

# Priority Parking Based on Cloud Technology



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**Abstract** Nowadays, finding parking space is becoming difficult as the number of vehicles is getting increased and acts as one of the major problems in traffic congestion. Many drivers are spending much time in circling city to find parking space, so the idea of priority parking system using IOT helps to find free parking slots in era of smart city and reserve these slots. This paper proposes a system which helps to find nearby parking slots near to the user at minimal cost. Authentication is also provided to avoid others using the booked parking slots. If the user cannot use booking slots, payment is refunded based on some terms and conditions.

**Keywords** Priority parking · Cloud computing · Booking

## 1 Introduction

In modern world, transportation is becoming an inevitable factor; we are much dependent. So much number of vehicles is increasing day by day which has negative impact such as traffic congestion, pollutants and waste in non-renewable energy, so some innovations are needed. Our proposed idea will help in reducing traffic congestion occurred by parking. Parking nowadays requires time, wastage in fuel and effort.

Main factors considered during parking are the accessibility of parking slot in which 30% of traffic is caused by drivers wandering in search of [2]. In 2006, a study revealed that 70 million hours were spent in search of parking slot which causes a loss of 700 million Euros each year [3].

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## 2 Literature Review

Smart navigation method, a-star (A\*) algorithm, is used for parking and location guider, which helps to locate destination [1]. In smart priority parking booking system, the optimal allocating of parking garage is a time-based dynamic system. The parking guidance and information system provide accurate localization and speed estimation of parking vehicle and this is the result of this system [2]. In cloud-based smart parking system, the minimal path is obtained through algorithm in IOT and for locating and tracing of vehicle [3]. By analysis and invoke of intelligent parking garage booking management system using ZigBee, location tracking is done [4]. In smart parking garage system, authors had proposed an android application, IOT and Arduino controller for electronic parking. The proposed android application is used for both local parking management and central parking management systems [5]. In smart car parking garage allocation system. This uses a linear programming tool for linear and sequential parking slot allocation [6].

## 3 Working Principle

First, user enter into the sytem using valid login credentials and requests for parking slots. If the parking slot is not available, it shows the hint message parking slot is not available and redirects it to the nearby parking slots in other condition; if parking slot is available, it shows the nearby parking slots and book these slots. After the vehicle reaches the slot, OTP will reach the user’s mobile for authentication, when its verified vehicle is allowed to park. There are two options available for booking, one is considering the time limit or not considering the time limit. In considering time limit, we can select the time limit for parking in the slot, and in not considering time limit, you can park from the starting time and amount will be collected till its parked. If time limit exceeds in considering time limit, the servo motor gate is only opened if exceeded time limit amount is paid, and if the booked slot is not used, amount is refunded based on conditions like traffic, intensity of vehicles and necessity (Fig. 1).

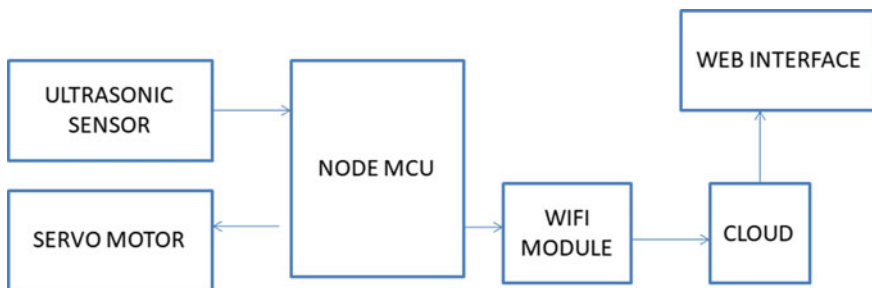


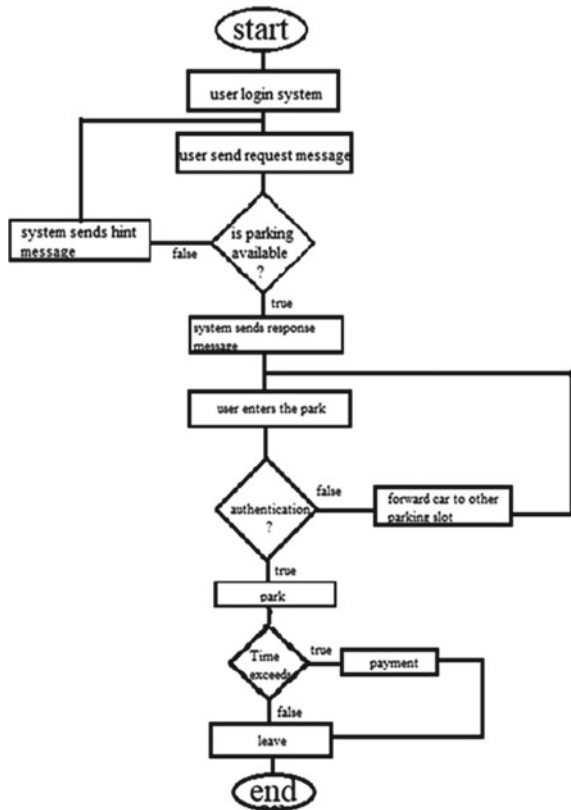
Fig. 1 Block diagram

- Step 1 Install the android application.
- Step 2 Choose a parking space.
- Step 3 Select an opening to the car stop.
- Step 4 To choose a time for which you want to stop your car.
- Step 5 Payment based on your credit card/Paytm/Google Pay.
- Step 6 To get confirmation after the payment the gate opens.

### 4 Flow Diagram

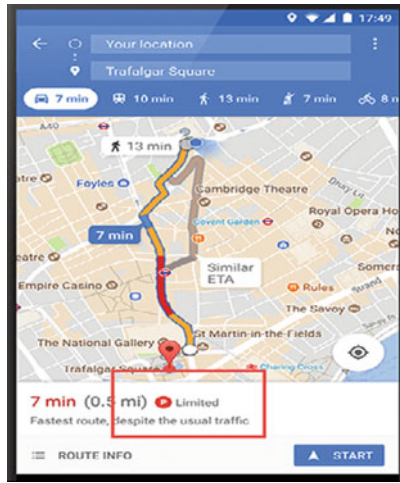
See Fig. 2.

Fig. 2 Flow diagram of the parking system

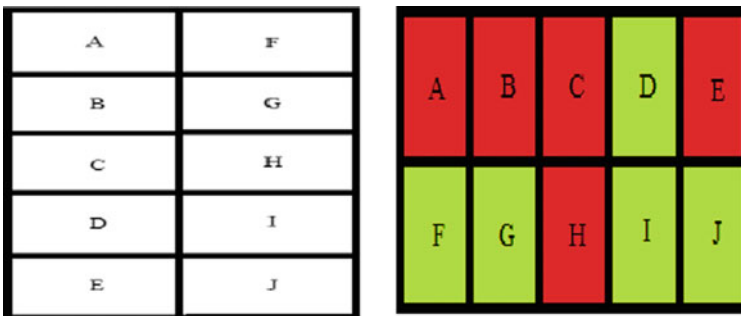


### 4.1 User Request

When users login to the system and send request message in search of nearby parking area, the application helps in searching nearby parking slots and book according to it. When they book the slots, they will direct to the parking slot by location service.

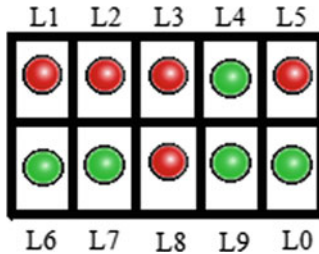


### 4.2 Parking Slots-Availability



Consider parking spaces A, B, C, D, E, F, G, H, I and J slots available. These slots can be viewed in the app. When its booked authentication is done to check the user’s identity, then it is allowed to park. In this, “red” indicates the booked slot and “green” indicates the free slots. When car is parked in slots, ultrasonic sensor senses that the car is parked and sends the data to node MCU, which is then processed and

further converted as readable data and viewed through user interface. The parking of car is sensed, and data is processed by node MCU changing the “red” color to “green” color.



LED panel set in the parking indicates the parking is available or not. L1, L2, L3, L4, L5, L6, L7, L8, L9 and L10 are used to indicate A, B, C, D, E, F, G, H, I and J slot.

## 5 Software Implementation

- Install the android application on your mobile device.
- Register the details of our mobile app.
- Login user details.
- Check user name and password, if it is valid, then display the home page.
- If it is an invalid, then go back to the login page.
- Book parking slot.
- Before booking the slots, generate the OTP.
- Choose the required date.
- The slot booking process is over and pays the excess amount from your credit card/Paytm/Google Pay.
- After payment, the gate is opened.

## 6 Specification

### Node MCU

ESP8266 is a low-cost controller. Wi-Fi module chip inbuilt in it allows connection to IOT. We can connect ESP8266 with any sensors to perform the required action. Controlling, monitoring and analysis can be done using node MCU. In our project, node MCU is used as main controlling unit which receives and transmits data from the user for parking slot booking.



### Ultrasonic Sensor

Ultrasonic sensors are used in a variety of applications. It is made up of piezoelectric crystal with high-frequency sound waves to convert electric energy into an acoustic energy. Sound waves from sensor are transmitted and reflected back from the target object like car to the transducer. By this process, distance is calculated which is used to verify the parking slot is filled or not.

$$\text{Distance} = (\text{Time} \times \text{Speed Of Sound waves})/2$$

### SMPS

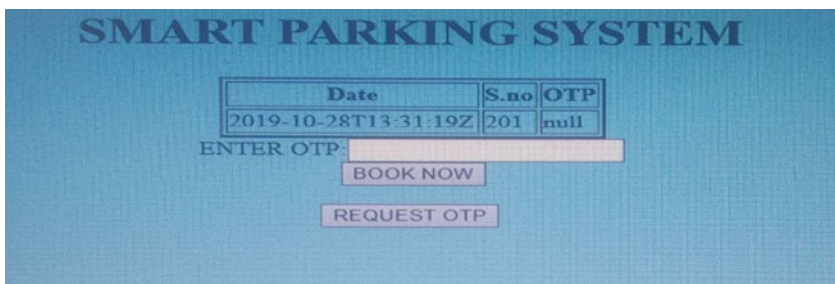
A switched-mode power supply is an electronic power supply that incorporates a switching regulator to convert electrical power it transfers power from a DC or AC to DC.

### Servo Motor

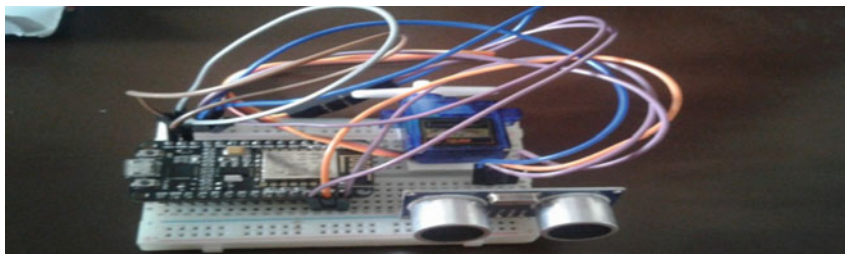
Servo motor is a rotary actuator/linear actuator which is for precise control of the angular or linear position, velocity and acceleration. A suitable servo motor is coupled to an ultrasonic sensor for vehicle position feedback. It is controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse and a repetition rate. A servo motor can only turn  $90^\circ$  in either direction for a total of  $180^\circ$  movement. The motor's neutral position is defined as the position where the servo has the same amount of potential rotation in both clockwise or counter-clockwise direction. The PWM sent to the motor determines position of the shaft, and based on the duration of the pulse sent via the control wire, the rotor will turn to the desired position.

## 7 Results

### Software Setup



### Hardware Setup



Thus, by using smart parking application, traffic-oriented accidents and time delay can be reduced to a large extent. It can be implemented in theaters, IT offices, malls, etc., and OTP generation allows other parking-oriented problems to be solved precisely.

## 8 Conclusion

Priority parking method is easy to use because of the user interface and IOT implemented in this project. Furthermore, improvisation can be made to implement it on a large scale without any cloud traffic.

## 9 Future Scope

In future, the changes can be implemented such as usage of camera that uses face recognition to reduce theft so that it could be reported at the nearby police station.

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