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Review on Automated Parking System

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ABSTRACT: The project entitled “THE Automated PARKING SYSTEM” presents an A parking system that provides an optimal solution for the parking problem in metropolitan cities. Due to the rapid increase in vehicle density especially during the peak hours of the day, it is a difficult task for the users to find the parking space to park their vehicles. This study proposes a smart parking system based on Computer Vision, OpenCV, and mobile applications. The proposed smart parking system consists of an onsite deployment of a slot module that is used to monitor and signalize the state of availability of each single parking space. A mobile application is also provided that allows an end-user to check the availability of parking space and book a parking slot accordingly. Smart parking can increase the economy by reducing fuel consumption and pollution in urban cities.

KEYWORDS: Automated parking system, Computer Vision, OpenCV, Reservation

I. INTRODUCTION

Parking is becoming one of the major problems for cities and is becoming very costly. For instance, finding parking spaces during work is challenging. It is more frustrating for the users to search for a parking spot in a parking lot. To overcome this problem many parking guidance systems have been proposed in recent years that try to enhance the basic parking system. All the systems require a mechanism to detect if a vehicle is in the parking spot. The person can register for the parking slot to park his/her car. A unique id is generated for the registered user and the time limit is given. The system will calculate the in and out the time of the vehicle which is placed in the parking slot and the amount will be detected from their account.

In this project, a camera is used as a sensor for video image detection. This is due to its capability and realization cost [1]. A similar project that used a camera for video image detection was presented in [1]. This project applies the edge detection with boundaries condition method for image detecting module while in [1] used point detection with canny operator method. There are some techniques for making reference images found in the kinds of literature [2-5]. The authors used a moving car as a reference image to detect the parking lot. In [2], the authors proposed the subtraction technique between consecutive images as a method to detect the car moving. Paper [3] tracked the moving object for the whole area of the door parking lots as a method to count the cars. Paper [4] used the change of the variance of brightness on the road surface in the stationary image (difference between consecutive frames). In[5], the authors proposed the time differential images as a method to extract moving objects from stationary objects. However, the moving object is often taken as many regions (called moving regions) in the differential images [6]. The problem occurs when the object is moving at high speed. It is difficult to capture its movement.

II. RELATED WORKS

Omkar Raut [1] has done that how the vehicle will occupy in the particular allocated place. OpenCV detects the presence of a vehicle or other objects. Once a vehicle is detected, the system needs a way to notify drivers of a parking spot being occupied.

The disadvantage is, the parking place will be detected only to the nearby places there is no Camera to search the parking slots from the far place

Arpita Jadhav [2] has developed an Automated Parking System In the case of pre-registered users IP cameras would capture the vehicle registration number and they can proceed without interruptions. As per their details like parking time estimate, their place of visit, etc. For pre-registered users, the amount will be deducted from the E-wallet and thereby users will be notified. A similar pricing system will be followed for new users but the payment is offline. The disadvantages are, the system could serve all the parking requests but beyond 80 it couldn't accommodate more cars since the parking is full.

Saurabh Rajput [3] implemented a smart parking system in which a CMOS sensor detects the number plate of the car and data is compared with the database and the user will be allocated with his required slot. When the user enters the allocated rotary parking slot, the ultrasonic sensors get triggered and the timer starts on. When the user gets down, he should be providing the details of the smart card which ensures that the user got down as well as it will be helpful when he wants to exit from the parking slot.

Shiprasad Gorte [4] implemented a smart parking system which uses the cloud-based IoT architecture for smart parking system which contain a cloud service provider which provides cloud storage to store the information about the status of parking slot in a parking area. The centralized server manages to store entire smart parking system information such as several slots, availability of vehicles, etc.

III. PROPOSED SYSTEM

The proposed system is used by the user to reserve the parking slot. Here the user can reserve the car parking slot. Once he enters the slot the period will get started and when the user leaves the slot he needs to pay the amount for the time his car is placed in the slot area.

A. System Design

The design of the system architecture describes the structure, behavior, and more views of the system and analysis. The goal of design is to produce a module of the system which is used to build the system. In the proposed system. Initially once the user login into the application he can view the real-time parking slots that are available to park.

After once he views the slot based on the FIFO method the parking will get allocated to the users so once he selects the parking slot by entering all the required information he can reserve the parking area So once he enters the parking area his parking time will get started, if the person will not take the car within the selected time the alert message will get. Then later he leaves the area the time in and time out time will get calculated and the amount will be paid.

B. System Architecture

The goal of design is to produce a module of the system which is used to build the system. Fig 1 shows the proposed system where:

- The user will register to the application, later he gets login into the application by entering the username and password.
- Initially on the homepage he can view the real-time slots that are available.
- By viewing the availability of the slots he selects the particular slot area and enters the required information such as vehicle number, parking slot number, in-time, out-time.
- The data is sent into the cloud and that slot gets allocated to the user.
- Once the selected out-time is getting into the finish if the person did not receive back his car the alert the message will be sent to the user.
- Later the user leaves the parking slot area he gets in to pay for the respective time.

- Later the availability of the slots will get updated on the homepage to view.

C. Algorithm

An algorithm can perform calculation, data processing, and automated reasoning tasks. As an effective method, an algorithm can be expressed within a finite amount of space and time and in a well-defined formal language for calculating a function.

Algorithm 1 describes the user and the staffing relationship about allocating the parking slot.

Algorithm 1: Algorithm of System Operations.

Step 1: Start

Step 2: If the user not registered

User register into the system

Else

Login into the system

Step 3: the user sends the request

Step 4: staff will receive the request

Step 5: if parking space is not available

Staff will send the message that slot is not available(try another Park! Unavailable space)

Go to step 3

Else

Staff will send the reserve parking slot number to the user

Step 6: user enters the car parking

Step 7: End

When a user tries to find a parking lot, the user should register to find a free parking lot by using the system, then the user will send a request through the application. The system will get the request and check the available parking to receive the message and to check the park using the application. When a car reaches a parking lot, the drivers should be verified by staff. This verification process is achieved via checking the parking website. If the information is correct, the driver receives a receipt and enters the park. Later, the driver checks if the lot is empty. If so, then he will park and change the state from reserved to park. If the current car parking space is full, the system will send a new message that includes-Try another Park! Unavailable Space, as shown in algorithm 1. **Algorithm 2:update staff table**

Step 1: Start

Step 2: detects the vehicle using the camera and sensor

Step 3: update the staff table

Step 4: if the vehicle is leaving

Update the staff table

Go to step 2

Else

Go to step 2

Step 5: End

After parking the car, the camera detects the change in the signal. The system updates the state of each lot every 2-3 minutes to update the table case, then achieved by the setting of the system as shown in algorithm 2; Update urgent data on a new vehicle park contains the new address. The new message will be selected based on the reserved parking lot of the current vehicle.

D. Working process of parking slot

When the ultrasonic sensor has the presence of the vehicle it will send the signal to the Arduino. Then Arduino will transmit the signal to the relay. Relay is connected to the led bulbs. When it receives the signal sent by the Arduino, based on that signal it will turn on or off the bulb. Ultrasonic sensors work by emitting sound waves then waiting for the sound to be reflected. When the car enters the respective slot, the sound waves sent by the ultrasonic sensor hit the car and reflect and sense the presence of a car.

IV. APPLICATIONS

The importance of Automated parking is:

1. Accurately sense and predict spot/vehicle occupancy in real-time.
2. Guides residents and visitors to available parking spots.
3. Optimize Parking Space Usage.
4. Simplifies the parking experience and adds value for parking stakeholders, such as merchants and drivers.
5. Helps the free flow of traffic in the city leveraging IoT technology.
6. Enables intelligent decisions using data, including real-time status applications and historical analytics reports.
7. Smart Parking plays an important role in creating a better urban environment by reducing the emission of CO₂ and other pollutants.
8. Automated Parking enables better and real-time monitoring and managing of available parking space which results in significant revenue generation.
9. Provides tools to optimize workforce management.

V. CONCLUSION

The problems which would arise while working with smart the parking system, as well as the solutions, has been described which gives a good platform for all the users. The implementation of an automated parking system, assures ease of life for individuals who struggle in daily routines of their day-to-day life. The system that we propose provides real-time information regarding the availability of parking slots in a parking area. Users can book a parking slot for them by the use of our mobile application. So the users can save their time from searching for parking slots.

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