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# Smart Parking System Using IOT

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***Abstract*:** As we can see "parking" is a major problem in big cities, as we have limited space and number of vehicles are increasing day by day. Thus automated parking system development is necessary.
**This paper introduces parking management system for Android which will be consisting of user reservation, slot reservation, and finally payment. Initially system will get user registered and then he/she can book slot for certain time period accordingly he/she will charge for the same. This system will help user to book park slot at any time form any remote location..**
***Keywords***: Nearest parking area, reduced time, smart parking.

## I. INTRODUCTION.

This paper represents automated parking system which is a necessary development as we see parking is major issue in big cities that drivers doesn't get any place to park their vehicles and result in travelling more than required causing more fuel consumption. It is difficult task as there is limited space and number of vehicles are increasing day by day sometimes it is cliché task to find park lot on weekend and holidays so pre-booked park lot will help user to get park lot easily. This system will assist the park to make user more comfortable to park his/her vehicle in his, and allotted slot. To do so we need to determine environment of parking lot and slot is allotted to user according to availability.

## II. LITERATURE SURVEY

First Paper represent the system is smart car parking reservation application and security, maintenance in a private car parking field. The system allocates the parking space to the user by observing the distance between the user and the parking space and calculates the average time for the user entering the parking space.
Receipts scanner and financial organizer
In second reference paper the authors have introduced the system which makes use of IoT technology and cloud computing to develop an enhanced parking system.
Cloud computing is used for storing real time data of sensors and user data.
The Third reference paper represented the system that is reservation-based parking system represented using an Android application. This system works on algorithms of parking space detection and nearest resource allocation.
The fourth reference paper represented the concept of new smart parking solves the parking problem by using mixed integer linear problem.
Algorithm used is optimal parking based on resource allocation and reservation.

## III.PROPOSED WORK

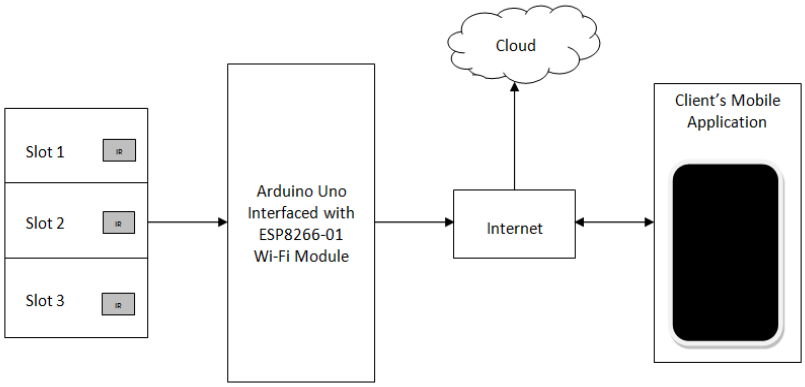



Fig. 1 smart parking system

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## IV.PROTOTYPE ARCHITECTURE

This system consists of various modules like server, database, mobile application and parking slot arrangement. In this system, an Android application is provided to user for parking slot booking purpose. A user must first download the android application in his android mobile phone. Then the user must register him with appropriate details like name, phone number, vehicle number, email id and password.

The registered information is then sent to the server system and data is stored in the cloud database. Along with user's information parking slot information is also stored in the cloud database which is always updated, and server manages and updates this information and keeps sending notification to the user after booking of parking slot. For booking a parking slot user first needs to get logged in.

Then user request for a particular parking slot through a mobile application. The database fetches the empty slot information which is provided through Arduino. At the parking slot there is a mechanism where Arduino and IR sensor is used. Arduino is used for managing IR sensor. The IR sensor is used for detecting the presence of vehicle in the parking slot. Whenever the car enters in the parking slot IR sensor will sense its presence and gives information to the Arduino and all the information is stored at cloud. System allocates user with a parking slot using the information related to parking slot fetched from cloud. This system is very simple and user-friendly.

## V. PROPOSED ALGORITHM

In our proposed system algorithm used is Reeds-shepp. This algorithm is used for

### *A. Parking Lot Occupancy Detection*

Parking Lot Map Construction-

The map is constructed with four information:

*1)* Parking slots' position (x, y, ψ);
*2)* Centerline of the parking lot boundary
*3)* Parking slots' size;
*4)* On-map localization information

### *B. Reeds-Shepp Curves based Path Generation:*

Path generation problem for automated parking can be considered as a simple 2D-path generation because the slope of the parking lot is negligible. Also the total path length is relatively short compared to driving on the road, the error which occurs due to the ignoring of the road slope can be ignored.

Thus, 2D-path is enough to design the reference path for automated parking control. To generate the reference path, the characteristics of the vehicle motion should be considered not to design the unreasonable path which could not be tracked. If the steering angle is constant and the velocity of the vehicle is enough low not to saturate the tire force, the motion of vehicle can be approximated as a circular motion which is traveled by the center of the rear axle.

### *C. Vehicle Control*

*1)* *Lateral Controller Design:* The lateral controller calculates steering wheel angle, which is sum of feedforward and feedback input, to track the reference path. Generally, error dynamics based feedback controller is used to tracking the path in normal driving condition. However, centimeter level accuracy is needed to park the vehicle without collision because there is not enough safety margin in parking lot. Also steering input is easily increased as maximum value in parking process. This means that if the tracking error is largely increased, it is difficult to reduce error while parking sequence. To deal with this problem, curvature based feedforward input is used to impose the control input before tracking error is generated. 3rd order curve which is fitted using nearest 7 waypoints is used to compute the curvature of the reference path. For feedback input, linear quadratic regulator (LQR) is used to determine optimal feedback control gain.

*2)* *Longitudinal Controller Design:* The longitudinal controller of autonomous vehicle usually designed as two-level structure, upper level controller and lower level controller. The upper level controller decides the desired speed or desired acceleration of vehicle to satisfy the desired motion. After that, the lower level controller calculates proper throttle and brake command to track the desired command of upper level controller. In this paper, the reference path is designed using Reeds-Shepp curves which assumed the desired velocity of the vehicle is constant. Therefore, designing the lower level controller is only needed.

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## VI. RESULTS

This system is working on android application. This application is easily available on play store, this application shown the available parking slot to the user which will help the user to book slot in advance also. User can view their reservation and also can cancel the reservation.

## VII. CONCLUSION

These proposed system is useful for solving the real time problem of insufficient parking slot availability, traffic congestion problem in big cities such as shopping complexes, school and colleges and popular places, especially during their peak hour.
Database used in these system is cloud database which is used to store huge data such as user details, vehicle no. ,vehicle type, slot details, etc.

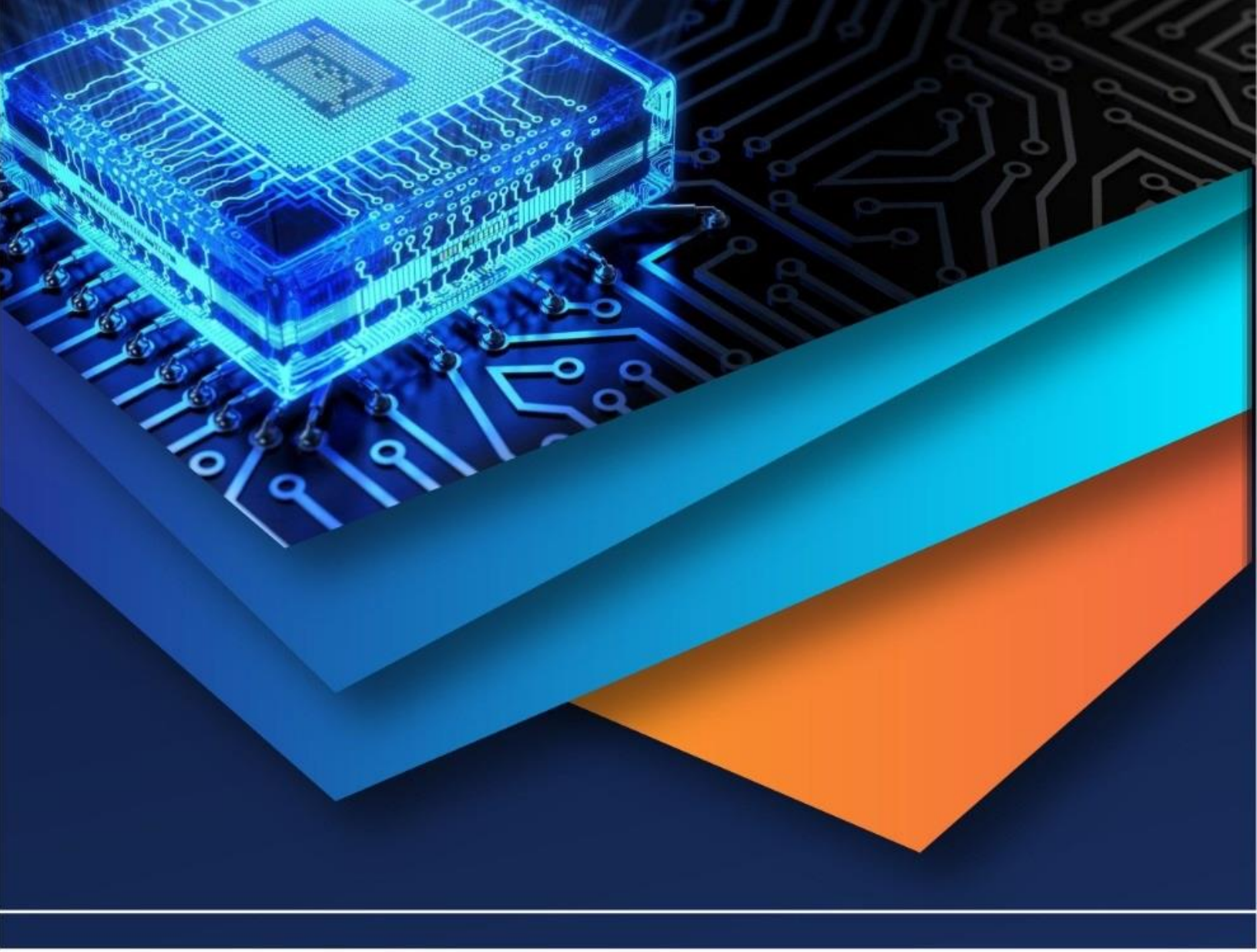
## VIII. FUTURE SCOPE

Our system is currently working only for android-platform mobile application. It can be rebuilt in a multi-platform structure so that windows and iphones users can also use this app.

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