

SMART VEHICLE PARKING SYSTEM BASED ON IOT AND RFID

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ABSTRACT

In recent days we can usually notice in the public places like the shopping malls, movie theatres, airports etc..., where people find it difficult to park their vehicles in the parking area because of the unorganized allocation of the slots on a random basis. Also finding a correct place for parking the vehicle is not only a time consuming but also a money consuming process. To avoid these issues, Smart Vehicle Parking System which is based on Internet of Things and RFID-sensor technology is implemented. The same system can be applied for any kind of a public place or for a corporate or any kind of an organization where people face parking issues, to facilitate an easier and a user-friendly parking system.

Keywords - RFID, parking slot, online payment, cloud storage.

I.INTRODUCTION

The smart vehicle parking system [1] is an innovative idea that provides a better solution for the problems faced during parking in commercial and public places. An Android application acts as the user interface as shown in Figure 1 in collecting the inputs from the user for parking like the area/place for parking, time period for parking and the slot in which the user wants to park his/her vehicle. Also it displays about the amount to be paid for the booked amount of time. The user is provided with the facility of paying the money online to recharge his/her RFID tag. When the user's vehicle reaches the destination, the detection of RFID by the sensor leads to automatic deduction of the money the user has to pay for the amount of time he/she has booked for parking the vehicle. If the user does not want to make use of the parking facility, he/she can cancel the slot that he/she has already booked. Every time the user books or cancels, he/she is notified with appropriate messages.

The entry and exit of the user's vehicle in the destination is properly noticed through the detection of the user's unique RFID tag by the sensor. The RFID-sensor technology [6] offers a safer and an efficient parking system by way of proper recognition of the users by making use of their RFID tag numbers. Hence the users can feel safe about money transfer and deduction processes. This overcomes the issues in manual parking management like unnecessary time consumption, improper notifications about the slots, difficulty in managing more number of vehicles in person etc.,

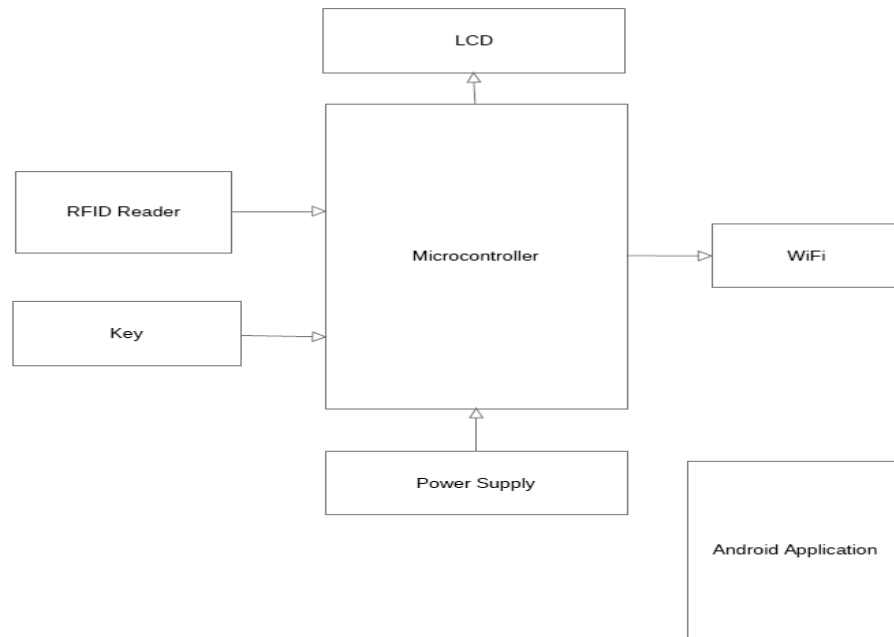


Figure 1 Block Diagram

II. RELATED WORK

Car Park System: A Review

As the vehicle usage is increasing rapidly every year, there are lot of traffic problems occurring often on the roads. The existing system for managing the traffic and allotting slots for parking the incoming vehicles on the road is not efficient enough in its functioning. The car park system is a solution that eradicates the before mentioned problem with the existing traffic management and slot allocation structure. It makes use of the sensor technology that helps the users in finding the available slots for parking. It also provides a difficulty free payment technique by which the customers can feel free with the payment process. The selection of the appropriate sensor can be made from the different kinds available in the market as suitable for amount of detection. The result of a recent survey is that the sensors used for detecting the vehicles play an important part in vehicle parking applications.

PARKING SYSTEMS ACROSS THE WORLD

There are different kinds of parking systems applied in many places around the world. These systems are constructed based on the advanced vehicle management technologies and enormous other resources. By the usage of these systems, the confusions involved in vehicle parking can be solved effectively. It involves several categories and separate features that are helpful in guiding the users in parking their vehicles without any complications or difficulties. The customers can also easily reach out in communicating about the issues they face in making use of this system. The system can be generalized for any location or for a particular city. Within a particular city, the system can also be dedicatedly applied for a specific place of usage or for the popular visited places, based on the user's requirements. The parameters for allocating the slot may vary depending on the density of vehicles in the destination, traffic on the way to the destination and many such parameters.

II. DESIGN

Phase 1:

Account Creation:

A new user has to initially register with the application by providing his username, email and mobile number.

Login:

After successful creation of the account, the users can login by using the username and password.

Inputs for Parking:

The user has to provide the inputs like area for parking, time duration etc., for booking the parking slots.

Message Indication:

The user is indicated with a message of the booking slot on successful booking. Otherwise, the user is indicated with a cancel message.

Phase 2:

Cloud Storage:

It is used to maintain the user credentials on a daily basis. Data gets expired after 24 hours of time [3]. It verifies whether the requested parking slot in a specific place is available or not and then notifies the user as illustrated in Figure 2.

Phase 3:

Radio Frequency Identifier:

It is attached to the user's vehicle for unique recognition in the parking place. It also ensures safe money transfer due to its uniqueness.

Detection using Sensor:

It senses the entry or exit of the user's vehicle by scanning the RFID reader in his/her vehicle.

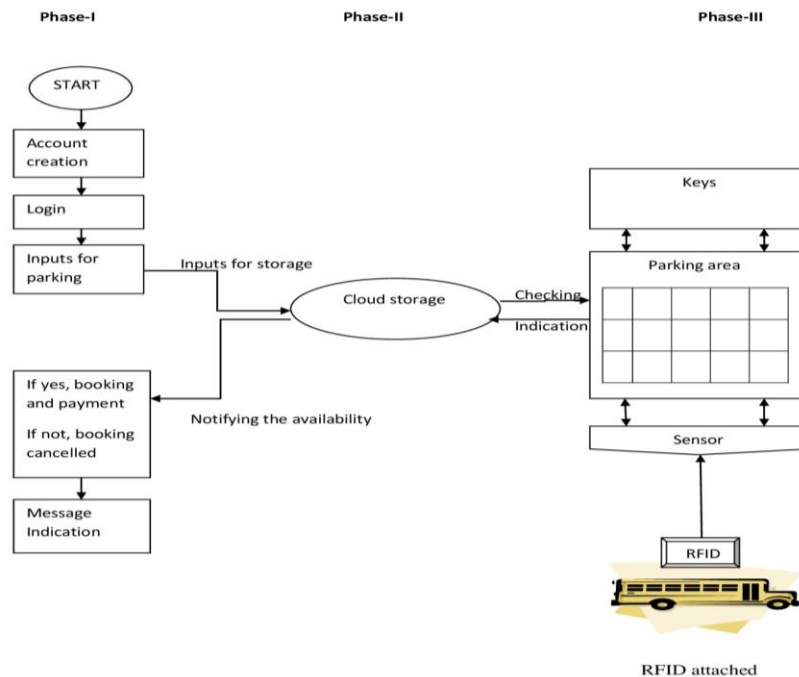


Figure 2. Detailed design

IV. METHODOLOGY

Enhancement via iterative improvement

Every time, on developing a new attribute or a feature for the system, it has to be completely unit tested for detecting the failures. While performing the unit tests, all possible cases like valid inputs, invalid inputs, wrong inputs and null cases have to be clearly tested. On adding an extra feature or an attribute to the already developed feature that is unit tested, a combined test for the both has to be performed. This kind of testing as shown in Figure 3 helps in improving the developed modules of the application in its functionalities.

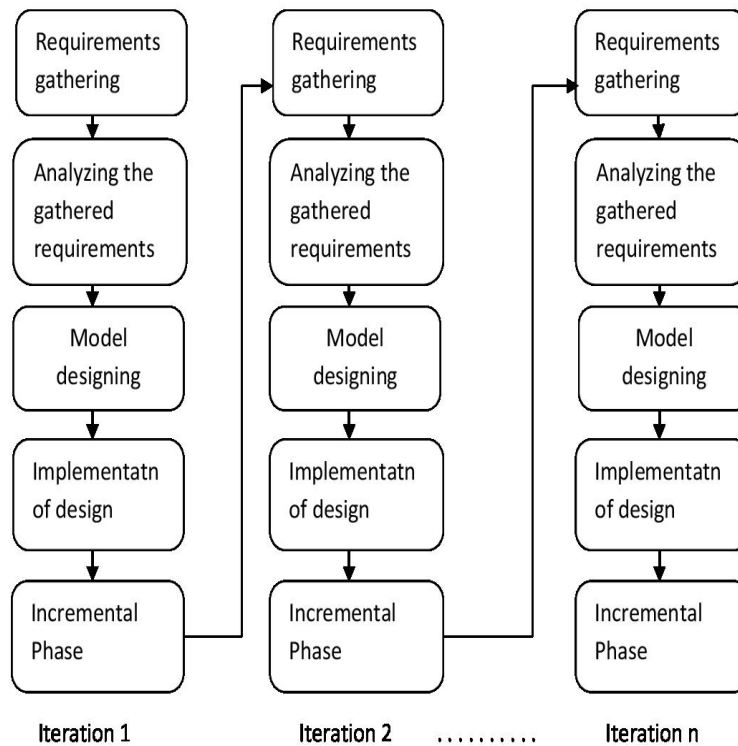


Figure 3. Illustration of Iterative development via incrementation

If the test is being performed before the complete development of any attribute or feature, the tests fail because of the improper implementation. If even on complete development of the attributes, sometimes the use cases may fail due to the incorrect development. In such cases, necessary modifications on the implementation of the structure have to be done for clearing the test cases. Let us consider the test made for the user interface where in the possible test cases are like properly getting the user inputs, creating account for the users, correct execution of the login area etc., If any one these fails, that particular portion has to be corrected for errors and then has to be checked for correct execution. If all the cases gets passed, then the other features like modules for booking has to checked for errors and then must be tested as a whole with the already tested user interface part as illustrated in Figure 4. Such kind of level by level improvement is called the iterative improvement.

The entire procedure consists of a collection of cycles of test processes. In every cycle few improvements can be made and on repetition of those cycles after previous improvement can enhance the application to a wider extent. On the execution of the final iterative cycle, most of the user requirements get satisfied.

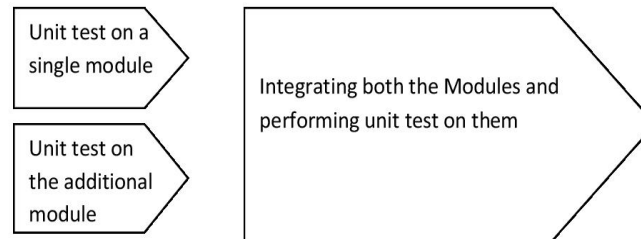


Figure 4. Demonstration of unit testing on phases

In case of any suggestions or any improvements to be done from the user's perception, it can be made by iterative execution of the particular feature that requires the mentioned changes to be involved.

V. RESULTS AND DISCUSSION

The solution provided by this system helps in reducing the issues faced by the people in finding appropriate slots for their vehicles to be parked in any kind of public places where lot of time is consumed in searching for the parking slot. The Smart Vehicle Parking System architecture integrates the android application with the prototype model of the parking area via cloud platform. The cloud platform is capable of storing and maintaining the user credentials for a period of 24 hours. It is responsible for notifying the users about the available parking slots in the place selected by the user and also showing the other slots that are booked. Thus the users can book any available parking slot and also can cancel the already booked slot. And it is valid for a day of time. The RFID reader makes sure whether the user made use of the parking facility or not. If the user did not make use of the facility for a certain amount of time, the slot is made unbooked and displayed as a free slot for the other users.

VI. CONCLUSION

The main objective of the project is to reach out the users effectively by the way of this solution by minimizing the chaos in parking for a hassle free travel. Users can find the best slot available and thus can save their time and effort. This system can be scaled to a larger extent of expanding its scope to the government sectors and popular commercials by which it can reach out to the common people to a greater extent.

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