An Implementation of Fast and Efficient Real Time Indian Standard High Security Number Plates Recognition and Detection System of Stolen Cars using RTOS

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Abstract—**In India automatic Indian number plate detection and recognition system have the important role in modern travel and traffic system. Its helps to monitoring the urban traffic and to recognition the automobile thefts. In this digital modern world 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 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. To verify the number plate of Indian cars, there itgoes through the following ways: To find the vehicles number plate which is done by capturing image of vehicles with the help ofgood quality CCTVand then extracting is done through the help of image segmentation of the captured image and recognition of characters is done with the help of OCR. After these process the number of vehicle license plate is displayed on graphical user interface in Matlab platform and it will verify with the stolen vehicle database with stolen date for further use of alarm will ring if stolen vehicle is detected. This system can be used for security purpose in heavy traffic area where it is difficult for the normal traffic police to verify the vehicle is stolen or not.**

IndexTerms—**Number plate Extraction, MATLAB, Recognition, Digital Camera, luminance condition, Arduino.**
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I. INTRODUCTION

Today is the generation were vehicles are extremely needed in our daily life, so it seems to be that the needs of the people result in the increase of the vehicles day by day. The number of vehicles are increasing as fast as the population is increasing as the needs are increasing. But it has been seen that it also creates disturbances to the human life such as huge traffic, large sound, crime cases like accidents, stealing of vehicles etc. and to control these types of issues a propermanagement of vehicle is needed. Out of these, Indian vehicles recognition system is one of the most attractive research section and this result manuscripts discusses some practical aspect of the recognizing number written on vehicle number plate. ANPR is system in which tracking the vehicle as per the need by their unique identification that is there number plate. 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. It is complex and not accurate reading and also very slow process of tracking vehicles. But automatic number plate recognition is the fast and efficient based system. It 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, tracking Indian vehicle through automatic process is very helpful to control the effective traffic surveillance and various security applications, like tracking burglary of vehicles,putting restriction over the unauthorized vehicles and authenticating the vehicles as per the allowed area. This system is automatic and easier to track the vehicle identification, other system works in manually. But it has been observed that Indian number plate is very difficult to identify as compare other foreign country number plate becausedifferent aspect ratio number plates in used in India and no standard color, font and sized is been used while in foreign countries vehicles number plate are been specified their standard. In this, system investigates real time capture an input image to identify some local patches containing in number plates. In an input image number 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, vehicles number plates can be track and it can calculate the duration of vehicle parked, this is done when a vehicles enter and exit in a parking area.Thenvehicles number plate is automatically detect and recognize from the database. A database of stolen vehicles is daily updated online by the authorized person. This system is developed in platform of Matlab and there is a GUI for user who can easily handle and control it.
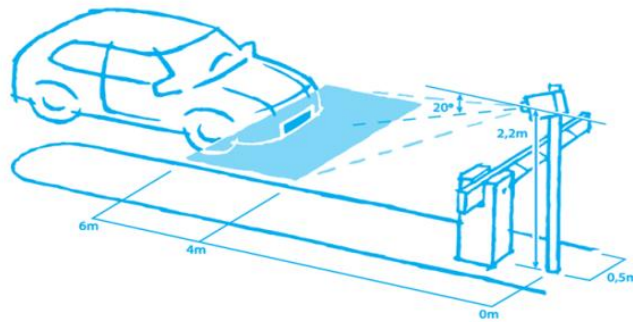
Figure 1: A practical scenario of Automatic number plate system for stolen vehicle recognition

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 is to help 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

In paper[13] system basically work on time monitoring of vehicles in a parking area, universities, colleges, schools, companies etc. there is a use of motion detection technique. The image is capture of the vehicles and further localization, segmentation and detection is done by using OCR. This author live tested 50 image and successfully detected 45 correct image and have a accuracy of 90%. In paper [17], the author implemented a system using template matching for vehicle number plate recognition for BMS College of Engineering through video analysis of vehicle entry and exit into the college campus. AI has been used and Template matching was implemented on the captured image and an average accuracy of 80.8%is been obtained. In paper [14] The author is worked in the problems that are faced in daily life of the people related to automobile that is burglary of vehicle, traffic congestion control and parking area management, the author reviewed a set of state-of-the art ALPR methods and, compared their respective performances by testing them on a rich database of vehicles from Ontario(Canada).The model of [11] the vehicle find out through in the use of SVM (Support Vector Machine) and contour let 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 [5] the author says that detecting a vehicle through number plate is more difficult as the number plate can be changed or it can be tampered or broken plate so the author try to detect the vehicle by checking chassis number and author achieved their correct identification of 95.49% of accuracy. Here OCR techniques was used, that used to convert the image into editable form. Basically an OCR technique is based on neural network fee-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. 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]. The use of 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 to convert captured image that is colour image into gray scale image mathematical formula [8] is used to convert it by.
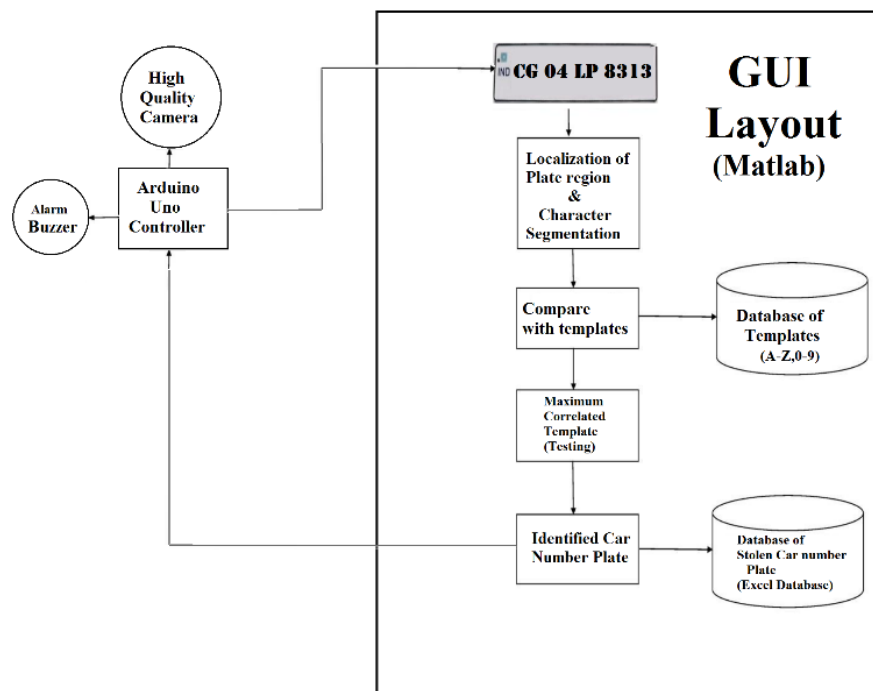
Gray = 0.2989 * *R* + 0.5870 * *G* + 0.1140 * *B*

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. In this algorithm searchthat are different from background in consecutive Frames for that it needs previously preparation of the background image which is not always possible when monitoring is been performed.

(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 the vehicle number plate each of the individual character are match from the complete alphanumeric database using template matching method. This matching process done by predefined template image and is been checked by all the possible positions in an input larger image and computes everyparticular numerical index which used to indicate that how the template is matched and what sort of matching of the image in that position done. Now segmented image of vehicle number plate is matched with predefined templates their having a valid vehicle number is extracted and that is matched from the database of excel sheet automatically. If it found that vehicle number plates matches with stolen database sheet then the alert system will be turn ON and by this it can be recognize. Here updation of daily stolen vehicle database is done online by the authority and connect to Matlab java connector.

IV. TESTING AND IMPLEMENTATION

Hardware Implementation

In this hardware implementation, Arduino UNO microcontroller is used as for the controlling of ANPR system. Here the ANPR system works as the captured image of vehicle number plate is processed in a computer and further preprocessing, segmentation and detection of an image is done in a computer system after that the OCR recognize the segmented image gives the final output of captured image vehicle number plate and that number is then compared to database of stolen vehicles and finally provides signal to Arduino microcontroller to regulate the system Hardware. Now if the number matches with the stolen database of the vehicle the it gives signal to Arduino microcontroller and it will switch ON the red signal with alarm buzzer to catch the burglar and if the it does not matches with the stolen vehicle database then it just shows the green signal and let the vehicle pass through the checking area.How this entire process and connection is done is shown below.
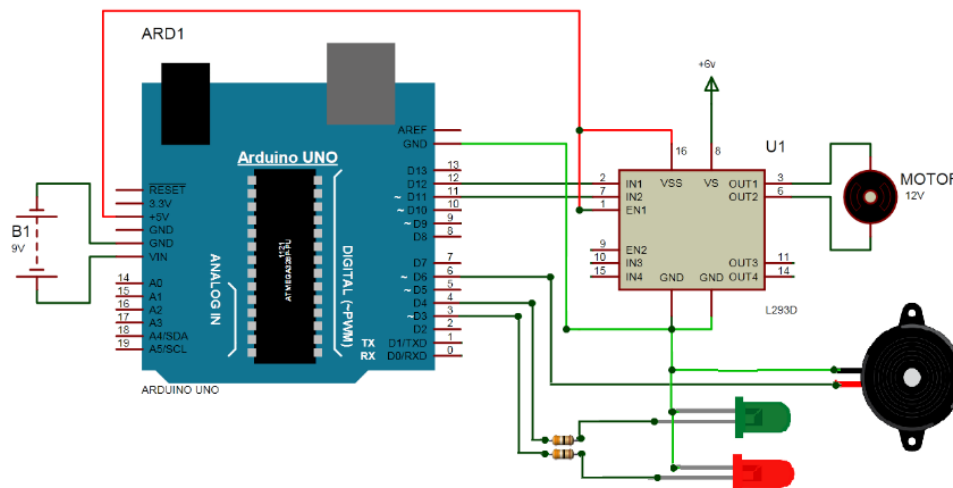

Figure 3 – Hardware Implementation of ANPR for Stolen vehicle detection System

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%

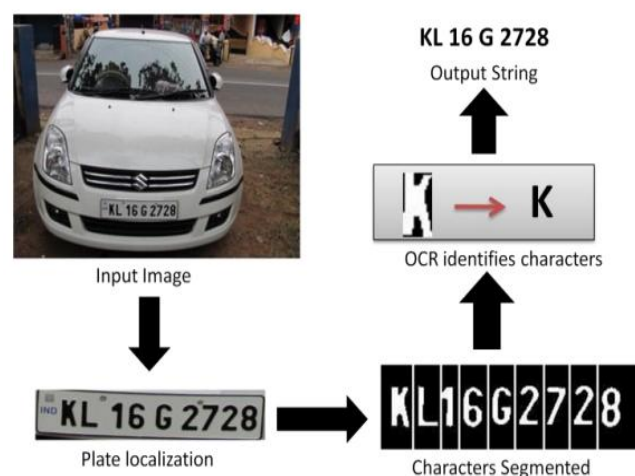*Table 1: Accuracy of our system with sample vehicle images*

Figure 5- A process for number extraction from plate

VI. DISCUSSIONS

We have design and implemented the stolen number plate recognition system. This system successfully detects the Indianvehicles number plate region from the vehicle image captured, vehicle number plate is one the unique identification of vehicles, so to detect it, different algorithms is used in various step for preprocessing, character segmentation and recognition of vehicle number

plate. After applying algorithms on numbers of vehicle captured images and found that it successfully detects, recognize and worked properly in the system. This project was basically designed for the Indian vehicles number plate detection system for security reason is like burglary of vehicles that couldreplace the current system scenario of manual entry. This project works successfully in verifying the number plate of a car in India. This system can resolve previously issues of the system. This system has the capability of handling large database of the stolen vehicle.

VII. CONCLUSION

In the vehicle license plate detection system, this system is very robust and show very accurate result with a mind blowing efficiency of plate localization of 95% with the input image of 40 it detected 38 and for character extraction 92.5% and character recognition of 90% with the same input image.And for stolen vehicles database the input of 20 image it detected 19 images and achieves an efficiency of 95%.In characterextraction template matching (OCR) algorithm is used for extraction and differentalgorithms that are presented in literature survey are also studied. For improving theperformance of template matching algorithm the format of license plate is studied.This integrated system used to detectthe vehicles that is also useful for traffic parameters in real time. Overall, this system was found to figure satisfactorily. This system is developed to overcome with the traditional problems with high accuracy and robustnessthat was good enough.

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