors, LED indicators, and ESP32 microcontrollers to gather data on parking slot occupancy. The platform is designed to offer real-time updates on available, reserved, and occupied slots, ensuring that users can make informed decisions. Additionally, the integration of a web interface allows users to view nearby parking areas, make bookings, and receive confirmation through QR codes for easy entry.

Parkyspot also provides a smart system for administrators, enabling them to manage and update parking information efficiently through an intuitive admin interface. The system has been developed to bridge the gap between traditional parking management and smart city infrastructure, contributing to improved urban mobility and convenience.
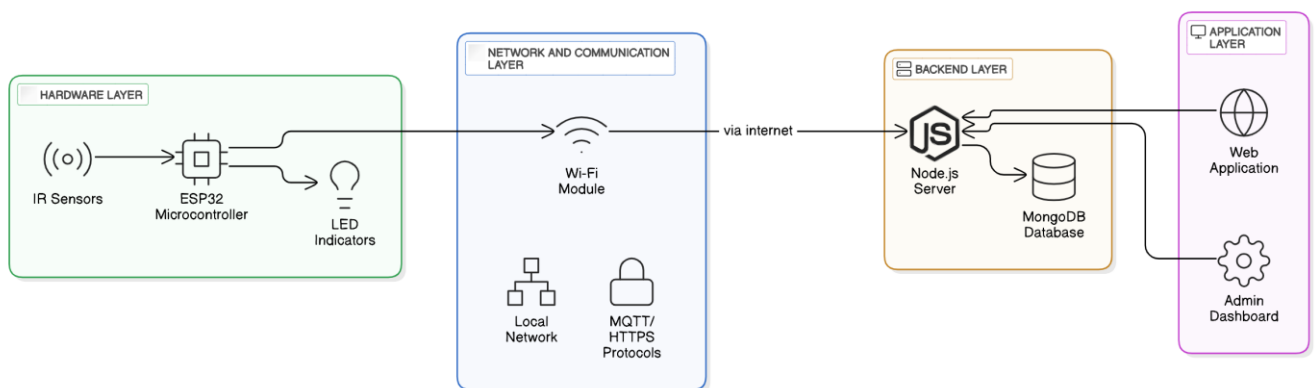

Fig 1.1 Parkyspot System Architecture

1.2 System Design and Development

The Parkyspot project combines Internet of Things (IoT) technology with web and mobile development to create a seamless and efficient parking management system. This system aims to improve urban parking by offering real-time parking slot availability, automated booking processes, and easy user interaction. The design integrates both hardware and software components to monitor and manage parking slots in real time.

Hardware: The system relies on IR sensors to detect the occupancy of parking spaces. These sensors are connected to ESP32 microcontrollers, which transmit the data to the central database. LED indicators (green, yellow, red) are used to visually display slot statuses (available, reserved, occupied).
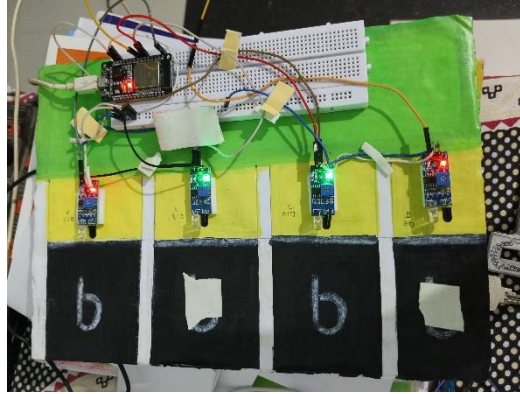

Fig 1.2 Hardware

Software: The user interface is built with modern web technologies such as HTML, Tailwind CSS, and JavaScript for an intuitive experience. The backend uses MongoDB to store data, enabling real-time updates and efficient parking management. A web application allows users to view available slots, make reservations, and receive QR code confirmations.

Integration: The system provides a comprehensive solution by synchronizing hardware data with the software platform. The integration of sensors, microcontrollers, and the web interface ensures that parking slot status updates in real time, allowing users to make informed decisions and avoid unnecessary delays.

1.3 OBJECTIVES

The primary objectives of the *Parkyspot* project are to:

1. **Enhance Urban Parking Management**: Provide a seamless system for locating, booking, and managing parking spaces in real-time.
2. **Improve User Experience**: Offer an easy-to-use platform for users to reserve parking spots with features like real-time availability, booking, and QR code verification for entry.
3. **Support Smart City Infrastructure**: Contribute to the growing trend of **smart cities** by integrating IoT technology in parking management.
4. **Reduce Traffic Congestion and Time Wasted**: Help reduce the time spent searching for parking, thereby improving overall traffic flow and reducing carbon emissions.
5. **Utilize Data for Optimization**: Leverage **data analytics** to optimize parking space management, identify usage patterns, and improve the overall efficiency of the system.

CHAPTER 2: LITERATURE SURVEY

The Parkyspot project aims to leverage existing technologies to address the challenges of parking management in urban environments. A key aspect of the research involves reviewing the evolution of smart parking systems and the technologies that have shaped modern parking management solutions. Additionally, it is essential to understand how data-driven systems and the integration of Internet of Things (IoT) technologies have been used in similar fields to inform the design and development of Parkyspot. This literature survey examines early systems, the growth of smart parking, and current trends in IoT and data analytics in parking management.

2.1 Early Parking Systems

Early parking systems were typically manual or semi-automated, relying on physical signage and attendants to manage parking spaces. These systems often faced challenges such as inefficiency in space utilization, difficulty in tracking space occupancy, and limited accessibility for users seeking parking. Early mobile applications focused mainly on providing static information, such as the locations of parking lots, hours of operation, and pricing. These applications did not provide real-time updates or booking capabilities, and they lacked integration with IoT systems or data analytics for optimizing parking slot utilization.the initial parking apps were simple tools designed to assist drivers in finding parking. As parking management technologies advanced, the need for real-time, data-driven solutions became apparent, driving the transition from static applications to dynamic, IoT-enabled systems.

Fig 2.1: Traditional Parking System

2.2 Modern Smart Parking Systems

The introduction of smart parking systems marked a significant advancement in urban mobility and parking management. Modern parking systems utilize IoT sensors, data analytics, and mobile applications to improve the efficiency and accessibility of parking spaces. These systems rely on a network of sensors, cameras, and mobile apps to monitor parking space occupancy, display real-time availability to users, and allow for automated reservations. For example, smart parking meters equipped with sensors can communicate with central systems to adjust pricing dynamically based on demand, ensuring that parking spaces are utilized efficiently. Additionally, real-time data from parking sensors can be used to guide drivers directly to available spots, reducing traffic congestion and time spent searching for parking. In line with the rise of modern technologies like machine learning and big data analytics, contemporary smart parking solutions incorporate advanced analytics to predict parking demand, optimize parking allocation, and enhance the user experience.


Fig 2.2 IoT Based Smart Parking System

CHAPTER 3: METHODOLOGY

3.1   Web Design and Development

3.1 System Design and Development

The *Parkyspot* platform integrates several modern technologies to provide a smooth, interactive, and efficient parking experience for users. The web interface will be built using **HTML5** as the foundational structure, ensuring that the platform is accessible, responsive, and easy to navigate. **CSS3** will be used to enhance the visual presentation of the site, allowing dynamic styling to create an aesthetically pleasing layout.

For dynamic interactivity and real-time updates, **JavaScript (JS)** will be used. This will enable functionalities such as live updates on parking slot availability, user logins, and the ability to book parking slots seamlessly. Additionally, the platform will be powered by **React**, a JavaScript library known for creating reusable components and enhancing user experience by rendering a dynamic **single-page application (SPA)**. React will allow for faster development and improved performance by enabling real-time updates without reloading the page.
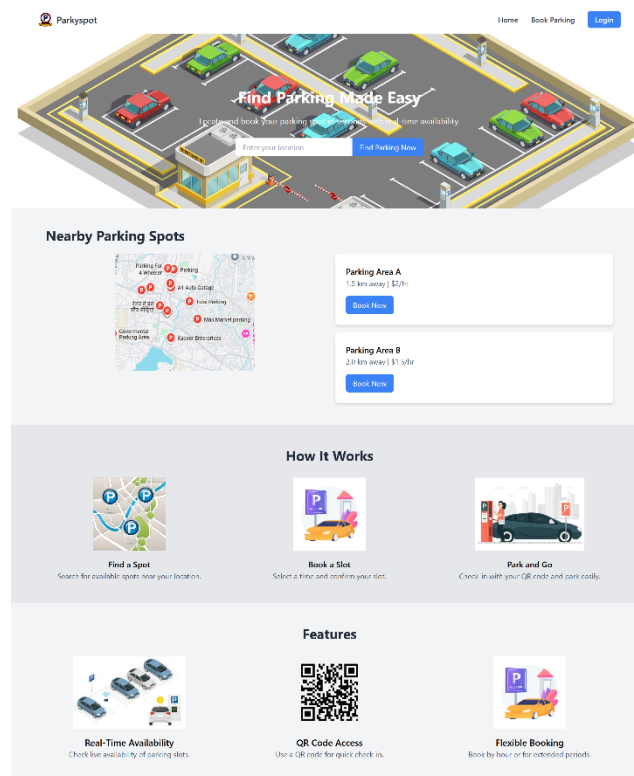
Fig 3.1: Parkyspot Web Design and Development

3.1.1 Providing Multiple Features on the Website

In today's digital era, the *Parkyspot* website will be the primary touchpoint for users, providing access to all the platform's features. The website will serve as a gateway to functionalities such as live parking slot status updates, booking management, and community engagement.

The website will allow users to:

- View real-time availability of parking spaces.
- Reserve parking slots with ease.
- Receive real-time notifications and booking confirmations.
- Access user profiles and manage booking history.

It will also serve as an informative platform, showcasing parking areas, rates, and other essential details for users.

Fig 3.2: *Parkyspot* Slot Booking Page

Parkyspot

Profile   My Reservations

My Reservations

Manage your upcoming, active, and past bookings here.

Upcoming & Active Reservations

Location: Downtown Parking
Slot: Slot 1
Date & Time: 2024-11-15, 10:00 AM - 12:00 PM

View Details   View QR Code   Cancel

Past Reservations

Location: Downtown Parking
Slot: Slot 2
Date & Time: 2024-11-10, 8:00 AM - 10:00 AM
Status: Completed

Go to Homepage   Book a New Slot

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Fig 3.3 Parkyspot Reservation Page

CHAPTER 4: RESULTS & DISCUSSIONS

Parkyspot aims to redefine urban parking by offering a seamless, real-time solution for users to find, book, and manage parking spaces. By utilizing modern technology, the platform ensures efficiency, reduces congestion, and simplifies the parking experience for users. The project has been successful in meeting its core objectives and has shown considerable promise in enhancing parking management in urban areas.

The project's key results include:
- **Real-Time Slot Availability**: The system successfully provides real-time data on parking space availability, ensuring that users can quickly locate and reserve a parking space.
- **Efficient Slot Booking**: The platform enables users to book parking slots in advance, reducing time spent searching for available spaces and improving overall user experience.
- **User-Friendly Interface**: The web interface is simple and intuitive, making it easy for users to navigate, view available slots, and reserve a spot.

The project has also made significant contributions to improving urban mobility by enhancing the efficiency of parking space usage. By offering real-time updates and booking functionalities, the system helps streamline the parking process, benefiting both users and parking lot administrators. The platform's use of IoT and web technologies provides a modern solution to a common urban problem.

Slot Availability Insights: The platform's ability to track and display real-time parking slot occupancy has proven valuable, allowing users to quickly identify available parking spaces.
Parking Management Optimization: Parkyspot provides administrators with the tools to manage parking lot occupancy effectively, ensuring that space utilization is maximized.

The Parkyspot platform is more than just a parking solution; it is a step toward creating smarter, more efficient cities. The next phase of development will focus on expanding the system's features, such as mobile app integration, payment options, and advanced data analytics to predict parking demand and optimize slot allocation.

Fig 4.1 Login Page

Fig 4.2 Register Page

Fig 4.3 Homepage

Fig 4.4 Slot Booking Page

Parkyspot   Home   Profile   My Reservations

✓

Booking Confirmed

❚❚ **Booking ID:** 1234A5

◎ **Location:** RAJEEV NAGAR

Slot Number: Slot 1

🕐 **Date**   **Time**
2024-11-15   10:00 AM - 12:00 PM

View My Bookings

Scan this QR Code at the Entrance

Keep this QR code handy for a smooth entry.

Download QR Code

Fig 4.5 Booking Confirmation Page

Parkyspot   My Reservations   Payment

Complete Your Payment

Secure your parking spot by making a payment.

Payment Summary

Reservation ID: RES123456
Parking Spot: A12
Date & Time: 2024-11-15, 10:00 AM - 2:00 PM
Total Amount: $10.00

Card Number

1234 5678 9012 3456

Expiry Date   **CVV**

MM/YY   123

Make Payment

My Reservations

Manage your upcoming, active, and past bookings here.

Upcoming & Active Reservations

Location: Downtown Parking
Slot: Slot 1
Date & Time: 2024-11-15, 10:00 AM - 12:00 PM

[View Details]   [View QR Code]   [Cancel]

Past Reservations

Location: Downtown Parking
Slot: Slot 2
Date & Time: 2024-11-10, 8:00 AM - 10:00 AM

Status: Completed

Go to Homepage   [**Book a New Slot**]

CHAPTER 5: CONCLUSION

Parkyspot has the potential to revolutionize urban parking by offering a modern, efficient, and user-friendly platform designed to address the common challenges faced by both drivers and parking lot administrators. By integrating cutting-edge IoT technology, real-time data, and seamless web applications, the platform simplifies the parking process, making it more convenient, transparent, and accessible.

The platform provides a one-stop solution that caters to all aspects of parking management, from finding available spaces to reserving and managing bookings. It creates a comprehensive system that benefits both individual users and parking lot operators by ensuring efficient space utilization, reducing congestion, and improving overall traffic flow. Parkyspot is more than just a smart parking system; it represents a step toward smarter, more connected urban environments.

The influence of Parkyspot extends beyond the platform itself, with the potential to contribute to broader goals such as urban mobility optimization, sustainability, and the development of smart city infrastructure.

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