

Designing of OCR Tool Box for Decoding Vehicle Number Plate using MATLAB

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Abstract - This paper is for designing of optical character recognition (OCR) toolbox for decoding of vehicle number. Nowadays our society is mostly depending on the digitalization and automation. In ancient days there is no such type of conveniences so they have faced tribulations. To rise above such problems this would be cooperative. OCR is the mechanical or electronic conversion of images such as printed, text etc. For this we are using MATLAB. In this we can track the details of vehicle owner by taking the photograph of number plate and that will be stored, processed in the OCR and details will be displayed. Tracking the details from the vehicle number plate will be a time saving process for police in case of thefts and traffic violation.

Key Words: OCR, structural Elements, DVN algorithm, xlsread and xlswrite.

I. INTRODUCTION

OCR technology provides reproductive systems by scanning and imaging systems the ability to convert images of characters in a font of machine character can be understood or recognized by a computer. Thus, images of characters in a font of machine are drawn from a bitmap of the image reproduced by the scanner. This project is completely based on concept of Digital Image Processing (DIP)^[1].

Digital Image processing is an absolutely crucial area of work for those groups and industries that are working in areas such as medical diagnostics, astronomy, geophysics, environmental science, data analysis in laboratories, industrial inspection, etc. Although not originally developed for users who are visually impaired, Optical Character Recognition (OCR) technology has become an aid for inputting documents quickly by and for users with vision impairments. A complete OCR system consists of a scanner, the recognition component, and OCR software that interacts with the other components to store the computerized document in the computer. The process of inputting the material into the computer begins with the scanner taking a picture of the printed material. Then, during the recognition process, the picture is analyzed for layout, fonts, text and graphics. Finally, the picture of the document is converted into an electronic format that can be edited with an application software. OCR systems designed specifically for users with visual impairments have modified interfaces that can be used with minimal assistance. In addition,

technological developments will see an increase in accuracy, including the ability of these products to decipher even handwritten materials. In general, OCR systems work as an external device with the user's existing assistive technology.

Various recognition techniques have been developed and number plate recognition systems are being used now a days in various traffic and security applications, such as parking, access and border control, or tracking of stolen cars. Automatic number plate recognition systems can be used in access control. For example, in many companies this technology is used to grant access only to vehicles of authorized personnel. In some countries, automatic number plate detection systems is used to automatically detect and monitor border crossings. Automatic number plate detection system is an image processing technology in which number plate of vehicle is used to recognize the vehicle. The objective is to design an efficient automatic vehicle recognition system by using the vehicle number plate, and to implement it for various applications such as automatic toll tax collection, parking system, Traffic control, etc. The system has four main steps to get the required information. These are image acquisition, Pre-processing(Number plate detection), character segmentation and character recognition^[2].

II. PROCEDURE

Proposed Automatic Car Number Plate Decoding System mainly focusing on decoding of vehicle number plate. Here decoding means providing the owner information after processing the vehicle number plate. We will be able to find the details of the owner after decoding the plate. The main toll was the MATLAB is chosen for the number plate decoding application. The task is to write an algorithm to decode the vehicle number plate.



Figure 1 Vehicle registration number plate

MATLAB is very useful as it have built-in-primitives and tools for the image processing. The advantages of MATLAB can be classified as follows: Platform independence, predefined function and device-independent plotting,

Graphical User interface and MATLAB compiler. It integrates computation, Algorithm development, Modelling simulation, and prototyping, Data acquisition, Data analysis, exploration, and visualization and Application development, including graphical user interface building. MATLAB is high performance programming language which has an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

There are two types of number plates in INDIA. We classified as Single layered number plate and double layered number plate. The examples are as shown below

Our algorithm contains four parts:

1. Designing of OCR tool box
2. Checking of no. Of Layers in the number plate.
3. DVN Algorithm
4. Database for Storing the Vehicle Registration Details

2.1 Designing of OCR tool box

2.1.1 Template Creation

First create a folder for the project (my folder name is *my ocr tool box*) to save and store the files. We have stored the binary images of all the alphabets and numbers in the sub-folder named as 'database01'.



Figure 2 Template creation

2.1.2 Reading of Templates

Here, in the above code we are saving the images into a variable by using command '*imread()*'. This function is used to call the images from the folder or from any location of the PC into the MATLAB.

2.1.3 Letter Detection

Here we are creating the second code file named *ocrrawpgm.m*. After that, we have resized the input image so it can be compared with the template's images by using the command '*imresize(filename, [50,30])*'. Then for loop is used to correlates the input image with every image in the

template to get the best match using the syntax '*correlation_result=corr2(input image,templateimage)*'.

If the **correlation_result>0.95** then the resultant text will displayed.

Example:

```
A=imread('database01\A.jpg');
A=imresize(A,[50,30]);
correlation_result =corr2(A,cropimg);
if correlation_result >0.95
    result(i)='A';
end
```

2.2 Checking of no. Of Layers in the number plate:

Before applying the algorithm first take decision about the number plate type. The decision was taken by aspect ratio.

If the aspect ratio is greater than 0.4 it is double layered numberplate. If the aspect ratio is less than 0.4 it is single layered number plate.

If the number plate contains 2 layers then it is spilt into 2 images and DVN algorithm is applied on two images and results are concatenated .

```
if aspectratio>0.4
    disp('double Layer');
    r1=ceil(r/2);
    xcrop1=x(1:r1,:);
    xcrop2=x(r1:r,:);
    [textt1,proce1]=mydvn(xcrop1);
    [textt2,proce2]=mydvn(xcrop2);
    textt=strcat(textt1,textt2);
    disp(textt);
End
```



Figure 3 Double Layered Vehicle Number Plate

If the number plate contains single layer then DVN algorithm is applied on image and result is displayed .

```
if aspectratio<0.4
disp('Single Layer');
[textt,proce1]=mydvn(x);
disp(textt);
End
```



Figure 4 Single Layer Vehicle Number Plate

2.3 DVN Algorithm

DVN Algorithm means Detection of Vehicle number Algorithm. In this procedure we will effort on the image taken as the input from the CCTV footage which is in RGB format. We will be transforming that image into gray scale using the syntax 'rgb2gray(inputimage)'. In general, a camera seizes the vehicle pictures and also the laptop procedures the captured pictures, detects the car place from the input pictures so reads data from car by applying numerous image process and optical character recognition techniques. There are multiple registration code recognition systems available, however due to the reality[3]. A lot of problems have to be solved during this process. For instance, during the recognition system procedure, there exists lots of obstruction. For example, camera limitation and natural scene effects are the main reason to get the good image or not. In general, the biggest challenges to the researchers of this area are the way in which they deal with the illumination condition problems, vehicle motion, viewpoint, distance changes and complex background. Methods to implement the proposed method offers a base for imposing automatic wide variety plate detection the usage of photo processing for toll collection at toll checkpoints.

Now the image is converted into logical image using the syntax 'im2bw (grayimage)'. Now the noise is eliminated using the structural elements. Now each letter in the image is laded with different labels using the command 'bwlabel (noiseless_image)'. Now each letter is cropped. Now OCR is applied on the each cropped image and converted as text.

Example :

```
text=ocrrawpgm(cropped_letters)
```

2.4 Database for Storing the Vehicle Registration Details:

After completing the above steps the result is stored in 'textt' variable (see section 2.2). Now it is stored in the Micro soft excel sheet using the syntax

```
xlswrite('mydata.xls',textt);
```

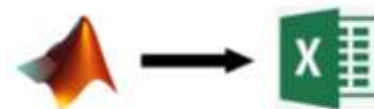


Figure 5 MATLAB to Excel Data Transfer

In the excel sheet we store the vehicle Registration information such as owner information, Address, District, State, PINCODE and vehicle type. For our project our excel sheet name is 'mydata.xls'

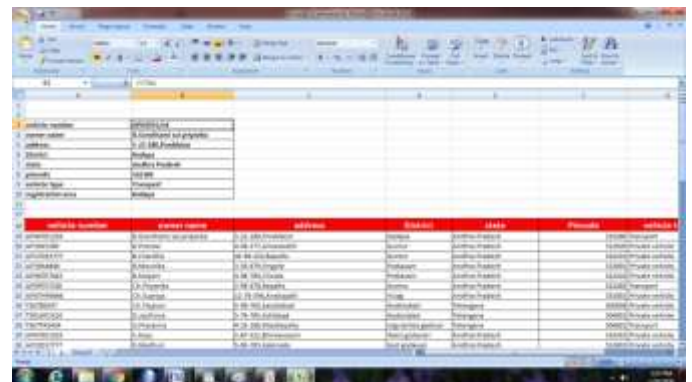


Figure 6 Data Base Creation in Excel Sheet

Now VLOOKUP is used for searching user data. The VLOOKUP function performs a vertical lookup by searching for a value in the first column of a table and returning the value in the same row in the index_number position.

The VLOOKUP function is a built-in function in Excel that is categorized as a Lookup/Reference Function. It can be used as a worksheet function (WS) in Excel. As a worksheet function, the VLOOKUP function can be entered as part of a formula in a cell of a worksheet.

There are four pieces of information that you will need in order to build the VLOOKUP syntax:

1. The value you want to look up, also called the lookup value.
2. The range where the lookup value is located. Remember that the lookup value should always be in the first column in the range for VLOOKUP to

work correctly. For example, if your lookup value is in cell C2 then your range should start with C.

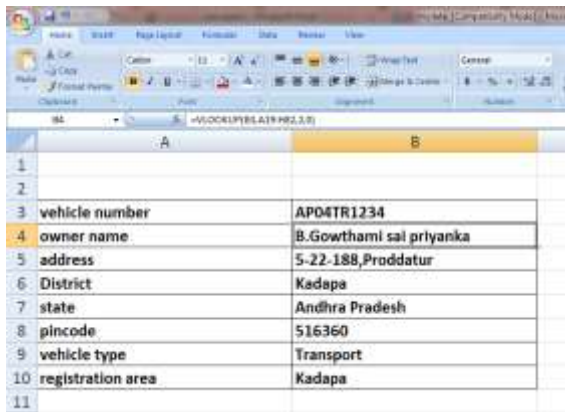
- The column number in the range that contains the return value. For example, if you specify B2:D11 as the range, you should count B as the first column, C as the second, and so on.
- Optionally, you can specify TRUE if you want an approximate match or FALSE if you want an exact match of the return value. If you don't specify anything, the default value will always be TRUE or approximate match.

Example:

=VLOOKUP (value, table, index_number, [approximate_match])

=VLOOKUP(B3,A19:H82,2,0)

Now the VLOOKUP function performs a vertical lookup by searching and display the required fields such as owner information, Address, District, State, PINCODE and vehicle type.



	A	B
1		
2		
3	vehicle number	APO4TR1234
4	owner name	B.Gowthami sai priyanka
5	address	5-22-188,Proddatur
6	District	Kadapa
7	state	Andhra Pradesh
8	pincode	516360
9	vehicle type	Transport
10	registration area	Kadapa
11		

Figure 7 VLOOKUP Results

Now the required data is in excel sheet now it is transferred to MATLAB using the syntax

[aa,bb,cc]=xlsread('mydata.xls');

The above command returns the text fields in cell array aa, returns the numeric data in bb and both numeric and text data in cell array cc, using any of the input arguments in the previous syntaxes.

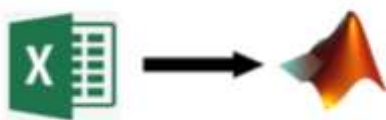


Figure 8 Excel to MATLAB Data transfer

Now the cc variable contains the output data.Its displayed using the command `disp(cc(2,2))`, `disp(cc(3,2))`, `disp(cc(4,2))`.....,

OUTPUT:



Figure 9 Result 01



Figure 10 Result 02

We checked 50 number plates only 2 number plates we got error. The accuracy percentage is 96%.

The character reorganization percentage is 99.6%.

We got those two errors in detecting 0 (zero) and O (Alphabet O).

CONCLUSION

In this, a software is designed which decode the vehicle number plate number using MATLAB. The proposed method is mainly designed for decoding of Indian vehicle number. This method has four main stages. This method has been tested over a large number of images which proved the efficiency and accuracy of the method. It has been observed that the proposed model exhibits 965% accuracy rate for our tested dataset.

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