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Python Automated Tool to Detect Over Speeding of A Vehicle Through ANPR Technology

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Abstract: Today, every country has serious issues with traffic management and car ownership identification. Car owners who violate traffic laws and drive too fast may be difficult to spot. It could be challenging for traffic officers to collect the license plate because of the speed of the moving car, making it impossible to identify and penalize such offenders. The creation of an automated system for number plate identification is crucial as a remedy for this problem. A web application that can identify license plates and display them will be created. To achieve the desired outcomes, EasyOCR and OpenCV will be combined with machine learning system models (such K-means or CNN). We'll make use of the YOLO dataset.

I. INTRODUCTION

Automatic Vehicle Number-Plate Recognition (ANPR) is a method that uses optical character recognition on pictures to read vehicle registration plates in order to provide vehicle location information. It may use cameras for policing traffic laws, already-installed closed-circuit television, or specialized cameras. Police departments all throughout the world use ANPR to protect the law, including assessing whether a vehicle is registered or licensed. It is also used for electronic toll collecting on pay-per-use highways and for cataloging traffic movements, such as by transportation organizations. In addition to the text from the license plate and the pictures captured by the cameras, some automatic vehicle number-plate recognition systems can be set up to save a snapshot of the driver. ANPR system needs to account for plate variations from location to site. Systems typically use infrared lighting to enable the camera to take the picture day or night. To help the department in charge of road safety, we are putting into action the project to automatically recognize the license plates of moving vehicles. The found license plates will be stored for potential reference in the future.

II. LITERATURE REVIEW

A. Vanshika Rai and Deepali Kamthania's Automatic Number Plate Recognition, ICICC 2021.

The author of this essay attempts to develop a mechanism for the detection and identification of Indian license plates. Before taking a picture of the vehicle, the proposed technology first recognizes it. The car number plate is isolated using image segmentation, and the characters are identified using optical character recognition. The technology allows for low-illuminated, cross-angled, and non-standard typeface number plates. In the pre-processing stage, different image processing techniques such morphological transformation, Gaussian smoothing, and Gaussian thresholding have been used. The contours were applied by border following and filtered based on character dimensions and spatial localization for number plate segmentation. The characters were then identified using the K-nearest neighbor technique.

B. Vehicle number plate recognition review paper, 2019 IJERT, by Vedika K., Rupali G., and 2.C. Gurvav.

This study uses OCR technology to recognize photos by converting them into text that is then shown on the computer screen. The gate opens only when the appropriate number of vehicles are visible on the number plate recognized; otherwise, it remains closed. The author claims that in the future, information will be detected and permanently stored via cloud computing. Hence it can be concluded that by leveraging more computer vision functionality, Open CV, as opposed to Matlab, delivers the best results for vehicle plate detection. Because it yields better results, the author picked tesseract OCR (Optical Character Recognition) for the recognition.

C. "A Novel Method for Vehicle Number Plate Detection," 2018 Eleventh International Conference on Contemporary Computing (IC3), pp. 1-6, doi: 10.1109/IC3.2018.8530600; S. Babbar, S. Kesarwani, N. Dewan, K. Shangle, and S. Patel.

The author suggests the "Threshold Modification" approach, which has previously failed in machine learning systems yet works well for reading license plates even in dimly lit or overly bright environments. OCR methods such as LR+RF, SVC+KNN, Additional Trees, and SVC have all been used and contrasted.

Using SVC, the segmented characters that were successfully detected had the highest level of accuracy. Only in dimly lit or sunny conditions should on be anticipated. Incorrectly angled license plates can also be detected using this method. The author advocates adding more vehicle classifications for buses, trucks, motorbikes, and scooters.

D. *A. Sasi, S. Sharma and A. N. Cheeran, "Automatic car number plate recognition," 2017 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), 2017, pp. 1-6, doi: 10.1109/ICIIECS.2017.8275893.*

This paper suggests a clever method for automatically identifying vehicle license plates using three efficient algorithms: a character segmentation and extraction algorithm, a hierarchical combined classification method based on inductive learning and SVM for individual character recognition, and Ant colony optimization (ACO) used in plate localization for identifying the edges. This study makes improvements to overcome the limitations, such as establishing an initial ant position that is precisely defined and applying weights to build a heuristic value that will provide more information about transition probabilities. Also, a character extraction and segmentation method is presented that contrasts the Kohonen neural network idea with the current Histogram and Linked Pixels method. The algorithm uses the idea to decide where and how big the characters should be.

E. *M. Atikuzzaman, M. Asaduzzaman and M. Z. Islam, "Vehicle Number Plate Detection and Categorization Using CNNs," 2019 International Conference on Sustainable Technologies for Industry 4.0 (STI), 2019, pp. 1-5, doi: 10.1109/STI47673.2019.9068049.*

The authors have presented a cascaded combination employing CNN model for a Class Letter recognition system that optimizes computation time while attaining a high accuracy rate. Because to its capacity to extract features through deep learning, CNN performs far better than traditional neural networks. The model is used to develop a Vehicle class letter recognition system that only accepts video input and utilizes information from a license plate. The authors only used Gray normalized pictures to train and test the CNN classifier. The author's ultimate conclusion is that the performance of the system will be enhanced by a powerful CNN model operating on a GPU machine.

F. *N. P. Ap, T. Vigneshwaran, M. S. Arappradhan and R. Madhanraj, "Automatic Number Plate Detection in Vehicles using Faster R-CNN," 2020 International Conference on System, Computation, Automation and Networking (ICSCAN), 2020, pp. 1-6, doi: 10.1109/ICSCAN49426.2020.9262400.*

The goal of the study is to identify license plates on moving vehicles under difficult circumstances, such as ones that are deformed, lit in high/low light, or unclean. The study recommends utilizing a Faster R-CNN to identify a vehicle's license plate on a surveillance camera placed near a busy intersection or other busy area. In order to achieve better results, the proposed system combines frame segmentation and image interpolation to extract the vehicle's license plate from the video. To recognize the numerals in the resulting image, the optical character recognition technique is applied. These numbers are entered into the database in order to access information like the make and model of the car, the owner's name, address, and phone number, among other things. This system's performance is evaluated using a graph model.

G. *A. Kashyap, B. Suresh, A. Patil, S. Sharma and A. Jaiswal, "Automatic Number Plate Recognition," 2018 International Conference on Advances in Computing, Communication Control and Networking (ICACCCN), 2018, pp. 838-843, doi: 10.1109/ICACCCN.2018.8748287.*

The proposed algorithm for no-plate recognition by the author has been evaluated. Because there isn't an ANPR system available that fulfills our requirements, it is difficult to customize one for educational institutions. When using template matching for quantity plates bought from static photos, an average accuracy of 82.6% has been reached. The accuracy of each character has been established. Its accuracy can be greatly improved by carefully positioning the camera to catch the optimum physique. The image processing approach is used by this number plate identification system. In order to read the image of the vehicle license plate, the author additionally employs an OCR system in this..

H. *J M S V Ravi Kumar , B Sujatha and N Leelavathi, "Automatic Vehicle Number Plate Recognition System Using Machine Learning", 2021, doi:10.1088/1757-899X/1074/1/012012.*

The main objective of the author in this study is to apply and combine several morphological processes in order to quickly recognize and translate the license plate of a certain vehicle.

This is based on several methods, including image enhancement, grayscale conversion, edge detection with bilateral filtering, and extracting the number plate number from the vehicle's picture.
After completing the aforementioned steps, the author analyzed segmentation and used it with OCR and template matching to find the text on the license plate.
This system was able to quickly and accurately detect the licence number from the image of the car.

I. *Divya Rastogi, Mohammad Shahbaz Khan, Kanav Jindal, Karan Singh, "A Real-Time Vehicle Number Plate Detection and Recognition System", Journal of Xi'an University of Architecture & Technology, 2020.*

The authors of this work have attempted to recognize the license plates of vehicles. The preliminary results of this experiment are really encouraging even with a very small sample size of training examples. Characters from number plates can be recognized using the real-time vehicle number plate recognition (RVNR) method, which can also be used to find number plates on moving objects. The author's method has the advantage of being extremely accurate at finding and identifying plates.

J. *Ravi Kiran Varma Pa, SrikanthGantaa , Hari Krishna Bb , Praveen "A Novel Method for Indian Vehicle Registration Number Plate Detection and Recognition using Image Processing Techniques", International Conference on Computational Intelligence and Data Science, 2019.*

The author of this work presents a novel image processing system for the detection and identification of Indian license plates that can handle noisy, dimly light, cross-angled, and non-standard font license plates. Several image-processing methods, such as morphological transformation, Gaussian smoothing, and Gaussian thresholding, are employed in this study's pre-processing step. For number plate segmentation, contours are applied by boundary following and filtered based on character dimensions and spatial localization. Once the region of interest has been determined, character identification is done using author filters, de-skewing, and the K-nearest neighbor technique. Results from the author's suggested approach were encouraging.

III. EXISTING SYSTEM

Machine learning algorithms are used by the popular Automated Number Plate Recognition (ANPR) system to immediately and automatically recognize vehicle number plates.
The system is used to manage parking, collect tolls, and enforce traffic laws. In order to identify the number plate, ANPR systems extract the characters from the number plate using optical character recognition (OCR) techniques and then classify the characters using machine learning algorithms. Speed Detection System: Speed detection systems use machine learning methods to calculate the speed of a moving object.
These systems employ cameras to capture images of moving objects, which are then processed to ascertain their speed. In order to anticipate the speed of the cars based on these features, machine learning methods are employed to extract information from the photos.
Law enforcement, road safety, and traffic management all employ these systems. System that Combines ANPR and Speed Detection: Systems that combine ANPR and speed detection capabilities are also available. These systems employ cameras to take pictures of moving vehicles, which they then process through machine learning algorithms to identify the license plate and calculate the speed of the vehicle. These systems are utilized for parking management, toll collection, and traffic enforcement..

IV. PROPOSED SYSTEM

The systems suggested may use deep learning and convolutional neural networks to recognize vehicle number plates and speed. These algorithms have the potential to improve the accuracy and efficiency of the systems and have shown positive results in object detection and recognition tasks. However, developing and implementing these systems might require a significant amount of computational power as well as expertise in computer vision and machine learning.

V. OBJECTIVES

1) To build a website with video functionality or webcam input.
2) To develop a mechanism for identifying license plates.
3) To show/store information about the identified license plate.

VI. METHODOLOGY

A. *Data Collection*

Get video proof of any moving autos through the designated area. This can be accomplished by setting up CCTV cameras or other types of video surveillance systems.

B. *Data Pre-processing*

Separate individual frames from the obtained video data using preprocessing. At this step, only the relevant frames that feature cars are kept after the irrelevant ones have been removed.

C. *Vehicle Detection*

To identify automobiles in each frame, use object identification algorithms like YOLO.

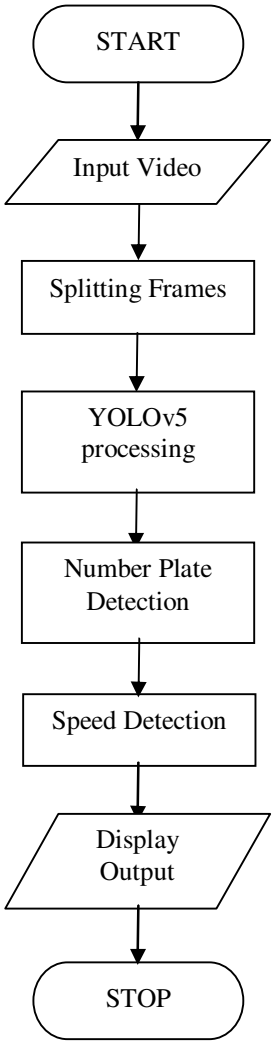
D. *Speed Detection*

Determine the cars' speeds by examining how they moved over time in the video frames. Optical flow algorithms or other applicable methods may be utilized to fulfill this stage..

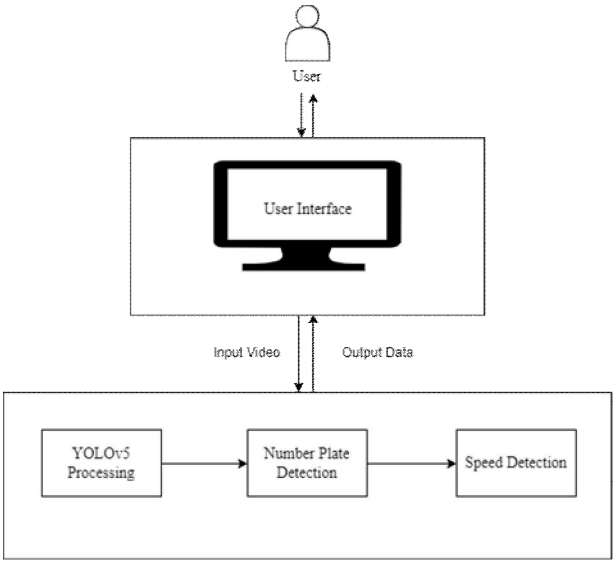
E. *Number Plate Detection*

Find and obtain the information from each vehicle's license plate using optical character recognition (OCR) techniques..

Flow Chart



System Architecture



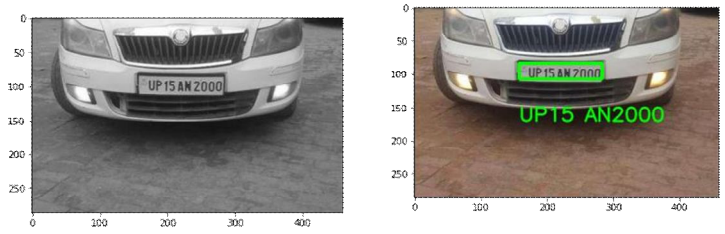
VII. PROBLEM STATEMENT

Detecting license plates of vehicles with violations of traffic regulations, such as exceeding the posted speed limit, automatically.

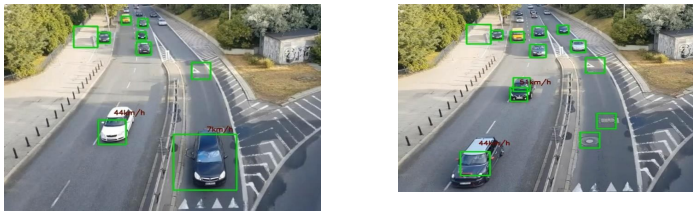
VIII. EXPECTED OUTPUT

The provided image will be converted to grayscale, which will help with image binarization later. Grayscale data can be turned into binary data, which only has the values 0 or 1, by applying a threshold setting. Edge detection of the license plate from the entire image is a function or use that the Sobel mask is capable of. The Sobel mask is commonly employed for edge detection in image processing. It identifies each edge in the input image. The license plate is cropped before character segmentation. The procedure of character segmentation involves dividing up each distinctive alphanumeric character on a license plate.

Hence, the characters must be transformed into various numerical values. You can do this by using the Vertical Projection Profile. VPP shall find the brightest and darkest colors that correspond to the normal hue of a number plate. This enables the computer to recognize the gap between each character and separate correctly.



In this figure showing user input vehicle imageand convert into number plate Recognition with plate



Show speed of Vertical in this figure

IX. CONCLUSION

The created model will be able to identify moving vehicle license plates and display those that go faster than the posted speed limit. The model's performance will be evaluated using its accuracy score. Eventually, the most accurate predicting algorithm will be coupled with a display that can identify license plates traveling faster than the posted speed limit.

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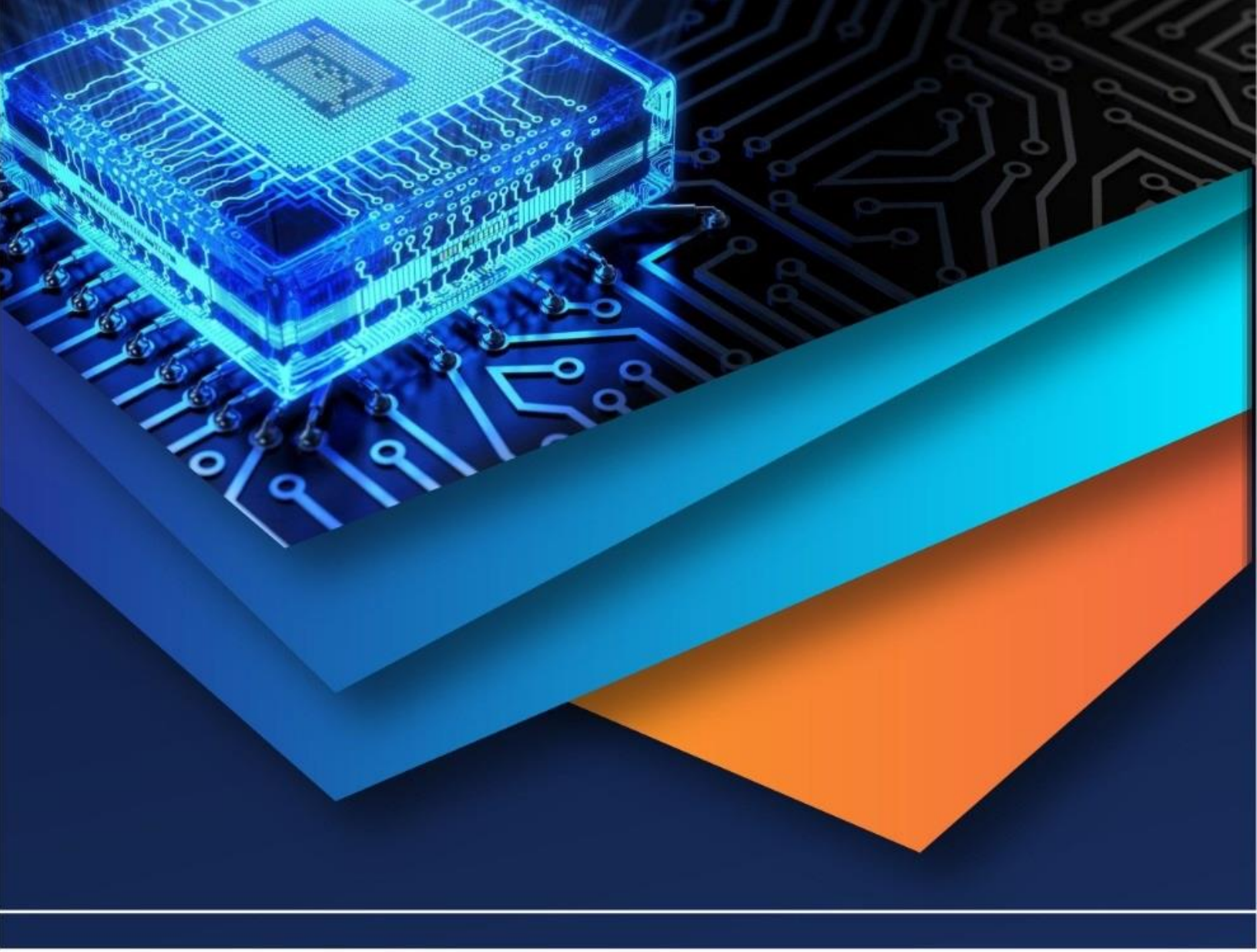

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