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Intelligent Parking System

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ABSTRACT

In the present world every other individual owns a vehicle be it a two or four wheeler. With such an increase in the number of vehicles there is required place to park. During holidays or weekends people prefer travelling to various places and due to lack effective utilization of the parking areas many vehicles are damaged. The present paper discusses on an intelligent system utilizing the parking space effectively.

Keywords: Vehicles, Internet of Things, Smart Phone, Parking, Lane, Pre-booking, Display Device, Drive-in, Main Server

1. INTRODUCTION

The present invention relates to the field of Internet of things (IOT) in Vehicle Parking.

The goal of this research is to develop a smart system for parking using IOT. The searching of parking space is a major problem and also contributes to traffic jam and road block in the cities. The rapid increase in the number of vehicles worldwide is aggravating the problem of the lack of parking space. Smart parking management systems provide convenience to the drivers.

The recent advancements in the area of IoT has provided solutions to manage parking space.

Our research team has developed a smart system that challenges the current system and provides the following advantages for enabling space for parking without creating any havoc to anyone.

1. A mobile application or website to reserve the parking spot in a complex.
2. A main server for data synchronization.
3. A token that contain information pertaining to an individual
4. Provision of grace time to the individual in case of late arrival
5. A scanner that is positioned at the entrance to scan the license plate of the vehicle to avoid cancellation of the reserved spot.
6. A two level security system that prevents the security threats inside the complex.

The implementation and description of intelligent parking system would be discussed in the preceding sections of this paper.

2. DESCRIPTION

The paper discusses in detail on a smart parking system which provides the user to book a slot well in advance to reduce the hassle at the end searching for a parking slot.

In the current scenario, due to increase in the number of vehicles the parking slots have been increased and the management has to be smart in allocating space to the vehicles. Thus the situation has become first come, first serve

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to avail the parking slot. The individuals coming late tend to lose out the opportunity to avail a spot and have to look for an alternative.

In such a scenario, the present invention provides an advantage that allows the user to book the parking slot well in advance thus minimizing the risk of searching for an alternative or settling in for higher price at the same parking area.

Fig. 1 describes the parking scenario 100 used in the present invention. The individual can book a parking space well in advance either through a parking mobile application 103 or through the website/web application 104. The parking mobile application provides a simple interface that provides a list of parking zones available the particular city and in that particular area.

The parking mobile application is in synchronization with the main server 102 of the parking zone, that keeps on updating the parking slots. The user interface through the web booking is similar to the mobile application except for the generation of a token. Instead a message is sent to the registered mobile device. For every registration a unique number is generated the use of which is mentioned below.

The parking system further has the facility of drive-in option 105 allowing the users reserve a parking spot immediately. For such users, a message is generated instantaneously, which contains the information mentioned above.

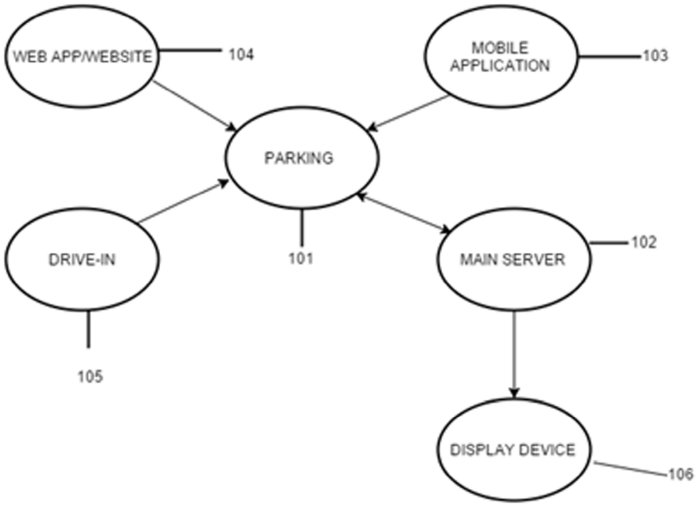

Figure 1: Parking Scenario

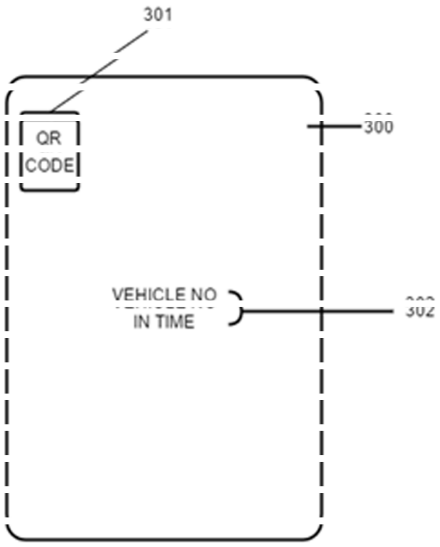

Figure 2: Booking Stage

Fig. 2 shows two stages of booking through mobile application (the web application/website has similar interface). The mobile application provides the user with an updated or refreshed list of parking spots available. The user can view different parking zones within an area or region 201. The user is presented with an option to choose the parking location 202. After the user selects the parking spot, the parking spot number and the floor number for that spot is generated. During the process of registration, the user has to provide any of his personal identification number such as PAN card, passport, driving license number or the like. Further the user has to provide the license plate number of the vehicle. At the end of the process a message is sent to the user confirming their details. The mobile application and the website further have the option of changing the license plate number in case the user wishes to take other vehicle.

The message will be having the information such as, user name, in time for the user, the parking spot identification number along with the floor number, the personal identification number provided at the time of registration, the vehicle license plate number. The parking system has a main server which refreshes every 5 seconds providing an updated list of the parking spots available. Thus the above system eliminates the booking of same spot by two different users.

The parking main server 101 is connected with a display device 106 that shows the number of parking spots reserved, the spots available. The display device is present at the entrance of the parking zone for the ease of users. The display device can be either an array of LED's programmed by a controller a LED of LCD screen or the like.

The parking system in the present invention provides an advantage by dynamic allocation of parking spots to the two categories, namely advance booking through application or website and the drive-in.

For the individuals who have booked through application or website, have to enter the unique registration number generated at the time of registration and a parking ticket 300 is generated which contains information such as the name of the driver, in-time, the parking spot, the floor number, vehicles license plate number. Fig. 3 shows the parking token. All this information is displayed is encrypted in a bar code, QR code 301 or the like. The token bears the vehicle license plate number and the in-time 302 that is visible to the naked eye.

The present invention provides two different kinds of queues, namely advanced booking queue 401 and the current booking, referred to as drive-in 404 as shown in fig.4. The individuals who have booked in advance are provided with a grace time of 15 minutes to reach the parking zone, else their reservation will be cancelled. At the entrance of the advanced booking parking lane 401, a scanner 404 is present that scans the license plate of the vehicle to ascertain the presence of the vehicle. As mentioned above, the change of license plate can be done easily by the user. This change is updated into the server of the scanner that is placed at the entrance. This ensures the reservation is not cancelled in case the queue is long. To avoid the queueing up of vehicles at the entrance, a number of turnstiles are present at the entrance. The token generating machine 403 generates the token 300 which contains the details as mentioned above.

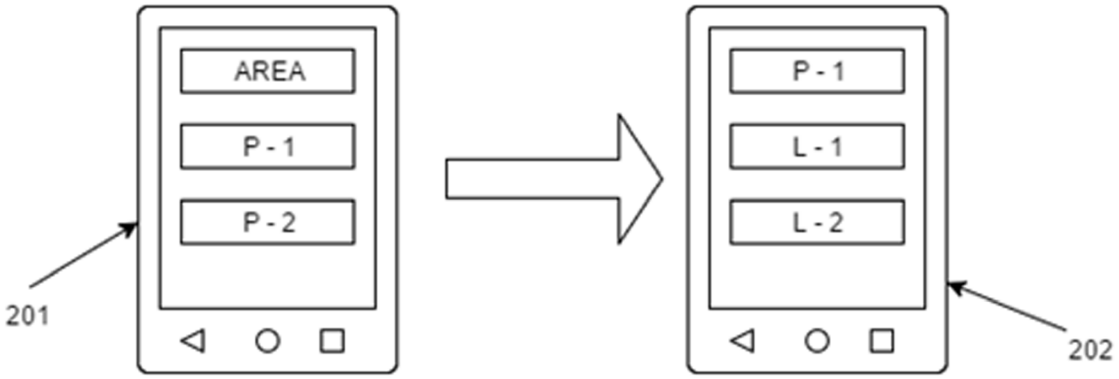

Figure 3: Parking Token

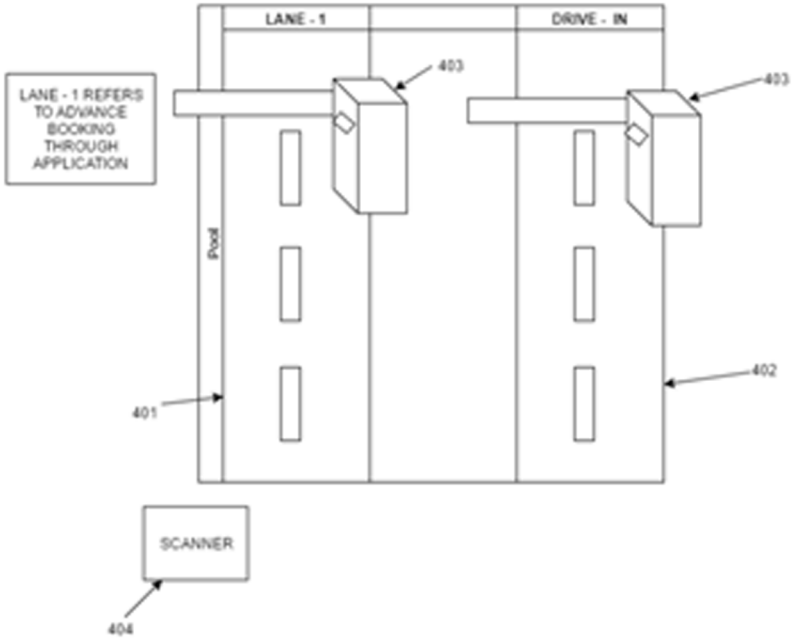

Figure 4: Drive-in-Advanced Booking Queue and Current Booking

Further, the individuals who have availed drive-in feature or current booking, after reaching the turnstile, have to enter their mobile number, personal identification number. A token will be generated having the information as mentioned above. In this case the parking spot is provided by the machine automatically based on the availability.

Additionally, a face detection apparatus is installed, not shown in the figure, at the entrance turnstile to aid in the security of the parking zone. In case of any security threat, the individual can be alarmed or recognized, if found guilty.

After the entrance turnstile, a security chamber is present that scans the entire vehicle. The system is present on either side of the system. The scan be either a thermal imaging, X-ray, laser scanning or the like. This vehicle frisking allows the elimination of any threat inside the vehicles. The scanned image of the vehicle is displayed in the monitor system of the security chamber and the vehicle is proceeds after obtaining a green signal from the security.

The vehicles are allowed to park inside the parking zone based on the parking slot identification number. Inside the parking zone a movable scanner system is installed overhead the vehicle parking area (not shown in the figure) in each floor at multiple locations that serves two purposes.

Firstly, it tracks whether the vehicle is positioned in the correct parking spot which is allocated for the vehicle. This is achieved by scanning the license plate of the vehicle. in case the parking spot mismatches for a particular vehicle, an alarm is raised to indicate that the vehicle is parked at a different slot. Secondly, the movable scanner scans the vehicle for any security threats. The second level of scanning provides a redundant measure thus providing a more secured parking zone.

In every shopping complex, there are multiple parking floors and the individual tends to use different gates for entering and exiting the complex. To serve this purpose, the current invention utilizes code scanners (bar code, QR code or the like) to scan and locate the vehicle.

At the exit turnstile, the individual is required to scan the code on the token. The system has the out-time locked according to the computer system clock and clocks according to the system. Thus, the person is no longer required to manually enter the out-time.

When the user scans the token having the code, the in-time is fed into the system and a bill is generated automatically. The customer can pay the bill either by cash or by card.

As mentioned in the beginning, the present invention utilizes facial recognition system. This system ensures that the same driver is driving the vehicle outside the parking zone to avoid theft of the vehicle.

3. IMPLEMENTATION

The present invention and its advantages can be implemented as described below.

Now-a-days, with the increase the increase in number of vehicles there is a huge requirement of parking space. Thus a system is required to provide and utilize the parking space effectively.

As mentioned above, due to the increase in number of vehicles, huge parking space is required. In the present invention a smart parking system is proposed wherein the user can book a parking slot well in advance through a mobile application or website. Additionally, the user can avail drive in facility in the parking system.

In another aspect, the individual can book a parking slot well in advance through a mobile application or through the website. The system is dynamic, in the sense, it allocates the spots dynamically for the user booking in advance and to the drive in users.

The system further includes a scanning system at the entrance and inside the shopping complex to defer security issues. A number a turnstiles are present at the entrance to avoid the delay waiting in the queue. The users who have availed the facility through the mobile application or through website have a separate queue from the drive-in.

The parking ticket detail is sent as a message to the user. The users can make payment either through mobile wallet within the application or through cash etc.

4. APPLICATIONS

The invention as described in the drawing finds applications in Offices, Shopping malls, Supermarkets, Hypermarkets, Shopping plazas and Movie Theatres.

5. CONCLUSION

The present invention provides a solution for asmart parking system that allows the user to book a parking slot in advance and further provides an increased security and lowers the threats at the parking areas.

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