An Efficient Approach for Automatic Number Plate Identification Using Optical Car Recognition (OCR) Technique

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Abstract - *Automatic vehicle number plate detection is a computer based image-processing technology that identify any digital character present on the number plate .Image-processing technique help to identify number plate information and extraction in the form of image. Number plate identification plays pivotal role in maintain parking system, traffic regulation. Moreover, useful in security system, toll collection plaza and RTO (regional transport office) etc. Recognition system used to investigate number plate character and helps to recognize moving vehicle number plate accurately and automatically.*

There are three main components for number plate character recognition system viz.

i) Extraction of vehicle number plate: It is the initial stage for detection of number plate and pre-processed for removing noise and obtained results are transfer to next part.
ii) Character segmentation: In this part include segmentation of individual character present on number plate. These segmented character s are separated and processed to an OCR algorithm.
iii) Optical character recognition (OCR): It is the technique in which optical character data will be transformed to encoded text format, later on by using template matching processed characters will be recognized and obtained ultimate output is string character with help of OCR technique.

For vehicle number plate recognition, different OCR techniques have been available it include, character detail matching process, Bi-directional neural network and cross correlation pattern matching All above techniques used for matching digital characters with template data along with processing time and memory for database.

The focus of this paper is a proposed an algorithm which is more effective technique for vehicle number plate identification based on open computer vision (CV) and OCR techniques which give better performance in identification also database memory required very low as compared to other systems . In this technique we have used python as a software language which is very useful and open CV as a read time application so it is more efficient than other algorithm which uses in Matlab. The main intention of this study is to identify vehicle number plate using open computer vision (CV) and optical character recognition approach along with python language software.

Moreover, it is easily find out number plate from small as well as large vehicle with different angle and extract the characters present on it using image-processing method. Afterwards algorithm is adapted to every character and generated array for provided characters then number plate characters analyzed by matching template with their identification array present in the database.

Key Words: Optical character recognition, open CV, number plate identification, algorithm, template matching.

1. INTRODUCTION

Today's age is electronic age due to advanced developments in electronic industry, use of electronic components from human bodies to satellite, so tremendous demand of electronic parts everywhere in the world. Vehicle industry also modified their vehicle using electronic components like sensors, GPS, speedometer etc. also unmanned or unscrewed vehicle coming in the market it is the miracle of electronic industry.

Large number of identification techniques implemented in previous study like boundary following technique, BAM neural network, color image processing technique, gray scale morphological method, cross correlation technique, all these technique used for number plate recognition. Vehicle number plate identification is plays very crucial character in traffic regulation, regional transport office (RTO), tracing stolen vehicles, automatic toll collection plaza, parking system and vehicle related crimes etc.[1].

To overcome this problem, we have tried to apply electronic knowledge for solving problem faces in vehicle number plate identification using OCR technique. This technique used to recognize number plate characters by comparing database and give expected identifications. Various techniques implemented for recognition of number plates but we have use simple, easily manipulated and cost effective optical car recognition (OCR) technique for automatic vehicle number plate identification.

Automatic number plate detection is divided in to different steps; extraction of number plate, image area contains number plate characters, division and character recognition. Generally for accurate identification firstly identify the vehicle number plate, area of number plate then process required to character recognition.

Main aim of recognition system is to control traffic on road, day by day traffic system in India developing due to advancement in technology. In India vehicle number plate system containing black colored digit and numeric on white colored background surface, Indian number plate sample as shown in figure 1.

Fig-1: Indian number plate sample

As seen from figure 1 shows, 1 represents "country code", then two digit letters indicate the "state code" later on two numeric digits represents "district code" followed by single letter (some time double letters) shows "type of vehicle" and eventually four digit numeric indicate that actual registration number[2].

2. LITERATURE SURVEY

Different techniques have been implemented previously for number plate recognition. Optical character recognition technique widely used because it is offline technique and performance depends on quality of input characters, in which scanned image of printed or text characters converts to machine encoded text by using optical character recognition technique. Number plate detected by using image captured from video camera proposed by Y.Huang,et.al, which is used to identify exact location of number plate area, image binarize and template matching for recognition by using Otsu method .Root mean square error used for prototype and binary image calculation [3].Two stage hybrid recognition techniques is a combination of structural and statistical recognition method proposed by X.Pan, et.al [4].Automatic vehicle identification system presented by Muhammad Tahir Quadri, et.al.The OCR is susceptible to misalignment and to variable size [5].Novel algorithm for vehicle chassis character identification depends on OCR technique by applying artificial neural network presented by Parul shah, et.al. This method gives improvement in accurate identification along with zero wrong identification rate [6].Artificial neural network based algorithm for ANPR application presented by Xiaojun Zhai, et.al and proposed algorithm used for real-time requirement in ANPR system [7].Algorithm consist of three fundamental parts i.e. edge detection algorithm, vertical projection and segmentation proposed by Kumar Parasuraman [8].Real-time and robust method of license plate detection depends on the template matching and morphology proposed by S.Hamidreza Kasaei [9].This study explores the automatic number plate detection by using optical character recognition (OCR) technique.

3. COMPONENTS OF AUTOMATIC NUMBER PLATE IDENTIFICATION SYSTEM

3.1 Extraction of Number Plate Character

Initially capture an image with the help computer connected USB camera with different illumination condition and various distance from the camera. The image have been captured is in the RGB format, afterwards this number further processed for number plate extraction. It is changed to gray scale image in to binary image then using different filters remove noise from input images [10].

3.2 Number Plate Character Segmentation

Extracted number plate character individually separated in each segment. Initially input image will be crop out from number plate characters and all characters fit in the number plate region then input characters compare with the database characters, as a result normalized in to the character set as the size of image present in the database.

3.3 Optical Character Recognition

In the OCR method input is an image and output is the character string, in which to separate each character from an image. Template matching is particular approach of an OCR technique. Template data present in database compared with the cropped image. OCR techniques recognize and identify the characters from input data, OCR technique is easy and simple it recognizes uniform font character present on the number plate.

3.4 Template Matching

In the number plate identification template matching plays vital role in enhancing accuracy .In template matching includes various steps as displayed in figure 2 below,
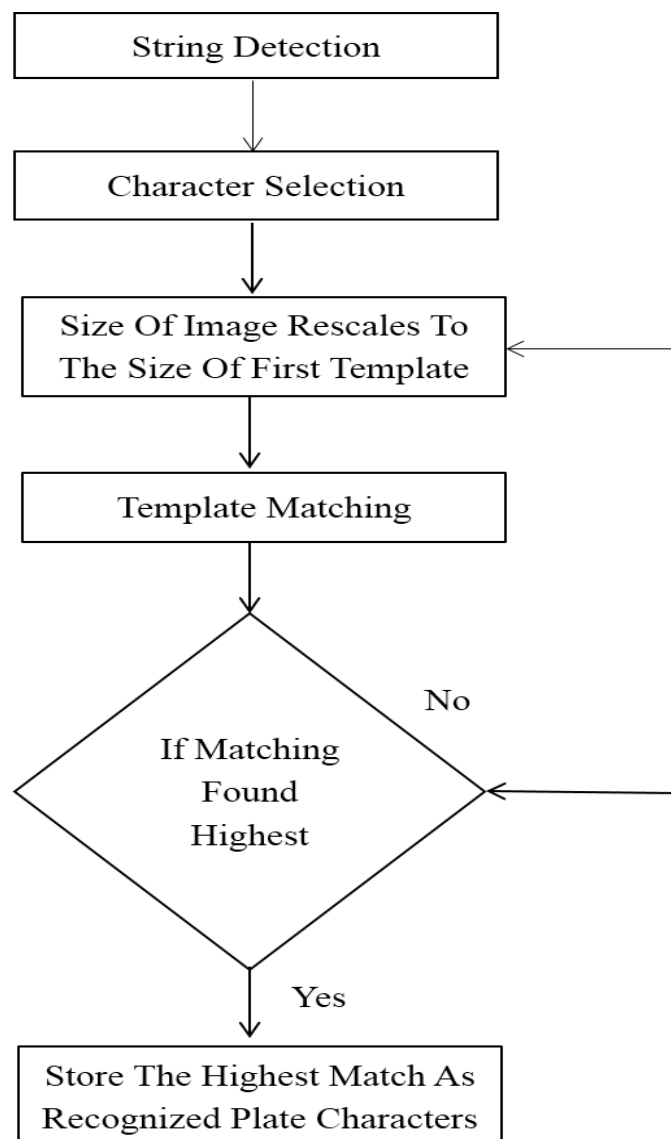

Fig- 2: Template matching flow diagram

4. PROPOSED ALGORITHM

It is the initial step by using USB camera capture the image from approximately one meter distance from the number plate and obtained clear image without any disruption. In second step cropping the character plate image and cropped image is segmented it is the input for recognition characters. In the third step characters are recognized with the help of OCR technique. The flow diagram for proposed algorithm displayed in figure 3 below.
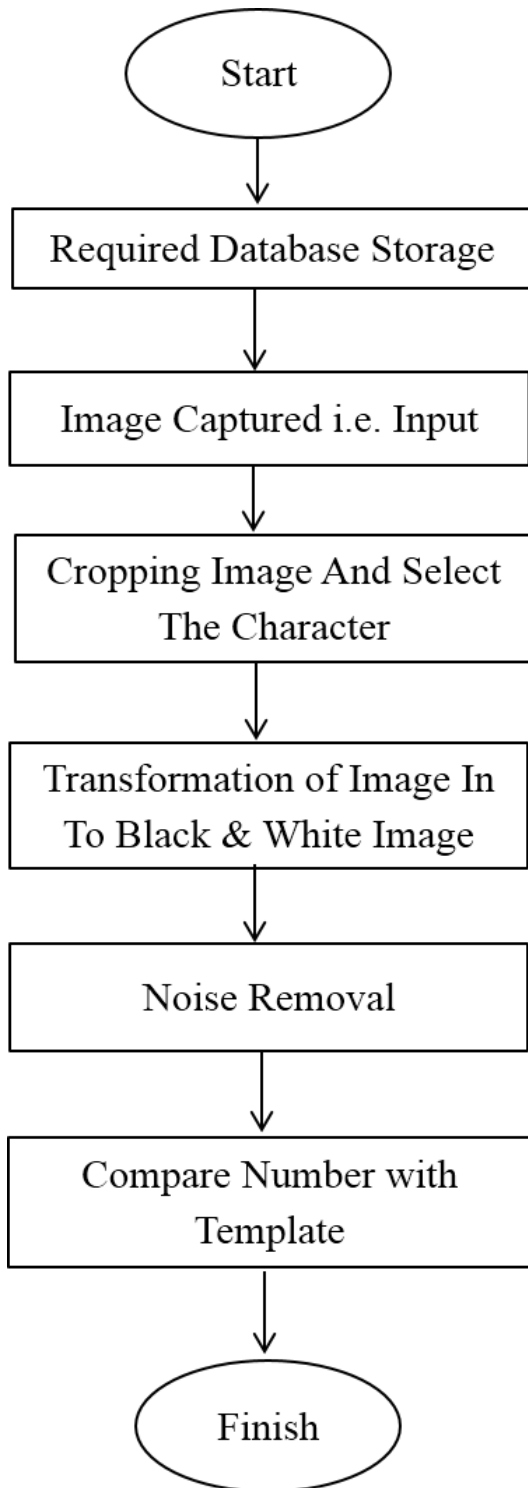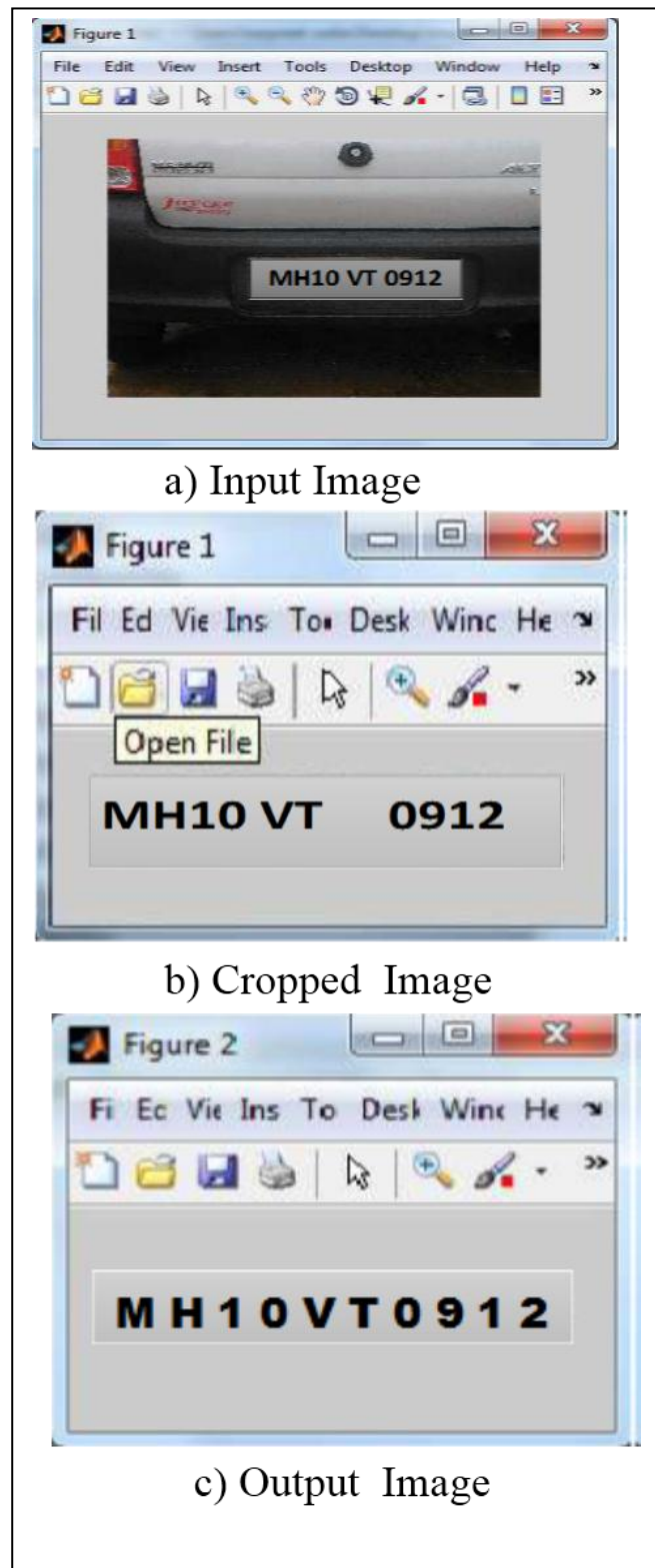

a) Input Image

b) Cropped Image

c) Output Image

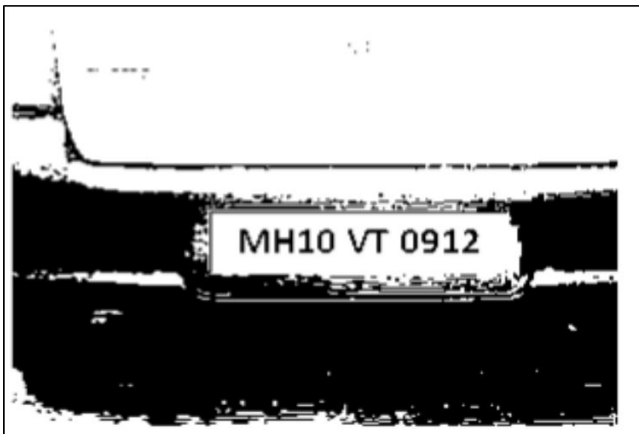**Fig-3:** Proposed Algorithm

4.1 In Detail Stepwise Image Processing During Automatic Number Plate Recognition System

1.Input Image

2.Grayscale image

3.Morphological Treatment

4.Grayscale To Binary

5.Final Output

5. FUTURE SCOPE

The OCR technique applied in this study for automatic number plate identification, this technique are sensitive to different sizes and sometime give incorrect results, so for improving OCR technique amphetameter conversion can be used so help in recognition in different size and angle images. Also, in future we have to develop new technique for extraction of different sized plates, high definition plate processing, different styles number plate can be done.

6. CONCLUSIONS

Successful results obtained with good accuracy for automatic number plate identification by using open computer vision (CV) and optical car Recognition (OCR) technique along with python software language this the outcome of our project.

In this study, we have employed efficient open computer vision and OCR techniques along with python as a software language for recognition number plate characters. Template matching used for enhancement in accuracy of number plate recognition. We have observed that some elements which plays vital role in template matching depends on OCR technique like Noise in image distance from camera, font type and background etc. In the future we eager to work on efficiency and time required for recognition. This technique has used for both alphabetical and numeric characters by using digital image-processing and OCR technique.

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AUTHOR CONTRIBUTIONS

Miss.V.T.Patil prepared hardware and software for automatic identification of number plate, writing research paper draft, **Vinayak S.Burud** fruitful discussion during writing paper, **Pravin B. Desai** discussed the algorithm and hardware work, **Pravin B. Ghewari** supervised and review the software work and discussed the results.

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