A REVIEW PAPER ON IMPROVED AUTOMATIC PLATE RECOGNITION SYSTEM

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Abstract— There are different types of license plates being used; the requirement of an automatic license plate recognition system is different for each country. Support vector machine is a machine learning algorithm with good performance, its parameters have an important influence on accuracy of classification, and parameters selection is becoming one of the main research areas of machine learning. There are various techniques available like SVM, neural network, genetic algorithm and many more to recognize the characters of license plate. There are various algorithms which can be employs to recognize numbers. The algorithm starts from a collection of samples of numbers from number plates. Each character is recognized by any technique like SVM, which is trained by some known samples in advance. In order to recognize a number plate correctly, all numbers are tested one by one using the trained model. The implemented technique must have great extent of recognition accuracy and excessive processing speed as compared to traditional techniques which was depend upon multi-class classifier. The advanced technique must give a superior direction for automatic number plate recognition.

***Keywords*— LPRS, Vertical Edge Detection, Localization**

I. INTRODUCTION

LPR is a combination of image processing, character segmentation and recognition technologies used to identify vehicles by their license plates. Since only the license plate information is used for identification, this technology requires no additional hardware to be installed on vehicles. LPR technology is constantly gaining popularity, especially in security and traffic control systems. LPR applications apply image processing and segmentation algorithms for license plate extraction, and each operation involves lots of computation. Government regulations and standards employed in the license plates can reduce the computational requirements substantially and improve the accuracy. Constraints and value ranges can be built on top of this prior knowledge, and used for extraction as well as validation of license plates [5]. Constraints contain range of values instead of exact measures, since the license plate text size, style and orientation can vary substantially in different images. In recent years, with the increase of terrorist activities around the world, security has become a major concern. The demand for security related services has been higher than there ever was, and there is a great need to find new way to protect ourselves or improve the existing methods by using information technology. One area of interest has been automated surveillance systems controlled by computers that could work independently with minimal human intervention. An automated system that could identity suspect vehicles passing though can issue alerts or report such incidence to corresponding authorities immediately. This will speed up response time and can save lives.

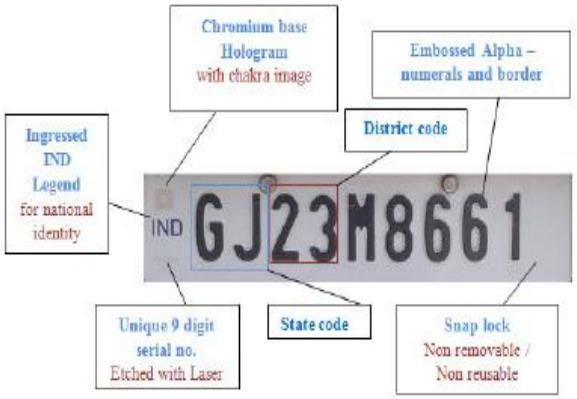

Figure1 License Plate Number Description

A LPRS will take as input images of the passing automobiles, captured using a high-speed camera at specified gateways. Then the captured images will go through the system that will identify the license plate number of the vehicle without human intervention [6]. The retrieved identity and the original image taken can be stored for review. Since vehicle information has already been detected at the time of storing, the information of interest can be indexed for fast retrieval and easily searched. The system can be completely automated by including motion sensor to trigger the image capturing device and a database system for storage. License plates have different size, character format, base material and color standards throughout the world. Generally, license plates are characterized by high contrast between characters and underlying background. However, license plates in some countries may contain background texture and images, which introduces extra complexity in localization and extraction of license plate information. Recent improvements in technology like infrared imaging and high resolution cameras, and utilization of high reflective backgrounds in license plate manufacturing have improved the accuracy of LPR systems. Sensors and other hardware peripherals are used to improve the image acquisition and

remove irrelevant details. A typical LPR system is composed of several hardware and software components as illustrated in Figure

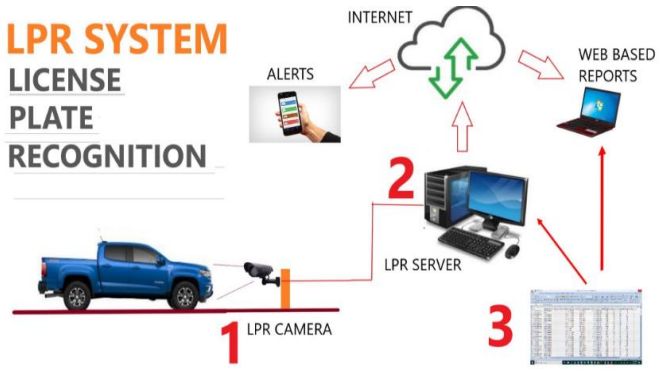

Figure 2 LPR system

II. LITERATURE SURVEY

P.R. Mendes, et al: There are huge numbers of vehicles in India and increasing exponentially with time. Traffic management system must be so powerful that it can able to detect vehicle perfectly. This paper depicted the concept of detecting an image of the number plate of an automobile from video with help of video processing with raspberry pi and after that using various techniques and algorithm number can be extracted smoothly. The system can be used in various domains like entrances of gates in school, colleges and highly restricted areas. As the vehicle crosses the system video is catch and then video is converted into images [1].

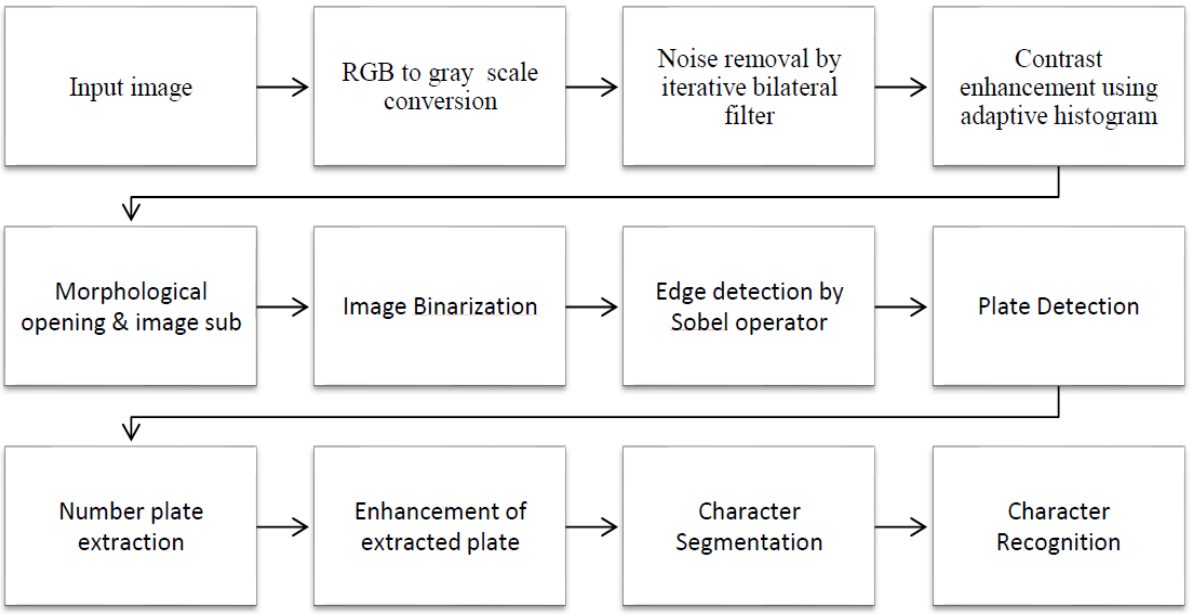

Figure3 Block diagram of proposed approach

Aniruddh Puranic, et al: The growing prosperity of urban India leads to ownership of vehicles an essential. Due to this an unpredicted civic issue came into existence which is traffic control and vehicle identification. Day by day quantity of vehicles on the roads increasing tremendously which leads to scarcity of parking. ANPR plays a vital role in addressing these problem as its application ranges from parking admission to monitoring urban traffic and to tracking automobile thefts. There are various ANPR systems accessible today which are based on distinct methodologies. This paper gives detailed review on different techniques and their application in different domains. The ANPR system accuracy was found around 81% and this technique used template Matching [2].

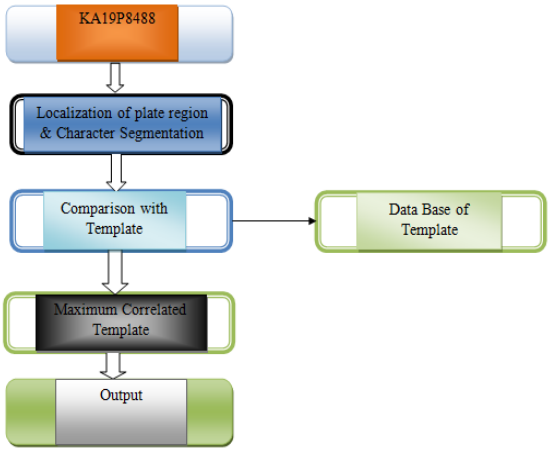

Figure4 Block diagram of system for vehicle number plate recognition using Template Matching

Anumol Sasi, Swapnil Sharma: Robust traffic surveillance systems integrate identification of vehicles which requires the detection and recognition of license plate numbers. This paper presented a smart approach of detecting vehicular number plates automatically with help of three different algorithms which are listed below:

- Ant colony optimization (ACO) used in plate localization for identifying the edges, a character segmentation and extraction algorithm
- Hierarchical combined classification method based on inductive learning
- SVM for individual character recognition.

Steps involved in License Plate Localization

1. Image Acquisition
2. Pre- Processing
3. Morphological Opening & Image Subtraction
4. Image Binarization
5. Edge Detection
6. Detection of Plate by Opening and Closing Operations
7. Actual Plate Number Detection

Syed Tahir Hussain Rizvi, et al: This paper gives a detailed investigation on Italian license plate detection and recognition system using deep neural classifiers. This work, trained parameters with highly accuracy and ALPR system are imported and utilized to reproduce the exact neural classifiers on an Nvidia Shield K1 tablet. The move of the trained architecture is unravel to execute license plate recognition in real-time. This research depicted better result in term of detection and localization of number plate in real-time on a mobile platform. However, the system leads to decrease in accuracy which is very crucial parameter [4].

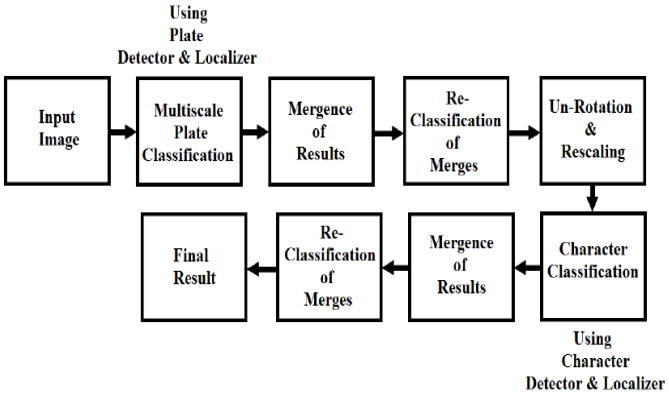

Figure5 Flow of neural network-based automatic license plate recognition system

A. F M Saifuddin Saif, Mohammad et al: Identification of vehicle number plate is critical issue in developing countries till now for accurate inspection of unregistered vehicles, traffic surveillance, and management and for Intelligent Transportation System. Major issues faced in recognition of a number plates are capturing utter level image of moving vehicles, to detect plate at an angle, complicated background, detection in adverse lightening conditions and many more. There are three main aspects in detection of a number plate that is extraction of vehicle plates from vehicle, Segmentation of characters and finally, Recognition of segmented characters. Finally, extensive experimental validation is depicted in five aspects, i.e. method, accuracy, processing time, datasets and relevancy with real time scenario [7].

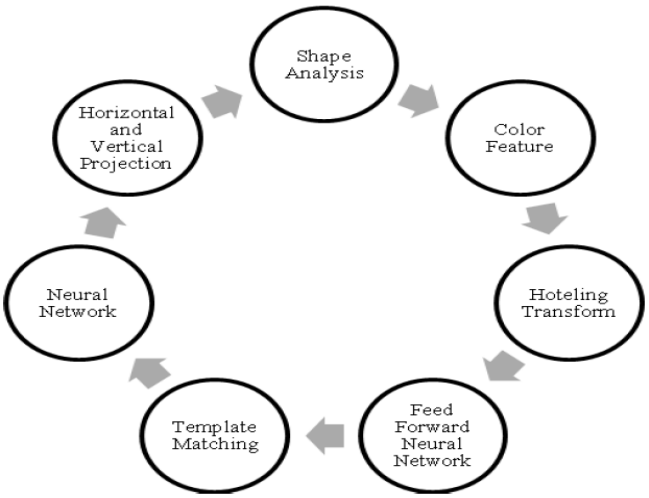

Figure6 Existing methods from previous research

III. BASIC METHODOLOGY

The license plate recognition process can be roughly divided into three steps as shown in Figure

- Plate Localization
- Character Registration
- Character Recognition.

Plate Localization

To extract license plate regions from background images, techniques based on combinations of edge statistics and morphology can achieve good results. After that edge operator on a gray image after smoothing and normalization to extract horizontal and vertical edge maps. Statistical analysis of edges was then performed to detect the rectangle of license plate. The procedure was performed in a hierarchical manner at different scales. Several license plate regions were left after the rule-based fusion. The final decision was made based on the connected component analysis. They claimed that their algorithm can achieve 99.6% detection rate from 9825 images. Many other license plate detection algorithms [8] also follow similar procedures. However, such methods are typically based on a hypothesis that the edges of the license plate frames are clear and horizontal. If the license plate frames were not clear or they had some affine transformation, these algorithms may not produce reliable results.

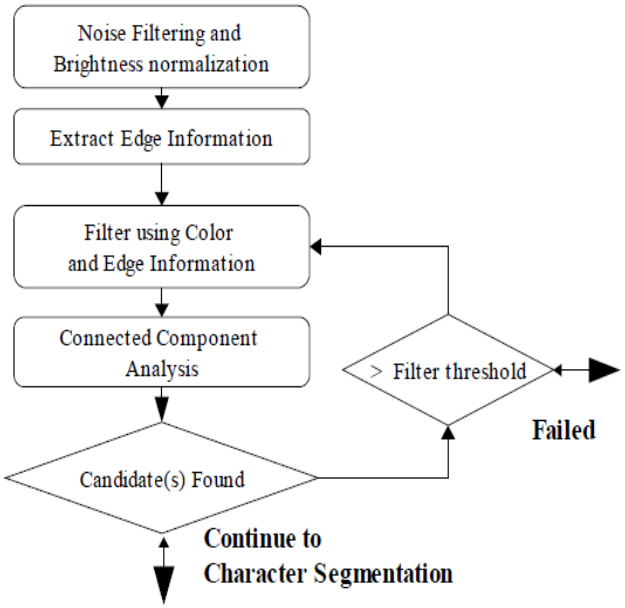

Figure 7 Flow diagram of plate localization

Vertical Edge based License Plate Registration: This algorithm is based on the contrast between the gray scale values and adaptive Thresholding for binarization, an unwanted line elimination algorithm followed by vertical edge detection using 2 * 4 mask and finally candidate region extraction for license plate detection. Figure enlists these steps involved in license plate segmentation.

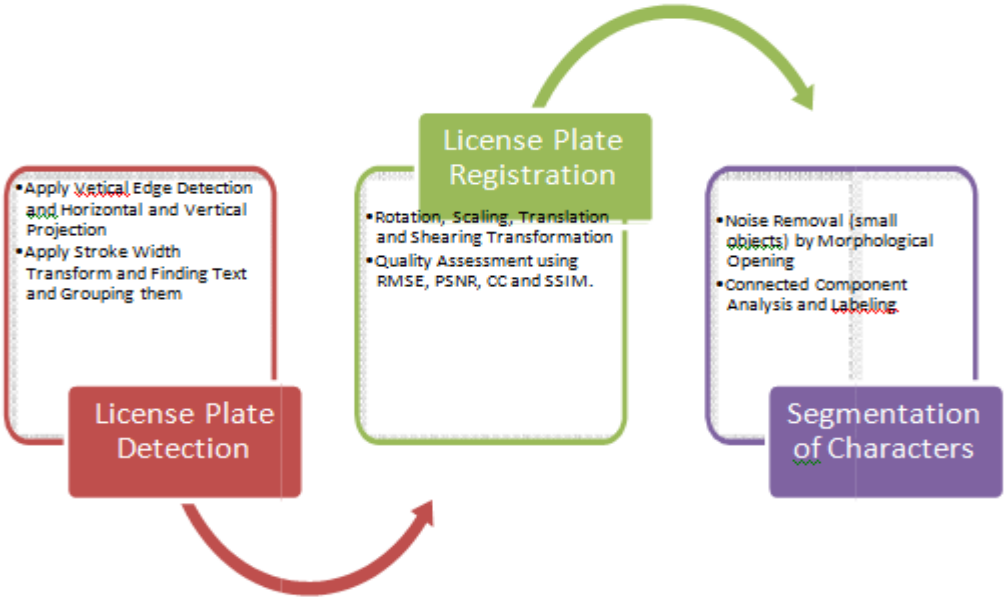

Figure 8 Steps involved in License Plate Detection, Registration and Segmentation

Adaptive Thresholding: The basic thresholding technique will choose fixed threshold and compare each pixel with that. Fixed thresholding method often fails when illumination varies spatially in the image, so adaptive thresholding technique can be used. Adaptive thresholding (AT) is an adaptive binarization technique which produces black and white image. It will convert gray scale variation of illumination changes into binary. Bradley [10] suggested this method using the integral image. The main difference between this two methods is different threshold is computed for each neighborhood rather than fixed threshold. AT is more robust to illumination changes. In adaptive thresholding, single pass of scanning is required and each pixel is compared with an average of the neighboring pixels and approximate moving average is calculated by traveling from left to right and top to bottom. If the current pixel value is T percent lower than the average then it is set to black, otherwise it is set to white. This method will preserve hard contrast lines and reject short gradient changes. The rectangular window size can be calculated from the width of the input image. It can be one eighths of the image width.

$$s = N/8$$

Where N is the width of the image and s is the local windowrectangle size s X s.

$$s_1 = \frac{s}{2}$$

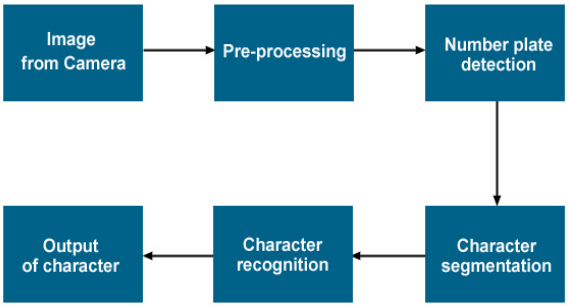

Figure 9 license plate recognition processes

Each step will be carried out by an independent module. An input image submitted to the system is first examined and processed to obtain the vehicle license plate region, then the plate region is process to locate each individual digit and character, these are then submitted to the final Optical Character Recognition (OCR) process to determine the identification.

IV. SOFTWARE USED

Software: It is powerful software that provides an environment for numerical computation as well as graphical display of outputs. In Matlab the data input is in the ASCII format as well as binary format. It is high-performance language for technical computing integrates computation, visualization, and programming in a simple way where problems and solutions are expressed in familiar mathematical notation.

V. CONCLUSION

There are various techniques to detect license plate and there are so many factor on which it depend how smoothly it can be detected. Basically there are three parts generally we use for detection that is image localization, segmentation and then recognition. In this paper, comprehensive review based on the various comparison of license plate recognition is demonstrated. This research performs critical reviews on experimental validation into five aspects, i.e. methods, datasets, accuracy, processing time and relevancy with real time scenario. Based on the challenges, reviews on various aspects, he recommended model is expected to be efficient to detect the number plate from various distance, perform detection in different conditions and deal with ambiguous characters where the main focus of the proposed model to achieve higher accuracy with least precision in real time. Propose comprehensive reviews are expected to reveal efficient

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