AUTOMATED SECURITY ENTRANCE SYSTEM

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ABSTRACT

Now a days it is a tedious task to maintain the manual records of our residential areas. Sometimes the security guard may miss some of the data to be updated in the manual daily records as there may be more than one vehicle approaching, which may lead to unsecured means of entry in the residential area or having incorrect information in the records, as we know children kidnapping and house robberies are some issues of India. It is because of many reasons. However, what if we are able to control and automate this in a way that we know who might be entering the residential premises without verifying the identity. We have developed a project for this small yet appealing topic. With the help of Python programming language, YOLOv4 algorithm, OpenCV, ocr. space API and where when a vehicle is at the entrance of the security gate, the number plate is extracted from the vehicle and is checked whether the approaching vehicle is a part of the premises i.e. apartment owner's vehicle or a guest vehicle, and if it is not both of these, then the entry of the vehicle is restricted to enter the residential premises.

Keywords: Automated Security Entrance System (ASES), Convolutional Neural Network (CNN), You Look Only Once V4 (YOLO V4), Optical Character Recognition (OCR), Number Plate Cropping, Detection

I.   INTRODUCTION

ASES can detect number plate of any vehicle i.e. two wheeler or four wheeler where input is an image of the vehicle and output is an image of cropped number plate of the vehicle which is output of Yolov4, then the number plate of the vehicle is converted from picture to text using ocr. space API. The converted text number is then searched in the database whether it is present or not. If present then the vehicle is permitted to enter the premises. [4] uses the system for only parking management purpose whereas our system ASES has a feature which can be expected to be used for most of all the residency projects, industrial areas, colleges, schools throughout the metropolitan areas of the city. However, we designed our databases suitable for a residential society. Furthermore, [4] is used for only Bangla region number plates whereas our system ASES detects number plate with English Language which covers maximum number plates of any region. Also, [4] systems speed decreases for the multiple plate detection. ASES can detect multiple plate within minimum time limit.

ASES can be used typically on any system even if it has processor of low processing power. The main aim is to click an image every 5 second of the security entrance gate, when the camera will detect vehicle, the number plate will be extracted from the image to text with the help of ocr. space API, and the number plates are detected with an accuracy of detection attained as 90.2%. This extracted text is then searched in the database to check whether the vehicle belongs to the premises or not, if not then it is not granted access to enter the premises. Thus, it works quite more efficiently in all terms like accuracy, speed of processing, smooth execution, general task implementation etc. YOLOv4 the heart algorithm of our system is used for optimal speed and accuracy of object detection. Using Yolov4, we achieved accuracy of 90.2% for detecting the number plates from the image.

II.   METHODOLOGY

The main use of ASES is to automatically detect vehicles, convert their number plate image to text and verify the vehicle have privilege to enter or not. This is a multi-process system which will be comprising of the following steps for the same. In this section we discussed about how to find the number plate in the captured image?
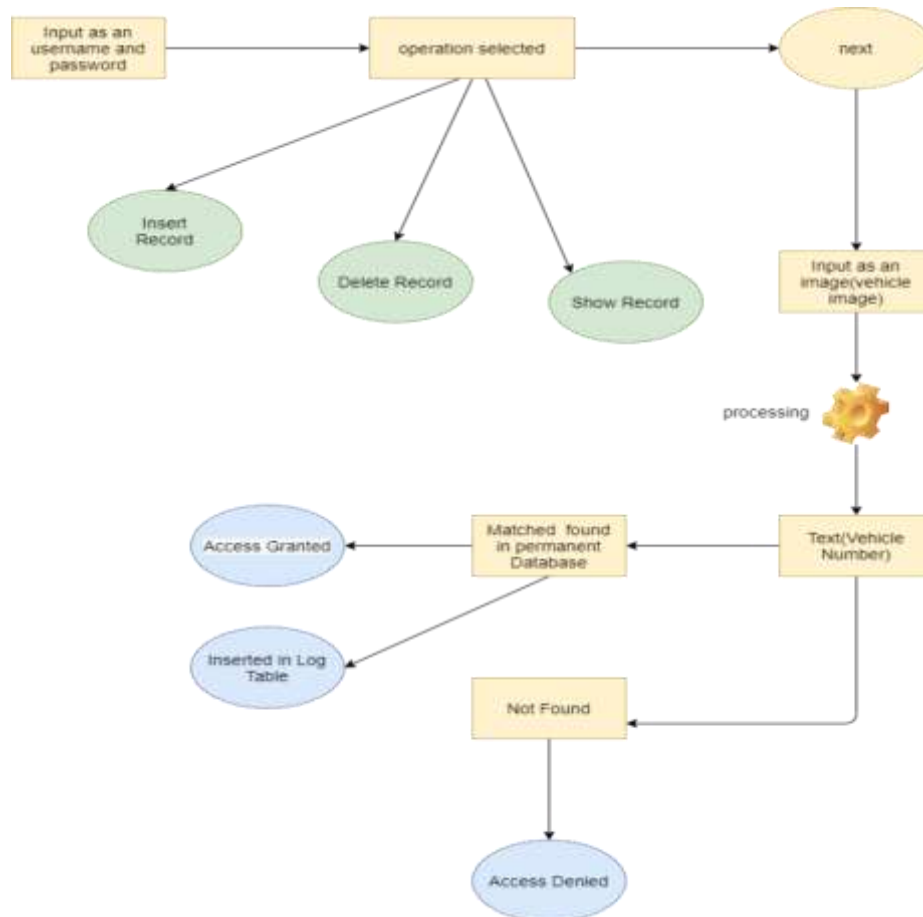
Figure 1: System Architecture

Following are the steps:

1) Image Capturing from Camera

2) Detecting Number plate from Captured image

3) Cropping Number plate image

4) Character Recognition (using ocr.space)

5) Display Vehicle Number

6) Searching Vehicle Number in Database

7) Notifying the guard

1) Image Capturing from Camera: In this method, we will be capturing the vehicle image from Camera footage. The image, which is captured, is in RGB format (Red-Green-Blue is an additive, projected light color system. The tiny dots that make up our displays are composed of RGB information). We will be performing further methods on this RGB image.

2) Detecting Number plate from Captured image: We capture image every 5 seconds, and then pass it to the out custom-trained YOLOv4 model. If the model detects the number plate then and only then, the image is stored on the hard drive, otherwise the image is not stored. Hence, saving the hard drive space and reducing the maintenance.

3) Cropping Number plate image: In this method, we will be working on the image i.e., the number plate that is detected from the above method. Cropping the detected number plate and adding 5 pixels around all edges for extracting the text properly. Cropped image is saved properly at the particular path. We will be performing further more methods on the cropped image.

4) Character Recognition (using ocr.space): In this method, we will working on the cropped image. We will pass the image using the ocr.space's . The API gives result as a .json file. We parse that .json file and get the

e-ISSN: 2582-5208

International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:06/June-2021   Impact Factor- 5.354   www.irjmets.com

registration number. Then the operations like trimming the unnecessary spaces, removing unwanted special characters are done. At last, we get the registration number same as it is in the image.

Figure 2: Converted Image from Image to Text

5) Searching Vehicle Number in Database: In this method, we will be working on the vehicle number, which is being saved by the model. We will be searching the vehicle number in our stored database. As we have developed this for residential premises, there are two tables as permanent and temporary (temporary table is a table which stores the record of guest vehicle number.

6) Display Vehicle Details: After performing all the methods of the Vehicle Number, plate detection. We will be displaying the details of the vehicle on the screen, if the vehicle is part of the premises. Otherwise a popup will tell the guard and access is denied. Also the details of the vehicle will be entered into the log table for record maintaining purpose.

7) Notifying the guard: In this method, if the registration number is not found in both of the tables, then the access to the premises is denied, otherwise the vehicle is permitted to enter the premises.

III.   MODELLING AND ANALYSIS

There are always some problems to perfectly verify the vehicle entering the premises and maintain a log of the records. While there are some applications present the maintain the log but they are not automatic. In addition, we have to manually enter the information. Which leads to errors when there are several cars to enter the premises. ASES can automatically verify the vehicles, maintain the log with all the sufficient data, and provide a functionality where a guest vehicle can also be added in database. All this can be done without using a computer of high specification. The main functionalities of ASES we can add a permanent record or temporary record in the database. We have also provided functionality to remove permanent/ guest records at any time.

Figure 3: Login Page

Figure 4: Maintenance Page

Figure 5: Insert Temporary Record Page

Figure 6: Insert Permanent Record Page

Figure 7: Delete Temporary & Permanent Record Page   **Figure 8:** Show Permanent Record Page

Figure 9: Actual Runtime Page

IV.   RESULTS AND DISCUSSION

In this section, results of the performance of ASES in terms of execution time and accuracy are being shown. The original image, detected image and cropped image show the process of detection and recognition as shown in the below table:

Table 1. Performance Analysis

The result of the proposed system of ASES is provided on sample size of 10 cars, which gave a maximum average accuracy of 93.5% and a minimum average execution time of 1.9sec. The advantages of using ASES are:

the processing time of the system is less as compared to other number plate detection systems. After comparing the output, we achieved the result that our system is cost effective. No additional hardware such as graphics card are required. System can work on any machine having minimum CPU as low as Intel core i3. The only thing that would be necessary is a camera having a good resolution, as all of the operations are done on the image itself, having a low-res image will definitely reduce the accuracy. Also having low light can reduce accuracy of the model by a little.

V.   CONCLUSION

In this paper, we present a methodology for detecting the number plates of vehicles and provide a security system for the premises. We created a system, which will provide security to the premises where vehicle data will be stored and accessed at ease. By realizing, the pandemic (Covid19) situation the user can operate the system while maintaining social distancing. Traditional logbook system of maintaining records will be replaced with ASES where in user can maintain the records with ease. The system generates record of vehicle number plate, time and date of entrance of vehicle. The data can prove beneficial for law enforcement agencies.

ACKNOWLEDGEMENT

VI.   REFERENCES

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