Original Article

VEHICLE NUMBER RECOGNITION AND COUNTING THE NUMBER OF VEHICLES

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Abstract

In Today's world new technologies are coming day by day. And these technologies are reducing the involvement of human and making things easier for us and thus reducing the human labor cost. India is one of the nations with the highest population densities in the world, so a lot of vehicles are there. Consequently, it is necessary to detect automobiles. This system recognises the image of a vehicle's licence plate from video and the number is extracted using various techniques and algorithms. The device can be used at college entrances and other places with strong access restrictions. When a car passes by the system, video is recorded and then transformed into images with the aid of the OpenCV programme.

Keywords: vehicle, easyocr, number plate, image, opencv, tensorflow.

Introduction

Today's generation owns a lot of vehicles all over the world. Thus, keeping tabs on automobiles is crucial. In the modern era, we can utilise a computer to track any vehicles instead of manually looking for them, which will result in greater precision [1]. Therefore, a vehicle number plate recognition system uses technology to recognise the number plate from footage the camera has acquired. It employs techniques including character recognition, segmentation, and number plate extraction. Due to its many applications, including traffic reconnaissance, access control, parking fees and toll payments, ticketing, and robbery prevention, automatically identifying vehicles has become important [2]. This method uses the licence plate and then sends it to be converted to a picture using a combination of hardware and software [3]. Any gate entrance can employ this technology. Thus, if an image is taken from this system, it can be correct [4]. Vehicle Number Plate detection is mainly aimed for the detection of the license plate number present on the vehicle and then extracting the data on the plate [5]. This is aimed at finding the details of the vehicle owner in case of any emergency or criminal activity related with the vehicle. A car can be recognised by its number plates, which are located at the front and rear of the vehicle [6]. These number plates are placed on every vehicle to easily identify the vehicle and owner of the vehicle. These numbers given to the vehicles are registered with the government authorities to keep track of the vehicle and owner of the vehicle [7]. Establishing a connection between a vehicle and its owner or operator is the goal of motor vehicle registration.

This link could be used for taxation or crime investigation due to the number plate contents. In the database of the issuing authority, the registration identifier—a numeric or alphanumeric code—uniquely identifies the vehicle [8]. Depending on the country and other regulations, these licence plates may have varied colours, fonts, and text sizes [9] [10].

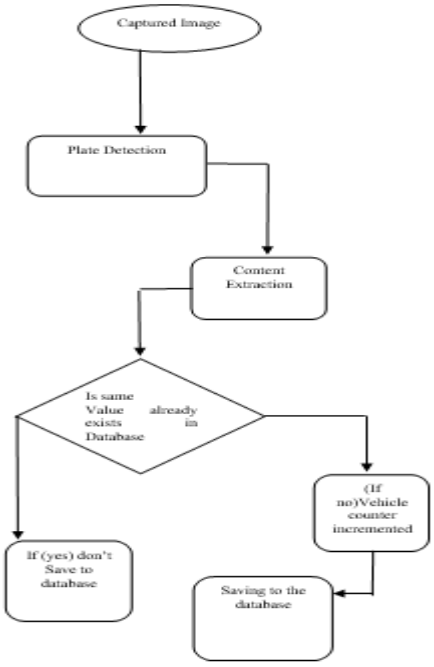
Literature Survey

The planned Smart monitoring system analyses the vehicles seen in the video and categorises both known and unidentified vehicles as residents, while unregistered vehicles are treated as visitors. Once the camera detects a vehicle entering the area, The plate will be scanned by an automatic number plate recognition system, which will recognise the car. The microcontroller compares the car number and the data set, collects the qualifications of the vehicle owner, and sends the data to the application via the cloud [11]. This System intends to remove the noise from the video and extracting the accurate data from the frame. Character segmentation frequently employs a number of custom methods, such as projections, connectedness, and contour-based picture components [12]. Character segmentation quality is strongly impacted by noise, low resolution, blur, and deformations in the input image because it uses a binary picture or intermediate representation as an input. This system will also count the number of different vehicles moving from the area and also extract the vehicle number [13] [14].

This system will help in maintaining the adequate security as it is saving the number of vehicles moving from the area and the vehicle number.

Proposed Methodology

This system will help in gathering information of those vehicles that are unstoppable and unstable and are in running condition with speed higher than average speed. The Proposed System will be working in the following way Image will be Captured from the video using opencv library. After that Plate localization will be done. Then plate detection will be done [15] [16]. Then Data from the number plate is extracted. Then the number will be checked from the database if there is any key with same value or not. If no key will be found then vehicle counter will be incremented. The final work is to save the extracted data into the database(in the form of key value pairs). Image processing and character segmentation techniques are used for number plate recognition. OpenCV will be helping in both, image capturing and counting the number of vehicles.



Both Front and Back Plates will be considered in the solution. Images of any Direction have been considered. The high resolution camera is considered for capturing of clear image.

Captured Image:

The camera used for image capturing or video frame is high resolution camera that helps in taking clear frame or clear picture of the number plate.

Plate Detection:

In order to minimise discontinuities, the edges of the image are discovered during edge detection using a clever edge detector. Following that, The number is thickened in the input image using a morphological operator to make it more noticeable.

Content Extraction:

Segmentation(uses template matching algorithm like OCR.) will be done on the image to get the number of plate separately. It will separate the characters and will reduce the noise from the image.

Saving in database:

The extracted number will be saved to the database for the future use.

The characters on the licence plate are divided via segmentation. To identify various characters and digits, OCR is employed. The characters are shown as text at output after being recognised. To recognise the numbers correctly and appropriately, recognition is lastly performed on licence plates.

OpenCV, EasyOcr and Tensorflow are mainly used in our system to fulfill the requirements.

OpenCV:

An open-source library for machine learning, computer vision and image processing is called OpenCV. Java, python, C++ and many other programming languages are supported by OpenCV. Pictures and Movies can be analysed by it to find objects, faces and human handwriting. All operations that can be performed with Numpy can be combined with OpenCV. OpenCV is used to solve many applications, including video/image search and retrieval, counting the number of vehicles on highways and calculating their speeds, among other things.

Tensorflow:

An open-source software library is TensorFlow. Researchers and engineers from the Google Brain Team, a division of Google's machine intelligence research organisation, first developed TensorFlow, for the purposes of conducting deep and machine learning research, However, the technique is adaptable enough to be applied in numerous other fields as well! Let's first attempt to comprehend what TensorFlow actually means. In essence, TensorFlow is a software framework for doing numerical computations on data flow graphs. Due to the variety of tools it has in its library, TensorFlow is flexible. It can be used for many different things, such as backend server training, inference, and deep neural network training.

EasyOcr:

In order to Know about easyocr we should know about ocr(optical character recognition) and what is the purpose of ocrThe modern digital revolution is OCR, also referred to as optical character recognition. In essence, OCR is a whole process that extracts text from digital photographs and documents in order to create editable text that can be used in other applications. Scannable paper documents, PDF files, and digital camera images can all be converted into editable and searchable data with the aid of OCR technology. EasyOCR is a Python library that uses PyTorch as the backend handler. I found that, even when a potent deep learning library, like PyTorch [17] [18], is backing it in the background, EasyOCR is the most user-friendly technique for extracting text from photographs. This improves the text extraction's accuracy and dependability. This method has improved the accuracy of cars that are travelling even at speeds above average but are unstable.

Implementation

The primary goal of the paper is to use the python libraries to find and extract vehicle number in various environments.

The restoration process is comparable to image enhancement. Image enhancement improves the image's quality. In this system first the image will be captured using opencv library of python. OpenCV helps in image capturing which is the first step of our application. As soon as a car enters the camera's field of view, OpenCV starts gathering data and sending it to the system. Then tensorflow comes into action by locating the data into csv file. Easyocr helps in detecting the edges of the number plate. TensorFlow is used for model training and object detection, and EasyOCR is used for character recognition [19] .

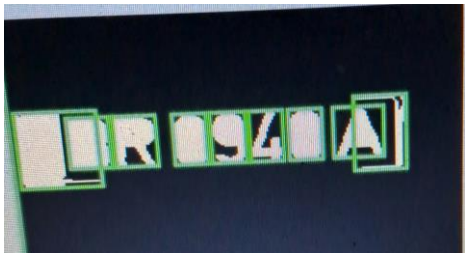
The region of interest, which is the actual licence plate, is separated using edge detection after the gathered image has been scaled and preprocessed. An image that is exclusively quantized using neutral shades of grey, from the least intense black to the most intense white, is referred to as a digital grayscale image. It binarizes the resulting grey image. By assigning the pixel values 1 for white shading and 0 for black shading, this is transformed into a logical matrix. Presumably, noticing the sudden change in contrast helps identify the area of the image that contains the licence plate. The surrounding area is not included. By contrasting the width and height coefficients of a real licence plate with the ideal. The system contains the noise. Grey processing and mean filtering are employed to reduce noise.

Captured Image:

Grey Scale Image:

Edge Detected Image:

Boundary detected Image:



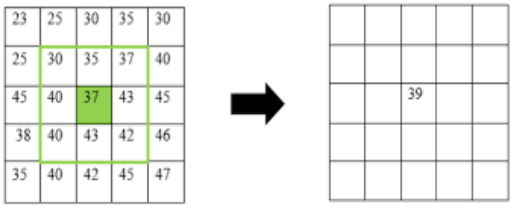
Region Image:

One of the character recognition methods is template matching. It is the technique of locating a sub-picture inside an image known as a template. A given template is compared to windows of the same size in an image by looking for similarities, and the window with the highest similarity score is chosen. It compares the image and the template pixel for pixel for each probable displacement of the template. A database of templates or characters is used in this process. Every potential input has a template in the database. The currently parsed character is compared to

each template to determine which template has the exact match or is the most accurate representation of the typed character for successful character recognition. The ideal position of the character is captured by adjusting the default template, and precise matching is carried out. Using the target character's template as a guide, the moving template matching method matches the target character from eight directions: top, bottom, left, right, top, bottom, left, and right.

The above image shows the Template creation

Mean filtering is used to remove unwanted noise areas. This filtering technique wraps a 3x3 matrix into an image. The dimensions of these matrices can be adjusted according to the noise level. The mean filter replaces each pixel's value with the mean of all the pixels in its immediate vicinity. The median value determined in a nearby neighbourhood replaces the value of each pixel in the mean filter.



Above image is representing how the mean filtering is done.

The built-in OCR capability divides the recognised licence plate area characters into segments to determine each character's bounding box. The character's smallest bounding box as determined by this function is returned. This technique is used to get all of the character's bounding boxes.

The work of vehicle number counting is done by the OpenCV which is maintained in separate database which will maintain the count of the vehicles in order to know that how many vehicles have visited that area. This counting is done for the different vehicles or if the vehicle has not previously visited that area. To do that keys will be checked eveytime after text extraction. If the same key value is found then counter will not be incremented but if same value is not found then counter will be incremented and the data is saved in the database [20]. Due of their rapid movement, some persons have trouble capturing all the nearby automobiles. In order to overcome this limitation, this application can be very well-versed to achieve the time-saving quality and be automated. It's not like one can watch a video while pausing it to take notes.

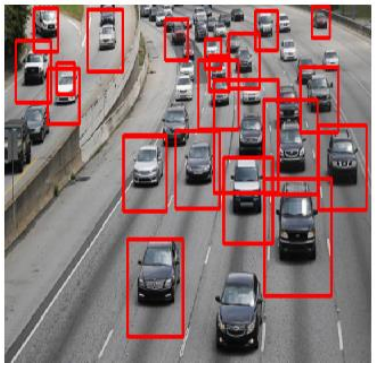


Figure shows how counting will be done.

Conclusion

After reviewing all relevant research papers and articles, it is possible to draw the conclusion that OpenCV, which includes greater computer vision functionality, provides the best results for car plate detection. Also OpenCV is responsible for counting the number of vehicles. This paper is solving the two issues concurrently that are

[1]. Vehicle Number Plate Detection

[2]. Counting the number of vehicles moving from that area.

Our Research has identified that there is no existing paper which is doing both the things at once. This is what shows the uniqueness of this project and also the project is capable of detecting the vehicles that are moving in more than average speed.

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