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Automation of Person and License Number Plate Detection System to Extract Various Fonts

Ms. Neha T. Kolkar[1], Mrs. Vandana B. Malode[2]

Student, Department of Electronics, MGM's JNEC, Aurangabad, India [1]

Associate Professor, Department of Electronics, MGM's JNEC, Aurangabad, India [2]

Abstract: Automatic car driver/person and license number plate detection system is the interesting and challenging research topic from few years. License number plate detection system (LNPDS) is applicable to large scale of uses such as Border crossing vehicle, Highway toll-collection and parking management at various locations, stolen vehicles and many more. Here the system is implemented to detect license number plates especially in INDIA. The detection system method process is divided into two steps viz. Character segmentation, Character recognition by using template matching in MATLAB. By using this algorithm detection of person and number plates is correctly done with minimum time duration and approximation as much as possible.

Keywords: Character segmentation, Character recognition and template matching.

I. INTRODUCTION

A wide range of information and electronics technologies into all fields of past few days' life caused demand for processing vehicles. It should be achieved by a human agent, or by special intelligent system which is be able to recognize vehicles detection by their license number plates in a real environment and it into related resources. Because of this, various detection systems have been developed and license number plate detection systems are today used in various security applications, such as parking lots and border crossing control areas or tracking of stolen cars. In entrance gate, driver and license number plates are used to verify the vehicles.

When a vehicle/car enters at entrance gate, license number plate is automatically detected and data stored in database and lost/stolen car is not given authority to exit. This technology is used in various localities to grant access only to vehicles of authorized users only. In some countries, LNPDS systems installed on country borders areas automatically recognized and verify border crossings areas. Each and every vehicle has to be registered in a central database and compared to a black list of lost vehicles. A license number plate is the unique identification of vehicle. Real time license number plate detection plays an important role in maintaining law enforcement and maintaining traffic management rules. Many license number plates have different styles varying by state. The license number plates have one row or two rows of numbers.

A typical example of an Indian car license number plate is shown in the figure 1 with identification of each character. Here Considering **AP 36HA 8591** is the standard specifications of Indian license Number Plates: Here 'AP' that is the first 2 characters stands for the state code, '36' that is a two digit number code which stands for the regional transport office where the car has been registered. 'HA' stands for type of vehicle (car, 2 wheeler or Commercial etc). Finally there comes a four digit car number ('8591'). After the 4 digit car license number reaches '9999' the next vehicle number becomes AP 36 HB 0001.

Fig 1: Indian License Number Plates.

Abbas M. Al-Ghaili, Syamsiah Mashohor, Abdul Rahman Ramli, and Alyani Ismail [1] proposed fastest method for car-license plate detection (CLPD) and presents three main contributions. The first contribution was to propose a fast vertical edge detection algorithm (VEDA) based on the contrast between the grey scale values, which enhances the speed of the CLPD method**.** The second contribution was proposed CLPD method processes very-low-resolution images taken by a web camera. After the vertical edges have been detected by the VEDA, the desired plate details based on color information are highlighted. The third contribution was to compare the VEDA to the Sobel operator in terms of accuracy, algorithm complexity, and processing time.

Bo Li, Bin Tian, Ye Li, and Ding Wen [2] proposed a novel algorithm for license plate detection in complex scenes, particularly for the all-day traffic surveillance environment. Unlike low-level feature-based methods, their work was motivated by component-based models for object detection.

G. Abo Samra and F. Khalefah [3] presented applied threshold method to overcome the dynamic changes of illumination conditions when converting the image into

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binary. Connected component analysis technique (CCAT) was used to detect candidate objects inside the unknown image. A scale-invariant geometric relationship matrix was introduced to model the layout of symbols in any LP that simplifies system adaptability when applied in different countries. Moreover, two new crossover operators, based on sorting, were introduced, which greatly improve the convergence speed of the system.

Bharat Raju Dandu, Abhinav Chopra [4 He have covered numerous number of the vehicle number plates in this paper but other type of number plates exist where such a character analysis cannot be applied using our fuzzy logic of character analysis. For such systems we have to make a few changes to our system. Hence we have focused our system on producing more accurate results and with lesser response time to the most common specifications of Indian vehicle number plates.

Pratiksha Gupta, Purohit G.N, Manisha Rathore [5] presented a new SIMULINK model in MATLAB. Template matching block of computer vision toolbox and Digital signal processing toolbox were used to detect vehicle number plate.

II. SYSTEM DEVELOPMENT

The LNPD system is developed for the security purpose. The vehicle which contains license number plate is detected through Web-camera fitted at entrance gate and captures the image of Driver/person sitting on driving side and license number plate. This capture images are passes to the LNPD system. The computer is built up with setup of MATLAB-R2012a software. The benefit of using this software is that fast processes and stores the image of driver with current date and time the image of person is stored in database. This data is transmitted to the Exit end and the system available to compares with the original data (DB) and then exits the vehicle. The basic working of the proposed LNPDS is shown in the following figure 2.

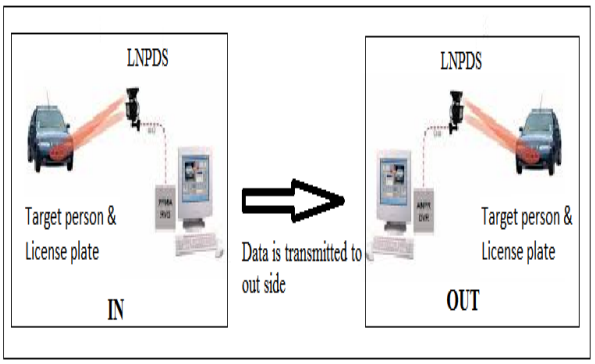

Fig 2: Prototype of Image Recognition Method

A. Proposed Methodology

The algorithm proposed in this system detection and recognition of vehicle license number plate automatically. For this proposed system algorithm is mentioned below.

1. Load image.
2. Pre-processing of capture image.
3. Character segmentation.
4. Character recognition using template matching.
5. License number extracted.
6. Detected person and number store in database.
7. Compare with database store for outside.
8. Detected number display on Notepad.

B. Proposed system flowchart

The proposed system flowchart is as shown in the following figure 3.

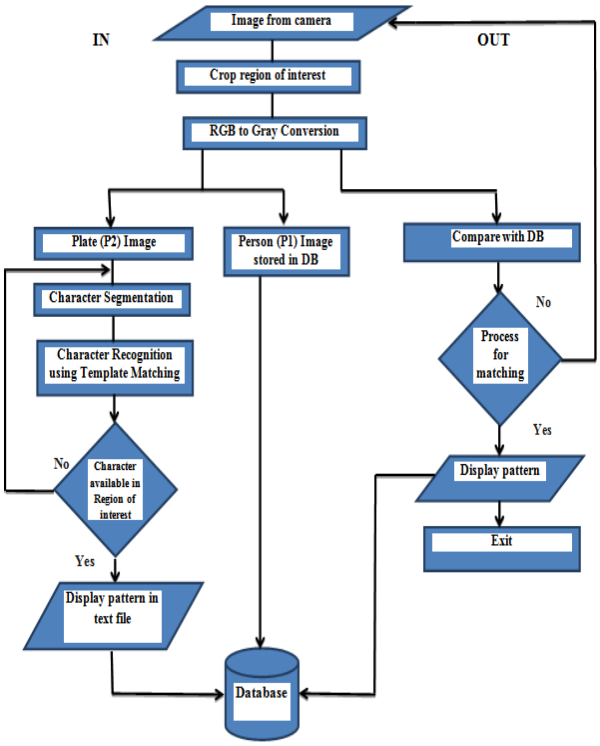

Fig 3: Flowchart of the proposed method

1. Pre-Processing

i. Capture image

The first process is the capturing of an image using electronic devices such as digital camera; webcam etc. can be used to capture the two images. For this project, vehicle front images will be taken with a Panasonic FX/Nikon digital camera. In this system pre-captured image will take. The capture images will be process as color JPEG format on the camera. Next step, we might proceed in using the MATLAB function to convert the color capture vehicle image into grey scale format. Input of this system is the color image captured by a camera placed at a distance of 1-4 meters away from the vehicle LNPs as shown in following Figure4(a).

Person (P1) Plate (P2)

Fig 4(a): Color input image

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ii. Grey scale conversion

In RGB format, each Pixel has three colour components i.e. Red, Green, and Blue. In pre-processing step, the color image is given as an input and it is converted into grey scale image shown in figure4 (b). This detected person image is stored in DB. The first process to digitize a "black(0) and white(1)" image composed of an array of grey shades is to divide the captured image into a number of pixels, depending on the required spatial resolution. This range is represented in abstract way as a range from "0" (black) and "1" (white), with any fractional binaries values.

Person (P1) Plate (P2)

Fig 4 (b): Grey scale image

2. Filtering

In this system we have use MATLAB-R2012a software. In this version of software internal dynamic link library (DLL) filter is used to remove the noise and this is interface to genetic DLLs.

3. Character Segmentation

This phase, given the dilation and segmented image, In this method segment all the characters, without losing features of the characters. Segmentation is one of the most important processes systems in the automatic license number plate detection system. If the segmentation fails, a character can be improperly divided into two pieces, or two characters can be improperly merged together. In order to recognize the vehicle license number plate characters afterwards, each character must be divided respectively. The individual characters have to be segmented from each other. In Character Segmentation, the characters and digits of the plate are segmented and each is saved as different image. Matlab toolbox function provides a function called region props. It measures a set of properties for each labelled region in the label matrix. The bounding box is used to measure the properties of the image region. This technique used for check the numbers with template used by template matching algorithm in Character Recognition (OCR).First, this grey image is segmented as shown in the following figure5.

Fig 5: segment image

4. Character Recognition

In our proposed system model character recognition is done by using template matching which is a pattern recognition system method. The outcome of this module in terms of foreground segments is to be recognized using template matching. In our proposed system, pixel values of template characters (A-Z, 0-9 and A-Z , 0-9) are stored in vector such that vector location 1 stores value for character A, location 2 for B and so on. Firstly, the various template samples are classified and then the recognized characters are normalized by the template size in the character database. It will match with all templates and calculate their similarity. Each data segment corresponding to each character is matched with all the various 36 data templates in the library. Finally the best match will be chosen as the result. An image is compared with predefined images, which will be referred to as templates. The template is given below in figure 6.

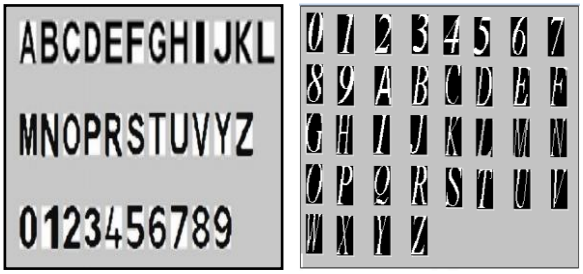

Fig 6: Database of templates

5. License Number Plate Extraction

The character recognition algorithm is used to recognize the character. Due to this character segmentation process noise is added and that noise is removed using the template matching. In this way, the noise removed from character. By using template matching algorithm, finally the character is extracted in notepad as shown in figure 7.

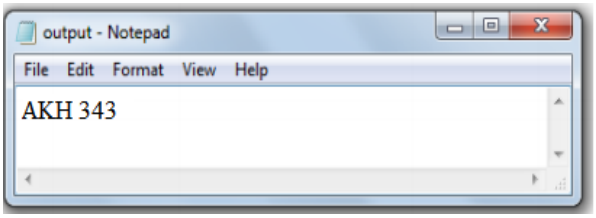

Fig 7: License Number Extracted in notepad

III.EXPERIMENTAL CONDITIONS

The whole samples is used in our technical specification were capture in different areas and various weather conditions such as Shady, Sunny, Rainy days taken from 07:00 AM to 08:00 PM. They contain different backgrounds and objects such as complex or not fixed. A lot of difficulties in the experiments are faced such as blurriness, illumination changes, similarity between LP and car-body colours, LNP sizes, LNP designs, and double-row LNPs, The web-camera pan angles are in between+20◦and−20◦,Whereas camera tilt is set from 0◦ to 20◦ Table I gives the simulation parameters specifications. If this proposed system algorithm is applied on a higher

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specification camera, the camera distance will also be increased.

TABLE I SIMULATION PARAMETERS

Parameters	Specifications
Environment	Outside
Image Capturing time	7am-8pm
Weather	Shady , Sunny and Rainy days
Total number of Images	100
Camera speed	27fps
Camera distance to LNP	1m-4m
Camera placement(Plate)	Pan ±20 , tilt 20º
Image size for Person	160x120 or any size
Image size for LNP	288x352 (not more than this)
Database of Template Font	24x42
Image background	Not fixed ; complex
License number plate size	Different
License number plate design	one row
Colours of LNP Background	Black, Yellow Or White
LNP Fonts	Different

IV. RESULTS & ANALYSIS

Experiments have been performed to test the proposed License Number Plate Detection system. Here, various images are tested by character recognition using template matching. Implements show that the algorithm has good performance on license number plate detection and character segmentation work. The results produced from the implementation of the algorithm are presented in this section. In figure 4 to figure 7 are denoted extract the license numbers from the car number plate image.

TABLE III EXTRACTED DATA

License Number Plate Detection Ratio			
Analysis Components	**Number Plate Detection**	**Character Segmentation**	**Character Recognition**
Accuracy	89/100	91/100	98/100
Percentage	89%	91%	98%
Execution Time	31msec	26msec	21msec

Analysis:
To conclude that segmentation and character recognition with template matching gives good result of this analysis and is done as shown in Table III and the graphical user interface for the experimental demo program is as shown in the figure 9.

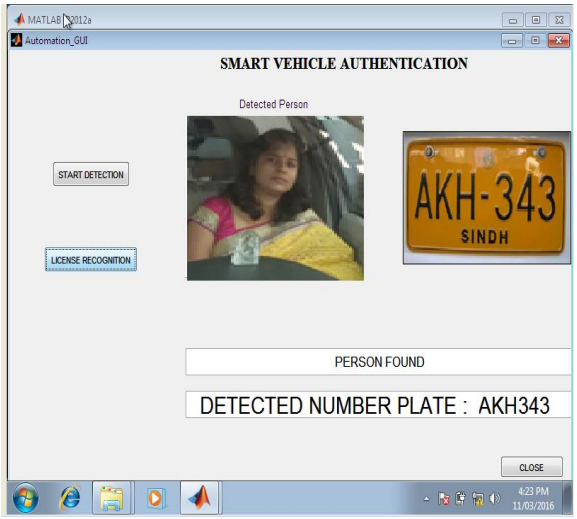

Fig 9: Graphical user Interface for the experimental demo

TABLE IIIII TESTED RESULTS

Weather	Captured Image		Number read by system	Results
	Person(P1)	LNP(P2)		
Morning			DL49AK49	Successful
Morning			HR99BJ6621	Successful
Evening			AKH 343	Successful
Afternoon			OL2CP00	Unsuccessful
Morning			MH12EE1433	Successful
Evening			M906090K	Successful

V. CONCLUSION

This proposed system gives a new and fast algorithm for license number plate detection system. The license number plate detection algorithm contributes to make the whole proposed LNPDS method faster. In this implemented system, a LNPDS method in which data set was captured by using web camera. In this implemented system 100 images taken from various scene, conditions and fonts. In this proposed system, the rate of correctly detected LNPs is 98%. In addition, the computation time of the LNPDS

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method is 21ms, which meets the real time requirements. In future, system can be able to work where the license number plate of two rows, in the night vision and the font of the plate is identical with varied font sizes, designs and the proposed system should not compromise. It should be sensitive and should be able to detect the number plate at any conditions as tracking stolen vehicles and monitoring vehicles for security purposed.

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BIOGRAPHIES

Ms. Neha T. Kolkar received the B.E in Electronics and telecommunication engineering from MGM's Jawaharlal Nehru Engineering College Aurangabad, under Dr. BAMU, Aurangabad Maharashtra, India. Now she is perusing the M.E. in Electronics from MGM's JNEC Aurangabad, Maharashtra, India. Her work has been published in 1 International level Conferences. Her research field includes digital image processing.

Dr. Vandana B. Malode received M.Tech & Ph.D. in Electronics from Dr. BAMU Aurangabad, Maharashtra, India. She is presently working as Associate Professor in Department of Electronics at Jawaharlal Nehru Engineering College, Aurangabad. She has published around 36 papers in International and National Conference and journals. Her research area is communication and OFDM technology And VLSI.

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