SMART CAR PARKING RESERVATION SYSTEM BASED ON INTERNET OF THINGS (IOT)

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Abstract :-
Internet of Things (IOT) plays a vital role in the surrounding environment. Generally people to facing problems on parking vehicles in parking slots in a city. In this paper we propose a Smart Parking System for large parking lots through vehicular communication. The proposed scheme enables the user to find the nearest parking area. And it mainly focus on reducing time for parking slots and even reduces fuel consumption which in turn reduces carbon dioxide content and harmful gases that let out into atmosphere. IOT devices to be integrated with cloud. Optical character recognition and facial recognition to provide two way security using Raspberry-pi.
Keywords: Smart Parking; Optical Character Recognition; IoT; Facial Recognition, Raspberry-pi 3.

INTRODUCTION

Finding a parking slot to park their vehicle has ended up being a disappointing issue to the drivers all the time. It has paved the way for traffic congestion which has turned out to be an alarming problem on a global scale and burning oil over million. With the increase in the growth of population, the rapid increase of traffic congestion on the roads.To solve this problem we use well know upgrading system INTERNET OF THINGS (IOT). Internet of things was introduced in 1999 at auto ID centre and first used by Kelvin ashton. IOT is shortly defined as things present in physical world or in an environment are attached with sensors or with any embedded systems and made connected to network via wired or wireless connection (smart devices).The current parking system obtain the availability of parking spaces using optical character recognition , Face recognition Also, it has been found that it has led to the burning of world's oil over a million. According to a report Smart Parking system could benefit in saving 2,20,000 gallons of gas till 2030 and 3,00,000 gallons of gas by 2050 , if it is executed perfectly. Searching for available parking spaces, vehicle theft in large parking lots also has become a serious concern facing our lives.Once if the allocated slot is accepted by the user, then the user can change his parking slot and can even reserve their own likely parking slot, which eliminates the restriction between the slot reservation and user request. The wireless technologies are employed to produce smart parking system. They could only give the parking information but didn't prove to "smart" enough. An idea to realize Smart Parking structure in perspective of reservation using Internet of Things (IoT). The two magnificent words in IoT are "Internet" and "Things". The Internet is the vast global network of connected servers, computers, tablets and mobiles using the internationally used protocols and connecting systems.

Real Objects + Internet + Sensors and Controllers = Internet of Things(IOT)

Internet of Things plays a vital role in the creation of Smart Cities. The most significant factors for the emergence of smart cities are comfy parking facilities and efficient transportation and management Due to the improvements in the sensor technology and the low-cost countryside of the Embedded Systems, we say that presentations can be created using Internet of Things. According to the latest report made by The International Parking Institute. We found that many innovative parking ideas have been developed.

They were able to deliver the parking information about the vacant parking lots. These systems used effective sensors in the parking areas and by tracking information from various sources and also deployed active data processing units. Here our proposed idea could be implemented using a mobile application so the drivers could get their parking information and reserve the vacant spaces of their wish as per their vehicle's width via Wi-Fi or Internet because today almost everyone can possess a smart phone with them. Next section covers the literature review of the existing models.

LITERATUREREVIEW

I) Smart Parking System using optic Wireless Sensor Network

This system expert the use of video cameras where they are structured in the parking slots are able to capture the license plate of the car, also display the parking spaces.

Advantages:
1. They are available for low cost
2. Easy to maintain and install by using optic wireless sensors

Disadvantages:
1. Due to high chance of failure in the device not much powerful.
2. The license plate detection is quite impossible.
3. It predict the size of the vehicles but not benefited.

II)Using Bluetooth and Zigbee sensor :

By using Bluetooth communication technique drivers identity is verified and also to book a slot zigbee sensors is used to detects the vehicles.

Advantages:
1. No need of Internet.

2. It is a regionalized system.

Disadvantages:
1. Bluetooth range is limited.
2. Difficult to maintain and Install.
3. Link gets detached if the driver is not active and once more a new slot has to be reserved.

iii.) Smart Parking System using IR sensors:
Feedback mechanism is used to find the availability of parking spaces. To monitor the parking spaces infrared sensors is used.

Advantages:
1. Utilization of slots is maintained properly.
2. Implementation is easily with a small budget.

Disadvantages:
1.Convenience of the space could be known only after the car arrives the parking lot, so if parking space is not existing it has to prevent from there and it might cause traffic problems.

iv.)Smart Parking System using RFID:
The vehicle's unique RFID tag is match with the given tag with the value in the database when it is read by the RFID reader in the parking lot entrance.
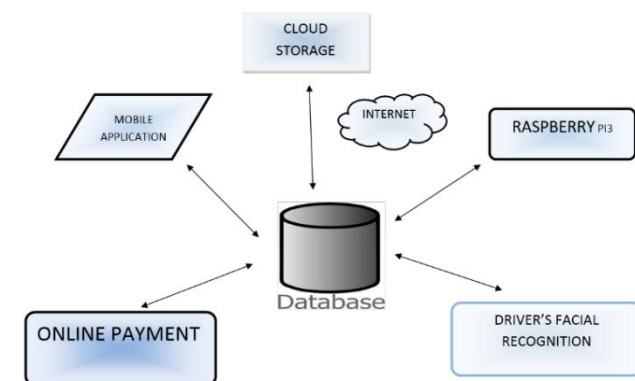
Advantages:
1. Fast method to identify and reasonablypriceeffective.

Disadvantages:
1. The system fails to work when RFID tags are damaged.

ARCHITECTURE&WORKINGOFTHESMART CAR PARKING SYSTEM.

The design architecture of the System is demonstrated in the following Figure 1.

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Figure 1: Design of Smart Parking system

To begin with, the user has to register the fine points in the mobile application to enter

the information into the server. After the credentials are registered, he has to sign in to his account, and book a slot for parking. If he has booked a slot, within 15 minutes he has to enter the parking slot. So, once his vehicle reaches the parking lot, vehicle's number plate is tested with the number plate given while booking a parking slot. This process uses Raspberry pi3 camera. Also, the driver's identity is valid by clicking a photo using a Raspberry pi3 camera. This is used because to avoid vehicle theft and other security issues. Once the verification is finished, the vehicle is allow to enter the parking lot and slot number is given. Once the vehicle is successfully parked in the slot, his parking time starts and again when driver arrives and takes his car from the parking slot parking time stops. Recept is sent to register account. He can then pay by using online. Then at the exit blockade the driver's face identity is again tested to match with the previous photo using facial recognition and then he is permitted to go out of the parking lot.

IMPLEMENTATION AND WORKING OF SMART CAR PARKING SYSTEM.

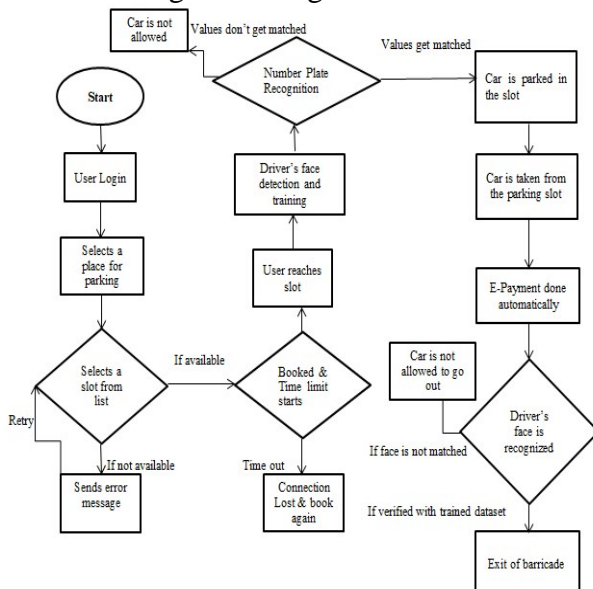Implementation and working is demonstrated in flowchart as given in Figure 2.

Figure 2: Flowchart of the system

We had implemented the system using a toy car and android app, but this system could be implemented in malls and multi storied buildings. Below are the steps involved in booking a slot in our parking system.

Step 1: Install the android app in the mobile.
Step 2: Register the app using the credentials.
Step 3: Login to the system.
**Step 4:** Select the area where you need to book the parking slot.
Step 5: Select the sub location and the slot number for booking.
Step 6: If it is available, the app asks for the License plate number.
Step 7: Within a time limit, the car has to reach the parking slot and then the verification process is completed.
Step 8: Once the car is parked and then taken off from the parking slot, the parking charges are deducted from your e-wallet.

The steps above are elaborately explained with the below screenshots.
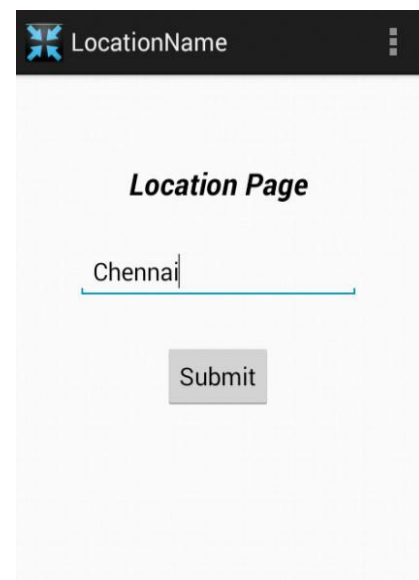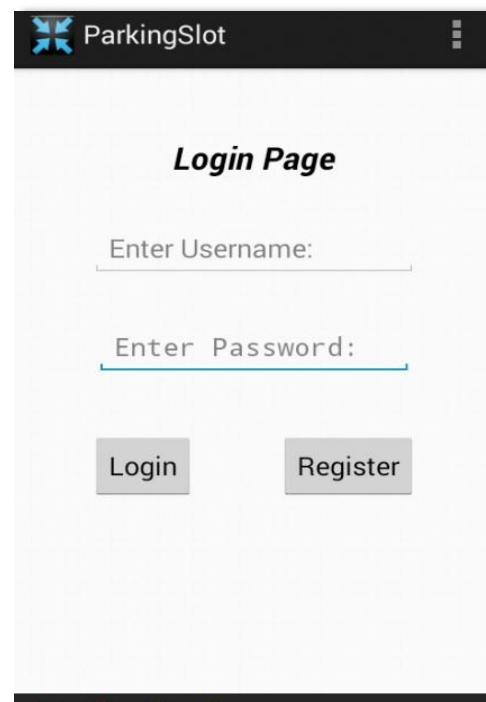
INTERNAL MECHANISM AND RESULTS OBTAINED

Facial Recognition

When the car enters the parking lot, the face recognition of the driver is done for security purposes. The Raspberry pi camera capture the photo and create the dataset of the driver's face. When the driver comes out of the parking slot, his face is once again recognized at the barricade to provide complete security and only if the face matches with the recorded dataset he is allowed to leaving out of the parking lot.

Automatic License Plate Recognition

Once the driver's image is snapped and trained in the database, a signal is sent to the raspberry pi to recognize the license plate based on Optical Character Recognition. This process has three main stages – License plate detection, Character Segmentation, Character Recognition.

1.License Positioning

The License Plate positioning starts with the pre-processing by graying of the image because sometimes the color of the car and the license plate might be same. It is followed by the morphological operation which includes expansion, corrosion, opening, closing to convert it into binary image.

2.Character Segmentation

Primarily, tilt correction is made out by positioning a horizontal line with the characters and marking a detection line with the complete character. The segmentation line is clearly determined based on the center of the character.

3.Character Recognition

A new method of character recognition based on KNN algorithm. This is a simple algorithm which is used to find the training points nearest to the required character. Then it is compared with the characters in the database.The 26 letters of English Alphabet and 10 numeric literals of different sizes and fonts are trained to the character image using KNN.

Figure 10: Original image
Figure 11: License positioning image

Figure 12: Character Recognition

CONCLUSION AND FUTURE SCOPE

The rapid urbanization of the world has made the concept of "smart cities" gain momentum in the international agend. The vision to be a smart city has always been a thought to all the urban cities. Since a couple of years, projects were taken and ideas were employed in many countries to make it into reality. Internet of Things stands out to be the indispensable technology implemented along with Cloud Computing. To be a smart city, Smart Parking facility is an essential service. Previous technologies were exploited which proved to be either not efficient or too expensive. We have employed Raspberry-pi which seemed to be cost efficient with easy install and maintain. In future we would develop application for iOS.

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