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IDENTIFICATION OF VEHICLE THROUGH NUMBER PLATE USING RECOGNITION ALGORITHM

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Abstract

The system's major goal is to keep track of the vehicles coming into and leaving the organization. Every car has a distinctive license plate number, which is the crucial point for this approach. The camera device that is placed at the entry takes a picture of the vehicle with the license plate. An image processing algorithm called Automatic Number Plate Recognition (ANPR) is used to process the collected image. An effective strategy to identify a vehicle's license plate and enhance the security and vehicle management system is to use ANPR technology. The vehicle number is then stored in a database where entry and exit time are also stored. Also, we will count the number of vehicle that is present in the organization in real-time, which will help in better vehicle management also. This idea of a vehicle Registration and Management System at checkpoints by Number Plate Recognition. will provide a better option rather than manual entry of information and will also do away paper data storage .

Keywords-- Character Recognition, Automatic Number Plate Recognition(ANPR), Camera, Character Segmentation.

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1. Introduction

In today's scenario, the number of automobiles in society is rapidly increasing, which is creating a lot of traffic, security and parking management problems in organization's which is becoming a time consuming issue. Mostly, a security officer confirms the authenticity of the vehicle before allowing entry thus, it requires a lot of time for this procedure. Additionally, keeping entries in the register is subject to human mistake, which might result in giving incorrect information in an emergency and make it difficult to find the correct person. Data availability is not guaranteed by keeping records in an excel file and register since we won't be able to access the required information if the system goes offline due to a power outage or the system crashes for any other reason. Some of the current systems complete this task without staff members and some of them

are challenging to establish, only a few of them are dependable. Here, we tend to propose a system which stores the information more efficiently and allows us to perform various operations. In order to receive correct and efficient required information at a faster rate. Maintaining record of vehicles entered in organizations like schools, company etc. Recognizing the vehicle number Plate by using ANPR and also to store this with related information alone can solve the problem of poor management and security.



Fig1.1 ANPR System

The agenda of this type of system is to efficiently perform the task to maintain and

store information of entering and exiting vehicles via its number plate and display the data in a user's friendly way with different operations. The study of number plate identification has been a primary concern for more than three decades and ANPR has been a very focused and researched algorithm. It has been noted that ANPR research has drawn a large number of researchers both historically and currently. This chapter reviews the various strategies for identifying and detecting license plates and its management system.

- The main aim is to ease the process of recognizing the vehicles entering an organization.
- This is planned to be done using the automatic recognition algorithm ANPR.
- Store the recognized information in digital format to make easy availability whenever needed.

2. Related Work

In [2], a deep ANPR model was employed to identify multi-national license plates. The suggested method in this system consisted of three basic steps, that are number plate recognition, character recognition, and multinational license plate layout recognition. An ANPR System for Car Parking Management, mobile device will capture an image of the license plate, and software was created that uses OCR in [3]. The time spent waiting to register a vehicle was decreased to 6 seconds. The system developed in [4] reduced the workload on the personnel at entry point in an organization. When a vehicle approaches the checkpoint, a CCTV camera records the license plate. Automatic Number Plate Recognition (ANPR) uses image processing to automatically identify the plate number and stores the information gathered into the database for future purposes. The system developed in [1] used three main steps to

recognize a vehicle's number plate, the number plate localization, the character recognition, and storing data in the database. The equipment, which resembles a camera, is situated at the entry and is used to capture vehicle

number plates. The Automatic Number Plate Recognition, then processes the acquired image. The car is determined to be an unidentified vehicle if the database does not show that the recognized number plate belongs to the organization. The organization vehicles' entry time and exit time are then noted. In [5], An image processing algorithm was used in order to recognize number plate from the images captured by camera. The main objective was to develop an effective car number recognition system to automate toll tax collection. [6] carried out ANPR on Bhutanese vehicles. A classification algorithm was created, and 94.6% accuracy was attained in [6]. The system in [1] also used the OCR system. A key tool for OCR in the Python programming language is python-tesseract. In [7] an algorithm was proposed in which we use already existing data to extract the vehicle plate number by matching it to the data. In [8] they proposed a model to build an efficient vehicle parking management and billing system to reduce the security personnel needed for it earlier. [9] was introduced to effectively extract the information required for identifying the vehicles and to track their activities from the clips recorded by the security cameras. This system majorly focus on reducing the load from security personnel, making a complete and clear records for future references, to give real time information of total number of vehicle in organization, with an efficient algorithm that also saves the time of the people. [10] aim was to solve the problem of hardships faced in identifying the plate number of a vehicle at the parking area.

3. Existing System

As a central processor, the raspberry pi 3 is

used. A raspberry is paired with a webcam to record the picture of a vehicle at the organization's entry gate as seen in fig.1. In order to send the retrieved data to the database, Raspberry Pi 3 is networked. When the authorized plate is discovered, the image is initially taken. The processor receives this captured image and processes it. Operating the Raspberry Pi 3 requires a VNC viewer, or virtual network computing. A network connection is used to remotely operate additional computers using a variety of remote control applications. The raspberry is coded, and after various processing stages, the image is finished. As the last step, the data available is sent to the database together with the appropriate timestamp of each vehicle's admission into the organization [11][12][13].

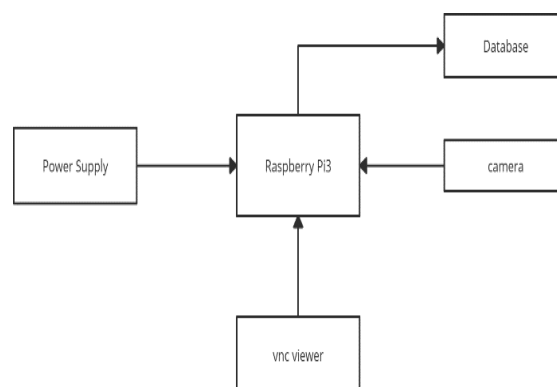


fig.1 Architecture of existing system

The system's processor is connected with the webcam. When the car is located, the ultrasonic sensor of the system sends a signal to the camera, after which the camera used in the system takes the picture of the vehicle and transfers it for further use to the system's processor. To

remove the extra jitter and disruption that are there in the acquired picture, image preprocessing is used. Here, the image is preprocessed using various techniques such as Gaussian filter, adaptive thresholding. These techniques remove noise from the image more quickly than other filters, however the resulting image is blurry. The

background and the region with the number plate are separated using the edge operator. Since the shape of a license plate is rectangular, the required area is found by comparing it to the edge's various dimensions. The process of contour detection is used to extract all of the objects with edges or closed area from a picture. Use filtering to separate the rectangular shape objects from the previously taken image of license plate [14][15]. The undesirable information is then removed from the image using morphological procedures. The number plate's edges are detected on both the vertical and horizontal axes. The operation is repeated until no characters are left in the area of the plate. The characters found in the region of the plate are truncated and stored. In order to identify each character separately, it is saved in a different variable. The size of the designated boxes vary depending on the character's size and shape. Python-tesseract is a crucial utility used in python's optical character recognition (OCR) system [16][17]. The text information contained in the photos will be read and recognized by the system. When used as a script, the detected text will be printed rather than written to a file. The character retrieves the characters from the license plate using OCR technology. The acquired area is produced as a original image once the license plate has been identified. The new image is subjected to OCR, which retrieves each of the character present. These characters could be the letters or numbers found on the license plate. After that, a string variable is created and the received image is transformed to text [18][19].

4. Proposed System

The process of manually entering the vehicle information by the security personnel at the checkpoint creates trouble to travelers, security personnel and anyone who is passing through a checkpoint and also causes more traffic congestion. With

the current setup, visitors might stand in line to register the details of their vehicles with security officers at the checkpoint. The proposed Vehicle Registration and Management System will be able to address these problems. It can lighten the load from watchmen, reduce vehicle traffic and people's time at checkpoints, and aid in timing the passage of a vehicle through a checkpoint. In this system, the objective is to recognize and capture the license number plate each time the vehicle enters or exits, and store the output as Digital Character into the database, with the details like entry or exit time as per the situation. This will be done by the ANPR method which detects the number plate automatically, and sends the information to Database. If the entry about the vehicle already exists, then it will be updated. If it's a new entry, then a new field for entry will be created to store the information. This store information can easily be accessed and used for future security references also [20][21]. The flow of steps are shown in fig.2 below.

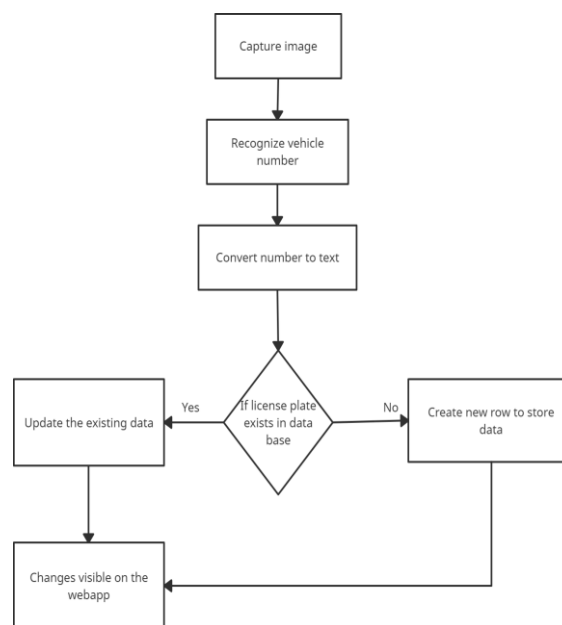


fig. 2 Flow diagram of proposed solution

4.1. ANPR (Automatic number plate recognition) -

a) Image collection [22][23][24].

In this stage, when a vehicle comes in close range, the camera device will record the image of the vehicle with the license plate and collect the image. This is the image which is to be processed for number plate detection.



Fig4.1.1 Image from dataset

b) Number Plate Detection [25][26][27].

The number plate in the input image from step a will be recognized at this stage. Since plate size is not uniform, elements including plate position, plate background, and plate size are taken into account. In order to detect number plates, the input image is first digitized, and then unique features that include number plates are detected.

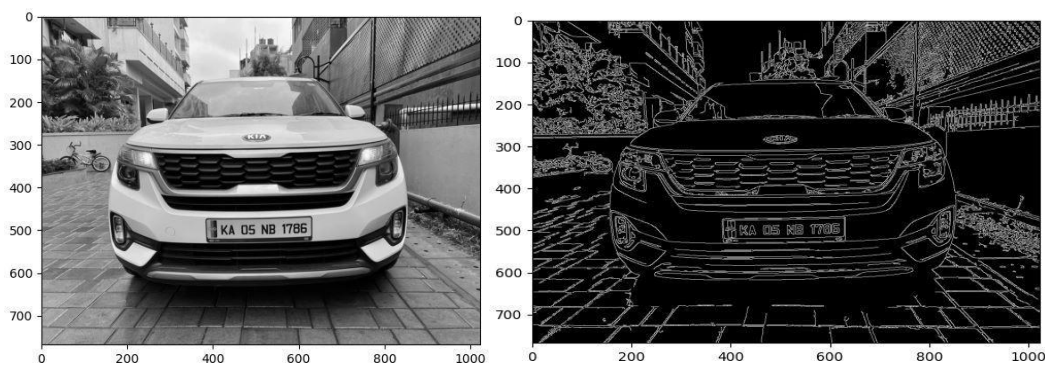


Fig4.1.2 a) making image grey b) Edge detection and Noise reduction

c) Character Segmentation

The binary picture is multiplied by the retrieved rectangular number plate, and the resultant image will have the necessary characters. Using bounding box techniques, which include drawing a rectangular box over each character, these characters are divided into segments. The bounding box will treat each individual character as an object. Every character on the plate will be distinguished from the backdrop by the character segmentation method. Character segmentation would be challenging if the number plate is dirty or cracked.

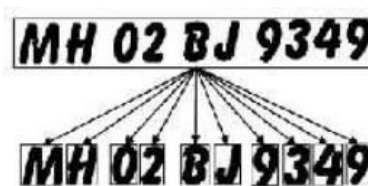


Fig4.1.3 Character Segmentation

d) Character Recognition

In the final phase, we recognize character by tesseract OCR engine in which the input image's separated characters are classified and transformed into useful ASCII text. The bounding box's characters are given into the template matching process. According to the pixel intensities, matching techniques compare the template image. Pixel by pixel, the input image is

compared to the output image, and the process produces a numerical index that estimates the probability of a match at a certain point [28][29][30].

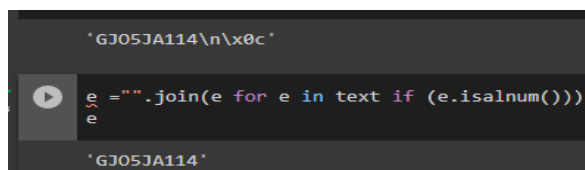


Fig4.1.4 Character Recognition

4.2. Database management

The output received from the ANPR

method will be in the form of Digital Character (to allow the matching step for adding further details). A database is utilized to store the output using the MySQL software. Python and the database are connected directly through the MySQL connector package. Also, the date along with time while capturing the image will be stored in the database. The admin can access and see the data from his computer or mobile phone. Table 1 displays an Abstract view of the database storing the data .

5. Result Discussion

Table.1 Abstract view of the database

S.No.	Vehicle Number	Date	Check-In Time
1	UP 15 AL2748	24/5/2021	1:00 PM
2	UP 15 KS2983	24/5/2021	1:12 PM
3	UP 15 OS9734	27/5/2021	3:00 PM
4	UP 15 PT8574	28/5/2021	4:00 PM
5	UP 15 ED0385	01/6/2021	5:00 PM
6	UP 15 BC9852	01/6/2021	6:00 PM

The result obtained by the proposed work is discussed here. Initially the input from the CCTV camera at the entrance will capture live images and store it in a file then the image is processed for number plate detection where we use CV for number plate detection .

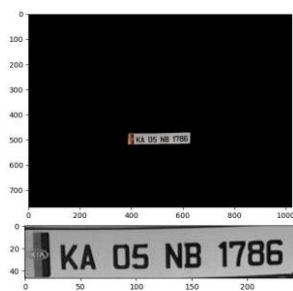


Fig5.1 Number plate detected

After detecting Number Plates they are Processed for character segmentation the character

segmented are detected by OCR (optical character recognition). the extracted data is then stored to database with date and time of the vehicle entry and the number of the vehicle already in the in the organisation.

S_No	Car_number	Entry_Time
1	KA05NB1786	2023-04-30 23:17:17
2	KL2158086	2023-04-30 23:18:47
3	HR26BR9044	2023-04-30 23:18:57
4	COVID9	2023-04-30 23:21:02
5	HS982FKL	2023-04-30 23:25:16
6	MA20EE0943	2023-04-30 23:26:58
7	HR26BR9044	2023-04-30 23:29:56

Fig 5.2 data stored in database

The accuracy shown by our proposed system is shown below:

Number plate detection	97.5%
Optical character recognition	96.9%

Table 2. Accuracy and the models

6. Conclusion and Future Scope

This System works primarily to lessen the burden on security personnel and ease the process of security. It is carried out via a number plate recognition method, which extracts the license plate of vehicle from the pictures that were detected by camera, and then convert picture pixels into printable alphanumeric characters. Once a character has been identified, it is stored in database storage with the corresponding time and date. There will be different filters

/functionalities to filter out the data according to the admin's need. In future, this system can be made more efficient by analyzing the steps of ANPR. Also, the process of registration at entry or exit points of an organization can be fully automated. In future this system can be used for smart parking management and can be a good step for smart India. where there will be no requirement of the security personnel in entry/exit check points for registration and also, no struggle in finding parking's.

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