
NUMBER PLATE DETECTION USING MATLAB

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ABSTRACT

The video surveillance system is used for security purposes and monitoring systems. But motion detection is a challenging part of video surveillance. Video surveillance system used for home security, military applications, bank / ATM security, traffic monitoring etc. Now with the decline in the cost of high-quality video surveillance systems, the detection and tracking of human activities has increased. Therefore, automated systems are designed for multiple detection functions, but the function of detecting illegally parked vehicles is left entirely to the users of the monitoring systems. The discovery of Indian cars by their numbers is a very interesting and challenging research topic from the last few years. It is noteworthy that the number plates of vehicles vary in size and size and have different colors in different countries. This function suggests a method for obtaining and identifying vehicle numbers that will assist in obtaining authorized and unauthorized vehicle numbers. This paper introduces a method based on simple but effective morphological operations and a method for obtaining Sobel edge. This method is simplified to separate all the letters and numbers used in the number plate using the combination box method. After separating the numbers and letters present on the number plate, the template matching method is used to recognize numbers and letters. Focus is given to locate the number plate correctly so as to divide the whole number by the letters so that each number can be seen separately.

Keywords: Surveillance, Authorized, Detection, Automated, Sobel Edge.

I. INTRODUCTION

Number plates are used to identify vehicles internationally. Vehicles are pointed physically or automatically. Automatic vehicle identification is a process of image identification of vehicles by their number plates. Automatic vehicle identification systems are used for the purpose of effective traffic control and safety applications such as controlling access to restricted areas and tracking of required vehicles. Numerical Recognition (NPR) is an easy way to identify a Vehicle. The NPR system of the Indian license plate is difficult compared to the foreign license plate as there is no standard component of the license plate element. Detection work is challenging due to the nature of light. Numerical detection has been carried out over the years, it is still a challenging task. The number plate detection system scans the inserted image to identify local leaflets containing number plates. Since a plate can be anywhere in an image of various sizes, it is not possible to scan all image pixels to find it. In the parking lot, number plates are used to calculate the parking time. When the vehicle enters the input gate, the number plate is automatically detected and stored on the website.

II. METHODOLOGY

There are five phases in number plate detection

Input Image

This is the initial phase which works on taking image as input. In this proposed phase, digital camera of 3.2 megapixel camera is used. The input image is 120 x160 or it can be 1200 x 1600 pixels.

Extracting Number Plate Location

RGB to gray-scale conversion is welcome, to facilitate the extraction of extraction, and to increase the processing speed. This conversion is $\text{gray} = 0.114 \cdot R + 0.587 \cdot G + 0.299 \cdot B$.

Then we take a binary photo, the binary image is closed by usage of square elements to facilitate the extraction of plate. Mathematical morphology is used to locate the region of interest and Sobel operator is used to calculate the boundary, that detect high light regions with high edge magnitude and high edge variance. The binary gradient mask shows lines of high contrast in the picture. These lines do not quite delineate the outline of the object of interest. Compared to the original picture, spaces in the lines are observed that surrounds the object in the gradient mask. These linear gap will disappear if the Sobel picture is enlarged using square formatting elements.

MATLAB built-in provides a method `imfill` (BW, "holes") that fills holes in the binary photo. This enlarged gradient mask depicts the shape of the cell very nicely, but there are still holes nevertheless.

Remove Connected Objects On Border

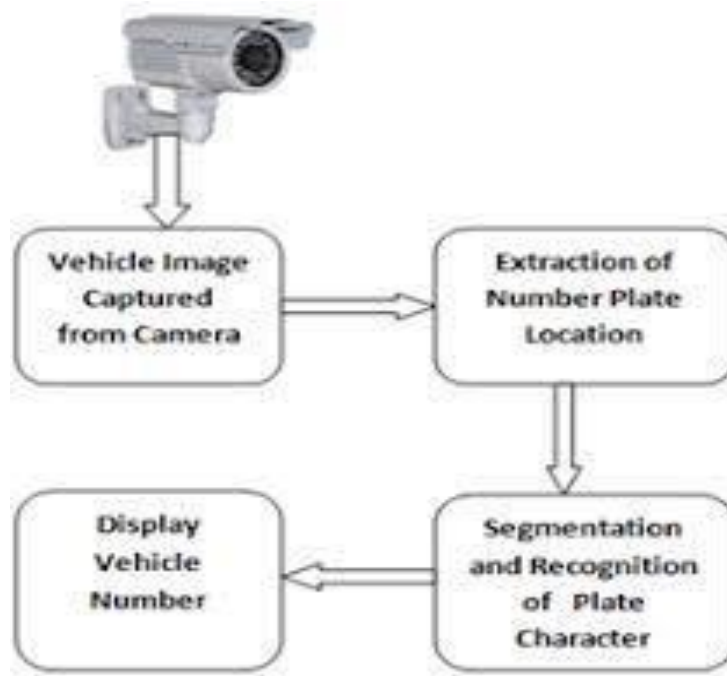
Interested region successfully separated, but not the only item found. Any objects attached to the image border can be removed using the MATLAB `imclearborder` function. Finally, in order to make the component look natural, the image is double-sided with a diamond and a line structure element. This helps to extract the number plate of the car area. Finding the only place of the number plate in a car image with the letters and numbers on it is a picture divided into sections repeated with a binary image.

Character Segmentation

Separation is one of the most important processes in identifying a number of numbers, because all the additional steps depend on it. If the division of the failure the character can be unfairly divided into two pieces, or two letters. The main solution to this problem is to use the binding box method. Where there is a binding box built on each letter and the numbers shown on each number plate, letter and number. is divided into plate number detection. At the expense of the connecting box we used some guidelines, `bwlabel` to find the number of objects connected to the image and the image matrix $<480 * 640>$. `Regionprops`. bounding box order detects matrices, containing links in the upper left corner of the box specify the width of the binding box next to another size. We draw a rectangle for each connected rectangle as we are able to observe in the code.

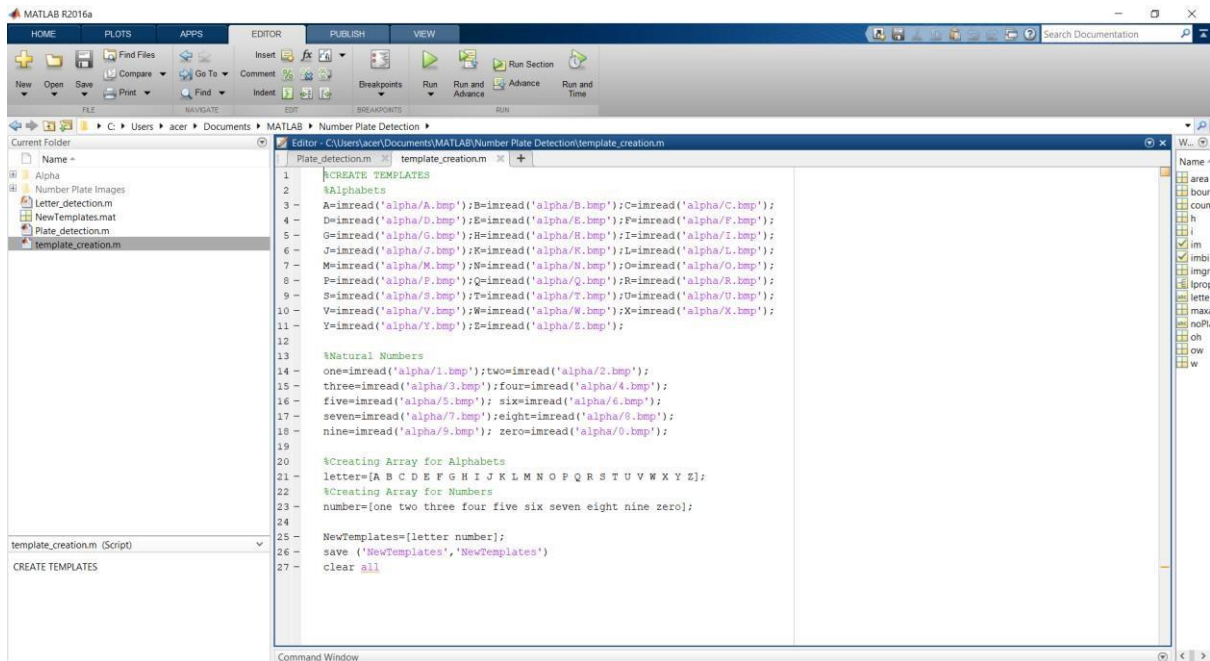
Character Recognition And Display Result

It is use for the purpose of segmenting an image of text into actual characters. Now each individual character in the given input is compared against the alphanumeric database using template matching. The matching process moves the image to all possible areas in a bigger source image and calculates a numerical index that describes how good the template matches the picture in that position. Character Matching is performed by comparing each pixel .The template is of size 42×24 .



III. MODELING AND ANALYSIS

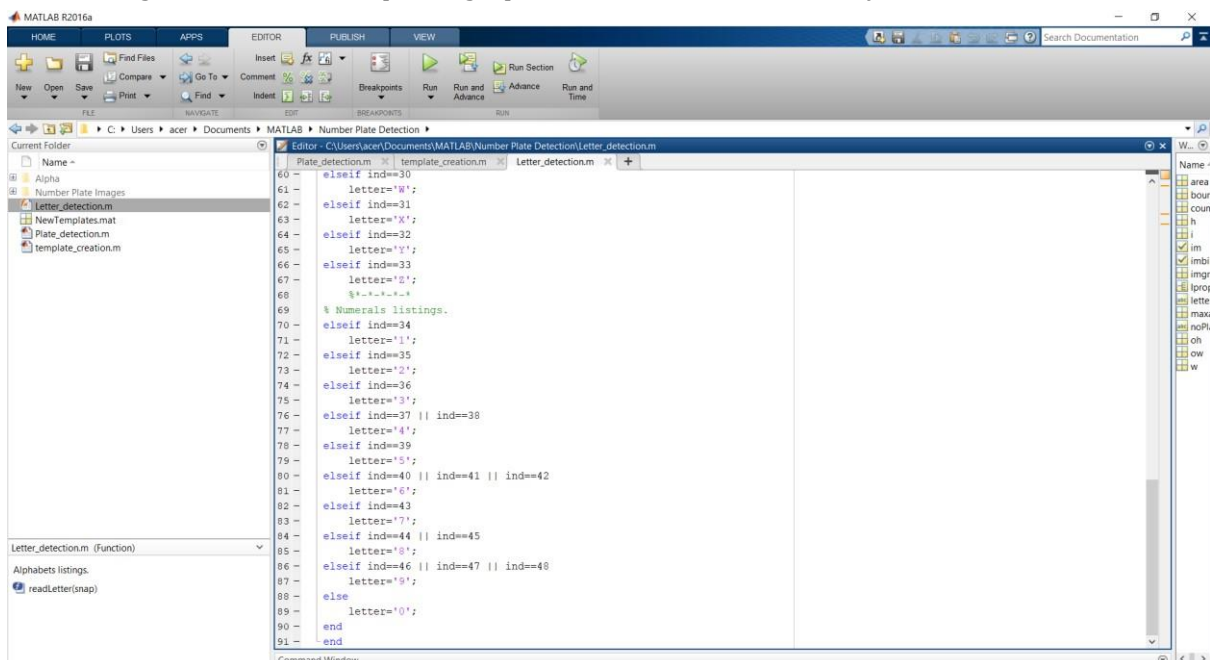
Step-1: Create a template_creation.m file- This .m file is defined to call the saved alphanumeric from the matlab memory.



```

1 %CREATE TEMPLATES
2 %Alphabets
3 A=imread('alpha/A.bmp');B=imread('alpha/B.bmp');C=imread('alpha/C.bmp');
4 D=imread('alpha/D.bmp');E=imread('alpha/E.bmp');F=imread('alpha/F.bmp');
5 G=imread('alpha/G.bmp');H=imread('alpha/H.bmp');I=imread('alpha/I.bmp');
6 J=imread('alpha/J.bmp');K=imread('alpha/K.bmp');L=imread('alpha/L.bmp');
7 M=imread('alpha/M.bmp');N=imread('alpha/N.bmp');O=imread('alpha/O.bmp');
8 P=imread('alpha/P.bmp');Q=imread('alpha/Q.bmp');R=imread('alpha/R.bmp');
9 S=imread('alpha/S.bmp');T=imread('alpha/T.bmp');U=imread('alpha/U.bmp');
10 V=imread('alpha/V.bmp');W=imread('alpha/W.bmp');X=imread('alpha/X.bmp');
11 Y=imread('alpha/Y.bmp');Z=imread('alpha/Z.bmp');
12
13 %Natural Numbers
14 one=imread('alpha/1.bmp');two=imread('alpha/2.bmp');
15 three=imread('alpha/3.bmp');four=imread('alpha/4.bmp');
16 five=imread('alpha/5.bmp');six=imread('alpha/6.bmp');
17 seven=imread('alpha/7.bmp');eight=imread('alpha/8.bmp');
18 nine=imread('alpha/9.bmp');zero=imread('alpha/0.bmp');
19
20 %Creating Array for Alphabets
21 letter=[A B C D E F G H I J K L M N O P Q R S T U V W X Y Z];
22 %Creating Array for Numbers
23 number=[one two three four five six seven eight nine zero];
24
25 NewTemplates=[letter number];
26 save('NewTemplates','NewTemplates')
27 clear all
  
```

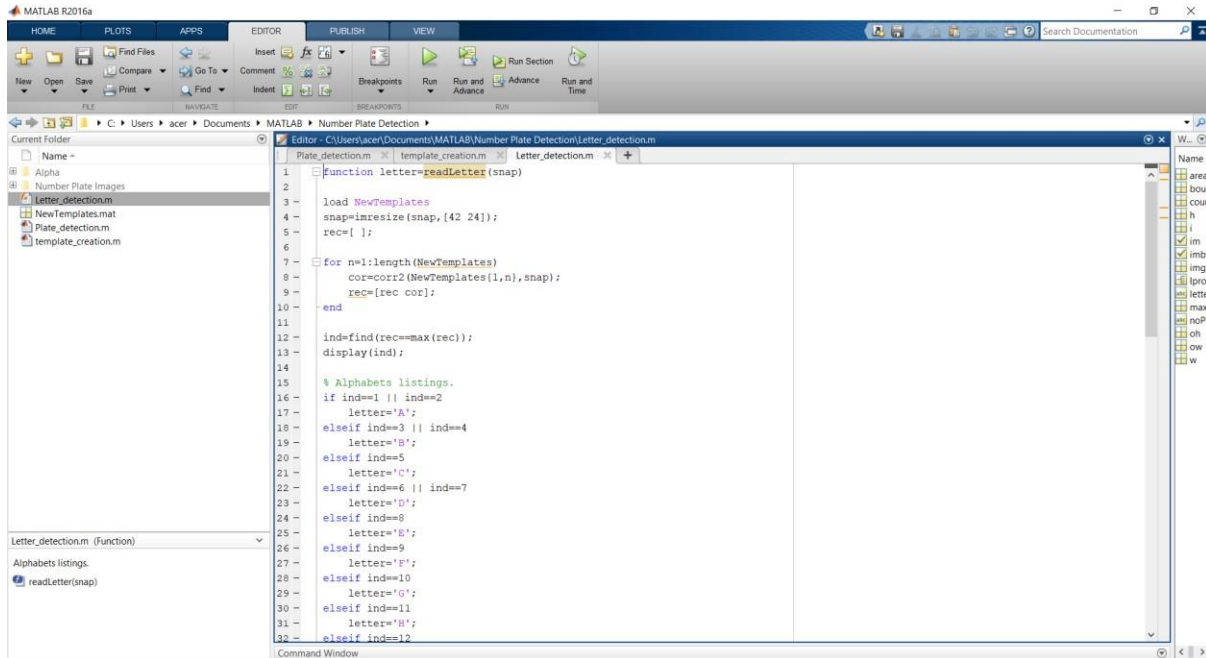
Step-2: Create a letter_detection.m file-This .m file is defined to read the alphanumeric from the input image and find the highest matched corresponding alphanumeric in the matlab library.



```

60 elseif ind==30
61     letter='W';
62 elseif ind==31
63     letter='X';
64 elseif ind==32
65     letter='Y';
66 elseif ind==33
67     letter='Z';
68 % Numerals listings.
69 elseif ind==34
70     letter='1';
71 elseif ind==35
72     letter='2';
73 elseif ind==36
74     letter='3';
75 elseif ind==37 || ind==38
76     letter='4';
77 elseif ind==39
78     letter='5';
79 elseif ind==40 || ind==41 || ind==42
80     letter='6';
81 elseif ind==43
82     letter='7';
83 elseif ind==44 || ind==45
84     letter='8';
85 elseif ind==46 || ind==47 || ind==48
86     letter='9';
87 else
88     letter='0';
89 end
90
91
  
```

Step-3: Create a Plate_detection.m file– This .m file is defined to Process the image and then call the above two m-files to detect the number.

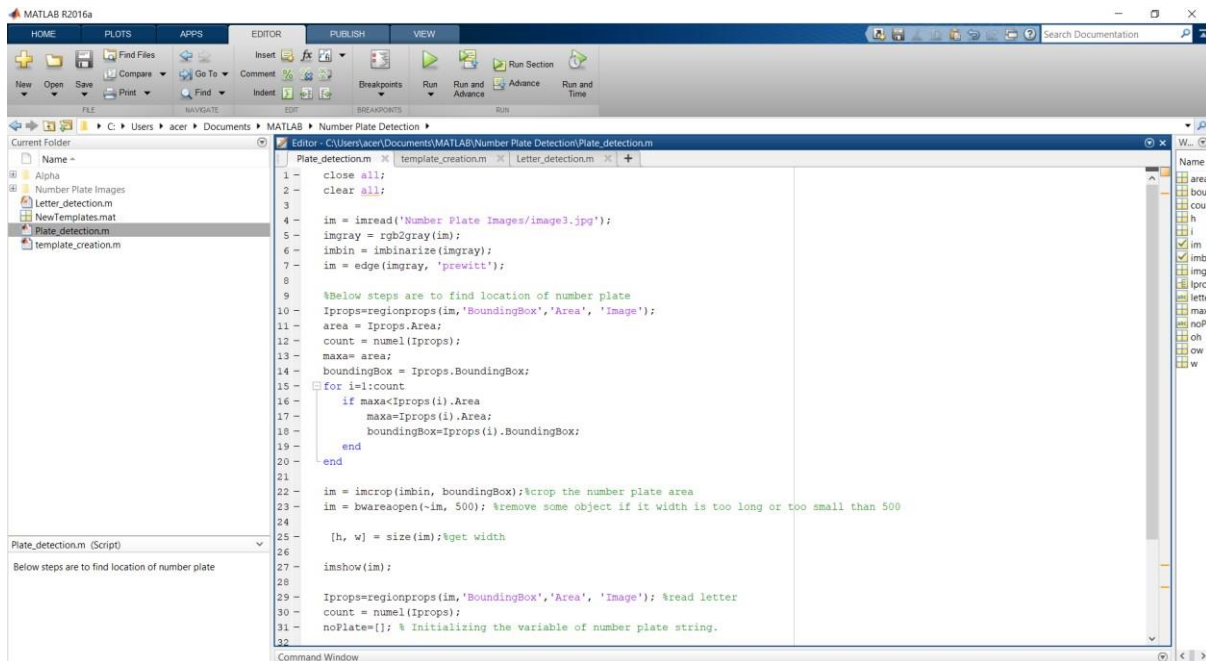


```

1 function letter=readLetter(snap)
2
3 load NewTemplates
4 snap=imresize(snap,[42 24]);
5 rec=[];
6
7 for n=1:length(NewTemplates)
8     cor=corr2(NewTemplates{1,n},snap);
9     rec=[rec cor];
10 end
11
12 ind=find(rec==max(rec));
13 display(ind);
14
15 % Alphabets listings.
16 if ind==1 || ind==2
17     letter='A';
18 elseif ind==3 || ind==4
19     letter='B';
20 elseif ind==5
21     letter='C';
22 elseif ind==6 || ind==7
23     letter='D';
24 elseif ind==8
25     letter='E';
26 elseif ind==9
27     letter='F';
28 elseif ind==10
29     letter='G';
30 elseif ind==11
31     letter='H';
32 elseif ind==12

```

Step-4: Add the files to MATLAB path and run the plate_detection.m file. The processed text can be viewed in the command window.



```

1 close all;
2 clear all;
3
4 im = imread('Number Plate Images/image3.jpg');
5 imgray = rgb2gray(im);
6 imbin = imbinarize(imgray);
7 im = edge(imgray, 'prewitt');
8
9 %Below steps are to find location of number plate
10 Iprops=regionprops(im,'BoundingBox','Area', 'Image');
11 area = Iprops.Area;
12 count = numel(Iprops);
13 maxa= area;
14 boundingBox = Iprops.BoundingBox;
15 for i=1:count
16     if maxa<Iprops(i).Area
17         maxa=Iprops(i).Area;
18         boundingBox=Iprops(i).BoundingBox;
19     end
20 end
21
22 im = imcrop(imbin, boundingBox);%crop the number plate area
23 im = bwareaopen(~im, 500); %remove some object if it width is too long or too small than 500
24
25 [h, w] = size(im);%get width
26
27 imshow(im);
28
29 Iprops=regionprops(im,'BoundingBox','Area', 'Image'); %read letter
30 count = numel(Iprops);
31 noPlate=[]; % Initializing the variable of number plate string.
32

```

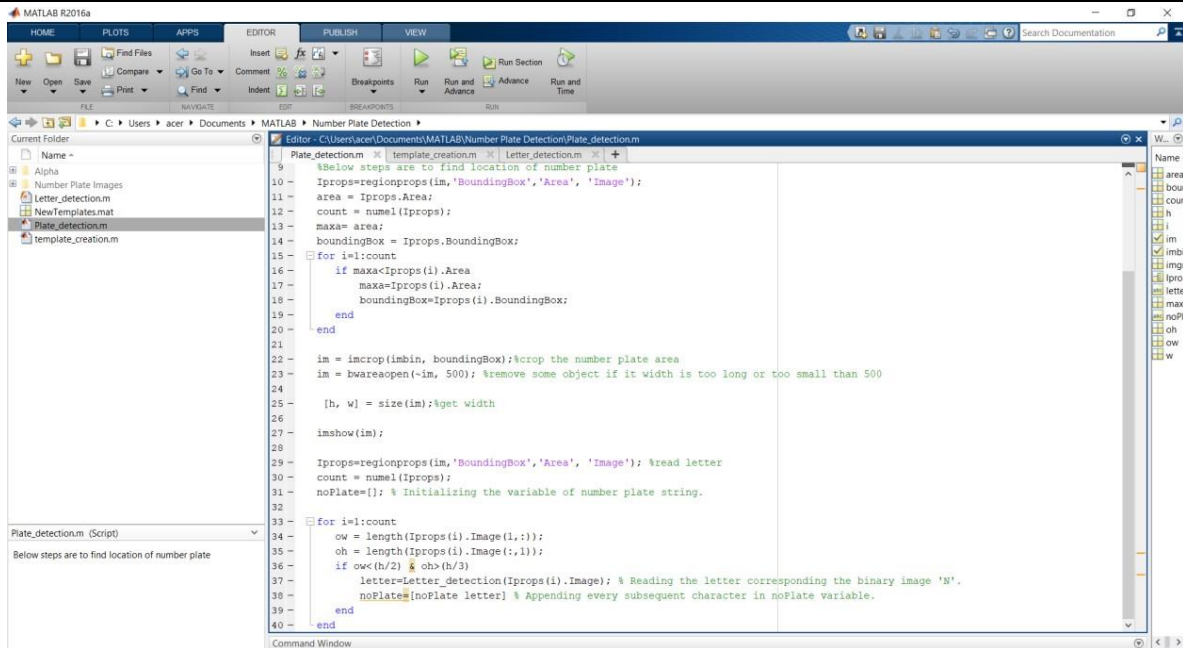



Figure 1: Image Of Number Plate

IV. RESULTS AND DISCUSSION

The given .png/.jpg files will be processed and number plate text is visible in command window.

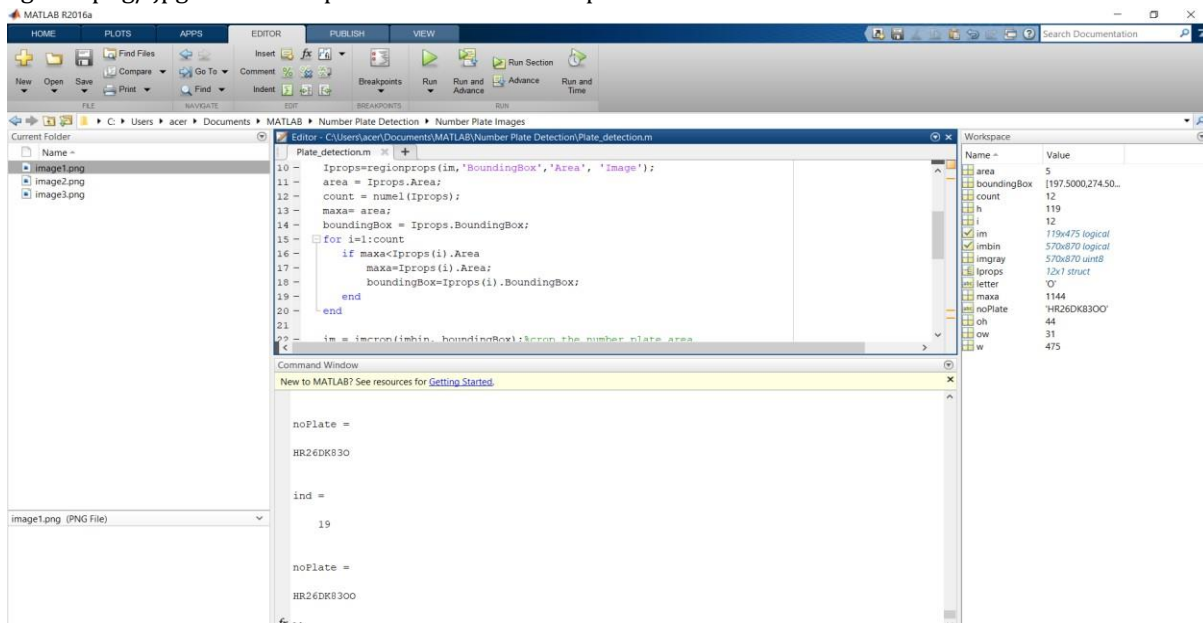


Figure 2: Output In The Command Window



Figure 3: Gray Scaled Image

V. CONCLUSION

We have implemented number plate recognition. Our algorithm successfully detects the number plate region from the image which consists of vehicle number & then character segmentation, recognition. We have applied our algorithm on many images and found that it successfully recognition. The project was designed keeping in mind the automation of the number plate detection system for security reason that could replace the current system of manual entry. This project was a success in recording the number plate of a vehicle although it has got its own limitation of image processing and other hardware requirements.

VI. REFERENCES

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