Reservation Based Smart Parking System

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Abstract: — **In traditional car parking system, there is no guarantee that the user gets a free parking slot in the parking area after time consuming manual search. In this paper, a Smart Parking System is introduced based on reservation using internet of things. The system users are categorized as Employees and Visitors. The visitor can reserve a parking slot through pre-booking or current booking. Two types of payment modes are introduced, for employees, the payment is based on monthly package and for visitors, the payment is based on time the user occupies the slot. Slots for users are allocated based on time scheduling. RFID technology is used for user authentication. In this system, an app notification is provided to remind the user that demanded time has been elapsed. The user has provision to extend the demanded time further, if required.**

Index Terms: RFID, SPS

I.   INTRODUCTION

Traditional parking are time consuming since user spends a lot of time by searching a parking lot manually, an alternative solution to this is the smart parking based on IoT. A web based reservation system is considered in our system where users can view various parking slots and get a parking space by pre-booking. The parking slot is allocated by scheduling, considering time as the constraint. In this system, focusing is done on two types of user's: employees (can book lot based on package i.e. for a month) and visitors (can book lot by giving starting and ending time).A payment scheme is also introduced in our system. For employees, since payment is done as a package, a reduction in amount is given. The payment for employee is directly withdrawn from their salary, if they book for a parking lot. In the case of visitors, an exit payment is done where the visitor need to pay for the time he uses the parking slot. An RFID reader is used for authentication, to check whether the car is registered or not. The payment for visitors is done with the help of RFID. An administrator part is there to add or delete extra slot or node. The status of slots in the node is seen as a blueprint by the administrator. An app part is also there to notify the user that allocated time is over and the user needs to vacate the lot or if needed, the user need to extend the time through website. A screen is there in-front of parking area to indicate the total count of slots in the parking space and also the free slots among them. A buzzer sound is generated in front of parking gate to indicate if an unregistered user attempts to enter the system.

II.   RELATED WORKS

The different types of parking arrangements [1] includes Rotary-parker, Car lift, Multi-parker, Level-parker, Slim-parker, Elevated-Type, Puzzle-Type, Multi-Level Circulation Automated Parking System, Combi lift parker and Multi-Level Floor Parking. Thus Multi–level car parking system [2] is suitable especially in regions facing space shortages, The system has an automated mechanized car parking lifts which transport the car to the different levels according to availability, it make use of the technique (PLC).The paper aims to develop a reduced working model [3] of a car parking system for parking maximum of 24 cars. A study based on the operational test at Rock ridge BART station in Oakland [4] involves two real time user interfaces to display parking availability information to users and a reservation system that allows users to check availability and make reservations. A potential analysis of smart parking lots to energy business [5] is done to transform traditional parking lots to smart parking lots which provide parking services and electric vehicle owners to charge and discharge their car for a particular amount. [6] developed several parking systems in order to improve the convenience of drivers and to reduce the congestion problem.[7]A car parking system is developed using Wireless Sensor Network(WSN) where each parking slot is equipped with one sensor to detect its availability.[8]RFID is mainly used for vehicle identification. This system can be used to develop automatic parking fee collection, thus saves time. An RFID solution added with the help of RFID tag attached with vehicle for authorizing

parking allowed to residents or not. Car parking mobile application is developed for Android mobile devices [9].Another study was based on reservation based smart parking system [10] where user can check parking information and complete their reservation based on Internet and Wi-Fi module. In cloud based transport system [11], an intelligent parking cloud collect parking information which contains decision process check.

III.   PROPOSED SYSTEM

The smart parking system helps the user in an easy way for reserving a parking slot online. It overcomes the problem of finding a parking slot which unnecessarily consumes time. This system provide additional feature of two types of users, employee and visitors. The employee books the slot for one month, he gets a discount by using stipulated period of booking scheme. If the parking slot is available, then the visitor can book it for specific time. After that time, an app notification will be going to users mobile to either move car from slot or to exceed time of parking. Other user gets that slot after removing this   car. This system provides the feature of cancelling the bookings. User can cancel the booking anytime. The parking slot will be vacant for the booked user till half an hour from time of booking. After that, the booking will be automatically cancelled and the person need to book again if required. The validity of car is checked using RFID

The details of parking space is displayed on the screen which is placed in front of the parking area. The online payment is done by user. The amount to be paid will be make out from their account. The payment is calculated based on the time basis .When a car enter into the slot, starting time is noted and whenever the car leaves the slot, relieving time is also noted and based on that payment is reduced from the credit. The client and the server side is stored on a web service while alert message is done by an android service.

User Module: In this module, user can login into the system using their email-id as user-id and a unique password. Users are also provided with the functionality of extending the booking time based on its availability. User can also cancel the booking, if it is not required further.

Administrator Module: The Admin module supports the user to login through a username and password. The back end is maintained using MSSQL and its controlling is done here. The admin manages overall functionality of the parking system.

Rfid Module: When the user swipes the card, the RFID tag details are read by the RFID reader and check whether valid or not with the database details of registered user. Thus authentication features are enhanced. The RFID tag is used to provide a unique identification for each registered user.

Payment Module: A specific amount will be withdrawn from the employee's bank account monthly based on package. Whereas for visitors, a pre-defined amount is decided by the admin for a particular period of time. A notification will be sent to user's mobile phone 5 minutes before the expiry of allotted time slot.

IV.   DESIGN AND METHODOLOGIES

A.   System Overview

The user can reserve the parking slot via internet and web services.   The users are categorized as employees and visitors.   A separate node is made available for employees.   When the visitor requests for a slot, the available slot in car park is allocated to the user.


Figure 1. *Proposed Architecture*

B.   System Operations

When a user wants to enter into the parking slot he/she must first register into the system. If the registration is successful username and password will be send to the user .The user then enter into the system with this username and password and request for booking slot.

The slot and node number is given to the user based on time scheduling. After authentication via RFID card check user can enter into parking area, only registered user can enter into parking area. If slot is full then slot not available message will be given to user. Based on end time provided by user an app notification is provided to indicate time about to exceed. If user need more time there is provision for exceeding the time. full then slot not available message will be given to user. Based on end time provided by user an app notification is provided to indicate time about to exceed. If user need more time there is provision for exceeding the time.
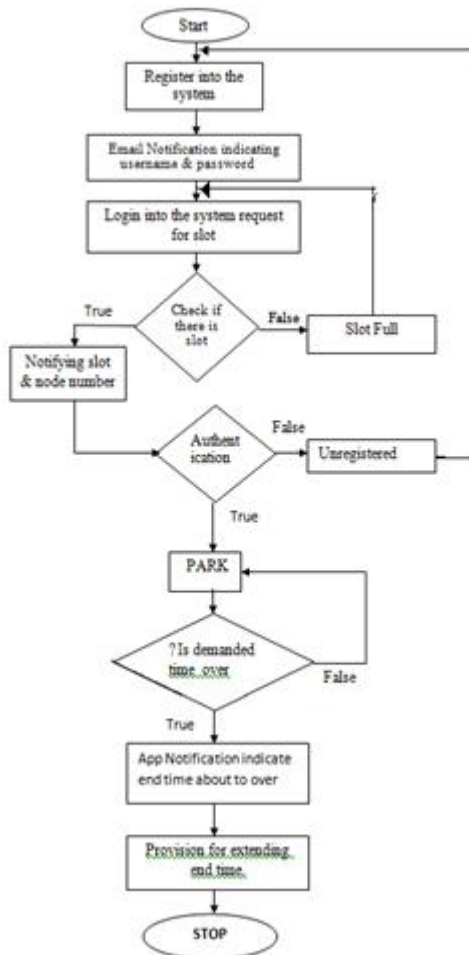
Figure 2. Algorithm of the system operations

Figure 3.Vehicle Process

User sends a request message for the parking slot in (1). The system responds in (3) by providing a free parking slot. The significance of RFID reader is to chek and authenticate the user reaching the parking area. If the user's demanded time elapses, in (5) a notification is send to users handset and email informing the time to park is about to over. The user has the provision to extend his time via requesting the system in (6). Thus the system sends a response message to the user on the successful extension of time.

V. ANALYSIS

Here we propose an excellent SMART PARKING SYSTEM by which the user can limit the time spent to find the parking area. The system considers two kind of user's such as employee and visitor and treat them separately. That is, employee have to pay the parking fee as monthly charges and also get a reduction in payment because of the regular usage of slots, while visitors have to pay when they exit

the slot based on the start time and end time of parking. If visitor need extra time, then there is an option to extend the time slot. Current booking and Pre- booking is available for the users. Priority Scheduling is implemented here based on the time in which user requests to park his/her car. i.e. if the time required is less, then the slot in the beginning of node is allotted. Otherwise, the slot at the end of a node is allotted.

The slot gets cancelled automatically if the car didn't occupy the slot after 30'minutes from the demanded time. It is possible to cancel the slot by user if user doesn't require the slot.

V.CONCLUSION AND FUTURE WORKS

Our proposed system reduces the waiting time of users for finding a parking space. Also we have an efficient mechanism for alerting the user by sending an app notification. Further studies are needed to enhance security using sensors.

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