AN EFFICIENT NUMBER PLATE DETECTION SYSTEM BASED ON INDIAN TRAFFIC RULES

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Abstract:

With the invent of automobile and advances in the world of machinery, there is a notable increase in the number of vehicles, two wheelers and three wheelers in the road transport. With the raise in the number of vehicles there is a lot of traffic violations that is happening in the road system. Based on the Indian traffic road system, monitoring the violation of such a incident is a huge task and also a tedious system. But however steps are taken to monitor the traffic breach that happens in the road transport through License Plate Detection mechanism for the vehicles that involves in over speeding or violating the rules. License plate location is a very important concept in vehicle license plate recognition for intelligent transport systems. Number plates can have different shapes and sizes along with different colors. The most common vehicle number plate in India have the background color as yellow or white with the font color black. Identification of number plate for vehicles in India has been discussed in this paper and the numbers have been segmented to identify them specifically. Our focus here is on two main steps: first is to find the number plate and second the segmentation of the number to identify them specifically. The main objective of this paper is to efficiently design and implement a method for License Plate Recognition (LPR) of Indian License Plates. We have manually acquired the images of various vehicles. Here for the detection point, we have used COCO-API RCNN and K-NEAREST NEIGHBOR.

Keywords: Image processing, Color Processing, License Plate Recognition

1.INTRODUCTION

The huge combination of technology, has made an enormous increase in the production of vehicles under various sophisticated category. This has also made the vehicular world as a resources in information systems. Since an independent information system has no value without any data, there is a need to combine vehicle information between actuality and the data system. This can be obtained by human agents or by special machine learning algorithm that will permit identification of vehicles by their license plates in real time scenario. Among intelligent equipment, a system of detection and recognition of the number plates of vehicles is noted. The system of vehicle number plate detection and recognition is used to identify the plates and then recognize the plate. The detection and reading of license plates is a kind of intelligent system and it is considerable because of the potential applications in several sectors which are quoted:

- Armed Forces: This system is used for the detection of stolen and searched vehicles. The detected plates are compared to those of the reported vehicles.
- Parking Management: The project can be used to monitor and control the entry of cars into and out of a parking lot. This will even provide increased safety.
- Road safety: This system here can detect license plates when the vehicles exceed some particular speed, coupling the plate reading system with road
radar.

2. LITERATURE SURVEY:

[1] Cheng-hung Lin, in his paper also has proposed a novel architecture for license plate recognition system, this paper says the system could identify the number plate of the system even in bad weather condition. He proposed that the system can be implemented using convolution neural network to improve character recognition of the system.

[2] M. Sarfraz; A. Zidouri; W.G. Al-Khatib, in his paper has worked for the character recognition concept on Saudi Arabian number plate system on various illuminous condition. The system is trained to identify the characters or numbers for the vehicles on sufficient illumination available.

[3] Fikriye, he has projected a paper where the number plate recognition can be done based on various weather condition and the system can detect the number plate which are damaged, blurred, and scary images.

[4] Volodymyr Turchenko, has identified the number plate designed and segmented the characters using image fusion, neural networks and threshold techniques to make the system work under various weather condition and to deal with various pattern of the number plate.

3. RELATED WORKS:

Automated number plate recognition is a very interesting topic that is gaining value day by day. With the amount of accidents happening every year, this tool can be used in observing the vehicular speed. This could also be used in reducing bottlenecks at toll centers[5]. The first step in the recognition process is obtaining a photo of vehicle usually by use of a mounted Charge-Coupled camera. After this, an algorithm must be used to transform an image to a string consisting of the license plate number. Further pre-processing must be done like image enhancement, plate area localization and noise reduction. An important characteristic of a license plate is its definite rectangular shape, which can also be exploited for localization purposes[6]. This would have to be followed by Image segmentation, where individual characters are identified based on their orientation[7]. A simple way to localize these features is to examine edge and variance as information. This can be done by applying COCO-API RCNN and K-NEAREST NEIGHBOR ALGORITHM and obtaining the image gradient. A binary edge image can be obtained using a threshold algorithm. A local variance image can be obtained by sliding a Window across the image and calculating the variance within each window. Combining these, areas of high activity can be localized. Number plate character recognition is then performed finally. An accuracy of 80% is obtained on the recognition of the number plates.

3.1 ENHANCEMENTS IN THE EXISTING SYSTEM:

The initial picture quality is enough for the development purposes. We can cut the license plates for the numbers, but number recognition was almost impossible for the second part because of the following reasons:

- The pictures obtained were along with normal exposure time that caused smoothing of the picture at a particular manner and number.
- The number was small to be analyzed efficiently.
- The label border has significant area that is considered as a region as the label actually occupies less than 80% of the image.
- Due to poor lightning, some characters like major zero seem to be separated in an internal manner. This is an extreme case where even the pre-
processing techniques cannot solve the problem.

- A lot of characters are at a strange upward angle, resulting from the depths of the threads. This may have important results for letter recognition. Identifying these types, unfortunately, would require three dimension vision techniques which are a topic for future discussions.

The proposed system is focused on solving the two main problems relevant in organizations and institutions, namely keeping a track of number of vehicles currently in the premises, while aiding owners if their vehicles are in the parking spots, and also this can be used at traffic lights with CCD cameras to observe the vehicles breaking any traffic rules and to observe if the vehicles are behind the red light every time. Since it is a Charge Coupled Device, we can use the system to observe and recognize the vehicles that cross the traffic light while the light was red. The database of the Registrar Office can be embedded in it so as to directly observe which vehicle belongs to whom. The system contains two major components. They are:

1. A photo capturing device.
2. The algorithm developed using Machine Learning, COCO-API RCNN and K-NEAREST NEIGHBOR ALGORITHM.

4. PROPOSED SYSTEM

This segment of the paper indicates how to identify the number plate. In the ANPR system, a monochrome color camera is used generally. For the number plate to be recognized, we need to first identify the number plate area. For the same purpose, we use three approaching strategies. Grayscale and color is used to identify the separated characters.

4.1 BINARY IMAGE PROCESSING

This method of Binary Image Processing is used to extract the number plate region from the background (fig 1). It is purely done by using the edge statistics. Also the image obtained is converted in to binary images and has the color range from 0 to 1.

**Figure 1** After converting the image in to binary format

4.2 COLOUR PROCESSING:

One of the most fundamental steps in image processing is the colour processing since
most of the countries have fixed norms regarding the colour of the number plate. Similarly, the plates in India have a white or yellow background with the number written in black. But at the same time, the brightness or the lightning can play a crucial role in the number plate recognition. Also, if the light is not adequate, the results of number plate recognition may be inaccurate.

4.3 CHARACTER SEGMENTATION:

In this particular stage, we aim to segment each of the characters, keeping in mind that the component of the characters is not to be lost. The plate characters are read mainly by the process of division. While in some cases, division may fail, in that case, a character is isolated in two pieces. As the characters are to be perceived, each character must be partitioned almost individually. The characters are differentiated and recognized from each other. This method is known as the Optical Character Recognition. Now as an important step of the Character Recognition, template matching is an important step. Through the templates, we find the area of a sub-picture. This includes the comparison of the template with the character being recognized. On comparing, whichever character is matched in the template, the image character is read at it respectively. Correlation of the picture is done pixel-by-pixel. Hence, for the above mentioned procedure, a database of characters or layouts has to be used. Alphanumeric characters have their own respective format. The below picture (fig 2) depicts a particular template.

5 Experimental Results:

The number plate details are captured by the system along with the captured number plate, RC book owner name and the mobile number (fig 3). These data can be obtained from the Indian RTO office when deployed in the road traffic posts. And if the vehicle is found to be over speeding and violating the traffic rules, then a message is sent to the owner of the vehicle on the details of fine imposed (fig 4).
To enhance our method, the experiment must be performed on different types of vehicles and number plates of different dimensions. The License plate recognition was not successful for cases where we had number plates at different angles and in cases where the picture could not be taken clearly. This is why the accuracy of the algorithm reduced.
6. CONCLUSION AND FUTURE ENHANCEMENT:
This paper involved studying Indian Traffic System, various OCR algorithms, Raspberry pi usage and Arduino usage with its strengths and vulnerabilities. The system is capable enough to identify the speed of vehicle and trigger camera to capture image. Once the image is captured the system initiates the number plate identification module to detect the number plate, then the number is compared with the database and the owner’s phone number is retrieved and a message is sent.

FUTURE SCOPE
1. Integration of all units can be improved.
2. The computational time can be improved by using better and efficient algorithms.
3. Program can be modified to work even when system memory is not enough.
4. High resolution cameras can be used to capture high quality images.
5. All the units can be made automated with good efficiency.

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