

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi – 590014



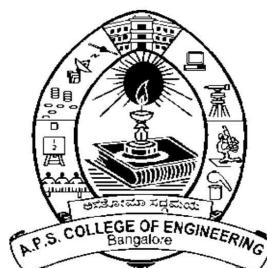
Industry Internship Report On “Smart Parking System”

Submitted in partial fulfillment of the requirement for the award of degree of
BACHELOR OF ENGINEERING

Submitted By

Anjana GR	1AP21CS007
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Pradeep Kumar J	1AP21IS022

Under the guidance of
Akhil Sai
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Dr. Prakash Jhadav



2024 - 2025

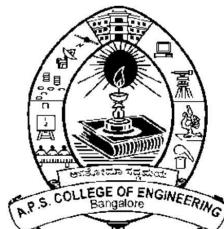
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CERTIFICATE

This is Certified that the *Industry Internship Project* work entitled

“Smart Parking System”

Is a bonafide work carried out by

Anjana GR

1AP21CS007

Pradeep N

1AP21IS021

Pradeep Kumar J

1AP21IS022

in partial fulfillment for the award of degree of Bachelor of Engineering of the Visvesvaraya Technological University, Belagavi during the academic year 2024-2025.

It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The Internship Project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the Bachelor of Engineering Degree.

Signature of the Guide

Akhil Sai

Xtrans Solutions

Signature of the Advisor

Dr. Shivamurthaiah M

Professor and HOD

Signature of the HOD

Dr. Shivamurthaiah M

Professor and HOD

External Examiner

1. _____

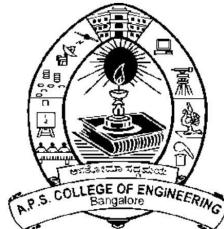
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Signature with date

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CERTIFICATE

Certified that the Industry Internship Project Work entitled "**Smart Parking System**" has been carried out at **VTU-VRIF in Collaboration with XTrans Solutions** by **Full Name (USN)** bonafide student of **Fourth Year, B.E** in partial fulfillment for the award of degree in **Bachelor of Engineering in Department Name** affiliated to **Visvesvaraya Technological University, Belagavi** during academic year **2024-2025**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in department library. The Internship report has been approved as it satisfies the academic requirements in respect of Internship work for the said degree.

Signature of the Guide

Akhil Sai
Xtrans Solutions

Signature of the Advisor

Dr. Shivamurthaiah M
Professor and HOD
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APSCE

Signature of the HOD

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Professor and HOD
Dept. Of CSE & ISE,
APSCE

INTERNSHIP CERTIFICATE

The certificate will be issued later so don't paste anything here.

Project Completion Certificate

I, **ANJANA GR** (Roll No: 1AP21CS007), hereby declare that the material presented in the Project Report titled "**SMART PARKING SYSTEM**" represents original work carried out by me in the **Department of CSE** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 –12, December, 2024**.

With My signature, I certify that:

- I have not manipulated any of the data or results.
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- I have explicitly acknowledged all collaborative research and discussions.
- I understand that any false claim will result in severe disciplinary action.
- I understand that the work may be screened for any form of academic misconduct.

Date:

Student Signature:

In my capacity as the supervisor of the above-mentioned work, I certify that the work presented in this report was carried out under my supervision and is worthy of consideration for the requirements of the B.Tech. Internship Work.

Advisor's Name : **Dr. Shivamurthaiah M**

Guide Name : **Akhil Sai**

Advisor's Signature

Guide Signature

Project Completion Certificate

I, **PRADEEP N** (Roll No: 1AP21IS021), hereby declare that the material presented in the Project Report titled "**SMART PARKING SYSTEM**" represents original work carried out by me in the **Department of ISE** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 –12, December, 2024**.

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Advisor's Name : **Dr. Shivamurthaiah M**

Guide Name : **Akhil Sai**

Advisor's Signature

Guide Signature

Project Completion Certificate

I, PRADEEP KUMAR J (Roll No: 1AP21IS021), hereby declare that the material presented in the Project Report titled "**SMART PARKING SYSTEM**" represents original work carried out by me in the **Department of ISE** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 –12, December, 2024.**

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Guide Name : **Akhil Sai**

Advisor's Signature

Guide Signature

Evaluation Sheet

Title of the Project : Smart Parking System

Name of the Students : Anjana GR

Pradeep N and

Pradeep Kumar J

External Supervisor:

Internal Supervisor:

Date :

Place :

ABSTRACT

The proposed Smart Parking System aims to enhance parking management by integrating ultrasonic sensors, Raspberry Pi, and a web app. The system will detect vehicle presence, manage slot availability in real-time, and allow users to reserve slots seamlessly through a web app. The integration of sensors and a relay mechanism will provide automated responses, ensuring efficiency and user convenience. Future development will focus on expanding system scalability and integrating payment modules for a complete solution.

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Chapter 1

INTRODUCTION

Managing parking spaces effectively is crucial in urban areas to reduce congestion and save time. This project introduces a Smart Parking System that leverages IoT technology to streamline the parking process. By using a Raspberry Pi as the central controller, the system integrates ultrasonic sensors to monitor slot availability and a web app to provide real-time updates to users. The intuitive interface and automation features aim to offer a hassle-free parking experience.

1.1. Objective

The primary objective of this project is to develop an efficient parking management system that automates the detection of slot availability and facilitates user interaction through a web app. This system will enhance user convenience and optimize parking space utilization.

1.2 Problem Statement

Parking lots often face issues like mismanagement and lack of real-time updates, leading to confusion and time wastage. This project addresses these problems by providing a system that monitors and updates slot availability in real-time while allowing users to reserve slots remotely. It also eliminates the need for manual supervision, making it ideal for high-traffic areas.

Chapter 2

APPLICATION

The Smart Parking System has a wide range of applications:

- **Residential Complexes :**

In gated communities and apartment complexes, parking management often becomes a point of contention due to limited spaces and lack of real-time availability information. The Smart Parking System provides residents with a streamlined solution to check slot availability from their homes and reserve slots in advance.

It also reduces the workload on security personnel, enabling automated slot allocation and ensuring fair usage of parking spaces. Visitors can be assigned temporary slots, avoiding mismanagement.

- **Commercial Areas :**

Malls, offices, and business hubs frequently experience high parking demand, especially during peak hours. With the Smart Parking System, users can check slot availability before arriving at the location, reducing time spent searching for spaces.

The system's ability to display real-time updates ensures better slot utilization, and businesses can integrate it with loyalty programs or offer reserved parking for premium customers. This leads to enhanced customer satisfaction and smoother parking operations.

- **Public Parking :**

Urban parking lots often face congestion due to manual management and lack of proper slot allocation. The Smart Parking System organizes public parking infrastructure by providing real-time slot statuses and enabling users to book slots through the web app.

This reduces unnecessary circling, improves traffic flow, and helps authorities monitor parking usage patterns. The automated system also lowers operational costs by minimizing the need for manual intervention.

- **Airports and Hospitals :**

In high-demand areas like airports and hospitals, where time is critical, the Smart Parking System facilitates efficient parking management by reducing waiting times and ensuring better utilization of limited spaces.

The system can prioritize slots for emergency services, staff, or frequent travelers. Real-time updates and automation also reduce human errors, providing users with quicker access to available slots and enhancing their overall experience in these high-stress environments.

Chapter 3

COMPONENTS

The Smart Parking System comprises the following major components :

- **Raspberry Pi :**

The Raspberry Pi serves as the brain of the system, handling data from various sensors and peripherals. It processes input from ultrasonic sensors, communicates with the Flask server to update slot statuses, and controls the relay mechanism for the barrier. Its compact size, energy efficiency, and ability to interface with multiple devices make it an ideal choice for IoT applications.



- **Ultrasonic Sensor (HC-SR04) :**

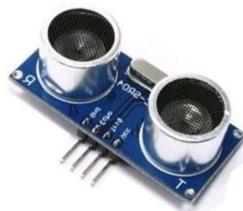
The ultrasonic sensor measures the distance between the sensor and an object, such as a vehicle, to determine slot occupancy. It works by emitting sound waves and measuring the time taken for the echo to return.

- **Key Features :**

- High accuracy for detecting objects within a range of 2 cm to 4 m.
 - Non-contact detection minimizes wear and tear.

- **Functionality in the System :**

- Detects vehicle presence in a parking slot.
 - Sends data to the Raspberry Pi for real-time updates.



- **Relay Module :** The relay module acts as a switch to control the barrier or gate mechanism in the parking lot.

- **Key Features :**

- Operates at low voltage signals from the Raspberry Pi.
- Can control high-current devices like motors or gates.

- **Functionality in the System :**

- Turns the barrier ON or OFF based on vehicle detection and user confirmation.
- Enhances automation by eliminating manual operation.



- **Keypad :**

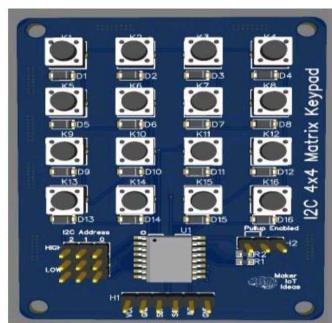
The keypad allows users to interact with the system directly by entering input such as confirming a booking.

- **Key Features :**

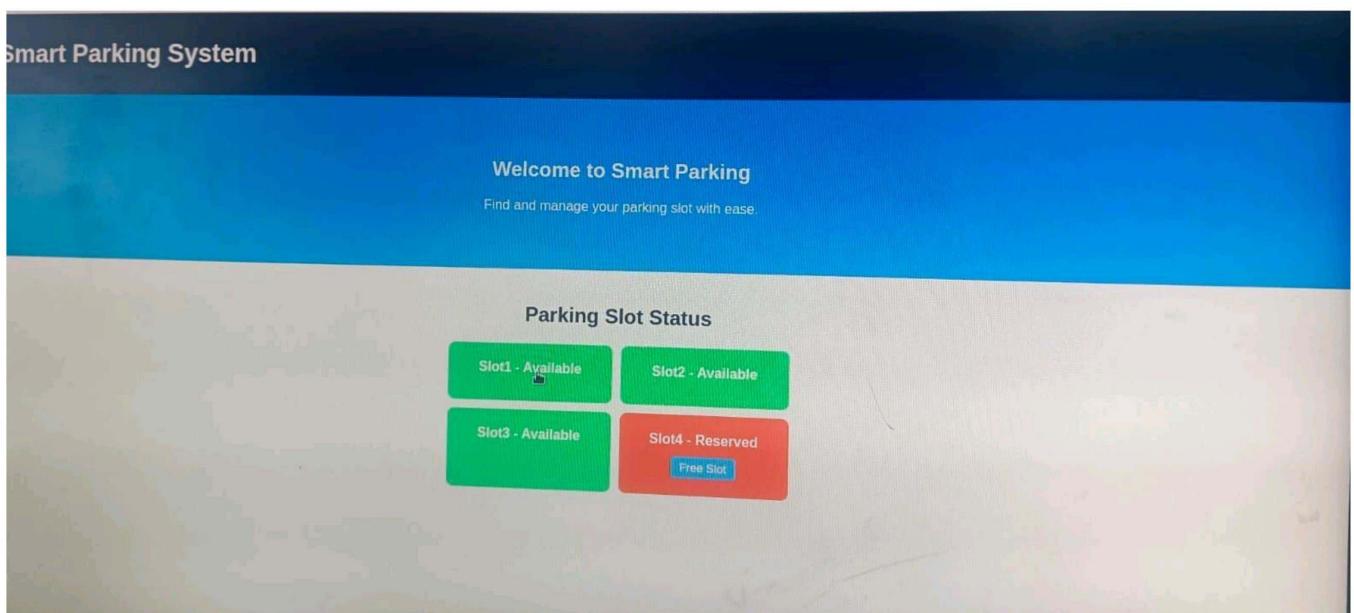
- Compact and easy to use.
- Configurable keys for specific operations (e.g., "y" for yes, "n" for no).

- **Functionality in the System :**

- Collects manual input from users when booking slots.
- Adds flexibility for scenarios where mobile interaction isn't possible.



- **Web App :** The web app provides a user-friendly interface for managing parking slots.
 - **Key Features :**
 - Displays real-time status of parking slots (available/reserved).
 - Allows users to book slots remotely.
 - Regular updates via APIs to ensure synchronization with the system.
 - **Functionality in the System :**
 - Serves as the primary user interface for slot reservation and status monitoring.
 - Enables remote interaction, reducing the need for on-site supervision.



- **Flask Framework :**

Flask serves as the backend framework for the system, handling API requests and processing data.

 - **Key Features :**
 - Lightweight and easy to set up.
 - Supports restful APIs for seamless communication.
 - **Functionality in the System:**
 - Manages slot booking requests and updates from the web app.
 - Handles sensor data and updates the slot status in real-time.

- **HTML, CSS, JavaScript :**

These technologies are used to build the web app interface:

- **HTML** : Structures the content of the web app.
- **CSS** : Styles the interface to ensure a clean and professional appearance.
- **JavaScript** : Enables dynamic updates, such as real-time slot availability.
- **Functionality in the System :**
 - Provides an intuitive and visually appealing interface for end-users.
 - Supports interactive features like slot status updates and booking options.

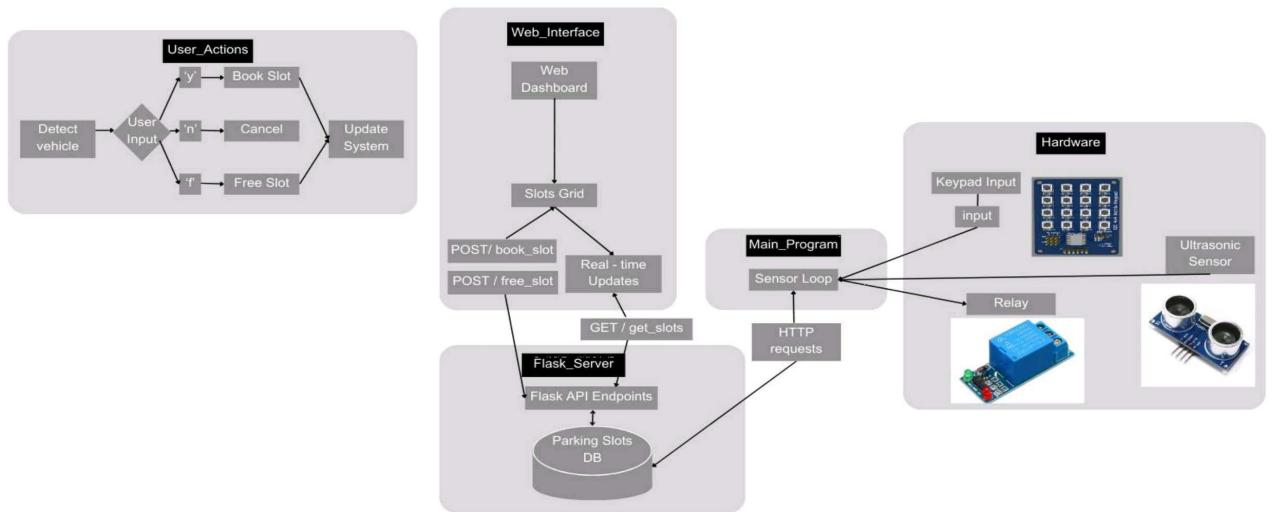
- **Power Supply :**

The power supply ensures that all components, including the Raspberry Pi, sensors, and relay module, function without interruption.

- **Key Features :**
 - Stable output voltage to prevent damage to sensitive components.
 - Compatible with Raspberry Pi and peripheral devices.
- **Functionality in the System :**
 - Supplies continuous power for reliable operation.
 - Protects the system from power fluctuations and interruptions.

Chapter 4

FLOWCHART



Chapter 5

CONCLUSION

This project successfully developed a prototype Smart Parking System that automates slot management and provides a user-friendly web app for reservations. The system has demonstrated its potential to enhance efficiency and user experience in parking facilities.

Chapter 6

FUTURE WORK

- **Integration with Payment Gateways :**

Integrating payment gateways like Razorpay or PayPal allows users to pay seamlessly while reserving parking slots. This automation eliminates manual cash handling, enhances user convenience, and enables businesses to track revenue efficiently. It is especially beneficial for commercial areas like malls and airports, where upfront payments can streamline parking operations and reduce disputes.

- **Scalability :**

Scalability ensures the system adapts to larger parking lots or increased users by adding sensors, using centralized servers, or transitioning to cloud platforms. This allows efficient slot management even in high-demand scenarios, making it suitable for urban parking, multi-level complexes, and large business hubs.

- **Mobile App Development :**

A dedicated mobile app improves accessibility by providing real-time slot updates, booking options, and integrated navigation. It allows users to manage parking on the go, making the system more versatile and engaging with features like notifications for availability or special offers.

- **Enhanced Security :**

Enhanced security using RFID or QR code authentication prevents unauthorized access to reserved slots. By linking these technologies to the booking system, users can enjoy a secure and organized parking experience, making it ideal for gated communities, corporate offices, and premium zones.

Chapter 7

APPENDIX

7.1 GPIO Pin Configuration

- **TRIG (19)** : Sends a trigger pulse to the ultrasonic sensor.
- **ECHO (26)** : Receives the reflected signal from the sensor.
- **RELAY_PIN (36)** : Controls the relay module for the barrier.
- **ROW_PINS (22, 18, 2, 3)** : Rows of the keypad.
- **COL_PINS (8, 10, 9, 11)** : Columns of the keypad.

7.2 APIs

7.2.1 **POST /book_slot** : Books a parking slot based on the slot ID provided in the request.

Request Format: { "slot_id": "slot1" }

Response:

7.2.1.1 **Success** : { "message": "Slot booked successfully!" }

7.2.1.2 **Error** : { "error": "Slot unavailable or invalid." }

7.2.2 **GET /get_slots** : Retrieves the current availability status of all parking slots.

Response:

Json :

```
{  
    "slot1": "available",  
    "slot2": "unavailable",  
    "slot3": "available",  
    "slot4": "unavailable"  
}
```

Chapter 8

PSEUDOCODE

Sensor Loop (sql)

Initialize GPIO pins and ultrasonic sensor

Start infinite loop :

 Trigger ultrasonic sensor

 Measure distance using echo

 If distance < threshold:

 Detect vehicle presence

 Prompt user to book slot via keypad

 If user presses 'yes':

 Send booking request to the server

 Confirm booking

 Else if user presses 'no':

 Continue monitoring

 Else:

 Mark slot as available

Flask Server (sql)

Define route for POST /book_slot:

 Parse input slot_id

 Check if slot is available

 If available:

 Update slot status to 'unavailable'

 Return success message

 Else:

 Return error message

Define route for GET /get_slots:

 Retrieve the current status of all parking slots

 Return JSON response.