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Park Smart with Internet of Things (IoT)

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ABSTRACT: Parking challenges have been a part of our country for a long time, With the increase of economic behaviour and upgrading the living standards of people, who won automobiles and motor cycles which increase metropolitan traffic especially during peak hours, Its difficult for drivers to search for a available space to park their vehicle, Which cause to serious traffic congestion. While Searching for parking space the vehicle burns about one million barrels of the world's oil every day. In this paper, we design and implement a Smart App with Internet of Things (IOT) which plays a vital role in connecting the surrounding environmental things to the network and made easy to access the things from remote location. However after installing the smart App drivers feel easy to find and reserve the place effectively. By such user can drive directly towards spot, upon arrival legitimate users are able to verify themselves through QR Code which is available in Smart App. User verification enables more efficient monitoring by getting simple text message(STM) from the admin. When driver reaches parking slot he has to show the QR Code to the admin. After parking they can request for wheel chair if they are physically challenged, where we are trying to serve the nation. Furthermore we study how smart app works by comparing with the existing parking system performance and also gives a quick review about alleviate traffic congestion caused by finding parking slots

KEYWORDS: Internet of Things (IOT), Simple text message (STM), QR Code, Smart App, Legitimate Users.

I. INTRODUCTION

The "Internet of things" connects devices and vehicles using electronic devices and sensors. Internet of things was first introduced in 1999 at AutoID center and first used by Kevin Ashton. As evolving this latest burning technology, It promises to connect all our surrounding things to a network and communicating with each other with less human immersion [1]. As expansion in vehicle activity in downtown is one of the impacts of the late fast populace development in urban areas. Notwithstanding the undesirable impact on the earth, the expansion in city movement has numerous different impacts which as speculated, incorporate the expanding demand on stopping frameworks reachable to the general population. Consequences, finding a free parking lot during rush hours is real trouble. Motorists keep cruising around wasting time and gas while expecting that a lot will be freed; this makes extra traffic delays and complication for other motorist. To mitigate such movement blockage and enhance the accommodation for Users, numerous smart parking systems raised up to fulfill the Customer services (example., Parking system administration suppliers and users) The Smart parking system contains only the information regarding the updated parking lots. All the information regarding the customers will be updated in the database, where the proprietor can check the details of the parking lot everyday through the graph.

In this paper, we design and implement the prototype of a Smart Parking with internet of things using android [2]. It not only broadcast real-time parking information to the drivers as part of a communal application, but also to provide reservation service as part of user-targeted service. The drivers can retrieve parking information and reserve their desired vacant spaces via Wi-Fi or Internet. The rest of this paper is organized as follows. In Section II we present about literature survey. In Section III we discuss about several existing approaches and challenges for smart parking systems. In section IV we will discuss about experimental results of existing parking system. In section V given about proposed methodologies. In Section VI, we present the detailed architecture of proposed reservation-based smart parking system. In Section VII, we explained the evaluation and results through extensive simulation. Paper concluded in Section VIII and next with Future scope The proposed Smart Parking is an intelligent parking system. Drivers can view and reserve a parking spot on the fly. The parking process can be a straightforward and non-stop process.

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II. LITERATURE SURVEY

Proposes a smart parking system that it reduces the drivers tension by assigning the parking spaces in a specific parking lot. henceforth reducing the energy consumption and traffic congestion is the objective of this system which make one's life more comfortable.

A. Search Blindly

Blindly searching for the free slots until driver gets place to park his vehicle. The driver will stop sailing his vehicle once he got the right place to park.[3]. Or else the driver will continuously search for the free space in the adjacent parking lots.

B. Information Sharing

The information [4] will be updated in the smart system app, By looking at the vacant spaces through the app, the driver will drove towards the available space. However the available spaces are very low during the rush hours, it states that many number of drivers are chasing the single slot to park their vehicle, this system is called "several-car-chasing-single-space" which leads to heavy traffic jamming.

III. EXISTING PARKING SYSTEMS

A. Vision based system

Estimating the parking lot information by checking the parking lot visually, The available spaces will be calculated by incoming and outgoing vehicle information.[5]. Based on that vacant space information will be shown for the next coming drivers to the building

B. Based on Sensor Method

Currently, sensors will be fixed at the parking entrance to check the number of vehicle entering in to the parking lot. The image sensor acquires an abundance of information, but it is vulnerable to bad weather and nighttime operation [6]. Now a days many more types of sensors are used to detect the vehicle even at the bad environmental factors, like rain, fog, wind snow etc.,

IV. EXPERIMENTAL RESULTS

A. Fake Parking Requests

The framework gathers and stores the information about the execution measurements including the status of parking spot, reservation time, parking location, driver's personality. All information stored by the framework is at any rate stamped with time metadata. As the client is permitted to book stand out parking spot at once from one id, it is a major test for us if client is attempting to book one or numerous solicitation at once from one id. To overcome this issue we implemented a queue buffer which constantly checking the new demand and contrast it and the current id demands. On the off chance that any requesting id matches existing id then the solicitation is straightforwardly disposed of and a message demonstrating 'no all the more parking spots accessible' is displayed.

B. Users Identity Verification

Verifying users identity is a major security concern as users with no reservation can enter and occupy someone else's

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parking space. In our proposed system, the user can open the application and verify their identity via the received QR code. Reservation authority sends a QR code to the user as soon as user reserves the parking space. At the parking lot host identifies the user by scanning the QR code generated by authority management system.

C. Delay in parking

User reserves a parking space for specific time duration (Starting time & ending time). What if the user is unable to reach the parking spot at the aforementioned time? So to overcome this challenge, we provided the time extend option to the user, but user can only extend the time by 15 min from the specified time. User has to pay some extra money to extend the time.

D.Timer

As soon as reservation time is about to expire, user must be notified about this. To deal with this problem, Smart App gives prior notifications at regular intervals to the user. For example, if there are only 30 minutes left to reach the expiration time. Smart App will give notification when 20 minutes are elapsed and when 10 minutes are elapsed a final notification is given.

V. PROPOSED METHODOLOGY

The proposed system will have the following features:

- The user can see the available slot in the parking space and book the slot before arriving at the venue.
- The booking is confirmed by the generation of unique QR code which is used in future for verification purpose.
- Admin can book, cancel and update the bookings of slot as and when the situation demands.
- The booking will expire if the user does not turn up within 15mins from the time specified and the minimum amount will get deducted from the user account.
- At the exit point, the time of stay of user in the parking lot is retrieved and amount to be paid by the user is calculated.
- The user can request for wheel chair if any physically challenged or old age people, once they enter parking area.
- Once the user leaves, the system updates the database.

VI. SYSTEM ARCHITECTURE AND DESIGN

System Architecture is the functional model that describes the structure, conduct, and more perceptions of a framework. An engineering depiction is a formal portrayal and illustration of a framework, sorted out in a way that thinks about the structure of the architecture which involves framework segments, the connections (e.g. the behavior) amongst them, and gives a platform from where the items can be attained, and frameworks built up, that will cooperate to actualize the universal framework

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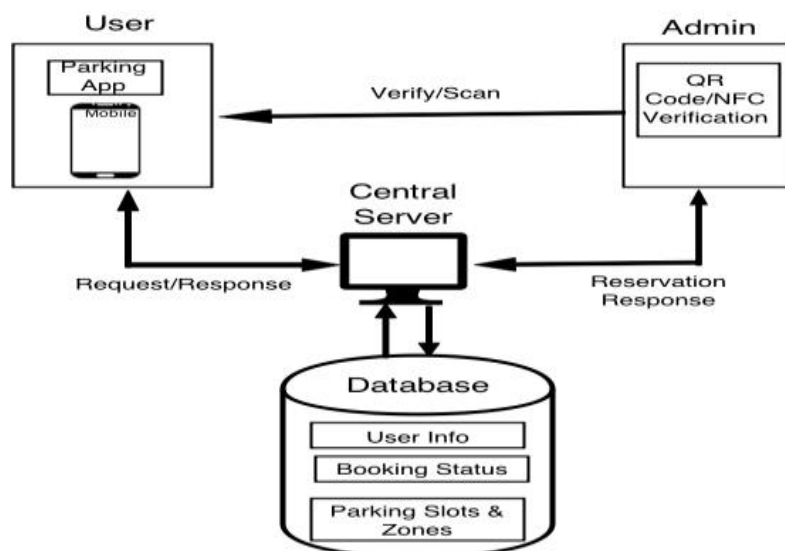


Figure 1: System Architecture

Figure 1 shows three segments in the smart parking model, including parking zones, customers and the database parking system. The administration system decides the parking costs and display lives parking accessibility data to customers (likewise motorists). After getting parking data, the customer chooses required parking garage and reserves a space. As soon as user reservation parking space, smart app generates a unique QR code and directs it to the user. As a result, the state of parking system is changed by users parking decisions.

A. Hardware



Figure 2: System Hardware components

Source: Collaborative mobile applications and advance services for smart parking.

Here, figure 2 illustrate a modular, which is service-oriented smart parking system, that includes web applications for parking operators and end users, as well as mobile applications for end users and parking controllers. The system consists of 3

Hardware components viz. 2 Android Smartphone's and a Central Server. One Android Smartphone is for user which would have parking App and another one is for the admin at the parking lot for Scanning QR code. It does the

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following functions:

- (1) operators to draw parking areas and define their details, such as the positions of parking places and their price per minute,
- (2) end users to be guided to the most suitable parking area, with also the indication of points of interest, and (3) controllers to check that end users have paid their parking fees, and in general to monitor all vehicles that have been parked in their area. Another important feature is the possibility for end users to share their knowledge about parking occupancy, which is very useful when a parking area is not provided with precise availability counters.

B. Software

All elements of the parking system - pay stations, entrance and exit stations and displays - are connected to the Internet and managed through a central server, The central server hosts both the relational database as well as the car park system management software.

As shown in the figure 3, User checks the availability of vacant space to park his vehicle through the smart app, using Internet, smart app Regional system allots available vacant space to the user, then the smart app checks the availability in local system. If the space is available in the local system, it books the space and notifies to the user giving conformation through the simple text message and the same will be updated in the local smart parking system.

Once the user gets the message in his inbox, he can drive to the parking place with the help of GPS and RFID to the right place to park his vehicle, which has been allotted to him.

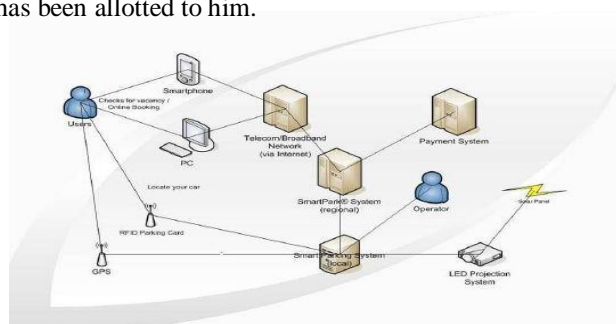


Figure 3: Flow of Proposed Model

VII. EVALUATION AND RESULTS

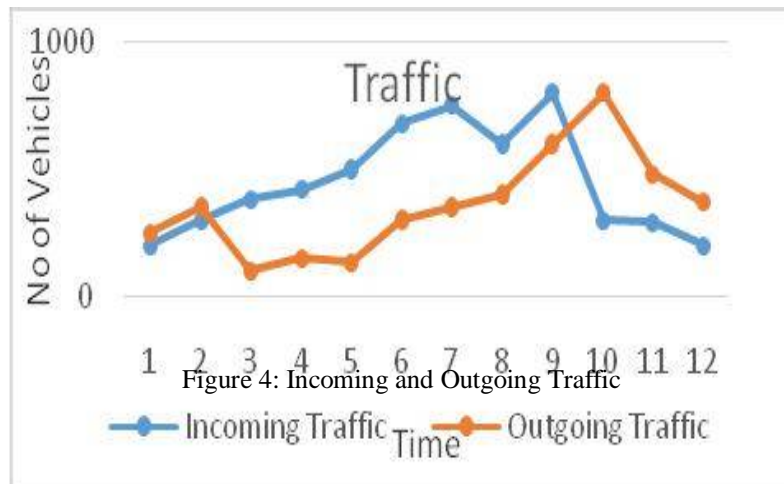
A. Parking Demand and Simulation

In the simulation, we use the real-world traffic traces to generate the parking demand [7]. Suppose we are having parking lot of 100 spaces and we are getting the request from the 120 users at the same time then simulation is done on the how many users from 100 gets the parking space and how much user not able to park the car because of delay or some reason, So remaining 20 user will get that parking space. If in such condition there are no parking spaces available and request are coming from users then waiting time of the user get considered based on how much time user has waited to park the car. We use the line graph [8] (As shown in figure 4) of the incoming and outgoing traffic of the target area to calculate the waiting time for the users to park.

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B. Possessor login page to check the results



Figure 5: Login page for Possessor.

This is a web application for the possessor of the parking area.(figure 5) Upon authentication, it allows the owner to have a look at the statistics about the parking for past 4 days along with the occupancy percentage based on which he can make various decisions, for example: he can increase/decrease the number of levels, he can increase/decrease the number of slots per level, he can rise/lower the price of various charges etc... It also allows the possessor to have a complete look at the database (which includes all the details of each and every reservation for past 10 days at the maximum) and he can execute a query that gives the total revenue that was collected for a particular number of days which eliminates the disadvantage of having manual payment and also this information can be used for various activities.

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Figure 6&7: Reservation Services

On clicking Booking, (can see in fig 6) It redirect to the next page (as shown in fig 7) where the user is provided a view of the various slots. On selecting the type of vehicle (2 wheeler or 4 wheeler) and selecting the level (Ground , Upper Basement, Lower Basement),the admin can make a booking on any of the slots that are available(indicated by green color).On selecting a free slot ,the admin is prompted to provide the entry time for the user. At the exit point, the admin can also free a slot that was occupied by the user.

If at some point when all the slots are occupied or booked (indicated by red color),the admin can click on a slot which has been already booked and check if another booking can be made depending on the time at which the initial booking has been made. On clicking on a red slot the admin will be prompted to provide both entry time and exit time. This ensures optimization of the slots being occupied with the aim that most users should not be denied a slot.

With this the driver is able to obtain the real time parking information and complete the reservation from the web server.

C.Advantages of Park Smart with IOT

- Saves time as the user need not search for a parking slot.
- Reduces traffic Congestion that occurs in most parking lots, especially during rush hour.
- Accurately predict the vehicle tenancy.
- Reduces emission of CO2 and other air pollutants, where it helps to create better tomorrow.
- Reduces traffic in the city flow more freely by using IOT technology [9].
- Helps the old age people and handicapped people by requesting wheel chair before entering to the building.
- It Reduces tension of vehicle users by reserving the vacant space.

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VIII. CONCLUSION

Park Smart with IOT, reduces the traffic congestion and eliminates the time that the user takes to find a place to park the vehicle thereby decreasing the mental stress; increasing the comfort level and makes the life of common man easy by allowing him/her to visualize and book in prior the parking slot according to his/her convenience. It also makes the job of the admin easy as the amount that has to be paid by the user is automated, he is also allowed to visualize the slot and he/she can see the statistics of the occupancy level for a certain period of days which allows him/her to take various decisions which increases the overall profit of an enterprise.

FUTURE WORK

Future research might examine optimization of multiple logins, e-payments, improper parking, sensor usage, cost effectiveness, and smart payment as well. If we want to execute our project through out the city or country ,have to install some sensors use like pressure sensors, Radio sensors, Thermal sensors, Proximity sensors, Optical sensors, Position sensors, ultrasonic sensors, etc.. which helps drivers to park their vehicle easily with the direction of sensors[10].

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