

SMART PARKING SYSTEM

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Abstract : Due to increase in the number of vehicles on the road, traffic problems are bound to exist. This is due to the fact that the current transportation infrastructure and car park facility developed are unable to cope with the influx of vehicles on the road. To overcome these problems, the smart parking system has been developed. Smart parking system is an integrated system to organize cars.

The motivation of this project is to help drivers book parking slot in advance. There is a dedicated app for the system. The user have to register to the system. After registering, the user can login and book a parking slot. Once the user books a parking slot, a QR code will be generated. The user will be allowed to enter and exit only if he has a QR code and registered mobile with him. Non-registered users will be directed to the available parking slots.

I. INTRODUCTION

Smart Parking System provides a solution to the parking of the vehicles. This system allows driver to locate a free parking space and book a slot in advance. Hence it reduces the time for searching a free parking slot and also traffic congestion. A dedicated mobile application is developed. The users can find free slots and book it through the app. The users can book a slot only when they are near to the destination (Say, they can reach the destination within 15-20mins). Various sensors are used to retrieve the status of the parking slot. The data collected by the sensors will be stored in the Firebase and accessed by the app.

II. PROPOSED WORK

Smart Parking System is divided into two parts:

A. Registered User

The users who wish to utilize the booking services have to use the app and register themselves by providing the name and car details. After registering, user can login and find the free parking slots. Once the user books the slot, a QR code will be generated. At the entry of the gate, the user can show the QR code and get it scanned. If the QR code is valid then user can enter the parking slot. Thus, less dependent on humans. During the entry and exit of the vehicle, the user must have a QR code. This feature provides security to the car. Only the owner of the car will have the access to the vehicle. Booking cancellation option is also provided to the user.

B. Non-Registered User

The users who do not have mobile or who do not want to book a slot can directly come to the parking slot. The users will be directed to the available parking slots.

III. REQUIREMENTS

● Hardware Requirements

- ✓ NodeMCU
- ✓ Breadboard
- ✓ RGB LEDs
- ✓ LEDs
- ✓ Ultrasonic Sensors
- ✓ IR Sensor
- ✓ Servo Motors
- ✓ Jumper Wires

● Software Requirements

- ✓ Android Studio
- ✓ Arduino IDE
- ✓ Firebase

IV. IMPLEMENTATION

Section I: Smart Parking System App

It started with developing an app for our parking system. This app contains Login and Register option. Firstly, the user has to register for the system. After registering, the user can login with his credentials. App provides the following features for the users.

- Get Directions - The user can get directions from his place to the destination. We are Google Maps for showing route and navigation.
- Book a slot - The user can book a slot of his choice by providing his vehicle number. (User can book a slot only when they are near to the destination).
- QR Code - After booking a slot, a QR code will be generated based on the username, time of booking, slot number and vehicle number.
- Cancel option - There is a cancel option provided for the users to cancel their booking.

Section II: Scanner App

The scanner app is used to scan the QR code of the user. Once a QR code is scanned, it checks in database whether the user has booked a slot or not.

Section III: NodeMCU and Sensors**A. NodeMCU**

We are using NodeMCU to upload sensor data to Firebase. NodeMCU (Node MicroController Unit) is an open source IoT development board called NodeMCU. One of its most unique features is that it has built-in support for wifi connectivity.

B. Ultrasonic Sensor Module

An Ultrasonic sensor is a device that measures the distance to an object from the sensor by using sound waves. The ultrasonic sensors are used to detect presence of the vehicles.

C. Servo Motors

Servo motors are used as barriers.

D. RGB LED's

RGB LED's are used to indicate the status of the slots. Whether the slot is booked or free or occupied.

V. WORKING OF THE SYSTEM

There is a dedicated app for booking a slot. The users can login and book a slot of their choice (The user can book a slot only when they are near to the destination). The user can get the directions to the parking area from the user current location. After booking a slot, directions to the parking will be shown to the user and also timer will be displayed. The user has to reach the destination within the given time otherwise the booking will be canceled.

If the slots are free then it will be showed in green colour. If it is booked then it will be showed in blue colour. If it is occupied then the LED will be off. After booking a slot, a QR code will be generated based on the username, time of booking, slot number and vehicle number. The QR code is generated for the security purpose. So that only the owner of the vehicle will have access to it. QR code is a must for entry and exit of a vehicle.

The QR Code generated will be valid only for two scans. Once the QR code is scanned twice (At the entry and exit), the booking data from database will be removed. One user can book only one slot. The user has an option of canceling the booking.

Once the user reach the entry of the parking area, the QR code will be scanned. If it is valid then automatically barrier opens and the user can park his car based on the slot number. There will be LED's which indicate the status of each parking slots. If the slot is occupied then LED will be off. If slot is free then it will be indicated by green colour. If slot is booked then it will be indicated by blue colour. The user can also cancel the booking.

If the user does not wish to book a slot then he can visit the parking area directly. He can park the vehicle in the available free slot. The users will be able to see the available slots in the app. The slots will be displayed in the app. If slots are free then the slot will be in green colour. If it is occupied then it will be in red colour.

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