License Plate Recognition using OpenCV

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Abstract – License plate recognition (LPR) plays an vital role in so many applications and a number of techniques that have been proposed for it The system proposes an fully automated license plate recognition using CV for extraction of license plates. However, most of them worked under restricted environment features, such as fixed illumination, limited vehicle speed, designated routes, and stationary backgrounds and most of them were just restricted to still images. In this paper, as few constraints as possible on the same are considered for better optimization and efficiency. The proposed method consists of two main modules that goes as: A license plate detecting module and a license number marking module. Once the plate is located in the image it is used to construct a box around it to make it easy for user to recognize the image. It can have multiple applications in many areas as for toll areas, smart parking ,and even for tracking vehicle as based on number plate making it a just another breakthrough for tracking made simple. Investigating on real time images showed accuracy of 96 percent when operated. This system can be they key to solve many problems like traffic control monitoring and parking systems giving it a new source of improvement.

Index Terms – License Plate Recognition, Haar-cascades, Image Processing, Skew Correction, Image Segmentation, Haar Like Features.

1. INTRODUCTION

License Plate Recognition (LPR) has discovered various applications in different zones. It very well may be utilized for naturally identifying vehicles in an auto stop, for vehicle get to control in a limited zone and for distinguishing and checking stolen vehicles. A LPR framework comprises of two noteworthy parts: license plate detection and character recognition.

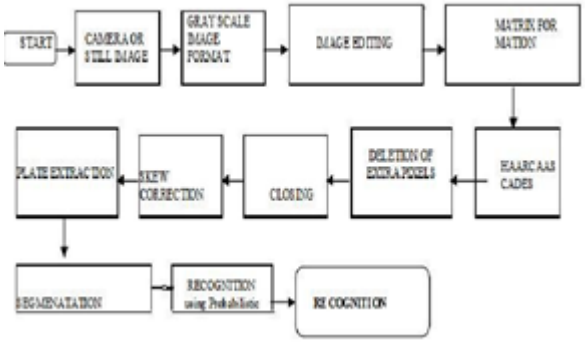
License plate detection is a urgent advance in a LPR framework. The nature of a license plate detection calculation impacts the precision of license plate recognition. Furthermore, numerous elements can influence the exactness and efficiency of license put detection. For instance, the nature of license plate detection might be debased because of surrounding lighting conditions, picture viewpoint bending, messages on pictures et cetera. The vast majority of the current license plate detection calculations are limited by different controlled conditions, for example, settled foundations, known shading., or assigned scopes of the separation among cameras and vehicles. Hence, it stays to be a testing issue with respect to identifying license plates under complex conditions.

In this paper, we present a LPR framework containing the accompanying commitments. Right off the bat, we present a haar classi-fier that uses the AdaBoost calculation to distinguish a license plate precisely. At that point, we propose a strategy that utilizations License plate detection calculation as appeared in builds a haar classifier of six layers for license plate detection. The classifiers of the initial two layers depend on two worldwide measurable highlights separately and are prepared through straightforward learning strategies. At that point, the layers as indicated by the staying four classifiers are prepared by AdaBoost learning calculation in light of neighborhood Haar-like highlights. The very much prepared classifiers are prepared to recognize the area of license plate in the entire information picture. The classifiers in light of worldwide highlights diminish the many-sided quality of detection calculation. The classifiers in light of nearby Haar-like highlights additionally enhance the detection rate and diminish the false positive rate. It demonstrates preferable execution over which connected discrete wavelet change (DWT) to find the license plate.

OCR has demonstrated its leeway in perceiving printed record or content where the foundation has no or almost no clamor. In any case, license plate pictures caught continuously ordinarily contain substantial commotion and are with complex foundations. Accordingly, it is trying to accurately expel the limit of a license plate and fragment the characters on the license plate. Regardless of which OCRs are utilized, the recognition precision will be altogether lessened if the characters are not appropriately fragmented. As of late, there have been numerous calculations created for character division on license plates. These calculations incorporate the works demonstrated depends on Hough change, in light of even and vertical projections, and in utilizing the Operator Context Scanning calculation to expand the handling velocity and exactness. In any case, it is as yet an issue for exact and constant character division under the circumstances when license plate limits are associated with inside characters,

characters are associated with one another, and characters are broken.

2. SYSTEM ARCHITECTURE



Fig(1) System Architecture

The basic working of this architecture has an input video sample broken down into frames and then each individual frame being treated as an still image for processing the work has been done. The image obtained is converted to gray scale and image processing is done on that .then we import haarcascades for the recognition of license plate detection .We convert the image into for of a matrix and decide to pass it through that haar till that Haar is able to recognize each and individual license late in the image. Once found the Haar using again a mat plot plots a box around that license plate making it much more system convenient and user reachable for application of it on various grounds. The multiple technology used in this are following explained.

3. HAAR CLASSIFIER

Haar-like features are advanced image features utilized in object recognition. They owe their name to their natural likeness with Haar wavelets and were utilized in the primary ongoing face detector. They have a wide application in all sort of question detection and recognition now. Truly, working with just image powers (i.e., the RGB pixel esteems at every single pixel of image) made the assignment of highlight count computationally costly.. Viola and Jones adjusted utilizing Haar wavelets and built up the alleged Haar-like features. These classifier are directly imported to code to implement them on the image.For each individual entity to be recognized there are list of Haar available that can be downloaded to bring down to functional use.

4. IMAGE PROCESSING

In this image processing we look for optimizing the image efficiently so that it is able to detect the image for using haarcascades. It includes gray scaling of it and various other multiple operations on image such as skew correction that helps to get an image better in matrix form on which haar like function can be layered for license plate detection at multiple condition .Here we use multiple functions that processes the image color and quality like histogram, superzoom making the image less vulnerable to noise that may affect the image processing.

Fig (2) gray scaling

4.1 VIOLA JONES DETECTION

In the detection period of the Viola– Jones object detection system, a window of the objective size is moved over the info image, and for every subsection of the image the Haar-like component is figured. This distinction is then contrasted with a scholarly limit that isolates non-objects from objects. Since such a Haar-like component is just a powerless student or classifier (its detection quality is somewhat superior to arbitrary speculating) an extensive number of Haar-like features are important to portray a question with adequate precision. In the Viola– Jones protest detection structure, the Haar-like features are along these lines composed in something many refer to as a classifier course to shape a solid feature or classifier. The algorithm has four stages:

1. Haar Feature Selection
2. Creating an Integral Image
3. Adaboost Training
4. Cascading Classifiers

4.2 IMAGE SEGMENTATION

In computer vision, image segmentation is the way toward dividing a computerized image into different portions (sets of pixels, otherwise called super-pixels). The objective of segmentation is to improve and additionally change the portrayal of an image into something that is more important and less demanding to dissect. Image segmentation is commonly used to find objects and boundaries (lines, bends, and so on.) in images. All the more definitely, image segmentation is the way toward allotting a name to each pixel in an image to such an extent that pixels with a similar name share certain characteristics.

The consequence of image segmentation is an arrangement of portions that all in all cover the whole image, or an arrangement

of shapes extracted from the image (see edge identification). Every one of the pixels in a locale are comparative regarding some trademark or processed property, for example, shading, power, or surface. Adjoining districts are essentially extraordinary as for the same characteristic(s).

The output of image segmentations is that the area in image that has highest probability of getting maximum number of predictions of finding a license plate. The one while traversing through row and column wise predicts using histogram where there is maximum candidate for the same.

4.3 SUMMED AREA TABLE

An image portrayal called the image assesses rectangular features in consistent time, which gives them an extensive speed advantage over more refined elective features. Since each component's rectangular region is constantly nearby no less than one other square shape, it takes after that any two-square shape highlight can be processed in six cluster references, any three-square shape include in eight, and any four-square shape include in nine. This precisely helps inbuilding square or rectangular summed zone on discovered distinguished license plate. This build structure helps us to identify the detected image separately from the complete image source. This summed area table can vary in size to size depending upon the function variable and the color defined while the spectrum defined for the line.

4.4 EDGE PROCESSING

Histogram is a graph which shows variable quantity of details over an range of the same block of an image. This helps us to understand the basic background layering of frames in image while gray scaling. The neighboring pixels value can be understood using horizontal and vertical histogram. First horizontal histogram in calculated where the column transverse method is used where first an pixel value in calculated then another pixel value is calculated and then their differences are checked and then the process repeats same for the second third and so on. This in end gives a series of quantative data which then can be used in vertical histogram row wise same process is done where in last an complete histogram gray scaling of an image can be formed which can be later processed more for better pixel quality to detect or identify image processing technique details.

5. LEARNING ALGORITHM

The speed with which features might be assessed does not satisfactorily make up for their number, be that as it may. For instance, in a standard 24x24 pixel sub-window, there are a sum of M = 162,336 conceivable features, and it would be restrictively costly to assess them all when testing an image. In this way, the protest detection system utilizes a variation of the learning calculation AdaBoost to both select the best features and to prepare classifiers that utilization them. This calculation builds a "strong" classifier as a direct blend of weighted straightforward "weak" classifiers.

The algorithm can be used to train the

$$H(x)=\mathrm{sgn}(\sum_{=1} h(\ ))$$

(a) Single license plate in an image (b) Multiple license plates in an image

fig (3) multiple image evaluation and testing

6. EXISTING AND PROPOSED SYSTEM

The existing system has complex module analysis and multiple segmentation process which makes it slow for the online or live usage as working down on each frame becomes hard for the system to work and delayed time request. The proposed system opens gate for new development of the applications using a much simpler and algorithm to get frame data and 3layers involved enhances the recognition and detection making it better and new sources for improvement in detection of it.This algorithm was verified using several input images having resolution varying from 680 * 480 to 1600 * 1200. The images contained vehicles of different colors and varying intensity of light. With all such images, the algorithm correctly recognized the number plate. This algorithm was also tried on images having number plate aligned at certain angle (approximately 8-10 degree) to horizontal axis. Even with such images, the number plates were detected successfully.

7. CONCLUSION AND FUTURE SCOPE

The future lies in the hand of AI by this statement we can understand that everything will be overpowered and taken under control by machines and working on image processing gives a wider scope to look through multiple aspects that benefits the future. The multiple applications of it on smart parking, toll areas charging, plate detection to sum up for various surveys, track for emergency help during medical breakdown and tracking vehicles based on license plate detection makes it a larger beneficial source to work upon and make it benefits user applicable at ground usage. Using deep learnig and machine learning algorithms for better accuracy and more improvised detection will give way to new image processing techniques overall that is going to be a lot more beneficial. This project can detect vehicle number plate and can extract number from it. But there are certain assumptions while doing this project. We can improve its quality based on certain parameters given below We can make improvements in terms

of text reorganization, i.e we will be able to extract text in any written format. So it will help to catch culprits who misguide security system by changing format of number plate. We can ground object detection version of license plate detection making it much more efficient and optimized for any condition when brought down for usage. The system now is efficient more than before to run down into many applications for navigation ,smart parking and detection. The architecture thus designed is much simple and robust in its use. Tested on 79 images it gave accuracy score of 96 percent which was relatively better as faster compared to existing modules .Training the image in deep learning configure it with internet system to update the criminal records whenever found, to the next station through websites.

1)Enhanced license plate recognition modules.

2) Tracking based on LPR

3) Smart Parking

4) Lessen human intervention in toll areas

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