

Automatic Number Plate Recognition - SMART Security check

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Abstract

With the advancements in Technology in recent Trends the Artificial Intelligence has shown its own recognition in the society. We are now converting all the Human interaction with AI in different places of our daily life. AI has been replacing all the human efforts to make the smart work. In such different areas we have selected an area where there is a much scope and necessity for developing and using smart techniques to simplify our daily routine. The vehicles that are entering into the campus by a Security Guard. For this it requires the image of the vehicle at the time of entry. The step by step process of recognizing the Number Plate is implemented by taking the image and identifying the part of number of the vehicle and read the vehicle number on the plate and store it in our database. Vehicle number plate region is taken and the image is preprocessed with CNN. In this paper we have implemented the process using Haarcascade_russian_plate_number library to recognize the number plate and OCR is used to extract the characters from the image.

Keywords : OCR,CNN, haarcascade,deep learning, opencv

I. INTRODUCTION

Automatic plate recognition is useful for security purposes in the existing society. It is most important for organizations to identify vehicles that are entering into the campus.

License Plate Recognition (LPR) is the tool used to record the license plate number as a security measure in organizations for the vehicles that are entering into the organization.

In the transportation system ALPR is a new technology to identify the number on the vehicle in the world of automation. This technology utilizes image processing to identify vehicles from the license plate image [1], there may be variations in the license plate and the environment where there are different approaches to utilising the font style, size and color and location of number plate. These differences in intensity due to lights or environment can cause problems during recognition. license plate [2].

In this paper we are trying to load an image of a car and the model will preprocess the image and extract the only number plate area using Haarcascade_russian_plate_number classifier and detect the image boundaries of the vehicle number plate of the image. The same is stored as a separate file and this is passed to the OCR where pytesseract is the library used to extract the text from the image and display in text format. The accuracy observed is almost 70% if the image resolution is good enough.

Earlier a security guard at a premises used to note down the data related to the vehicles that are entering into the gate. Now we can convert the same in SMART way to note down the vehicle number by fixing a camera at entrance which will capture the entry of the vehicle and store the image.

II. LITERATURE SURVEY

[1] In this paper the author has discussed about the different CNN techniques available for implementing the Automatic Number plate Recognition. The process is divided into several steps as, Image acquisition, Image pre-processing by dividing the image into layers, License plate recognition and localization, License plate Character segmentation. An overview of all the techniques is discussed in this paper by the author.

[2] In this paper the Vehicle number plate is extracted by using image segmentation and OCR technique which is used for the recognizing the characters from an image. The system detects the vehicle RFID and then it captures the vehicle number plate.. In the database they are storing the vehicle's owner name, place of registration or address etc. If the id and the number are matching with the database then it shows the message "Authorized Person". This is used to implement as a security check in a specific organisation.

[3] In this paper the system the entry of the vehicle into the area is identified and is captured by the camera. Then the image is processed and character segmentation and character recognition is done. This is implemented using Matlab. In this paper the main objective is to identify the smart way to implement the vehicle entry for traffic control or any parking system etc., The system has four main steps to follow and implement ANPR i.e, image acquisition, plate localization, character segmentation and character recognition.

III. PROPOSED METHODOLOGY

Artificial Intelligence

Artificial Intelligence is the new technique trending in the society after COVID. Many tools have been developed using this Artificial Intelligence. AI is the technique of making a system behave like a human. The machine is training to thing and learn the things from the data provided to it and identify the same for the new things that are about to happen. Out of these techniques Deep Learning, Open CV has evolved a wide range to predict the chances of occurring of the events.

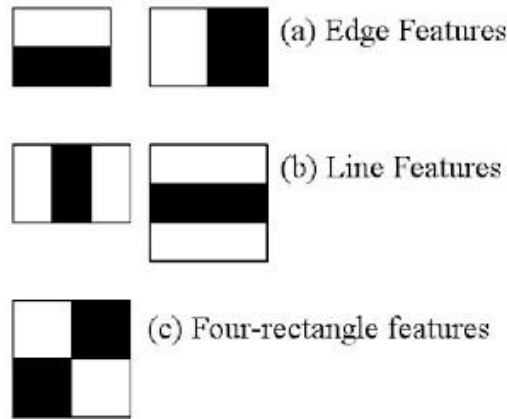
A machine is made to learn from the data which is classified by human and predict the new data basing on existing feature extractions is known as supervised learning. If the machine itself classifies the things by identifying the common features and predicting the new data is known as unsupervised learning.

Out of these techniques Haar Classifier is one of the tool used to detect the features from the images and extract meaningful information. In this paper we are implementing the Automatic Number plate recognition using Haarcascade Classifier as Haarcascade_russian_plate_number.

HAARCASCADE

This is a classifier used for Object Detection method which is proposed by Paul Viola and Michael Jones in the paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001. It is a Machine Learning technique approach where a cascade function is trained by taking a lot of positive and negative images and then it is used to detect objects in other images.

Basically, this classifier algorithm required a lot of images of cars to train the classifier and extract features from the training set. This classifier identifies the location of number plate on the vehicle which are used for training and then easily identifies the place of numberplate and draw the outline on the image. This uses the convolutional kernel. All the features are a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle.



In feature extraction of the image the image is to be converted into gray scale and each pixel is identified to get the exact feature in the new images. Each and every pixel is to be observed and identify the feature to detect the give feature in the new images. One disadvantage in this is that if the image is in a particular scale only the data can be extracted accurately. Basing on the pixels and image resolution the prediction may give wrong results also.

Optical Character Recognition (OCR)

Optical Character Recognition (OCR) is a technique used to scan an image and identify the text in that image. In this project we are trying to extract the text that is the vehicle number from the vehicle image and write the text in the database for future reference. The extracted text is made editable and occupies less memory when compared to storing an image in memory.

The technique of Optical Character Recognitions is utilised in many applications to make the work smart and easier and more accurate. The applications of the OCR tool is Passport recognition in Airports, Automation of Data Entry by speaking, Recognition of License plates, To extract the business card into text and Converting handwritten documents into electronic images, converting of text to audio files Some of the Open Source OCR tools are Tesseract, OCRopus.

In this paper we have implemented the Tesseract to extract the vehicle number from the number plate image.

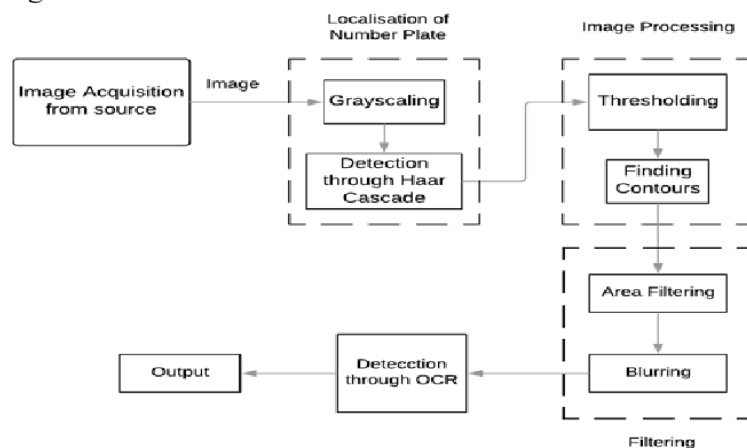


Fig. 1. Algorithm flowchart

IV. IMPLEMENTATION

As there are many techniques and tools to identify the Vehicle number Detection we have implemented the same using Python. Initially the image of the car either front or back is taken as input to the model. Then the image is converted into GrayScale to identify the image edge detection. Then the grayscale image is passed to the HaarCascade Classifier , a classifier which detects numberplate `Haarcascade_russian_plate_number()` where the image boundaries are identified with edge detection and a new cropped image of the number plate is saved as `NumberPlate.jpg`. And now we have separated the number plate from the actual image. Then we need to pass this image to the OCR `pytesseract` library which will extract the text from the image and display the text that is extracted.

V. RESULTS

Here there are some disadvantages that if the number plate is not clear or writing of the number plate with different font and style it could not give 100% accurate result. We have implemented for some of the vehicle images if the image is clear and the font is good then we get 90% of accuracy of the text identification., other wise there are 70% chances to get the text extraction. To improve we need to pre-process the image by using different digital image processing techniques and get the exact result.



```
print("Number on Plate is")
print(text.replace(" ", ""))
```

Number on Plate is
AP16BP1668



```
print("Number on Plate is")
print(text.replace(" ", ""))
```

Number on Plate is
AP16BZ5253

```
[111] cv2.imwrite('numberplate.jpg', number_plate)
cropped_license_plate = 'numberplate.jpg'
cv2.imwrite('cropped_license_plate.jpg',
            cropped_license_plate)
# convert the license plate characters to string
text = pytesseract.image_to_string(cropped_license_plate, lang='eng')
predicted_result = pytesseract.image_to_string(img, lang='eng')

[112] print("Number on Plate is")
print(text.replace(" ", ""))

Number on Plate is
HR26DK8337
```

VI. CONCLUSION

In this paper we have implemented only the fundamental idea to detect the number plate and convert the number into text. This can be extended to store the data into the database as the vehicle enters into the gate we can note down the time and date of entry of the vehicle with its vehicle number and make a future expansion.

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