

Smart Parking System Based on Rules



Nikita Hatte, D. G. Khairnar, M.R.Kalyanshetti

Abstract: *The intelligent town idea plays a significant part in today's technological term. Consequently, the worry about parking in an urban area has become imminent. The parking problem can become a great chance presented by present trends to satisfy the world's linked continuum. This article focuses primarily on the smart car parking system idea. This system of parking offers 6 slots. But up to n amount of slot can be extended. The proprietor is assigned to each individual slot. And in the allocated scheme, the proprietor must park the car, but when a remote slot is assigned, i.e. slot 9, 10 makes the system uncomfortable to use for a brief stay. Therefore, a rule-based service customization method is used and this parking scheme will record remain time for a few days and the system will therefore allocate a slot to the vehicle's proprietor. Together with the IR sensor and RFID reader, Raspberry Pi is used in this scheme and linked to the web page with integrated Wi-Fi.*

Keywords: IoT, RFID, parking system.

I. INTRODUCTION

With an advent of IoT, it is now feasible to build a parking scheme. The primary problems in the smart cities are the management of traffic control and parking facilities. Chasing a parking space in larger towns is not always easy for drivers and it gets harder with more and more consumers getting their own vehicles. As the cars grow quickly, there is the issue of parking, which leads to air pollution as well as traffic congestion. Therefore, by keeping adequate car parking management, reducing the waste of time. The issue of parking in the bigger towns occurs in tourist sites, shopping malls or other business regions.

There are two main issues a) finding parking space in the shortest possible moment b) find theft vehicles.

The availability of the parking slot will detect by using ultrasonic sensors. A Wi-Fi chip is attached to each sensor. The gateway consists of a raspberry pi board that uses MQTT protocol to update the cloud. The user interface is provided with a mobile application. System implementation costs are

high in light of the fact that each detecting node has its very own Wi-Fi chip [1].

In huge urban areas, an automatic parking management can be an unavoidable option to justify traffic management. This paper also proposes an efficient and relatively inexpensive car parking framework (CPF) based on this integration. Using the standard I2C protocol, the design discussed the segmentation of sensors (sensing boards) into a single mote, and the experimental results show significant reduction in costs and energy consumption [2].

The conceptual idea of cloud-computing based on intelligent parking services in smart cities is described. The related IoT sub-system involves sensor layer, interaction layer and application layer. It outlines a view of the system design at the top level. To demonstrate the parking services requirement with the platform being proposed, a cloud-based smart car parking system is depicted for use over a university campus [3].

The four different parking states are accessible parking space, parking space reserved, parking space used and parking space load or unload. Car parking is simpler by using a smart city's context information The NFC digital wireless payment technology is being used here. The presence of the car was detected using geomagnetic sensors. Based on geomagnetic sensors, the major drawback of vehicle occupation identification is that sensor response is inclined to magnetic interference [4].

The author investigated the intelligent parking management program based on a WSN, analyzing the requirements of real parking management systems. A new prototype system is also implemented to realize the designed functions using motes crossbow products [5].

This paper represents the design of a smart car parking system with RFID and microcontroller to support the tedious design of modern car parking. A parking tower with two floors and two slots per floor will be described and implemented in the presented prototype model. The system created with the arduino will automatically identify the completely empty slot and park the car at the appropriate slot. A set of sensors, GSM and applications are embedded integrated together in order to truly work as just a system to ferry the car to its measured parking slot. The current system embedded with an RFID smartcard enables us to calculate the period of time after which the car is parked, thereby assisting an automatic e-commerce system to deduct from the user account the amount for that period of time. The scheme has a GSM add-on module to automatically respond to users' SMS requests by allowing them to have the available slots at a given point. In the overall parking system, temperature sensors, CO2 sensors are used to indicate the safety aspects [6].

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The author highlights the problem of unwanted time consumption when finding parking spots in any commercial parking spaces. In this system user reserves the parking area by sending messages to the GSM modem's parking end. This GSM modem provides password and slot number when slots are available to enable or deny access to the parking area for entry and exit. IR sensor is used to indicate an empty green LED slot.

The user can park the vehicle in the given zone and it will only be valid for a certain period of grace after prioritization of the next user. The RFID technology is used for parking entry and exit as well as RFID tag debiting the parking fee amount. The biggest contribution is more security for the system. This enables users to use SMS to reserve the parking slots [7]. This paper proposed GPS-GSM system and implemented smart vehicle safety system. Even after it is stolen, this system provides control over the vehicle. It provides vehicle safety by closing the doors and stopping the movement of the vehicle. It is necessary to send the door command from the mobile to restart the vehicle and unlock. This system lowers the stress of finding stolen vehicles. It can also be added to provide high safety in future biometric recognition. It makes it easy and fast to recover stolen vehicles. You can easily locate your stolen vehicle with your mobile without any additional cost [8].

II. PROPOSED SYSTEM

The main aim of this paper is to find a parking space by using a RFID system. Raspberry pi board is used here which has inbuilt Wi-Fi module through which we can communicate easily to system. RFID reader reads the owner's information which is stored in the RFID tag. Fig.1 shows the suggested system block diagram. RFID tag is provided to each car proprietor at the moment of registering, which will be read by RFID reader. The parking scheme notes that after 4-5 times monitoring its behaviour the vehicle's time in the parking area, the system chooses which slot is allocated to that car according to obviously specified criteria. The predefined criteria are to allocate closer slot to vehicles that remain for a brief period of time and if they remain longer then allocate far slot. If the unregistered car enters the parking area, the car should be registered on the website. The closer slot will be allocated after the car is enrolled.

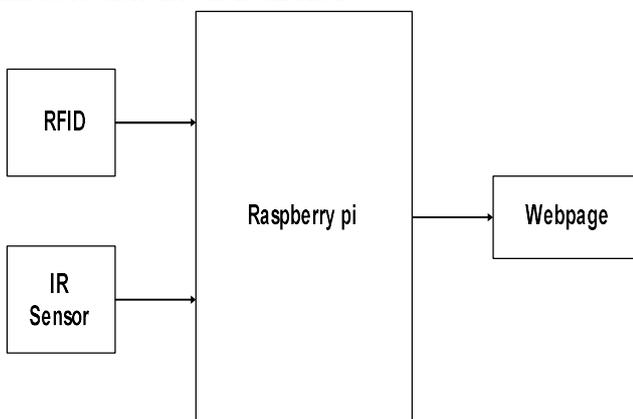


Fig. 1. Block Diagram of Proposed System

Details about the car owner, time, remain time, parking slot status, etc. are stored or collected using Raspberry Pi which

has Wi-Fi equipment built in and can be saved on the web page. This information is also stored in the cloud and used for the system's self-learning.

The parking slot status is detected using the IR (Infrared) sensors. The status (empty and filled) on the webpage is updated so the system can automatically and precisely allocate empty space to the user.

1. Proposed rule-based system:

Let there are 7 slots as appeared in table beneath, each space is saved for one reason. The arrangement of ruled are given in table 1.

Table I. Slots Numbers and Reservation

Slot no.	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Reserved for	Guest	Guest	Regular + micro time (10 AM to 3 PM)	Regular + micro time (3 PM to 6 PM)	Regular + SUV	Regular + mini	Stolen

Table II. Set of Rules

Rule no.	Applied for
Rule 1 (R1)	Stolen vehicle
Rule 2 (R2)	Type of vehicle

2. If a slot is vacant it is represented by 0, if the slot is occupied then it is represented by 1.
3. Slot number will be represented as 1 when vehicle is fit in particular slot otherwise 0.
4. Stolen vehicle means R1=1 otherwise 0, R2=00 (mini), R2=01 (micro), R2=10 (SUV), R3=0 (10-3PM) and R3=1 (3-6PM), R4=0 (guest) and R4=1 (regular), R5=0 (missed time).

III. METHODOLOGY

The Fig.1 shows the flowchart of the proposed system. After initializing the system, system first checks the empty slots. If the entire parking slots are full then it convey this to the user via webpage i.e. system updates the webpage. Then a car is allowed to enter in parking area. RFID fetched the details of the vehicle owner i.e. car owner name, age, gender, vehicle number, license no. whatever the information user enter during registration is fetched by the RFID reader via the RFID tag. The information is updated on webpage. When car leaves the parking slot or the parking area, information again updated and in and out time of the vehicle is recorded by the system.

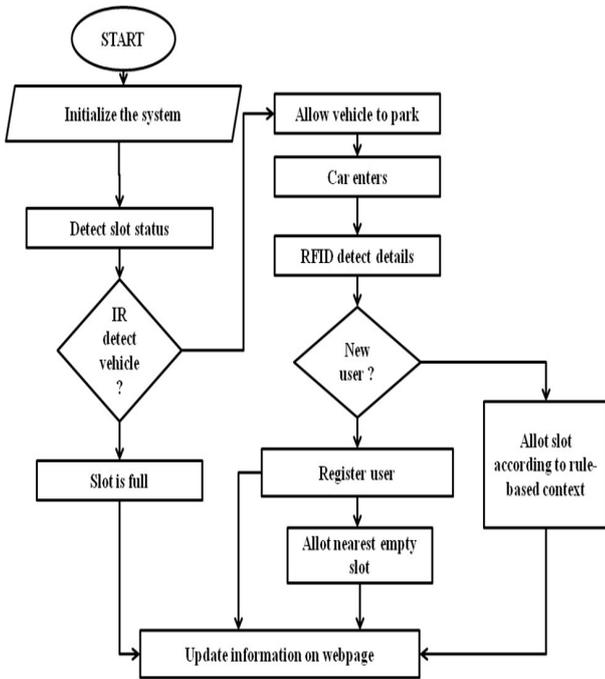


Fig.2. Flowchart of Parking System

IV. RESULTS

The RFID reader is used to read the tag given to every vehicle owner. After reading the tag, all the data is given to raspberry pi board through the SPI (serial peripheral interface) protocol. Python is used to read the SPI data and all the data uploads in mysql. Here PHP and HTML languages are used for designing purpose and it is display on the GUI.

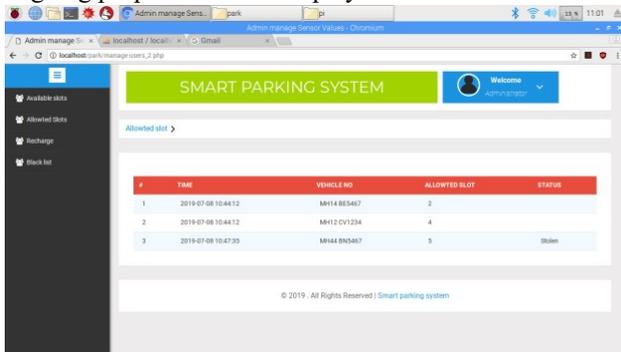


Fig. 3. Allocation of Slots.

Fig.3 shows slots allocation along with stolen vehicle. After entering a vehicle in a parking lot slot will be allocated n if vehicle is stolen as number is mentioned in black list then stolen vehicle is detected.

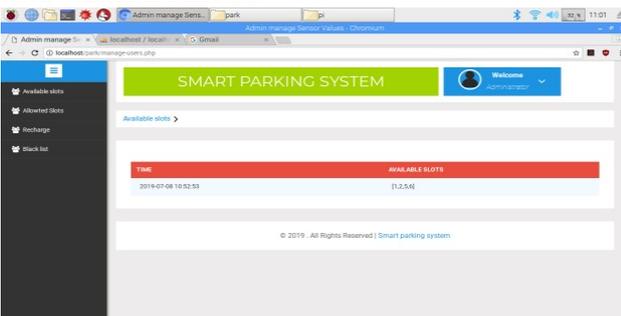


Fig. 4. Available Slots.

Fig.4 shows the available slots in parking lot so that vehicles can be parked efficiently.



Fig.5. Login to System

Fig.5 shows the system login. For login purpose I created the account. As the username and password is put, we enter the system.

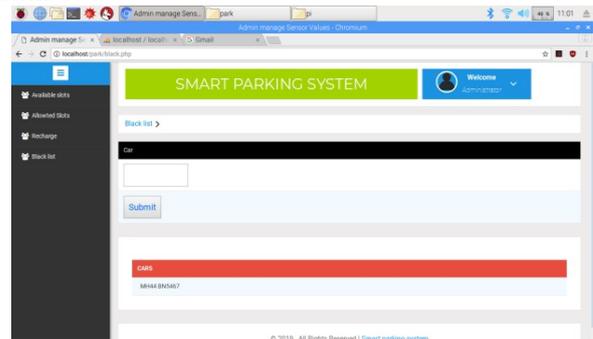


Fig. 6. Black List.

Fig.6 shows the black list which is given by the police through the access. So that stolen vehicles can be detected smoothly.

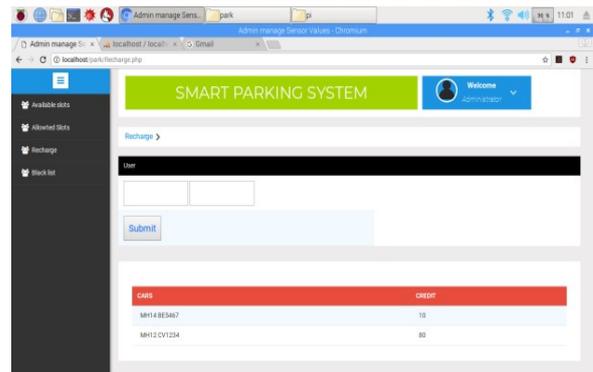


Fig. 7. Recharge Module.

Fig.7 shows the recharge module to pay the charges of parking through paytm. If owner does not have account then first account is created then he/she can pay.

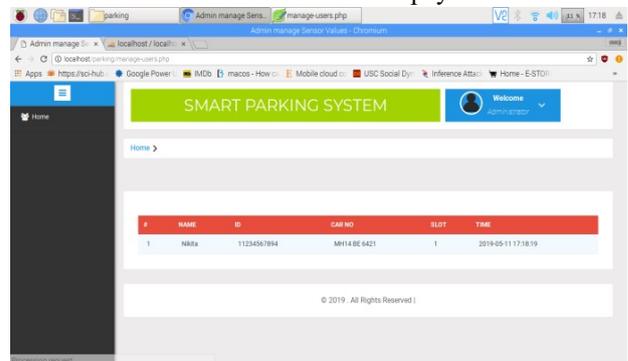


Fig.8. overall parking system

Fig.8 shows the overall smart parking system. Owner data, ID, vehicle number, allocated slot, stay time, etc display on the system. And Fig.9 shows the overall database.

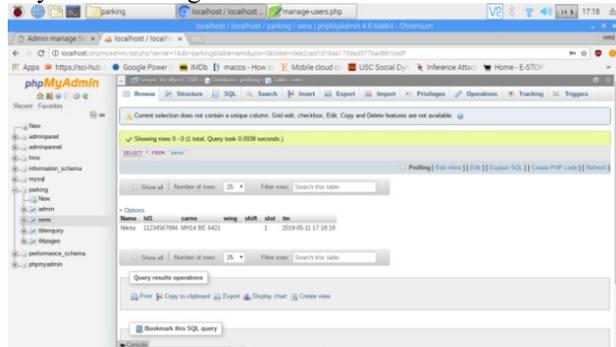


Fig.9. Database

V. CONCLUSION

In the smart cities parking plays the important role to control traffic related problems. To overcome this major problem, the automatic vehicle smart parking system is main thing in the traffic and commercial area and this system can be controlled without human interference. This paper proposed the integrated IoT based highly intelligent parking system which resolves parking issues. This system gives real time information from the availability and number of parking slots in the parking area and this parking space can be booked by user from remote location. User gets the information of available parking slot by using web server. By executing smart parking system using IR sensors and RFID, the system will work efficiently as well as the waiting period of the user to park the vehicle is reduced. All the data related to the stolen vehicle is added to the server and by using IoT the notification will send to the nearest police station. At the same time these stolen vehicles can be detected.

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