International Journal of Scientific Engineering and Research (IJSER)
www.ijser.in
ISSN (Online): 2347-3878
Volume 2 Issue 3, March 2014

Registration Plate Recognition System

Seetharam S[1], Suresh Kumar M[2], Sai Saravana Harish R[3], Manikandan T[4]

[1,2,3] Student of Electronics and Communication Engineering,
Rajalakshmi Engineering College, Chennai, Tamil Nadu, India

[4]Associate Professor of Electronics and Communication Engineering,
Rajalakshmi Engineering College, Chennai, Tamil Nadu, India

Abstract: ***A Registration Plate Recognition (RPR) system is one kind of an intelligent system and is of considerable interest because of its potential applications in various tracking, monitoring systems. The proposed system aims in developing an efficient technique to detect the registration plate in Indian context including double row plates using various approaches in image processing.***

Keywords: Vision Assistant, LABVIEW, Geometric Matching, Template Matching

1. Introduction

Registration Plate Recognition is a system with a variety of possibilities in developing algorithms or methods to monitor the present dense vehicle environment. It has a wide range of applications in parking lot system, toll collection system, etc. In general, recognition of vehicle is done by human who takes more time and need more members to do this and indeed there is loss of accuracy in many situations. Hence RPR is developed for vehicle's registration plate identification to assist the human operator and to improve the speed.

The task of recognizing registration plate in Indian context is a bit difficult as vehicles do not follow the standard format for the registration plate. Indian registration plates are currently available in single or double row with different fonts, etc. The current situation with multiple variations across plates adds a considerable amount of complexity in recognition process. In order to provide a solution to this context the plate extraction tool automatically analyzes an image of the vehicle and extracts the license plate from the image. After this extraction, the extracted number plate is segmented for characters and correspondingly the characters are recognized. This system can be further extended to be maintained in database. In the proposed system, the code is developed using Vision Assistant and LABVIEW image processing tools.

2. Proposed Model

In this system, the recognition of the number plate follows the below mentioned stages:

1. Image Acquisition
2. Plate Localization
3. Character Segmentation
4. Character Recognition

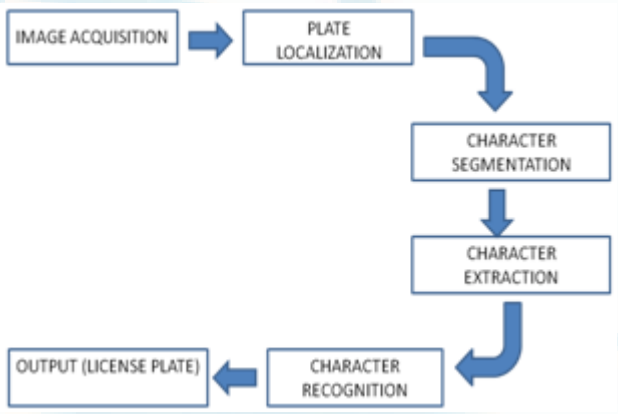

Figure 1: Steps in proposed model

2.1 Image Acquisition

Image Acquisition is the basic and very first step in any RPR system and there are number ways of acquire an image. Yan et. al. [2] used an image acquisition card that converts video signal to digital images based on some hardware-based image pre-processing. Naito et. al. [5], [6], [7] developed a system of sensing, which uses two Charge Coupled Devices (CCD) and a prism to split an incident ray into two lights with different intensities.

2.2 Plate Extraction

Registration Plate extraction is one of the important stage in a RPR system. Hontani et. al. [1] proposed a method for extracting characters without prior knowledge of their position and size in an image. The technique relies on scale shape analysis which is again based on the assumption that characters have line-type shapes locally and blob-type shapes globally. However, this method has disadvantage of requiring huge memory and computationally expensive. Instead of using this technique, template matching approach can be used to extract the plate from the image.

2.3 Character Segmentation

For the process of character segmentation many different approaches have been proposed like region growing. The

International Journal of Scientific Engineering and Research (IJSER)
www.ijser.in
ISSN (Online): 2347-3878
Volume 2 Issue 3, March 2014

basic concept behind this technique is to identify one or more criteria that are related to the desired region. After establishing the criteria, pixels that fit to the requirement are searched. Whenever such pixel is found its adjacent pixels are checked and if any of those pixels are found to be fit in the requirement then both pixels are declared as belonging to the same region.

2.4 Character Recognition

This stage introduces the methods that are used to classify and then recognizing the specific characters. The extracted features are classified using either the statistical, syntactic or neural approaches. Statistical pattern recognizing approach is an inefficient approach for recognition and other approaches based on the number of black pixel rows and columns of the character and comparison of the values to a set of templates or signatures in the database. But the later approach is found to be efficient for only specific characters. Geometric matching approach under Optical Character Recognition (OCR) is found to be efficient in recognizing the characters by matching the geometry of the each individual character with the set of pre-trained character sets.

3. Script Development

3.1 Color Plane Extraction:

As the processing of image in a color plane is difficult a particular color plane is extracted from the acquired 32-bit color image to convert it into a 8-bit grayscale image. Out of the three available color planes to extract from the image red color plane is more often used to obtain the corresponding grayscale image. This is because it gives some added clarity in further processing of images.

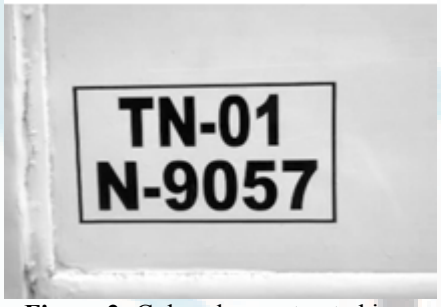

Figure 2: Color plane extracted image

3.2 Plate Extraction

In order to isolate the registration plate from the acquired image a technique called Template matching is used. With this technique each and every part of the image is checked for the match in reference with the pre loaded template. Once the template is matched with some are of the image a center is chosen which is also pre-assigned in reference template. This is done in order to set the coordinate system that could use as a reference point while describing the Region of Interest (ROI).

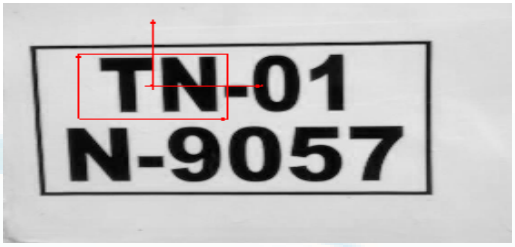

Figure 3: Extracted Plate with reference coordinate system

3.3 Thresholding

Thresholding is one of the important stages in segmentation process. It involves grouping the pixels into foreground and background pixels with respect to the pixel values. Pixels with intensity values ranging between lower and upper threshold values are called foreground pixels. Pixels with intensity values ranging outside the lower and upper threshold values are called background pixels. This is done in order to convert the grayscale image into binary image so that the image is ready for the segmentation and recognition of characters. i.e. ready for the OCR session.

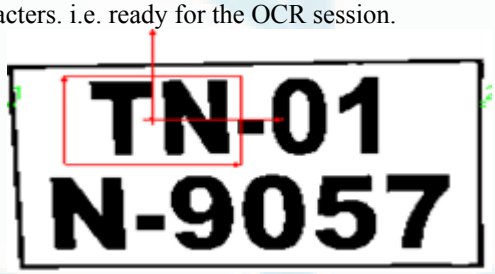

Figure 4: Image after thresholding

3.4 OCR Session

In the session of Optical Character Recognition (OCR) initially the region of interest is drawn with the help of the coordinate system set previously in the process of extraction of plate. Once the ROI is drawn the characters present in the described region is segmented with the help of bounding rectangular box. It then extracts the feature information of each segmented character. After this process it compares each segmented character with the pre defined character set and eventually returns the recognized characters.

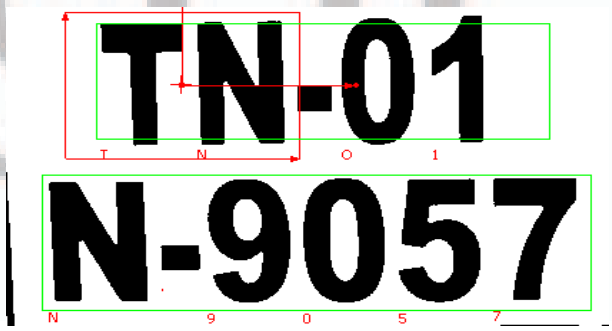

Figure 5: Image after Segmentation and Recognition

International Journal of Scientific Engineering and Research (IJSER)
www.ijser.in
ISSN (Online): 2347-3878
Volume 2 Issue 3, March 2014

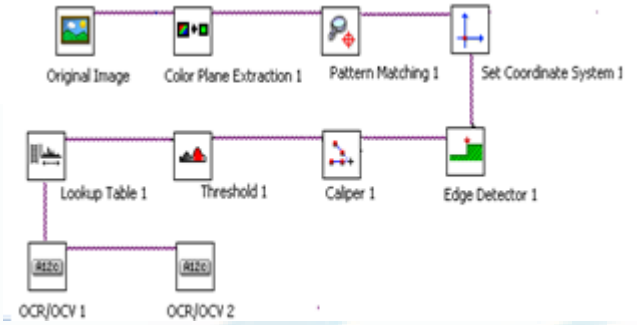

Figure 6: Script developed in Vision Assistant

4. Code Development

In script development each and every stage involved in the image processing is analyzed. But in order to implement the image processing practically there need to be some code which has to be developed under image processing software. Here we develop the code with the help of Laboratory Virtual Instrument Engineering Workbench (LABVIEW) which is a graphical programming language that uses icons instead of codes for defining a function. It consists of two parts namely Front panel and Block diagram.

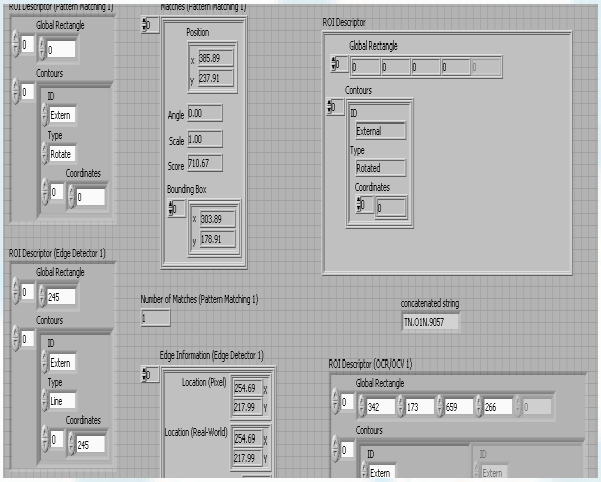

Figure 7: A part of Front Panel of the RPR system

Front panel is the interactive user interface of a VI. The front panel can contain knobs; push buttons etc. which are the interactive input controls and graphs, LED's etc. which are indicators. Controls simulate instrument input devices and supply data to block diagram of the VI. Indicators simulate output devices and display the data that block diagram generates. The front panel objects have corresponding terminal on the block diagram

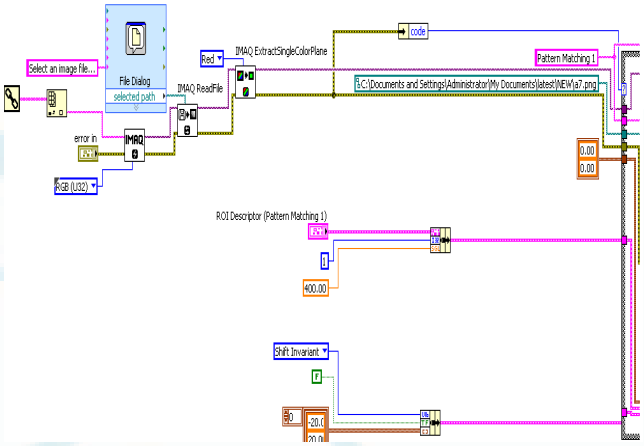

Figure 8: A part of the Block diagram of RPR system.

Block diagram is the VI's source code, constructed in Lab View's graphical programming language, G. The block diagram is the actual executable program. The components of the block diagram are lower level VIs, built in functions, constants and program execution control structures. Wires are used to connect the objects together to indicate the flow of data between them. The data that we enter into the front panel controls enter the block diagram through these terminals and after execution the output data flow to indicator terminals where they exit the block diagram, re-enter the front panel and appear in front panel indicators giving us final results.

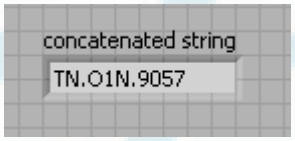

Figure 9: Output

The above figure shows the concatenated output of the double line number plate in a single line. This is done by using concatenate string function in LABVIEW.

5. Conclusion and Future work

The plate recognition process needs very accuracy to recognize the fast moving vehicles. To conquer over this many systems are being proposed. This paper deals with the recognition of double row number plates in the vehicles. We have used the color plane extraction and thresholding process in the preprocessing function. The proposed system was applied over 100 images with some images being of similar kind and others different. We were successful in recognizing maximum number plates with an efficiency of around 92.5%. For the real time application, this model can be applied with some preprocessing techniques like filtering before segmentation and post filtering to improve the efficiency.

References

[1] Hontani, H., and Koga, T., "Character extraction method without prior knowledge on size and information",

Proceedings of the IEEE International Vehicle Electronics Conference (IVEC'01), pp. 67-72, 2001.
[2] Yan, Dai., Hongqing, Ma., Jilin, Liu., and Langang, Li, "A high performance license plate recognition system based on the web technique, *Proceedings IEEE Intelligent Transport Systems,* pp. 325-329, 2001.
[3] J. Cano and J. C. Perez-Cortes, "Vehicle license plate segmentation in natural images," in *Lecture Notes on Computer Science*, vol. 2652,F. J. Perales *et al.*, Eds. New York: Springer-Verlag, 2003, pp.142–149.
[4] S.-L. Chang, L.-S. Chen, Y.-C. Chung, and S.-W. Chen, "Automatic license plate recognition," *IEEE Trans. Intell. Transp. Syst.*, vol. 5, no. 1,pp. 42–53, Mar. 2004.
[5] S.Kranthi, K.Pranathi and A.Srisaila "Automatic Number Plate Recognition", International Journal of Advancements in Technology , ISSN 0976-4860, Vol 2, No 3, July 2011.
[6] Kuldeepak, Monika kaushik and MunishVashishath "License Plate Recognition System based on Image Processing Using Labview ", International Journal of Electronics Communication and Computer Technology (IJECCT) Volume 2 Issue 4 , July 2012.
[7] Satadal Saha, Subhadip Basu, Mita Nasipuri, Dipak Kumar Basu., " License Plate Localization from Vehicle Images: An Edge Based Multi-stage Approach", International Journal of Recent Trends in Engineering, Vol 1, No. 1, May 2009.
[8] Naito, T., Tsukada, T., Yamada, K.s Kozuka, K., and Yamamoto, S., "Robust license-plate recognition method for passing vehicles under outside environment", IEEE Transactions on Vehicular Technology, vol: 49 Issue: 6, pp: 2309-2319, 2000.
[9] Hansen, H., Kristensen, A. W., Kohler, M. P., Mikkelsen, A. W. , Pedersen J. M., and Trangeled, M., "Automatic recognition of license plates", Institute for Electronic System, Aalhorg University, May 2002.
[10] Christos Nikolaos E. Anagnostopoulos, *Member, IEEE*, Ioannis E. Anagnostopoulos, *Member, IEEE*, Vassili Loumos, *Member, IEEE*, and Eleftherios Kayafas, *Member, IEEE*, "A License Plate-Recognition Algorithm for Intelligent Transportation System Applications",IEEE Transactions on intelligent transportation systems, Vol. 7, NO. 3, September 2006
[11] J. Sauvola and M. Pietikäinen, "Adaptive document image binarization,"*Pattern Recognit.*, vol. 33, no. 2, pp. 225–236, Feb.2000.
[12] T. D. Duan, T. L. Hong Du, T. V. Phuoc, and N. V. Hoang, "Building an automatic vehicle license plate recognition system," in *Proc. Int.Conf. Comput. Sci. RIVF*, 2005, pp. 59–63.

About Author

Mr. Seetharam S is pursuing Bachelor of Engineering (ECE) of Rajalakshmi Engineering College and presently is in Final year. His research interests are Image Processing and Networking. He also did a project in Robotics.

Mr. Suresh Kumar M is pursuing Bachelor of Engineering (ECE) of Rajalakshmi Engineering College and presently is in Final year. His research interests are Image Processing and Microprocessor and Microcontroller. He did his diploma in Electronics and communication at Don Bosco Polytechnic College, Nagapatinam. He also did a project in RFID.

Mr. Sai Saravana Harish R is pursuing Bachelor of Engineering (ECE) of Rajalakshmi Engineering College and presently is in Final Year. His research interests are Image Processing and Digital Communication. He also did a project in Robotics.

Mr. Manikandan T is a Associate Professor & Co-HOD of Electronics and Communication Engineering department of Rajalakshmi Engineering College, Thandalam, Chennai, Tamil Nadu. He is currently pursuing his Ph.D at Anna University, Chennai. His topic of research is "Lung cancer diagnosis and 3-D visualization". He did his bachelor's degree in Engineering from Vellore Engineering College (currently known as Vellore Institute of Technology) Madras University, Vellore & master's degree in Engineering from CEG, Anna University, Chennai during 1998 & 2007 respectively. He is having 16 years of teaching experience which includes both UG and PG. He also guided many projects at UG & PG levels. He has 20 international journals and conferences in his credit. His research interest includes Medical image processing, Bio-sensors, Watermarking and Artificial Intelligence.