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# TROUBLE FREE PARKADE

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**ABSTRACT:** In this fast-growing economy, the number of vehicle users increases exponentially demanding more parking space. The pervasive presence of smartphones encourages users to prefer mobile application-based solutions. The growth of IoT has paved the way for the integration of mobile devices, wireless communication technologies, and mobile applications. This paper proposes a Trouble free parkade that integrates with mobile applications. It provides a comprehensive parking solution both for the user and owner of the parking space. Features are provided for reserving a parking space, authenticating a reserved user, identifying the nearest free space depending on the size of the vehicle, navigating to the parking slot, and computes account information on a daily, weekly, and monthly basis. IR sensors are used to identify if a parking spot is free. Availability of a free slot with its location information is transmitted using WIFI module technology, microcontroller, and wireless communication technology to the server and is retrieved through a mobile application. An RFID tag attached to a vehicle is used to authenticate a user who reserves the parking slot on an hourly, daily, weekly, or monthly basis. A scheduling algorithm is used to identify the nearest free slot based on the size of a vehicle. The owner of the parking space can get the analytics of the number of free and available slots for a given period, the occupancy rate on weekdays and weekends, and the amount collected for a given period and can use it for fixing variable parking fees. The mobile application is designed to provide a rich customer experience.

## I. INTRODUCTION

Smart city uses the information, communication and technologies to improve the operational efficiency for the public, helps in accelerating towards the improvement quality of life for citizens. Internet of Things (IOT), Automation, and Machine Learning are the emerging trends which drive towards smart city adoption. Any city can be considered for smart city initiative, by introducing system like, smart parking systems that use a mobile app to help the drivers to locate parking slots, smart traffic management to track and analyze the traffic flows, Sharing information electronically, monitor the environment changes enabled sanitation etc. The figure 1.shows strategic components to develop smart city mission improvement, smart innovation, energy, smart transportation, smart traffic light ,automatic street light, smart parking, smart innovation on thinking and etc.,. Any smart applications include sensors, which are deployed in environment, collects the information from device/sensor are processed and analyzed to manage the applications. This approach would reduce the cost of manpower and increase productivity. The Internet of Things (IOT) is a set of physical devices, vehicles, home appliances, embedded with electronics, software, sensor, actuator and network connectivity which enable to connect and exchange data. It facilitates connections beyond Machine - To - Machine communications, involving various protocol, domains and real-time applications. Sensors can be networked together to sense several physical phenomena such as soil, vegetation, water bodies[24], habitat monitoring, object tracking etc. Smart parking system is a classic example that demonstrates how the Internet-of-Things will be effectively and efficiently used to make life easy for a common citizen.

## II. LITERATURE SURVEY

Smart parking [1] has proposed a system which uses Google map application. Ultrasonic sensors and data collected are stored in the cloud. Android application map gives user friendly information regarding vacant places. Each slot has one LED display which helps to find the right parking place. The IOT based parking system using Google [1] is proposed to allow the user to reserve the parking place. Mobile application, finds the current parking place. In this system IR sensor is used to find a vacant place and is displayed at entry and exit gates. RFID tag issued to authorize a person entry to the parking place. If the person is authorized, a signal is sent to open the gate[2]. Advanced CAR Parking System [3] using Arduino and Raspberry PI to detect the free slots. This system uses a web



server for booking, Google Maps using GPS. Results are displayed in the mark graphically.

Effective car parking system [4] was proposed which uses IR sensors, authentication is done using RFID tag. ZigBee is used for communication.

Android Based Smart Car Parking System [5] Android based application obtains information about available empty parking slots. The android application would have customer details including area, state, vehicles number. Application having user enter and exit time and choosing a parking location. User details are stored in the MYSQL database. LEDs indicate the parking slots are empty or filled. Camera is used to capture the car number plate and convert the image to check whether the car is an authorized user car or not [5].

Smart Parking System based on Embedded system [6] uses smart parking system uses embedded and sensor network which uses android and windows application. In this system, Raspberry PI is used, IR sensor is used to find a vacant parking slot. V2I communication to driver sending the parking request providing user information status of conform reservation. Infrastructure to Vehicle (I2V) communication is used for reserve parking place applications and shows direction. JSON format used to interchange the data. QR code is used for the security purpose, webcam used to scan the code and authorized to show the parking lot direction[6].

A Privacy-Preserving Pay-by-Phone parking system [7] was proposed. The parking system can be reserved by pay by phone method. Mobile application using credit card payment method is implemented. New user can register and the new user contacts the system server and to purchase new e-coins. Each e-coin has a parking duration slot. Parking officer queries of on-board devices by performing RFID query[7].

Smart parking guidance system [8] proposed the parking guidance and information. System provide driver information and availability of parking slot through the VMS on internet. This system can be classified two different type off-road and on-road. Off-road used Pneumatic tube, loop deducted, Pneumatic tube to deduct presence of vehicle, Acoustic sensor-noise level to presence of vehicle, piezoelectric sensor-vibration to identify presence of vehicle security purpose used RFID. On-roadway ultrasonic sensors transmit wave to identify, IR sensor-emitting reflected wave to identify vehicle is present or not.

American countries use park me app or google map API to find a vacant place[22]. India's capital New Delhi from 2015 started planning to collect all relevant data about parking lots and parking areas current infra-structure of parking place ownership. Web pages or mobile apps are used to book parking places[23].

### III. PROPOSED SYSTEM

The proposed system consists of phases. Each of the phase is explained below:

1. Development of Android app
2. Free Space Identification
3. Authenticating user vehicle
4. Classify parking slot
5. Navigating to parking slot
6. Visualization in server for owner to analyze

After booking for a free parking slot, if the vehicle enters the entrance gate, it is assumed that each car has a built-in RFID card and RFID reader verifies the vehicle and is authenticated. The parking slot may be allotted for small vehicles and large vehicles.

#### NAVIGATING TO PARKING SLOT

Android application having GPS location to navigate the allotted parking area to booked users.

It graphically navigates from current location to parking area location.

Web page shows lane details date and time, booking time lane status, user detail and user feedback.



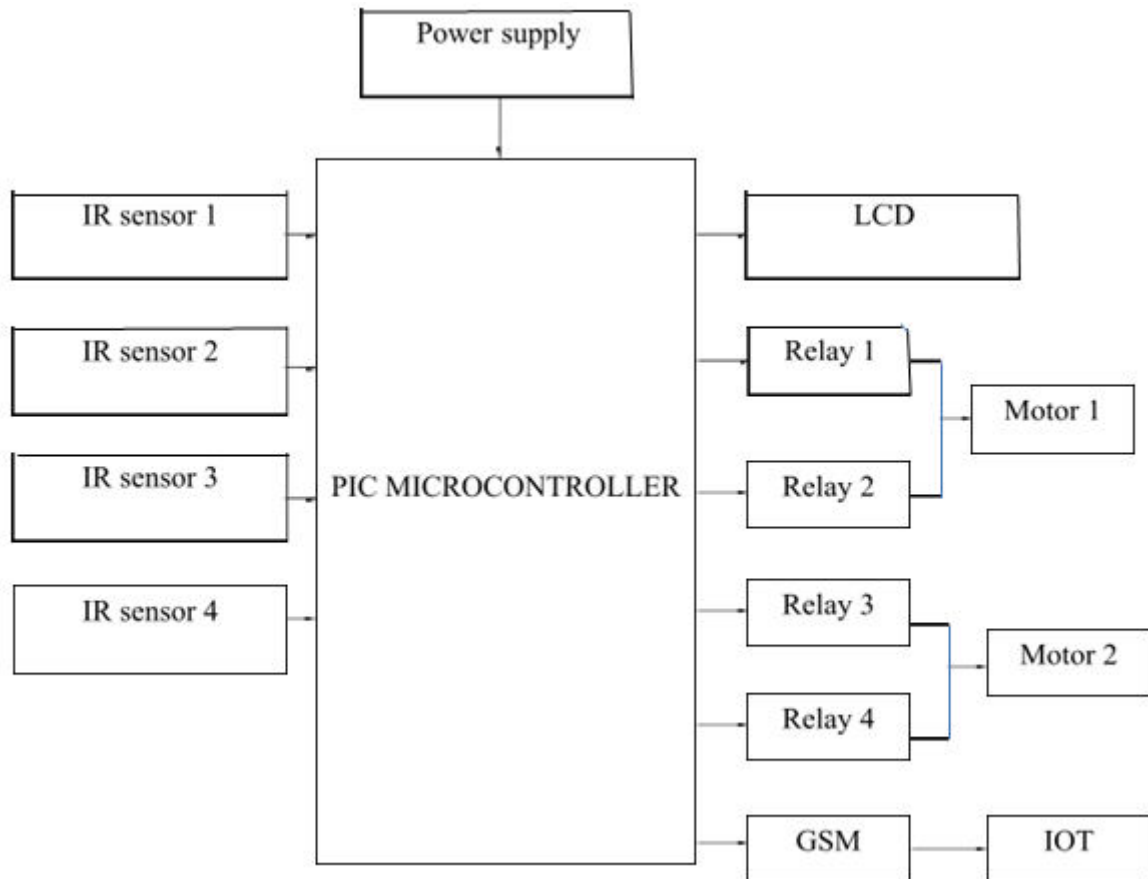


To enable a user to use the smart parking system, users need to register with a user ID with vehicle number. User can set up the default payment option in his account settings. The android app is built for booking parking slots and payments. The application is used to find the free slot and users need to specify the estimated time of arrival and parking slot usage start and end time. The IR sensors used to identify the parking slot are free or occupied. Parking slot is empty LED shows slot number N (empty), D (occupied).

**ADVANTAGE**

- To check the parking slot availability.
- The system reduces the driver’s effort and time to search parking space
- The user to locate and reserve a parking slot in online, navigation from entrance gate to available parking slot

**BLOCK DIAGRAM**



**III. IMPLEMENTATION**

**A. Identifying Free Parking Slot**

Free slot identification is verified using Infra-Red (IR) sensors. The IR sensor used for each parking slot. The infra-red sensor detects the vehicle in infra-red waves reflected and covers a short distance. A pulse of IR light is generated by the IR sensor and emitted by the emitter. Detected information will be sent via the WI-FI module to transfer the information to the microcontroller board and results are displayed on the LED screen.



## B. Parking Car InSlot

The car enters the parking slot. When the car is parked in the slot the IR Sensor detects the car is parked and the A pulse of IR light is generated by the IR sensor and emitted by the emitter. Detected information will be sent via the WI-FI module to transfer the information to the microcontroller board and results are displayed on the LED screen.

## C. Processing Payment

Automatic number-plate recognition can be used to store the images captured by the cameras as well as the text from the license plate, with some configurable to store a photograph of the driver. Systems commonly use infrared lighting to allow the camera to take the picture at any time of day or night

## D. Payment For Parking

When the car leaves the slot. IR Sensor detects the car has left the slot. ANPR is placed at the exit gate which will read the car plate number and process the amount which should be paid. QR code will be placed in the exit gate for the user to pay the money for parking. After the payment is done successfully IR Sensor in the exit gate will detect the car and the door is opened

## IV. CONCLUSION

In this work, Trouble free parking has been proposed which integrates several physical devices to check the parking slot availability. Mobile app allows the user to locate and reserve a parking slot in online, navigation from entrance gate to available parking slot is also the proposed system reduces the driver's effort and time to search parking space. Prototype is built for a single storage parking slot, but this model can be extended for multi storage parking space.

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