Virtual Traffic Police Using Machine Learning Algorithms

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Abstract— In the new evolving world, traffic rule violations have become a central issue for majority of the developing countries. The number of vehicles on the road is fast increasing, and the number of traffic offences is expanding at an exponential rate. Managing traffic violation offences has always been a time-consuming and risky task. Even while traffic management has gotten more computerised, it is still a difficult challenge to solve, because of this various plate formats, sizes, rotations, and non-uniform lighting are used during picture acquisition. circumstances. The main goal of this project is to properly and cost-effectively control traffic regulation breaches. The proposed model includes an automated system which uses camera to capture video and presents Automatic Number Plate Recognition techniques for plate localisation and character recognition, as well as other image alteration techniques that make it faster and easier to recognise the number plates. The message-based module is used to warn the car owners about their traffic rule infraction after recognising the vehicle number from the number plate.

Keywords: Character Recognition, Traffic Violation, Image Processing, Vehicle Number Plate

I. INTRODUCTION

In every country there are driving rules available for people to drive carefully. When these rules are broken it is defined as a road violation. There road violations that happens in day-to-day traffic For instance, most typical violations include red-light violations, excessive speeding, and passing other cars across double and single white lines. These road protocols are strictly followed in the areas where the majority of accidents occur. We have implemented a OpenCV and python-based system, called as "VIRTUAL TRAFFIC POLICE". This technology is designed to make police job easier by providing a user interface Image processing technology is utilised to detect lanes, cars, and vehicles that violate the rules. The team used ultrasonic sensors to create the system, which allows it to receive conditions and recognise when a violation occurs. It will be easier for the police to catch persons who breach traffic laws, and the number of police officers who take bribes and are dishonest will be reduced. An image of the violation with the location, time, date and an image of deriving gadgets around the present site where the infraction occurred, the car will be delivered to the nearest police officers.

II. LITERATURE SURVEY

In Nur-A- Alam et.al [1] The super resolution technique is used with the convolutional layer of CNN to reconstruct the pixel quality of the input image. Each character of the number plate is segmented using a bounding box method. In Md. Amzad Hossain et.al [2] Connected Component Analysis architecture used for detecting the number plate and segmenting each character. mainly focused on edges detection, morphological processing vertical projection for actual plate detection. supervised classification technique of the machine learning approach is used. In P.Meghana et.al [3], system uses image processing technology for identification of the vehicles. This system can be used in highly populated areas and highly restricted areas to easily identify traffic rule violated vehicles. OCR algorithm. In Tahniyath Wajeeh et.al [4], The system proposed isolates the bikes from the images by approximation crops the most It then passes it to the feature abstraction and matching system in the area where a helmet might be present. In Lokesh Allamki et.al [5]On the detection of a Helmetless rider, the License Plate is extracted and the Licence Plate number is recognized using an Optical Character Recognizer. Using a Webcam or a CCTV as input, this application can be developed in real-time. In Vedant Singh et.al [6] paper proposes an automated system to monitor Traffic Violations in wide range of vehicles, using YOLOv3 to detect and track vehicles and save a snapshot in case a violation is committed. In Amirgaliyev Beibut et.al [7] Advanced systems for tracking and identifying stolen, unauthorized vehicles are based on automated number plate recognition technology. Genetic and HOUGH algorithms are used. [8] "Effective Algorithms and Methods for Automatic Number Plate Recognition" by Amirgaliyev Beibut et.al compares various available techniques for number plate recognitions and choses the one with highest accuracy.[9] The Automated Parking Fee Calculation Using License Plate Recognition System" by Worawut Yimyam et.al proposes methods for automated fee calculation by detecting the number plate which is mostly used in parking lots and tolls.

III. PROPOSED METHODOLOGY

From the literature survey it is seen there is a need for an enhanced framework depicting the violations and a system which detects them and notes down vehicle number. The proposed methodology is as shown in Figure 1.

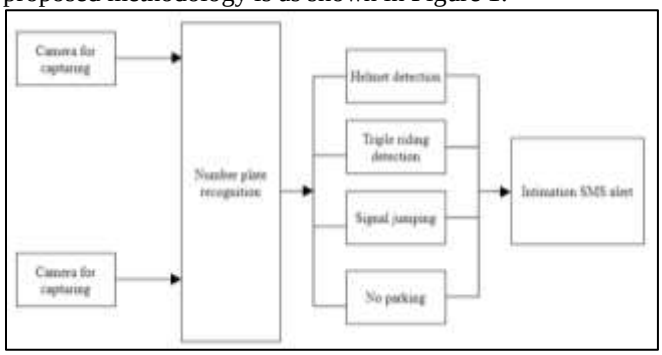

Fig. 1: Proposed block diagram for violation detection.

A. *Target users*

End users are the Toll gates, parking lots, traffic signal control room, borders etc where vehicle record can be maintained and also violations can be controlled seamlessly without traffic police. Whole traffic system can be automized.

Accidents and other disasters can be reduced since the traffic rules are followed properly.

B. YOLO V3

For real-time violation detection, there is a need for accuracy and speed. Hence a DNN based model You Only Look Once (YOLO) was chosen YOLO is a real-time object detection technology that is state of the art. YOLOv3 is a major advance over prior YOLO versions in terms of speed and accuracy. In contrast to systems like R-CNN, which require thousands of network evaluations for a single image, it provides predictions with just one. This makes it a thousand times quicker than R-CNN and a hundred times faster than Fast R-CNN. YOLO is trained with images of violations such as triple riding, signal jumping etc. so that it is able to detect violation in image or video fed through camera.

C. Data Collection

1) Smart Camera:

Camera is fed with images or video stream that contains violations like signal jumping, no parking, riding without helmet and it is processed to detect number plate. Images can either be from dataset or any live images. images that contain both faces and also non-faces is fed to detect triple riding. This is used to detect the faces in real time The Haar-cascade technique is implemented using OpenCV. the image is divided into grids, and if the grid is non-face window, then it is directly discarded in single shot

D. Noise Filtering

After the violation is detected, next step is to find its number plate area. For this, noise is reduced to clearly locate the plate. We intend to use Gaussian filter to correlate the pixels neighbouring and this can reduce the noise and localizing the plate.

E. Image Binarization

Image binarization is a process to convert an image to black and white. A threshold is chosen in this method to categorise certain pixels as black and others as white. The main challenge is the assigning of the threshold values for an image. Sometimes It becomes extremely difficult, if not impossible, to choose the best threshold value. This challenge can be overcome using the technique called Adaptive Thresholding. A threshold can be manually set by the user or automatically set by an algorithm, which is known as automatic thresholding. It is followed by edge detection canny edge detection is used here.

F. Character Segmentation and Recognition

Because character recognition is fully dependent on segmentation, segmentation is an important aspect of the vehicle licence plate detection system. If segmentation is not done properly recognition will not be accurate. As a result, the bounding box method was employed to solve this problem and produce superior outcomes. The bounding box approach entirely encloses the labelled region in a rectangular box. When a connected region is labelled, the bounding box's corner co-ordinates, as well as its height and width, are determined. After segmenting, the next step is character recognition. The primary goal of recognition is to convert visual text into characters. Each character from the license plate is compared completely against with the alphanumeric database which uses template matching. In matching process, the obtained sub-image will be compared against the template images in all possible position in the database and it calculates all numerical index for each character in order to get better matching from template images. OCR is used for character recognition.

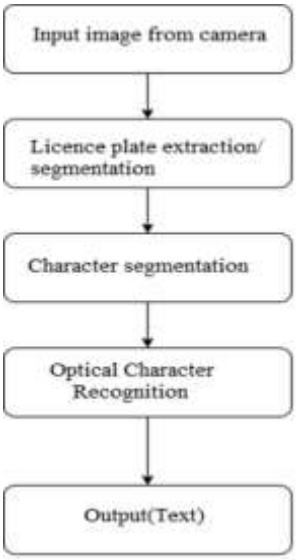

Fig. 2: Methodology used

IV. EXPERIMENTAL RESULTS AND ANALYSIS

In our work, we utilized a distinctive color, diverse points, and diverse measure pictures. We worked with up to 40 pictures in 8 classes. These pictures are utilized to prepare and test our actualized NPR framework. For executing our work we utilized diverse instruments that are: YOLO V3, coco framework, open cv, Spyder, Python, Keras and Tensorflow. For 50,000 iterations, the model was trained using YOLOv3 for photos in five classes. The detections of all the objects classes were obtained with high precision value and precision was nearly 75%. We discover superior execution from our work in each step of Number plate recognition. We found 91% accuracy for plate extraction, 89.5% for helmet detection, 92.45% for signal jumping detection and 87.8% for triple riding.

V. CONCLUSION

This project mainly focuses on recognising maximum types of violations effectively and efficiently in two wheelers and identifying number plate. YOLO v3 is used for detection of violation which is one of the efficient methods now a days. Our project's libraries and software are all open source, making it extremely adaptable and cost-effective. The project was mainly built to solve the problem of non-efficient traffic management. As a result, we may conclude that if used by traffic control departments, it would make their job easier and more efficient.

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