

Regularizing Vehicle Legalities through Machine Learning Techniques

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Abstract

This project aims to check the vehicle-related legalities i.e., insurance, registration related matters-license, grant certificate of fitness for Goods Carrying Vehicle (GCV), Passenger Carrying Vehicle (PCV), private vehicles and two wheeler's. This work would be done by petrol bunk workers by screening the registration number on the plate. A camera is used to capture the registration plate from which the number is identified using an image processing system that can deal with low illuminated, cross angled, nonstandard font number plates by employing techniques such as, morphological transformation, Gaussian smoothing, Gaussian thresholding in the pre-processing stage and sent to the respective servers. This license plate recognition is done through the Convolutional Neural Network (CNN) model which is further connected to the servers which checks for the legalities by redirecting to the insurance servers and RTO servers respectively. After the same, the vehicle holders are warned and fined accordingly based on their vehicle legalities perfection. This fine receipt is redirected to the respective servers for future use. This is one of the necessary systems designed to detect the vehicle number plate to get information about the vehicle legalities. This system illustrates a design and development for a new effective way for regularizing vehicle-related legalities using machine learning techniques. This system is implemented at the petrol bunk.

Keywords: CNN, Image Processing, Generalized Server, Fine

I. INTRODUCTION

India is one among the fastest-developing nations in the world. Though the government makes sincere and committed efforts in improving the economy in full swing, the government faces quite many hurdles like evasion of tax etc. Currently, the insurance penetration in India is 3.7% of the Gross Domestic Product(GDP) as against the world average which is 6.31%. General insurance is growing at a rate of 18% per annum. It is an alarming fact that nearly 57% of the vehicles in our country are uninsured and many people have their license and other vehicle legalities non-renewed. Though the government has taken measures to check through traffic police, the manpower is very small compared to the number of vehicles plying on the road. Though it's a crime of not having a 3rd party insurance it's not been taken seriously by everyone thereby depressing our economical revenue to a huge volume. This project helps in improvisation of the economy through

the financial sector by identifying the uninsured vehicles plying throughout the country. The statistic reveals that due to government norms the new vehicles which are registered are given insurance with bundled policies i.e. it covers the own damage portion of the vehicle for 1 year and the liability portion either for 3 or 5 years. This trend has emerged in the recent past only. But the vehicles which were registered earlier do not need the purpose of insurance whereby it hinders economic growth. The victims who met out with an accident with uninsured vehicles the plight of the family of the victims who suffers either with grievous injury or death is pitiable when it goes with the UNINSURED VEHICLE that is they do not receive any compensation which makes their families of the victims a worse scenario. On the other hand, though the victims lose their life the economic condition of families is unaffected by the way of compensation under various heads as stated by insurance companies through motor accidents claims tribunals. Here comes the real importance of why the vehicle should have insurance when plying on a public road. This project helps the Indian public as well as the government. This project identifies through many techniques as stated below to find an uninsured vehicle plying on Indian roads and ensures insurance and safety to the general public. This project utilizes various latest techniques, programs and designs in finding out uninsured vehicles on the road. This includes various image processing techniques such as image blurring, edge detection, contour detection and various character segmentation and recognition techniques. The character recognition includes CNN model from which the recognized number plate is fed to the pytesseract which is further fed to the database for legalities checking. The fines are generated according to the legalities perfection and also the petrol is filled accordingly.

II. LITERATURE REVIEW

License plate recognition remains one of the challenging and major task in computer vision. Developing accurate and fast object detection techniques is a crucial task for developing a successful License Plate Recognition system. The object detection operation could be used for both number plate detection and character recognition. There are two kinds of features for object detection, the hand-crafted features and the deep learning features. In recent years, deep learning-based object detection techniques are outperforming the hand-crafted based techniques

The below table tabulates glimpse of the reference papers we used.

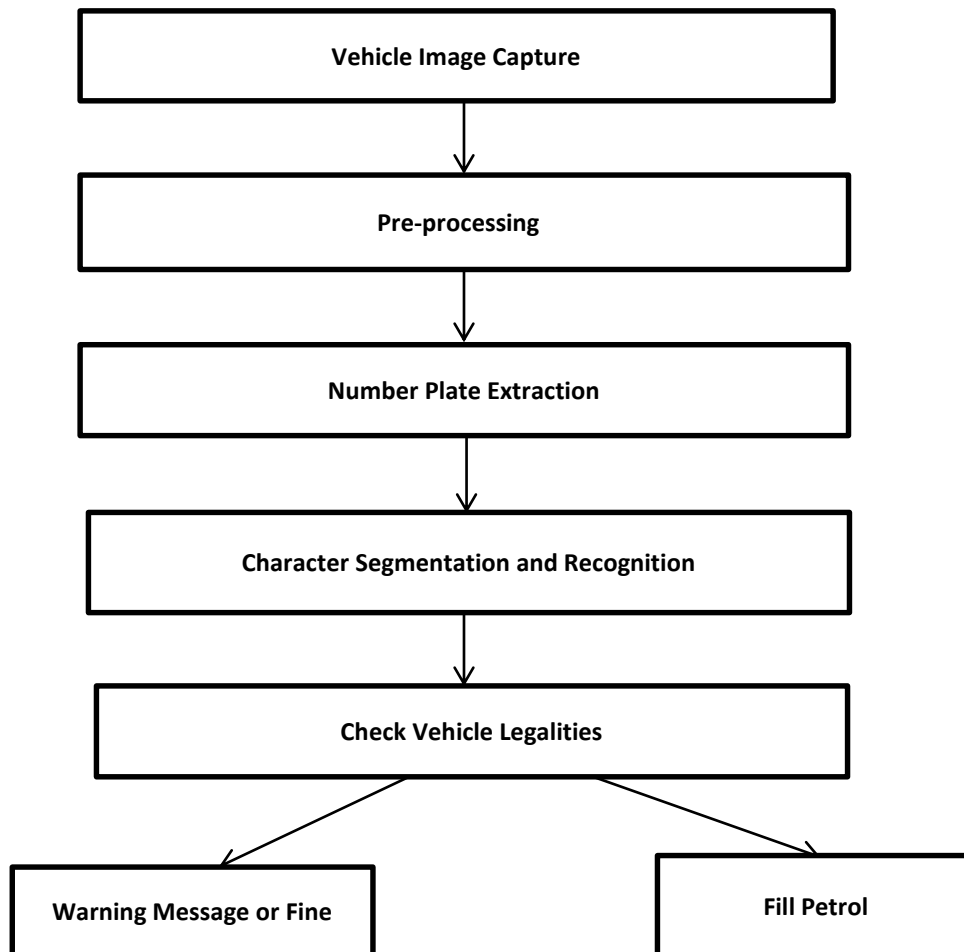
Author	Title	Method	Remark
[2]Ravi Kiran Varma P, Srikanth Ganta, Hari Krishna B, Praveen SVSRK	A Novel Method for Indian Vehicle Registration Number Plate Detection and Recognition using Image Processing Techniques	Used K-nearest neighbor algorithm for character recognition.	Used Optical Character Recognition(OCR) for character recognition
[3]K.B. Sathya, S. Vasuhi, V. Vaidehi	Perspective Vehicle License Plate Transformation using Deep Neural Network on Genesis of CPNet	Used Capsule Network for License plate recognition.	Used Convolution Neural Networks and OCR for License plate recognition.
Abhay Singh, Anand Kumar Gupta, Anmol Singh, Anuj Gupta, Sherish Johri	Vehicle Number Plate Detection Using Image Processing	Used the system to check if a person has violated traffic rules.	Used the system to check vehicle legalities.

III. METHODOLOGY

This project aims to check whether a vehicle is properly legalized. If all the legalities (insurance, license, FC) are perfect the petrol is filled i.e. the fine is not generated as all the legalities are perfect. If any one of the legalities is not

taken, then a fine of 100 rupees is generated. If any two of the legalities are not taken, then a fine of 200 rupees is generated. If any three of the legalities are not taken, then a fine of 300 rupees is generated. If any of the legality is not renewed, then an additional fine of 100 rupees is added to the fine generated previously. This fine is paid at the police station.

3.1 Proposed Architecture



3.2 Algorithm

Step -1: License Plate Recognition

1.1 License plate detection

In this we will detect the license plate from the vehicle. We will use the contour option in OpenCV to detect the rectangular number plate. The accuracy can be improved by knowing the size, color and location of the number plates. For this the camera is trained at those particular specifications. The following steps are done step by step as follows,

a) Resizing the image

It helps to avoid problems with image resolution and helps in fitting into the frame.

b) Converting to grayscale

Gray scaling speeds up the process so we no longer have to deal with the color details when processing an image.

c) DE skewing (if required)

It is process in which skew is removed by rotation an image in the required direction.

d) DE noising by bilateral filter

The useless information is called noise, by using a bilateral filter (blurring) will remove the unwanted details from an image.

e) Edge detection

It allows users to observe the features of an image for a change in the gray level.

f) Contour detection and sorting

Firstly, the contours are detected and from that our license plate is obtained by sorting them by the shape of the number plate which is rectangular in shape.

g) Masking the parts other than number plate

Except the number plate all other places are masked.

1.2 Character Segmentation

After detecting the License plate/number plate we need to crop it and save it as a new image. Hence to do those process the following steps are followed,

a) Cropping

The image is cropped according to the need and saved

b) Converting to grayscale

Again, gray scaling is carried out only if it is necessary.

c) Edge detection

Edge detection is done if it is required again. This is because the image is an edge detected already.

1.3 Character Detection

The Region of Interest(ROI) is detected using the pre-trained CNN model by transfer learning. With the detected coordinates the number plate is detected and is fed to the OCR for character recognition.

1.4 Character Recognition

To extract the text from the detected number plate(image) we use Optical Character Recognition(OCR).

a) Using Pytesseract

To read the numbers and alphabets in the number plate and to fetch the information from the detected image we use the pytesseract package.

Step 2: Database checking

We will first collect data (Vehicle registration Number, RTO legalities) to store to store it in the database. After getting the vehicle registration number, the latter is checked in the insurance and RTO database. After checking the data of the vehicle using registration number the legalities are checked for their perfection in their respective databases. If all the legalities are perfect, then the petrol is filled else it is redirected to the fine modules.

Step 3: Calculation of fine

If the legalities are not done within the next petrol fill, then the vehicle the holder has to pay the fine for the same. This is done in such a manner when any one of the legality is not correct a fine of 100 rupees is generated likewise the fine increases in according to the number of incorrect legalities

IV. RESULT ANALYSIS

We achieved better accuracy for our license plate detecting model when compared within most available models. Also most license plate detecting model are focused on parking lot allotment or for tollbooths, we focused on finding whether the owner of the vehicle holds proper vehicle legalities

1. Fine – 100

a) A fine of rupees 100 is generated when any one of the legalities is not proper whereas others are perfect.



Fig.1 Fine of 100 is generated when renewal is not perfect whereas others are perfect.

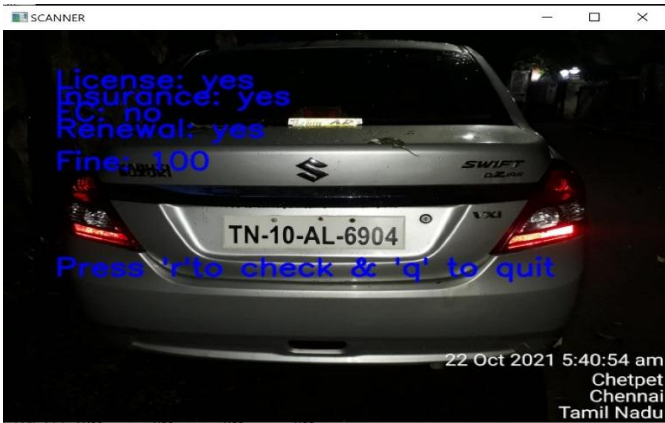


Fig.2 Fine of 100 is generated when FC is not perfect whereas others are perfect.

b) A fine of rupees 200 is generated when any two of the legalities is not proper whereas others are perfect

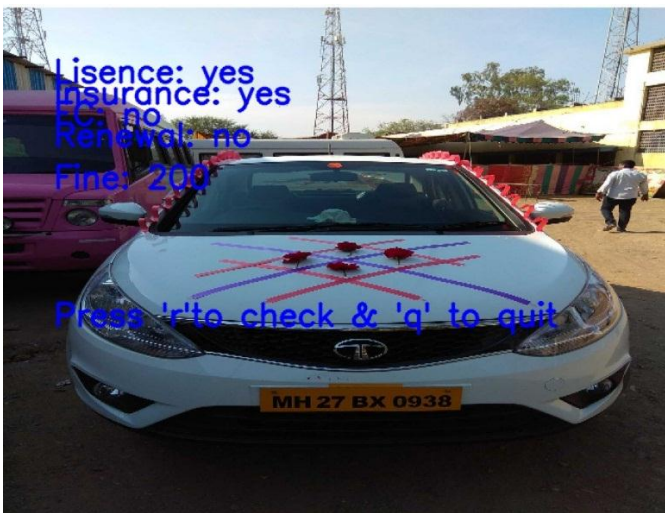


Fig.3 Fine of 200 is generated when renewal and FC are not perfect whereas others are perfect.

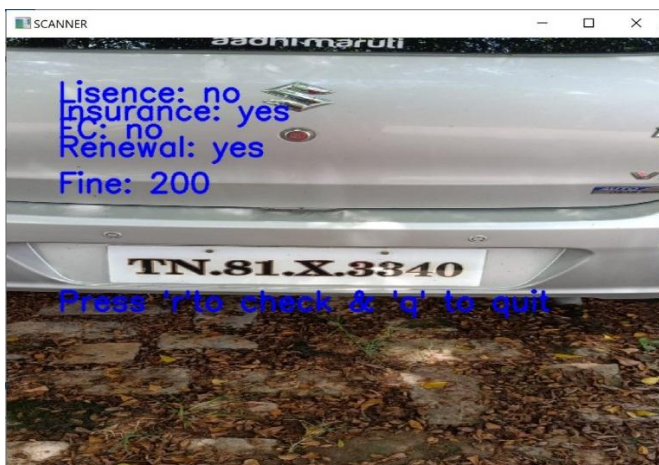


Fig.4 Fine of 200 is generated when license and FC are not perfect whereas others are perfect

c) A fine of rupees 300 is generated when three of the legalities is not proper whereas other is perfect



Fig.5 Fine of 300 is generated when license is perfect whereas others are not perfect.



Fig.6 Fine of 300 is generated when FC is perfect whereas others are not perfect.

d) A fine of rupees 400 is generated when all the four legalities are not proper



Fig.7 Fine of 400 is generated when all the 4 legalities are not proper.

e) Allowed for fueling is generated when all the legalities are proper

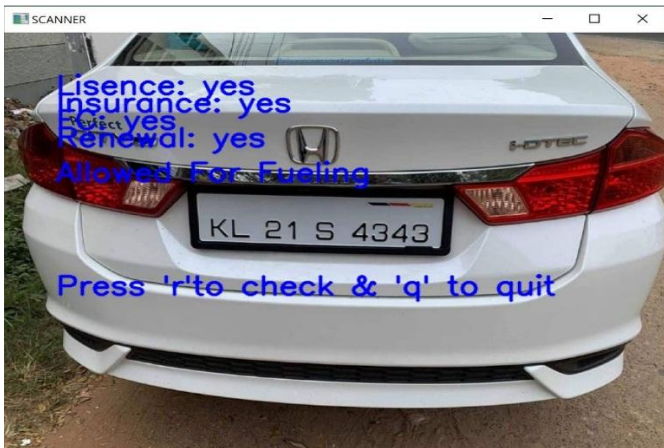


Fig 8 Allowed for fueling is generated when all the legalities are perfect.

V. CONCLUSION

In this project, we discussed how machine learning techniques can be useful for regularizing vehicle legalities and reducing the number of uninsured vehicles plying on the road. Despite the advancement in various sectors and technologies we still face issues with uninsured vehicles. By the proposed project, the vehicle registration number plate image is captured which is then processed and redirected to get the information of the owner from which the legalities are checked and the necessary measures are taken to get the legalities done. We perform a technique in which the picture of the vehicle plate is taken, and the noise diminishment is performed on it to get the rectangular number plate alone. After this process, segmentation and identification of characters are done. Once the characters are recognized the vehicle number is obtained from which the required data can be obtained.

VI. FUTURE WORK

In future, the system can be extended to detect numbers from special License plates such as from military vehicles, diplomatic vehicles, High Security Registration Number plates(HSRP) etc. The system can be further improvised by using a Bar-code fitted registration plate to scan the plate easily for checking the requirements and further by using motion sensors with proper proximities to detect the vehicles at a distance thereby reducing the cross entry of the auto mobile. The system can also be implemented for electric vehicles by using the same mechanism in the cameras at the traffic signals

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