

An Automatic Real Time Indian Standard Number Plates Detection and Recognition Using Matlab

¹Ekta Sahu, ²Mohd. Shajid Ansari

¹M. Tech Scholar, ²Assistant Professor

¹Software Engineering, ²Computer Science,

¹GD-Rungta College of Engineering & Technology, Bhilai, India

²GD-Rungta College of Engineering & Technology, Bhilai, India

Abstract— India is a development country with large number of population. In India 60% of people uses vehicle. So, we need to a system which can be monitor the vehicle identity. Its helps to monitoring the urban traffic and to recognition the automobile thefts. In this digital modern India large number of vehicles, cars around us in our daily life creates many of disturbances such as heavy road traffic, the stealing of vehicles at the places like parking areas, toll plazas, heavy traffic roads, Shops. Every year many of vehicles, car are be stolen, No any vehicle can be tracked. This automatic number plate detection and recognition is the solution of this such of problems. There are many algorithms and methodologies are be used to tracking of the vehicle number, but it is more challenging task in some of factors like as different non-uniform font style and letter on plate which is effects in recognition process. In India the car number plate having the different shape and size. The detection of number plate goes through the following steps: finding plate location in vehicle image which is captured from the CCTV or camera, segmentation and recognition of characters from number plate. Number of license plate is displayed on graphical user interface in Matlab platform and verified in stolen vehicle database with date for further use and alarm will ring if stolen vehicle is detected. This system can be used for security purpose in heavy traffic area where normal traffic police cannot be verify the vehicle is stolen or not.

Index Terms— APNR, Number plate Extraction, MATLAB, Recognition, Digital Camera, luminance condition, Arduino.

I. INTRODUCTION

We see number of vehicles around us in our daily life and everyone needs it but with population increase, vehicles increased last decades in large quantity. But it created disturbances to human life such as huge traffic, large sound, crime cases such as stealing of vehicles, accidents, etc. and therefore management of vehicle is very necessary. As a result, there is a lot of work going on to improve the transportation of vehicles. Out of these, vehicle Plate Recognition System is the most attractive research issue and this manuscripts discusses some practical aspect of recognizing number written on vehicle number plate. A Vehicle Plate Recognition System is a tracking system that identifies the vehicle so that the car is tracked down through the existing database. Each Number plates are unique for each vehicle, its takes the unique identification of each vehicle all over country. So its need to be monitor and recognize. We can track number plates in two ways firstly manually and second is automatically. In India traffic police noted manually the vehicle number plate. It is complex and not accurate reading. But automatic number plate recognition is the fast and efficient based system. Its helps to track the maximum number of system at a time with an accurate reading. Automatic number plate system uses the image processing system of Matlab. In India Indian number car plate recognition is very helpful to control the effective traffic surveillance and various security applications, such as tracking of the wanted cars, and restrict and authenticate in any area. This system is automatic and easier to track the vehicle identification, other system works in manually. Indian number plate is difficult to identify compare other foreign country number plate cause of different aspect ratio number plates in used in India and no standard color and number plates are use. In this system investigates real time capture an input image to identify some local patches containing in number plates. In an input image plate can be exist anywhere in captured image with various color and size. It is not possible to do easily to check every pixel of the car input image to detect and locate it. In parking area, number plates can be track and used to calculate the duration of car parking. When a cars enter in parking area of input gate, then number of plate is automatically detect and recognize from the database. We have a database of stolen car which is daily updates in online. This system is developed in platform of Matlab and we use GUI for user who can easily handle and control.

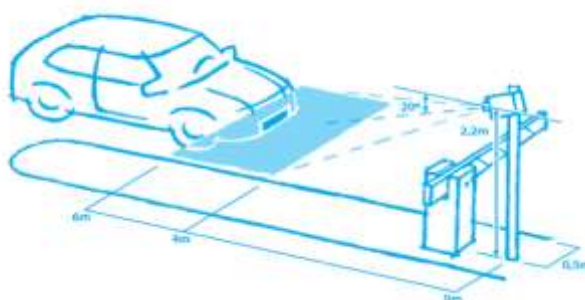


Figure 1: A practical scenario of Automatic number plate system for stolen vehicle recognition

Objective:

The main objective of this paper is to design and implementation a system based on Matlab GUI (Graphical User Interface) , which can be detect the Indian car number plate and can recognize the car is stolen or not. This system helps to many traffic police and also be helps to people many entry system in authorized area. This system is compact and low cost. In this system a real time high quality camera capture the

car images. The camera direction control by Arduino Uno and motor. After the car images capture the Matlab GUI helps to detect and recognize the car status. We have an alert system in.

II. LITERATURE REVIEW

Vehicle number plate recognition has been an ongoing innovative research for over the last few years. Many researches have been carried out to identify the different type of vehicle such as a truck, car, bus or any four wheeler vehicle. In paper [14], the sobel filter algorithm was used to address this issue to get the edges of the vehicle which is applied to detect and recognize the type of vehicle. The model of [11] the vehicle find out through in the use of SVM (Support Vector Machine) and contourlet Transform. They showed many numerical results on data set of pictures. However, they could not be applied the any technique to real-time capture of video stream [2]. In the paper [16] monocular images technique are used for car recognition. They applied canny edge detection for detect edges to detect the presence of vehicle and their number plate and SVM classifier to recognize the vehicle number classification. In paper [12], recognition of the type of vehicle irrespective of scale, size and rotation variation of vehicles number plate where [7] we applied the filter, MACH filter and Log r-theta Mapping techniques.

In paper [18], OCR techniques was used [5], which is a commonly used technology for optical character recognition, which is used for translation of scanned images of printed text into format of machine encoded text. Basically an OCR technique is based on neural network feed-forward system. This is proposed for where two real character images, which is no-overlapping to each other, sets of data uses for training and training using neural network technology. ANN based neural network system used for pattern recognition. ANN generally used feed-forward neural network based intelligent computing architecture, which can be classify the inputs into a set of target categories. Neural network done work well and can achieve better performance to other even the size and color of number plate be different it is also work under in the difficult environment.

III. SYSTEM APPROACH

The proposed system contains various stages as image acquisition, pre-processing, number plate localization, character segmentation, character recognition. The system is designed in Matlab based GUI application.

A. Car Image Captured By Camera

Arduino Uno attached with the motion sensor which detect the motion of car. Then the motor helps to rotate the camera for capturing the car images from real time videos [2]. We use the high resolution picture quality camera for image acquisition, identified is captured using high resolution digital camera.

B. Preprocessing

Firstly, we convert the input RGB color image to a gray-scale images. To speed up the process, the image is first downscaled to 50% of the original. Here mathematical morphology [6] is used to detect the plate region and the sobel operator are used for calculation of the threshold value. After this system we will get a dilated image. Then we use imfill function for fill the holes, so that we can get a clear binary image.

Mathematical morphology

Morphology is the study of shape. Mathematical morphology mostly deals with the mathematical theory of describing shapes using sets. In image processing, mathematical morphology is used to investigate the interaction between an image and a certain chosen structuring element using the basic operations of erosion and dilation.

Sobel operator

Simple Sobel filter that performs edge detection on images. Sobel operator is used for edge detection using first derivative. Horizontal and vertical components used. Gradient is the square root it taken for the sum of two components.

Imfill function

Fill image regions and holes. `BW2 = imfill(BW,'holes')` fills holes in the input binary image BW. In this syntax, a hole is a set of background pixels that cannot be reached by filling in the background from the edge of the image.

Overall Layout of the number plates recognition system

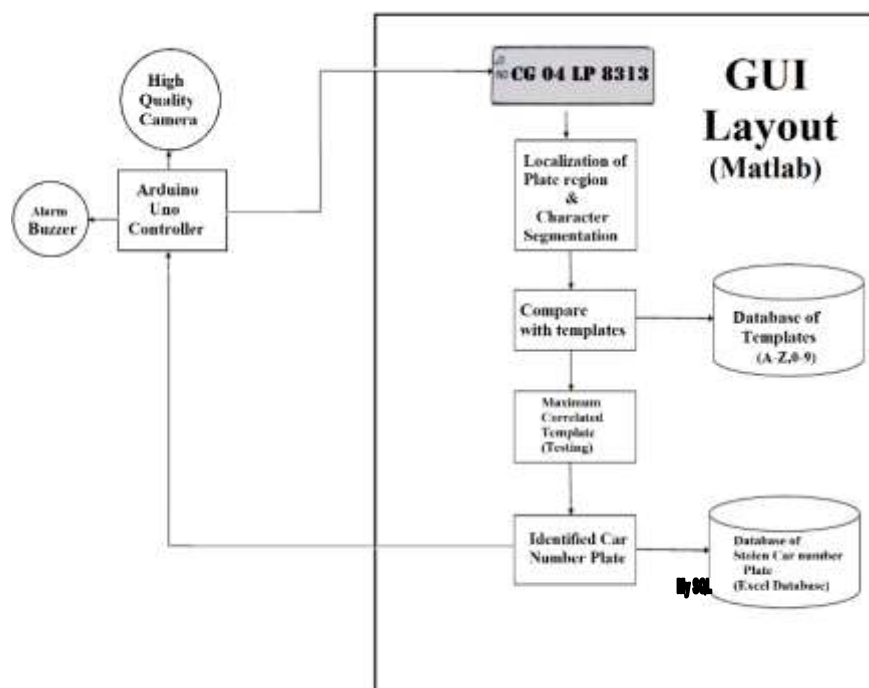


Figure 2: A GUI layout System overview of Indian Number Plate Recognition System

C. Indian Number plate Localization

Pre-processing is the important technique to filtering and edges detection. The image is pre-processed, passing through gray scale filter and edge detection method is applied. Which applied to the isolate of the plate region of interest. Localization [1], [4] is an algorithmic function for identifying a number plate. By the use of localizing determines the aspect ratio of number plate of vehicle image. This algorithm search the similar background color of in image unified proportion and mean contrast differentiate number plate objects on a vehicle.

(i) Edge Detection

There are many methods of which performing edge detection of image. We detected the edges of input image [6], here we using canny edge detector which used to takes a gray-scale image as its input of this system, and then returns a binary image of same size [11] as an output image, where the edge detection function finds the edges in the input gray image.

(ii) Character Segmentation

In the identified number plate region where character are segmented using function of region-props of Matlab, It is use to find the boxes bounding for each characters. This function returns the smallest bounding box, which [13] contains a character. So, we can use this method for obtain the bounding boxes of all character in vehicle number plate.

D. Character Recognition

Template matching is a technique of character recognition. It is method of finding the fixed location of a template (sub-image), which inside of captured image. Template matching having similarities [12] between a given template image and windows with same size in an image and that identifying the window, that produces highest similarity measure. It works with pixel-by-pixel comparison and each possible pixel displacement of the template image.

E. Identify the Stolen Car

The main purpose of this state that recognize and classification of binary images that have contains character which is received by previous stage. After doing this stage each character must have a valid label and having an error factor. If this error factor is greater than a predefined data value will be used for reject the false characters which passed from previous one. For the time of classification step some features must have collected data from the characters. This is use for because image to text into characters conversion. In number plate each individual character match from the completer alphanumeric database using template matching method. The matching process checked the template image to all possible positions in a input larger image and computes a particular numerical index which indicate that how the template is matches and what quality of matches the image in that position. After template is matched we having a valid vehicle number which is matches from the database of excel sheet automatically. If the stolen vehicle is detect then the alert system will be on. We can be recognize data using the internet. We store stolen vehicle database in online database and connect to Matlab java connector.

Optical Character Recognition

OCR tries to address several issues of abovementioned techniques for automatic identification. They are required when the information is readable both to humans and machines. OCR systems have carved a niche place in pattern recognition. Their uniqueness lies in the fact that it does not require control of process that produces information. OCR deals with the problem of recognizing optically processed characters. Optical recognition is performed offline after the writing or printing has been completed whereas the online recognition is achieved where computer recognizes the characters as they are drawn. Both hand printed and printed characters may be recognized but the performance is directly dependent upon the quality of input documents. The more constrained the input is, better is the performance of OCR system.

IV. TESTING AND IMPLEMENTATION

Hardware Implementation

The hardware model consists Arduino microcontroller for controlling the complete hardware of the ANPR system. The ANPR algorithm on a PC receives the image and performs the processing, which Yields the vehicle number. This Number is then compared to standard database and finally provides signal to Arduino microcontroller to control the system Hardware. If the inputted plate contains the authorized number then the Motor and green indication light will be switched on, and if the inputted plate contains an unauthorized or stolen number then buzzer alarm and red indication will be switched-on. The complete hardware model is shown in figure below.

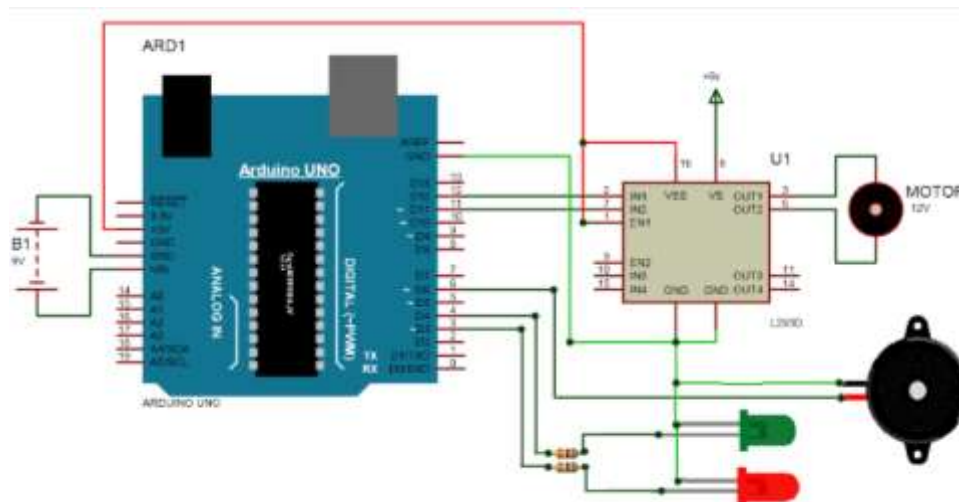


Figure 3 – Hardware Implementation of ANPR for Stolen vehicle detection System

Software Implementation

We design a Matlab based GUI model for this system. Which is helps to people easy handles the system. This gui model is customize and compact, Which having the many of function like as set stolen vehicle database, load captured vehicle images, analysis function for number plate extraction and recognition. We also display records the current date. We have one module to control the system of hardware connection, if we have the stolen vehicle then active the alarm section and if not stolen vehicle then active the open door section.

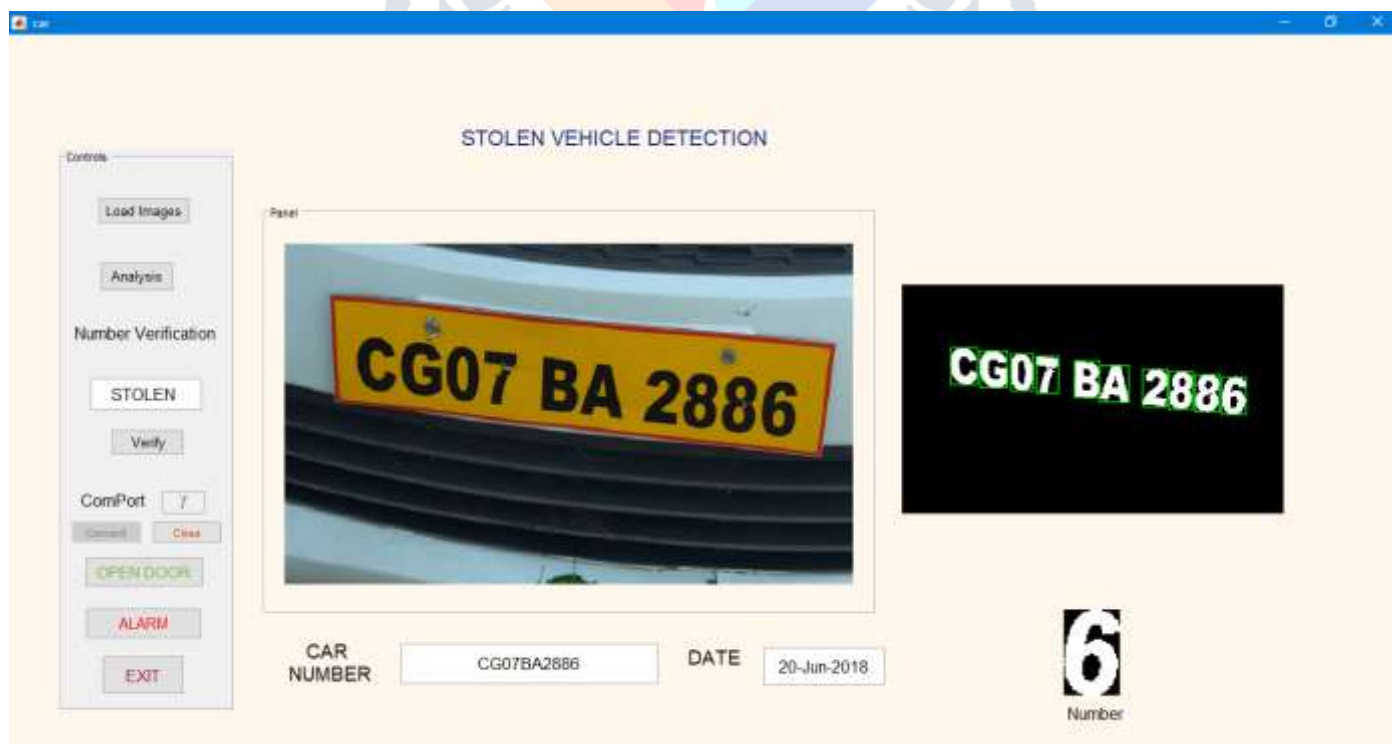


Figure 4- A GUI implementation of ANPR for Stolen vehicle detection System

V. RESULTS

Experiments have been carried out on different vehicle and different time. These indicate the high correct detection rate which is indicative of the method's superiority and high robustness. In the experimental set up two different colors of LEDs —Red and Green are used to indicate vehicle stop condition and start condition respectively. A buzzer is also incorporated whenever vehicle is stolen. Our system can be detect the number plates and recognize their number are present in stolen database list or not. We show a table below which have some of result outputs. In our System we also connect the Mysql server for data storing online.

Experiment	Parameter	Input Images	Output Image	Efficiency
1	Plate Localization	40	38	95%
2	Character Extraction	40	37	92.5%
3	Character Recognition	40	36	90%
4	Stolen Detection	20	19	95%

Table 1: Accuracy of our system with sample vehicle images

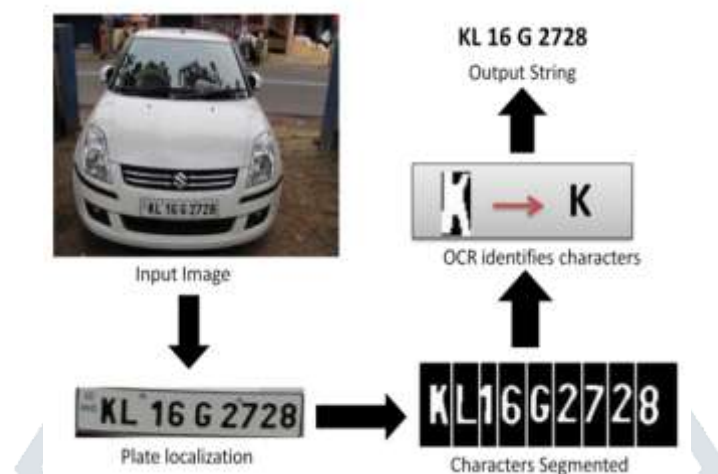


Figure 5- A process for number extraction from plate

VI. DISCUSSIONS

We have design and implemented the stolen number plate recognition system. Our efficient algorithm can successfully detects the Indian number plate region from the vehicle captured image, which consists of vehicle number & then character segmentation, recognition. We have applied our algorithm on many vehicle captured images and found that it successfully detects and recognize and worked properly. The project was designed keeping in mind the Indian the number plate detection system for security reason like stolen vehicle that could replace the current system scenario of manual entry. This project was a success in verifying the number plate of a vehicle. This system can be resolve the many of the previous issue of systems. This system can be handle large database of stolen vehicle.

VII. CONCLUSION

In license plate extraction the strength and weakness of the different extraction algorithm have discussed which are available in the literature and comparisons of all the methods have been done. Proposed two methods for extraction of license plate i.e edge detection method and the block variance technique are presented. The block variance algorithm has been tested on 90 images and giving 94.4% accuracy measure. In character extraction template matching (OCR) algorithm is used for extraction and different algorithms that are presented in literature survey are also studied. For improving the performance of template matching algorithm the format of license plate is studied. This integrated system locates tracks and extracts traffic parameters in real time. Furthermore, the system can utilize any existing traffic surveillance infrastructure without further modification or tuning (except for the camera calibration that calculates image metrics). Overall, the system was found to work satisfactorily and the background reconstruction algorithm added robustness to the process. In normal traffic conditions the system responded well and the outcome results regarding vehicle license plate and trajectory were accurate enough. The experiments carried out showed that the proposed algorithm is capable of real time operational working due to its low complexity. The background reconstruction algorithm allows the unobstructed operation of the system without human intervention.

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