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Automated Parking System Using Number Plate Recognition

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Abstract: Finding a suitable parking spaceas been a significant concern for people, The difficulty roots from not knowing where the parking spaces are available at the given time. The traditional parking methods cannot be used today as they are ineffective at utilizing space and are time consuming. As a result, the purpose of this research is to Automate the parking system using number plate recognition. The system uses image processing of recognizing registration plates of the vehicles for operation of parking system. Overall, the systems run with pre- programmed controller to make minimize the human interaction in parking system

Keywords: parking system; Imageprocessing; Optical character recognition; Automate

I. INTRODUCTION

When we take into consideration the current world scenario, we see that Covidhas taken over our typical lives. One of the vital elements involved in the service being offered to customers around the globe ishuman touch. An operation carried out by a robot is considered of lesser quality whencompared to that action which involves the need of humans. But we certainly cannotassume this right in our current situation.The Covid-19 might seem to be ended butthe threat is never nil.

Adding onto the above scenario, we often end up in some situations when we havestruggled hard just to find a parking spot which is unoccupied in a certain parking area. It might get complex for someone new and cost them their precious time which is not ideal and needs to be dealt with. Hence to solve these problems we've come up with an astounding idea to develop an automated parking system which is free of human touch and aids the customer tofind a nearest parking spot in the available list of options. Adding on to this we also have added a feature to make this process hassle free by making the payment for the utilized period of time online through our mobile application.

II. RELATED WORK

It's ongoing research to find the mostoptimal and time efficient way for parking mechanisms in the malls. Many researchers have proposed various methodologies to solve this problem.

In the reference paper[7] used the Faster R-CNN method to detect the number plate using a surveillance camera. Whereas faster R-CNN used a separate network to predict the region that was proposed. The image then underwentcharacter segmentation, image interpolation and Optical Character Recognition(OCR). This method was 99.1% accurate.

In the reference paper[1] proposedthe method of recognizing the vehicle's license plate number manually at the parkinglot . The methodology they used was conversion of RGB image to Grayscale image and then converting the grayscale image to binary image. Further they applied noise reduction, character segmentation and OCR.

In the reference paper[2]proposed the automation of car parking systems using an android application. The methodology involves four modules forimplementation of this system those are Interfacing of Microcontroller with LCD,GSM and RF module.And an AndroidApplication.

In the reference paper[3] implemented a number plate identification system using image processing concepts.

This system imposed Binary image processing, Contrast extraction, median filtering. Character Segmentation extracted the character from the number plate. Theresulting image was taken as input and then compared with the database using the method of OCR.

The reference paper[4] used the method of UAV vision which detected the number plate using a camera at the entrance as well as the exit. Methodology implemented was Tesseract OCR Engine which is a type of OCR also called as Google OCR that is usedfor character Recognition. And to improve the OCR they used a look-up table. Thismethod was 70% accurate, Cost and maintenance of drones and the low-quality image from the drones were a major drawback.

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In the reference paper[5] proposed an intelligent parking system especially for cities.They used IOT and cloud functions to improvise the parking system in the cities.

Methodology on which the parking systemis designed was subjected to four stages: device and networking level, Internet of things platform level and parking application level.

1) Ultrasonic Detector for vehicledetections

2) Path optimization with ant colonyalgorithm

In reference paper[6] proposed a method to solve the problem of inefficient and disordered parking with respect tobuildings. It was based on methodologies such as License plate detection , Charactersegmentation, Character recognition, OCR. With time the usage of methodologydiffered with the result of the accuracy theypropose.

For the development of autonomous or intelligent parking systems, a variety of strategies are used. The study of these systems reveals that their proper operation necessitates some or all human interaction. Image processing has been considered as one of the intelligent systems for car parking.A brown circular image of the parking slot is collected and processed in this method to detect a free parking slot. The 7-segment display shows information about the currently available parking spaces. Initially, a brown-rounded image of parking spaces is captured. To make binary pictures, the image is segmented. The image's noise is eliminated, and the object boundaries are traced.

A vision-based automobile parkingsystem is being developed that detects free parking spaces using two types of pictures (positive and negative). The object classifierrecognises the needed item inside the inputin this function. Pictures of vehicles from various viewpoints may be found in positiveimages. There are no automobiles in negative photos.

To identify the presence of automobiles in the area, the given co- ordinates of parking lots are utilised as input.For feature detection, car-like characteristics are employed. However, depending on the type of camera utilised, this technique may have limits. Furthermore, because the coordinate system picks precise parkingspaces, the camera must be fixed. The method may be limited by a limited collection of positive and negative pictures.

The number plate recognition approach, which is being used to construct an automated automobile parking system, is based on image processing. The picture of the vehicle's licence number plate is captured in this method. It's then divided to get the number plate's component characters.

Free parking spaces are detectedusing ultrasonic sensors. The number plate photos are then captured and analysed. Atthe same time, the current time is recordedin order to compute parking rates. The LCD shows a 'FULL' indicator, indicating that no parking space is available. However, the method has several constraints, such as the backdrop colour being required to be black and the character colour being white. In addition, the study is limited to one-row number plates. A mechanical model with image processing capability was presented as part of the Smart Parking system concept.The automobile would be parked on numerous floors using lifts. In order to prevent unauthorised automobile entrance,image processing is also employed to recordthe number plate and store it in a database for comparison.

As a result, we want to offer an automobile parking system that is totally automated with minimal human interaction, and that overcomes the limits of current systems.

III. MOTIVATION

With rising urbanisation and increased population density in cities, mobility solutions are in greater demand. Many individuals in industrialised economies choose private autos as a form of mobility. As the level of living rises in manyregions of the world, an increasing number of people and businesses purchase new automobiles.

The difficulty of finding place to park these automobiles in cities has arisen asa result of this. The parking lot concept has grown significantly over time, from just a space where individuals may park their automobiles to areas where automated solutions are used to assure security and operating efficiency.

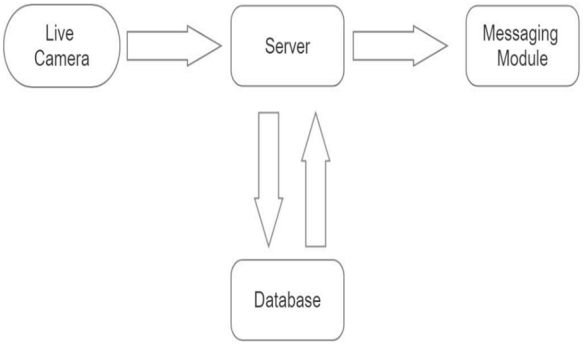
Malls and other commercial hubs are sprouting up all over cities, drawing a rising number of individuals who prefer to drive in.This has boosted the need for mall parking lot management systems, not only to ensure that customers have a pleasant experience, but also to avoid squandering money and resources.

Information management is also problematic with paper-based ticketing systems. The administration should be able to offer information about any car parked in their spot instantly in the event of any unpleasant situations. This is made feasible by automated electronic systems.

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IV. PROBLEM FORMULATION



A camera near the society gates that can record images of automobiles together with their licence plates and send them to the server runs an algorithm to extract only the licence plates from the obtained picture. The number plates are retrieved using the clever Edge detectors, which will onlyidentify the automobile number plates in the image and delete all other unneeded elements.

V. PROBLEM SOLVING

A. Module 1

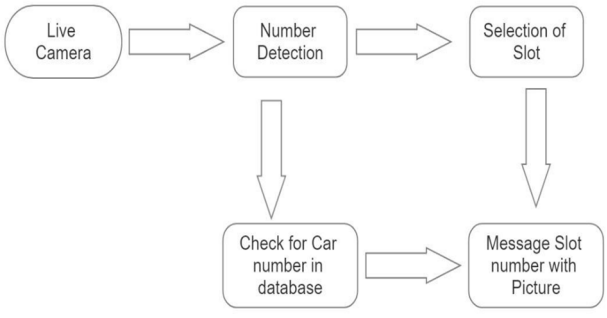
Canny Edge Detector:

Initially, the picture is converted to a B/W format since it's easier for the Canny Edge detector to work in that particular format, after which the image is resized tofit the right size suitable for detection. A bilateral filter is applied in the later stages, to reduce the noise obtained from theoriginal image. Then finally the actual edge detector is applied to crop out the other things from the image retaining only the number plate. Optical character Recognition: Tesseract OCR An Optical Character Recognition Engine (OCR Engine) to automatically recognize textin vehicle registration plates.

Py-tesseract is an optical character recognition (OCR) tool for python. That is, it'll recognize and "read" the text embedded in images. Python- tesseract is a wrapper for Google's Tesseract-OCR Engine. It is also used as an individual script, because it can read all image types like jpeg, png, gif, bmp, tiff, etc. Additionally, if used as a script, Python-tesseract will print the recognized text rather than writing it to afile. It has ability to recognize more than 100 languages.

OpenCV is an open source computer vision library. The library has more than 2500 optimized algorithms. These algorithms are often used to search and recognize faces, identify objects, recognize scenery and generate markers to overlay images using augmented reality, etc.

B. Module 2

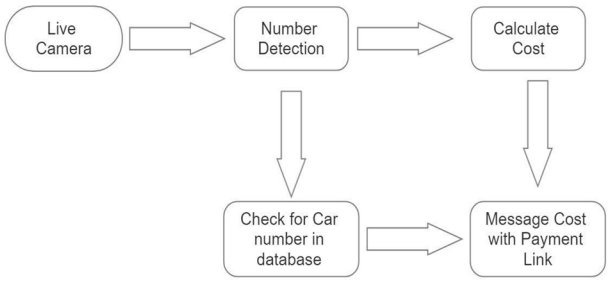


Once the numbers from the number plate are obtained, that number is checked from the database to obtain the owner's info, once we get that information a basic linear algorithm isrun to assign the nearest slot for the car,and the slot details along the map route is sent to the owner's message, which can be followed along to reach the allotted slot.

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C. Module 3



This is the reverse of the second and first module, an exiting camera which tracks the outgoing vehicles and clicks pictures to detect the car numbersof outgoing cars, and then the module 1 algorithm is applied in the same way to extract car numbers. Once it's done, the database is checked for entry time and using the current time as exit time, the cost is calculated about which another message is sent to the user when they exit. Which includes the cost along with the payment link, using which the user can directly pay via UPI.

VI. DATA MODEL

A. User Table

Attribute	Data Type	Description
UserID	INT	Unique key given to the user
Ph No	INT	User's phone number used to send the message
Car No	STRING	Number detected by the algorithm using the number plate
Name	STRING	Name of the user

B. Parking Table

Attribute	Data Type	Description
Parking ID	INT	
UserID	INT	Unique keygiven to the user
Entry time	DATE TIME	Entry time of the user into
		parking area
Slot ID	INT	Slot number assigned
Exit time	DATE TIME	Exit time out of the parking area
Fee	INT	Total amount payable

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C. Slot Table

Attribute	Data Type	Description
Slot	INT	Slot number assigned
IsFilled	BOOLEAN	Checks whether theslot is filled or not
Distance	INT	Distance from theentry

VII. CONCLUSION

While developing a life-size model, the model was analysed. The model has been created, and the programme has been successfully implemented. It depicts how the planned automated smart parking system operates. Space optimization, cost effectiveness, and execution are the primary advantages. of incommunicado.

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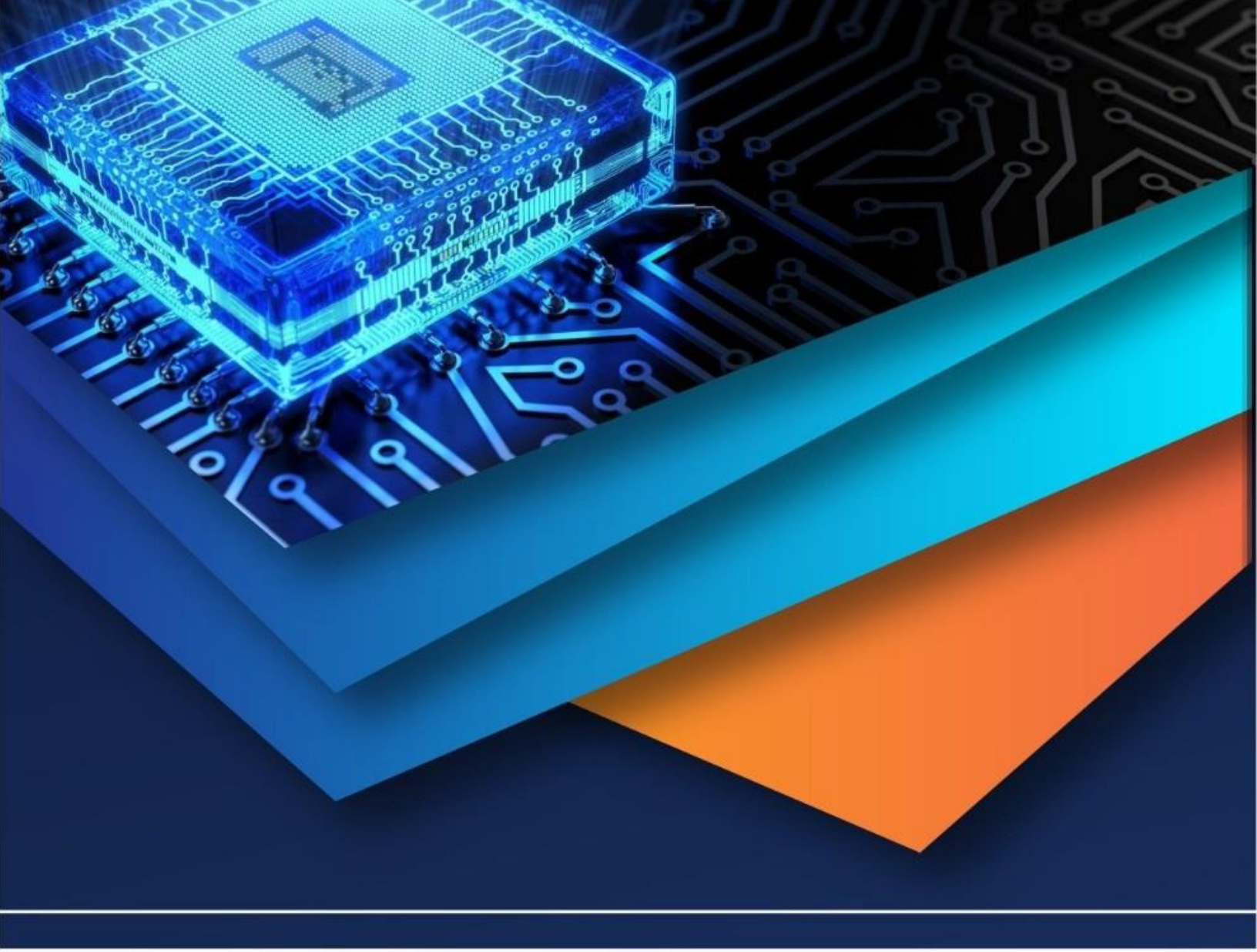
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