Vehicle Detection Based On Image Classification

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Abstract- Optical character recognition (OCR) is an image processing technology which uses efficient algorithms to detect the vehicle number from real time images. The objective is to design a efficient vehicle recognition system and to implement it in a toll gate system. In this project, Lab view software is used for training, testing and for code generation. The optical character recognition technique (OCR) is used to convert the printed image into characters. The characters are trained and stored as .abc file and the stored data is converted into block. Finally the software is generated and integrated with hardware.

Indexed Terms -- OCR (optical character recognition), Lab VIEW, vehicle number recognition, toll gate

I. INTRODUCTION

Optical character recognition or optical character reader, often abbreviated as OCR, is the mechanical or electronic conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a Scene-photo (for example the text on signs and billboards in a landscape photo) or form subtitle text superimposed on a image on an image. Laboratory virtual instrument engineering workbench (LabVIEW) is a system design platform and development environment for a visual programming language from national instruments. This software is initial released in 1986. This LabVIEW software is written in C, C++, .NET. The graphical language is named "G", not to be confused with G-code. Originally released for the apple Macintosh in 1986, LabVIEW is commonly used for data acquisition, instrument control, and industrial automation on a variety of operating system (OSs), including Microsoft windows, various versions of unix, linux, and macOS. The proposed system consists of six steps [1] Detection of the vehicle & capturing the image of front view of vehicle. [2] Converting the printed image to characters using OCR technique. [3] Training the characters. [4] Developing the block diagram. [5] Generating the code. [6] Interfacing with hardware.

II. LITERATURE REVIEW

Vehicle detection System consists of four modules: image acquisition, color plane extraction, optical character recognition and character training. The efficiency & accuracy of the system largely depends on the fourth module & various approaches have been used for this purpose. There are several common searching algorithms to locate vehicle license plate. Searching algorithm rely on color information [2]. In this method the color plane extraction is used to extract the likelihood ROI in an image [2]. These algorithms are usually fast and can detect all the RTO fonts and standardized license plates. High color plane extraction rate is achieved in red plane, whereas in the red plane extraction the license plate image which is captured is converted into binary and based on this extracted image the English characters and digits can be classified easily. Several algorithms also utilize neural networks for license plate extraction [2]. There are several algorithms used in detecting the characters and digits. This system [3] uses the optical character recognition (OCR) algorithm for identifying the characters present in the extracted image. Here the extracted license plate is given to the [3] optical character recognition algorithm and this OCR detects and separates each character with respect to its shape and size. This system works best for official license plate fonts and must have at least some space between the character and digits. Then it compares the segmented characters with the trained characters. Presently, there are many machine learning tools to train characters. Here [4] we use NI OCR training interface of NI Vision assistant which is a tool of LabVIEW software to train the characters of the license plate images. The more characters and digits we train, the more accuracy we get on recognizing the segmented characters.

III. PROPOSED SYSTEM

Our proposed vehicle detection system majorly contains four modules which is shown in the Figure 1. The first one in image acquisition in which the image which is acquired from the camera is taken. In the second module the image is turned into binary through the relevant color plane extraction. In the third module the optical character recognition algorithm is used which has several steps shown in Figure 2. Finally the characters are trained to get better accuracy of detection.

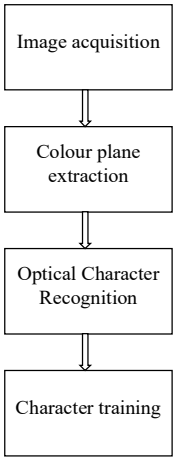

Fig. 1: Modules of our system

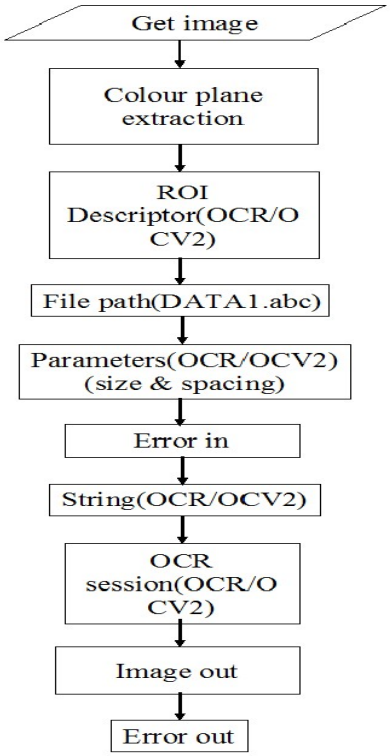

Fig. 2: Proposed Algorithm flow

1. Image acquisition:
First of all, an image is captured from the front of vehicle using a camera. In the proposed system, images are taken using a camera having resolution 1280*720pixels is used. The captured image is then acquired in LabVIEW and then converted into grayscale. Figure 3 shows the captured image and converted in grayscale.

Fig. 3: Get image

2. Color Plane Extraction:
To extract red/green/blue color plane from a color image. In addition to demonstrating the extract color planes and grayscale images, the code is designed to also show the difference between the color plane extraction and gray scaling of an image. Thresholding converts an image into a binary image, with pixel values of 0 or 1. This process works by setting to 1 all pixels whose value falls within a certain range called the threshold interval and setting all other pixel values in the image to 0.

Fig. 4: Color plane extraction (Red plane)

3. Optical Character Recognition:
Optical character recognition (OCR) is machine vision software that translates images of characters into text and to identify characters in an image, the Lab view software need to be trained to identify each character. To identifying the characters segmentation of number plate process is important in OCR.

Fig. 5: Extracted number plate

I. Number Plate Segmentation

In this segmentation process, the characters and digits of the plate are segmented. To do this first we have resized the number plate for specific size, so that the edge characters are not detected if the font size is high and also based on different number plate. By finding out the properties, start and ending coordinates of each character are found and each character is saved as different image in a cell of matrices.

Fig. 6: Segmented number plate

4. Character Training:

After the segmentation in ocr block we have to edit the character set file to go for next process. Then the training interface block is opened for training the characters. In that we have to type the correct string in number plate then the strings are trained successfully and displayed in text read and also we can view in Train/Read block to see all trained characters with different fonts that can be stored in some file. In OCR Training interface we have different options to change each character size, width, height, and also we check the accuracy in class score of trained characters in OCR interface. And also we can change the threshold, size and spacing, Read options are available in OCR block.

Fig. 7: Result of trained image

IV. INTERFACING WITH HARDWARE MODEL

The VNR system is interfaced with hardware model & database to make an automated toll tax collection system. The hardware model consists of proximity sensor to detect the presence of vehicle, a web camera to capture the image, motors to open/close the road barriers of toll gate, desktop computer on which OCR algorithm is executed, node mcu microcontroller for controlling all the components of hardware model. As the vehicle arrives at toll gate, the infrared (IR) sensor detects the vehicle and opens the gate by manually. The camera connected to the PC to captures the image of front view of the vehicle & applies OCR algorithm on the image to recognize the vehicle's license number. The trained characters will already stored in some file that will help to identify the characters of the vehicle number automatically. If the number plate is displayed on the PC it will identify whether the vehicle is registered or not, if this process is done the vehicle will move near to the gate, then IR sensor will help to open the toll gate automatically. The hardware design of the system is shown in figure 8.

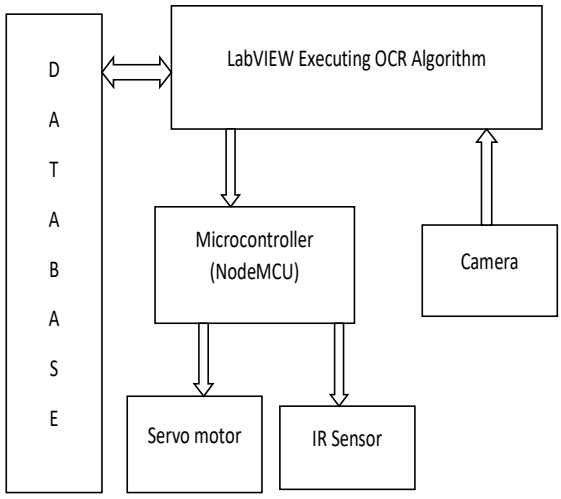

Fig. 8: System Hardware design

V. CONCLUSIONS & FUTURE WORKS

In this paper, we proposed an efficient vehicle detection system using optical character recognition with the help of LabVIEW software. The system has been tested on many images of various lighting conditions and can be implemented on motorways and highways for automatic toll tax collection.

The proposed system works quite well however, there are still areas for improvement. The camera used in this project is average quality & cannot detect fast changing targets due to the long shutter time. The system robustness and speed can be increased if high resolution camera is used.

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