

A Review Paper on Automatic Number Plate Recognition System using Machine Learning Algorithms

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Abstract- Automatic number plate recognition technology is a tool applied to smart cities in investigation and crime prevention. It has been widely used in parking management systems and toll booths on highways which have a rigid shooting angle and lighting surroundings. If the vehicle is an un-authenticate, then it becomes a very tedious and time-consuming task and very hard to search that vehicle. Recognized number plate displays on graphical user interface and stored in a database with time and date for further use. It will be beneficial to reduce the problem such as traffic violation cases and to enhance security in parking areas. Computer vision technology plays a very pivotal role in this project for moving vehicle number plate character recognition. Images from video sequences are taken to recognize the plate characters. Character recognition technique from the number plates based on aforementioned system recognizes and differentiates between genuine and fake number plates. In the project that we present number plate characters are easily identifiable from the machine learning algorithms incorporated in our system.

Keywords- Automatic number plate recognition; Image Processing; Machine learning

I. INTRODUCTION

The increase in vehicular traffic on roads creates a high demand with advancement in technology for traffic management and monitoring. These days traffic monitoring is done by computers using machine learning and image processing. It saves manpower and also accomplishes some complex tasks like counting vehicles on highways, parking violation alerts, database management, blacklisted and stolen vehicle alerts etc.

Management of vehicles and transportation are tedious and time-consuming tasks. If it is completely operated manually that reflects enormous errors and difficulties. Therefore, it is necessary to develop automatic detection of vehicle number plate by recognition system.

The need for residential parking spaces, entails as profession management driven approach is rising unfettered. A very large number of the world's population live in cities and in turn require secure and easy parking spaces which they are use daily. The authorized vehicle registered in the parking management system along with owner information is stored in this system. Every time the vehicles enter or leave the parking lot, will trigger real time data reflecting the ingress of said vehicles.

In recent years computer vision technology has made great strides in dealing directly with real world problems. This enables us to foresee a new era of machine vision applications.

The aim is to explore the current challenges in machine vision applications and to stimulate the exchanges of knowledge in highly effective and practical machine vision techniques.

II. LITERATURE REVIEW

In this paper [1], Shows implementation and accuracy of Otsu method and K nearest neighbor (KNN). Otsu method used for converting RGB image into binary image and extract characteristics of image. KNN is used for classification and this algorithm is robust against noise. Feature extraction in pattern recognition used for converting pixels into binary form. Feature extraction is done by Otsu method and KNN classifies by comparing neighborhood test data to training data. Test data is determined by using learning algorithm and by using classification process, groups that test data into classes. Otsu method based on pattern recognition process, uses a binary vector without influencing the threshold value. To get good result and better binary segmentation adjusting the distribution of the pixel values of image is done. KNN classification in this study proved a great boon in recognition of vehicle number plate.

In this paper [2], Presents supervised K-means machine learning algorithm utilized to segregate the characters into subgroups and these subgroups are in turn classified further by Support Vector Machine (SVM) which recognizes blurred license plate images and improves accuracy. This method will differentiate the obstacles in character recognition due to the angle of camera, the speed of the vehicle and the surrounding light and shadow. The camera captures faint and unrecognizable character images .SVM has high accuracy and superior performance and is used for regression and classification. Multi-classification SVM classifiers need to be able to classify different class of samples. The huge amount of samples enhances the workload of SVM classifiers thus affecting its accuracy. The usage of supervised K-means hard to recognize characters are easily classified. The SVM is further utilized to classify the character of subgroups and to decrease the classes of characters which in turn reduces the quantity of SVMs and their entanglement.

In this paper [3], Research is on KNN algorithm which is used for classification of characters from number plate. An image processing camera installed on a highway analyses the feed received capturing the images of vehicles along that highway. A contour within a number plate is

computed as if they are valid characters along with their size and after that plates are segmented from detected contours. Each contour is classified using KNN algorithm. The KNN algorithm is trained using different set of training data which contains 36 characters comprising 26 alphabets and 10 numerical digits. The algorithm is tested on formerly segmented characters and compared with character recognition technique such as artificial neural networks.

In this paper[4], Shows implementation of a technique to recognize the characters on the number plate and whilst uploading details related to a number plate onto the server. The hindrances which are faced in this process are blurred or ambiguous image. This in turn is segregated to extract the image of the vehicle number plate. The process leads to compartmentalizing the characters from the number plate and apply KNN to extract the characters. Then uploading the same onto the server.

In this paper[5], Deep learning method is used for training process. The extreme machine learning classifies the plates accurately. This system is composed of two parts, One is to preprocess and extract features using HOG and the second part classifies each number and alphabet to analyze and segregate each number and letter that appears on the car's number plate. Extreme learning machine (ELM) is a fast supervisor learning algorithm working on single hidden layer feed forward networks and its classification performance is comparable to the SVM. ELM is used as classifier whereas HOG is to extract important features from the plate to recognize Thai characters on number plate. The ELM system is used because of its fast speed and acceptable testing and training tenets.

In this paper[6], Number plate recognition in India, a large quantity of issues come up, reason being, a plethora of font sizes, different colors and double line number plates etc. Add a high level of inaccuracy in the final result. In this research all these problems on real Indian road conditions are taken care of. ANN is used for character recognition and SVM is to detect plate contour. Various algorithms to remove noise and enhance plate recognition and the usage of neural network for best results with easing lots of camera constraints.

In this paper[7], Recognition of UK number plates has been implemented with aid of machine learning algorithms in ANPR which are SVM, ANN and KNN. To develop efficient application, the enormous car image dataset is created from scratch which is necessary to train the machine learning algorithms. Number plates collated from high resolution digital images combined with advanced computer vision techniques and armed with most powerful ML algorithms, to develop fast and reliable applications. This day and age sees improbable advances in the field of computational sciences. The system receives the car image, processes it and analyzes with KNN, SVM and several computer vision techniques. Final result identifies the number plate of the car in the image.

In this paper[8], The aforementioned proposed system concerns unclear number plates with differences in weather and lighting environments, high speed vehicle and different traffic situations, which add to the difficulties of extracting relevant details of vehicle number plate. By addressing the various issues with hardware platform along with real time and ingenious algorithms. The dataset thus received includes images as of various paths from different road, street and highway, daytime and nighttime, inclement weather environment and different number plate clarities. The proposed application for various parts of the system are robustly receptive to variations in light, size, clarity of the number plates. Since our system is not language dependent, an industrious reliable ANPR for high speed application is proposed. The aforementioned techniques and algorithms along with our dataset help in compiling a dedicated set of solutions to problems and challenges involved in the formation of number plate recognition system in various intelligent transportation system applications.

III. PROPOSED SYSTEM

The proposed system will automatically recognize un-authenticate vehicle by using automatic number plate recognition system. Record of authenticate vehicle in residential areas will be stored on the database. Whenever the vehicle arrives at the parking system, the sensor detects the presence of vehicle and the camera takes the image and extracts the number from number plate.

The metamorphosis of data from video cameras into a new dimension is an attempt to provide vision to computer and machine learning to learn activities carried out by computer. Open cv library is supported with many image processing functions and amenable to all operating systems. It mainly focuses on real time image processing to recognize vehicle number plate.

The recognized number on the plate is matched with the recorded database. If the number does not match the vehicle is denied entry as an un-authenticate, leading to the gate remaining closed and the buzzing of alarm which in turn sends a message to parking management authority via GSM .It may also be displayed on a cellphone.

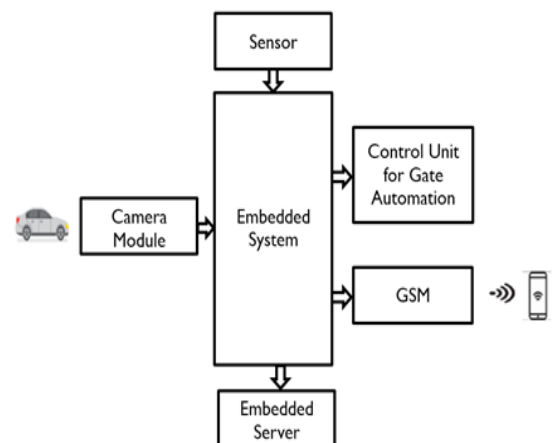


Fig.1 Block diagram of the proposed system

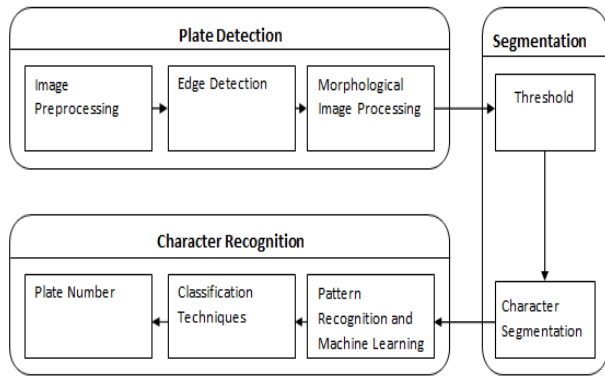


Fig.2 Image Processing Algorithm

i. Image Acquisition-Input image captured through camera.

ii. Image Preprocessing-

a. RGB To Gray Conversion-Color image does not help to identify important edges and other features. Processing of RGB image is complex and it requires more processing time, so first we have to convert colored image to gray scale image.

b. Image Enhancement-Adaptive histogram equalization is to enhance contrast of image (gray color image). In this we construct several histograms each for distinct region in image. This is advantageous because in ordinary histogram, single histogram is for entire image.

c. Median Filtering-To remove noise in the image.

iii. Edge Detection-Edge is a boundary between two regions with relatively distinct gray level properties. It detects discontinuities in intensity values. The basic step in recognition of plate is to detect plate size (rectangle), thus we have to detect edge of rectangular plate. Using the sobel operator, the edges in image are highlighted. This in turn reduces amount of data in the image and processes the required data for further use.

iv. Morphological Image Processing-Structuring element is to create output of same size. Using dilation and by adding pixels to the boundary of the object to increase the thickness of the edges. Using Shrinking operation, thinning the image to eliminate irrelevant parts.

v. Threshold-In this method, two distinct levels are awarded to pixels that are above and below to the selected threshold value. To separate the object from a background image is converted in binary form. Gray level threshold is a simple process .The value of threshold (T) is selected and compared with the pixel of the image. It also transforms the input image (K) into an output binary image (F) which is being segmented. In global threshold, the histogram of the image is partitioned using a single threshold value. Threshold means the volume of gray level falling between baseline boundary which lies amongst the pixels found in the foreground and background.

$$F(x,y) = 1 \quad \text{If } K(x,y) \geq T \quad (1)$$

$$= 0 \quad \text{If } K(x,y) < T \quad (2)$$

$F(x,y) = 1$ For Image Object

$F(x,y) = 0$ For Background Object

T = Threshold.

vi. Segmentation-Character segmentation is a bridge between a number plate extraction and character recognition. In this, different characters on a number plate area are segmented. Various reasons such as lighting variance, plate frames and rotation are those which hinder the segmentation work. A segmentation method is also known as a boundary box analysis. By this method, characters are assigned to connected components and these are extracted using the boundary box analysis. The segmentation process is completed upon reduction of noise in the image.

vii. Character Recognition-The method of character recognition is completed by using feature extraction to extract the features of characters and their different classification techniques. A machine learning algorithm is used for recognition of characters from the number plate.

IV. REFERANCES

- [1] Maulidia R. Hidayah¹, Isa Akhlis², Endang Sugiharti³” Recognition Number of The Vehicle Plate Using Otsu Method and K-Nearest Neighbour Classification”, Scientific Journal of Informatics Vol. 4, No. 1, May2017.
- [2] Liu, W.-C., &Lin, C.-H. (2017). “A hierarchical license plate recognition system using supervised K-means and Support Vector Machine”, 2017 International Conference on Applied System Innovation(ICASI).
- [3] Quiros,A.R.F.,Bedruz,R.A.,Uy,A.C.,Abad,A.,Bandala,A.,Dadios,E.P.,Sa lle,D.L.(2017),”A kNN-based approach for the machine vision of character recognition of license plate numbers”, TENCON 2017 - 2017 IEEE Region 10 Conference.
- [4] Thangallapally,S.K.,Maripeddi,R.,Banoth,V.K.,Naveen,C.,&Satpute,V. R.(2018).”E- Security System for Vehicle Number Tracking at Parking Lot”,(Application for VNIT Gate Security). 2018 IEEE International Students’ Conference on Electrical, Electronics and Computer Science (SCEECS).
- [5] Subhadhira,S., Juithonglang, U., Sakulkoo, P., &Horata, P. (2014). “License plate recognition application using extreme learning machines”,2014Third ICT International Student Project Conference (ICT-ISPC).doi:10.1109/ict-ispc.2014.6923228.
- [6] Singh, A. K., & Roy, S. (2015). “ANPR Indian system using surveillance cameras”,2015 Eighth International Conference on Contemporary Computing(IC3).
- [7] Leticia Fernandez sanchez, cranfield university, “Automatic number plate recognition System using machine learning techniques”, PHD Thesis, cranfielduniversity,2017-18.
- [8] Rahim Panahi and Iman Gholampour “Accurate Detection and Recognition of Dirty Vehicle Plate Numbers for High-Speed Applications”,IEEE Transactions on intelligent transportation systems, vol. 18, no. 4, april2017.

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