Intelligent Parking System Using Android Application

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April 14, 15 - 2017

Abstract

“Intelligent Parking System using Android Application” provides user an easy way of booking the parking slots through an application. To avoid the problem of traffic conjunction in commercial areas that unnecessarily consumes time, this paper provides the easy reservation system for parking. In this application the user can view various parking slots and check for the availability of slots. Whenever a user books a particular slot it will be marked red and all the available slots will be green. Booking can be done through credit card/net banking. This application also provides an additional feature of canceling the booked slot within 20 minutes from the time of booking. If the user fails to reach the destination on time then the reservation will be cancelled and the payment is refunded. On successful payment a parking number is sent to user’s email or to his mobile number for further enquiry. Hence this application reduces the user’s effort and time of searching the parking slot and also avoids conjunction of traffic.
1. Introduction
Too many cars, too much traffic and there is no enough parking area. This is the situation which is seen in most of the metropolitan cities today. People keep on roaming on roads searching for a parking space to park their vehicles especially at peak hours of time. Our proposed system presents a smart parking system that regulates a number of vehicles to the nearest parking space at any given time based on the parking space availability. “Intelligent Parking System (IPS)” is implemented using the Operating System Android. The user requests the Parking Control Unit to check the status of available parking slots. As soon as the user request, all the available free slots are displayed to the user. If the availability of parking space is confirmed, the user can book the parking slot and proceed to pay. The vehicle follows its path towards the starting of the parking area. The user fixes his slots by showing his confirmation details to the concerned person at Parking area. After communicating, the vehicle will further follow its path to the allocated parking slot. After successful parking the slot details are updated simultaneously in the Administrators database. Finally the time to find for an empty parking slot is minimized. The main responsibility of the Intelligent Parking System (IPS) is to help the user to find an area where parking is available and total number of slots free in that area. Thus our proposed methodology reduces the user’s effort and time of searching a parking slot.

2. Proposed Application of Intelligent Parking System (IPS)
The proposed system is an Android Application which mainly consists of three modules. The user can choose a parking space that is nearest to his destination after getting login to the application. After the user books a particular slot the administrator updates the status of that respective parking slot to “RESERVED”. If the user doesn’t arrive to the parking slot within 20 minutes from the time of booking his booking will be cancelled and the status is updated to “EMPTY”. Intelligent Parking System (IPS) is based on the client-server architecture. It’s economically beneficial since it doesn’t require any heavy infrastructure. It is neither sensitive to temperature change nor affected by any extreme air turbulence. The main objectives of Intelligent Parking System (IPS)
application is to provide the following:
1. Intelligent, ubiquitous, user friendly automated parking system application that minimizes user’s time and avoid traffic congestion in metropolitan cities.
2. To ensure safe and secure parking slots within limited area, which is of most urge.

3. Methodology
The slot allocation method follows a sequence as stated below:
Step1: Initially the slot selection is made by the user from his mobile phone. He checks for the availability of a parking slot that is nearest to his location. If it is available, he moves to the next stage or else go to the initial state.
Step2: Transfers request for parking slot from the mobile using Android application.
Step3: The Parking Control Unit (PCU) gets the slot number requested by the user.
Step4: If the payment is done successfully, then the requested slot is reserved in the parking area.
Step5: After reserving a particular slot by the user then the status of that respective slot will be marked as RED=RESERVED and the remaining will be GREEN=EMPTY.
Step6: As soon as the vehicle gets entered into the parking slot, the timer gets ON and measures the total time.
Step7: As soon as the vehicle moves out of the parking slot, the timer gets OFF and the total cost will be displayed.

Modules
Intelligent Parking System mainly consists of three modules. They are
- User Module
- Administrator Module
- Booking Module

![Figure 2.1-1 Architecture of Intelligent Parking System (IPS) User Module](image-url)
This module of the application deals with the user interface/user experience. This module provides the user with the flexibility of registering, logging in, booking and making the payment. If the user is new to the application then, the user must register in the application by providing the user’s details. After the registration, the user logs in using the user-id and password. Once the user logs in, then the user browses the parking slot then books that parking slot followed by the making the online payment.

Administrator Module
This is the operative module of the application. It works in the backend for managing the database and performs various operations on it. The administrator stores all the user’s data in the database as soon as he gets registered with the application. Administrator maintains the details of all parking slots (both empty and reserved), their price for booking, user details in database and the modification on these data is only can be done by the administrator. The administrator also provides the payment method to the user.

Booking Module
This is the main module of the application and it deals with the booking of the parking slot. When the user is ready for booking then the booking module comes in the scenario to provide user the necessary information for booking. The available slot, cost to book the slot and the necessary processing in regards to these, are done by this booking module.

4. Output Screen
Client Side
Initially, the user need to install IPS application on his android device. After installation the IPS icon will be displayed on his android mobile screen.

Registration and login:
If the user is a new user he needs to get registered with the application by giving all his details. The data which is entered by the user is stored on the server. These details consists user name, email, password, address etc. This registration is done only for the first time. After successful registration he receives a unique login ID both to his mobile and mail. After the user gets registered with the application, the user can login by providing email and unique ID. User gets this unique ID both to user’s mail and mobile number as soon as he gets registered. If the user gets successfully login to the application then the user is said to be an authorized user.
Check for a slot and its status:
User login the application where he can view various parking slots in his destination location. User selects his desired parking slot that is nearest to his destination. After selecting a slot the user needs to check for the availability of that respective slot. The user can check the status of the slots with the help of green and red colour indications. Where green colour indicates that the respective slot is empty and the red colour indicates that the respective slot is already allocated to some other user.

Payment and Logout:
On availability of empty slot, the user can confirm his booking of his desired slot. After reserving a particular slot the use can proceed to the payment option or else terminate the entire process. The system requires full payment in advance either through a credit card or a debit card. Hence, the user needs to give all his card details to book his desired slot. After successful payment he receives a slot number, both to his mobile and mail. After utilisation of a particular slot he can move out of the parking area by clearing his payment. He can check all the details in his account and can logout. The user can also leave a feedback to share his experience.

Server Side
Initially the administrator logins the application by using his username and password. The administrator has authority to add new users and stores their details in the database which are used for further purpose. On receiving the request at server side by
user, the administrator shows all available locations at the nearest requested destination.

**Login:**
The administrator can login to the application by giving email and password. If the administrator gets successfully login then the administrator is said to be authorized. After getting login to the application the administrator can carry out many tasks such as:

- Adding Parking Locations
- View Parking Locations
Add and view Parking Locations:
The administrator can add different locations where parking slots are available. The user can select any location which is nearest to his destination. The administrator can also delete the locations if he wishes. The administrator can view different locations where parking slots are available and can also check the status of different parking slots.

View All Users and Respective Booked Slots:
The administrator can view all the users who are using the application and can also check the booking details such as the time and date at which the user requires a slot, number of hours a user is using the allocated slot, at which location he requires a slot etc. The administrator can view all the reserved slots of all registered users. The administrator takes this as a reference for further allocation.

Users Feedback and Logout:
The administrator can take feedback from different users. He can either reply to the user's feedback messages or simple delete them. The administrator can move out of the application by simply clicking on logout button. He can check all the details in his account and can logout.

5. Conclusion
Intelligent Parking System (IPS) is used to book parking slots without any great effort by the user using an android device. The user can check the status of parking area and book the parking slot in advance. This will result in overcoming many problems which are being created due to the bad management of the traffic. Mobile computing has proven as the best area of work for researchers in the areas of database and data management so this application is applied in Android Mobile OS. This application is utilized by can be applied nook and corner due to its easy usage and effectiveness.

6. References
[2] Thanh Nam Pham1, Ming-Fong Tsai1, Duc Binh Nguyen1, Chyi-Ren Dow1, And Der-Jiunn Deng2 “A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies”, IEEE Access, Received July 24, 2015, accepted August 16, 2015, date of publication September 9, 2015, date of current version September 23, 2015.


