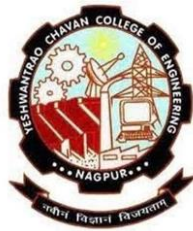


# **Yeshwantrao Chavan College of Engineering**

**Department of  
Electronics and Telecommunication**



## **Project Report**

Innovative Practice: Project Based Learning

Class: VI Sem

Subject: Principles of Image of Processing

Session: EVEN 2022-23

### **Project Title:**

## **Vehicle Number Plate Detection**

**Under The Guidance of**

**Dr. Yogita Chitriv (Dubey)**

**Submitted by:**

- 1. Bhargav Sable - 274**
- 2. Nikhil Talatule -275**
- 3. Yash Barapatre -278**
- 4. Yashraj Tarte - 279**

# Abstract

Checking the Vehicle Number Plate is an important task for traffic monitoring, security and law enforcement. In this project, we are planning a Vehicle Number Plate Detection system using MATLAB. The system plans to use imaging techniques to identify and verify vehicle number plate. The system has three main stages: Pre-processing, number plate identification and character segmentation. The Pre-processing phase includes image resizing and noise removal. The plate analysis phase consists of edge recognition, morphological operations, and selected areas of interest. Finally, the character segmentation stage uses a combination of features and thresholds to separate characters in the detected number plate. The proposed method has been tested on the vehicle image dataset and good results have been obtained. The proposed system can be used in real-world applications such as toll collection, parking lot management, and law enforcement.

# Introduction

Vehicle Number Plate Detection is an essential task in Intelligent Transportation Systems (ITS). It is an important application of computer vision technology. It has a wide range of applications such as automatic toll collection systems, automated parking systems, traffic monitoring systems, etc. The purpose of this project is to develop a Matlab-based system for detecting and recognizing vehicle number plates in real-time using image processing techniques. One of the challenging tasks in this field is to detect the number plate accurately and efficiently from an image or video stream. In recent years, there has been an increasing demand for developing automated systems that can detect number plates in real-time with high accuracy. The system is designed to capture the image of a moving vehicle, detect its number plate, and extract the characters from the plate using Optical Character Recognition (OCR) techniques. The system uses a combination of image processing techniques such as image segmentation, morphological operations, edge detection, and feature extraction to detect the number plate region in the image. Once the number plate region is detected, the characters on the plate are recognized using OCR techniques. The performance of the system is evaluated using various metrics such as accuracy, processing time, and detection rate.

# Methodology

The Working model for vehicle number plate detection using Matlab can be divided into several steps, as follows:

1. Image Acquisition: An image of a vehicle with a number plate is captured using a camera or retrieved from a dataset.
2. Pre-processing: The acquired image is pre-processed by performing operations such as resizing, noise removal, contrast enhancement, and image filtering to prepare it for further processing.
3. Plate Detection: A plate detection algorithm is applied to locate the number plate region in the pre-processed image. This can be done using techniques such as edge detection, morphological operations, and colour thresholding.
4. Plate Segmentation: The number plate region is segmented to separate the characters from the background. This can be done using techniques such as connected component analysis and contour analysis.
5. Character Recognition: The segmented characters are recognized using optical character recognition (OCR) techniques such as template matching, feature extraction, and machine learning.

6. Output Display: The recognized characters are displayed as the final output, along with the original image and the location of the detected number plate.

The above methodology can be implemented using various techniques and algorithms in Matlab, depending on the specific requirements and constraints of the application.

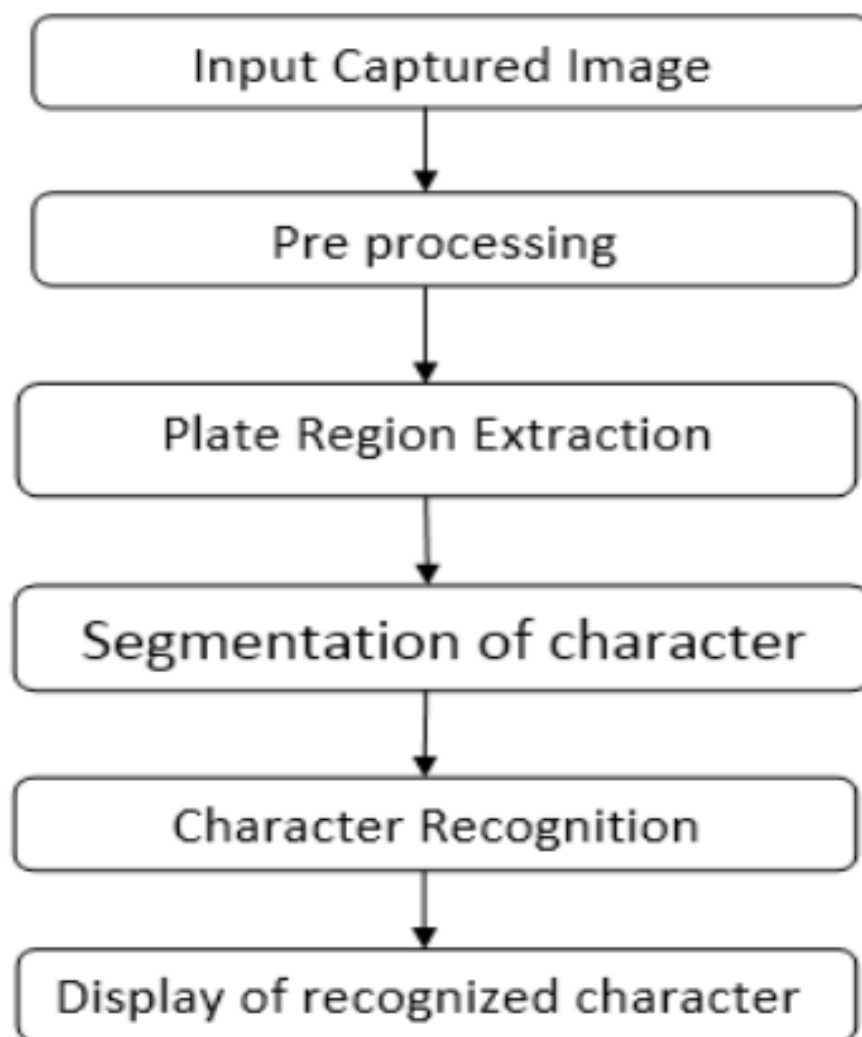


Fig 1 : Flow Diagram for Vehicle Number Plate Detection

# Result and Discussion:

The experiment is successfully carried out by using the above said methodology in MATLAB (R2022b). For this, we have taken different images with varying sizes.

## Experiment No. : 1

As our initial experiment, we have taken an image of size 960x1280 pixels which is then prepossessed to get the number plate. The characters are then segmented. The results are shown below:



Fig 2.1 : Input Image of 960x1280 pixels



Fig 2.2 : Extracted Number Plate and highlighted Numbers

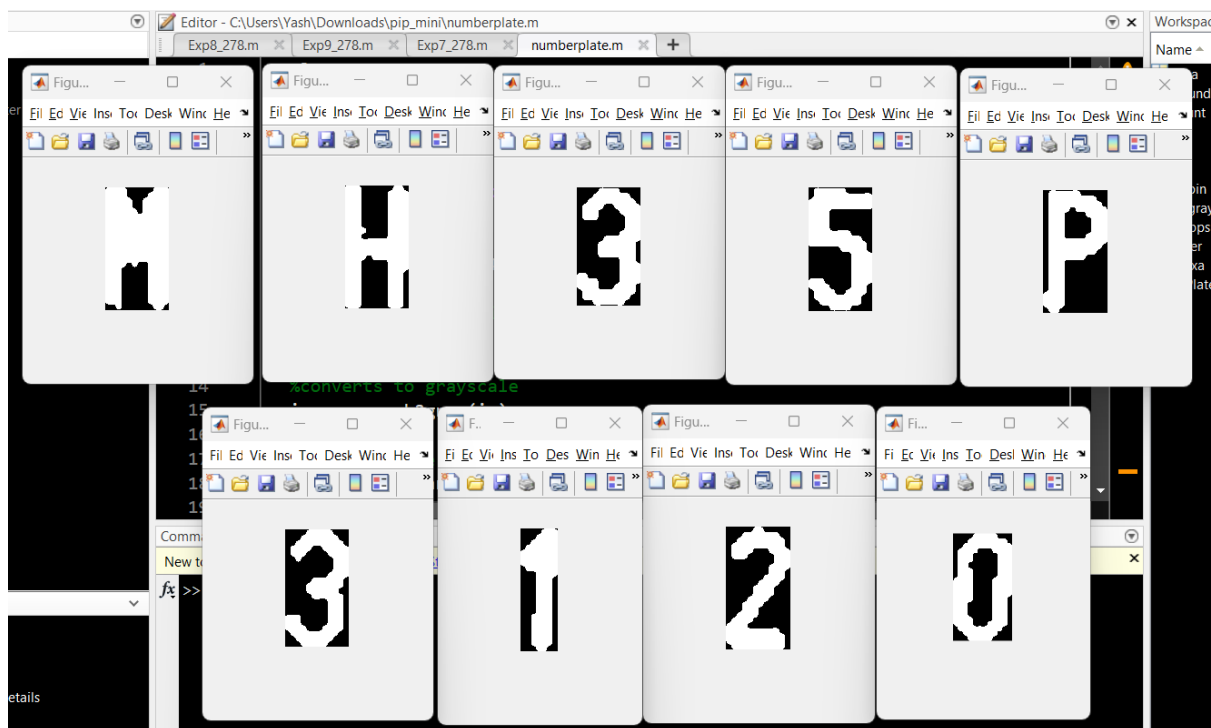


Fig 2.3 : Each Extracted Character

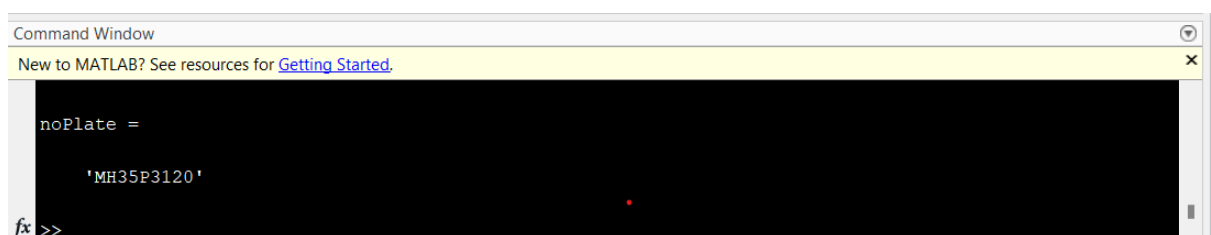


Fig 2.3 : Each Extracted Character in command window

## Experiment No. : 2

The experiment is further carried out with a few more images of varying sizes and then the same above mentioned steps are repeated to get the expected results. The figures below shows the results obtained for an input image of size 422x176 pixels.



Fig 3.1 : Input Image of 422x176 Pixels



Fig 3.2 : Extracted Number Plate and highlighted Numbers



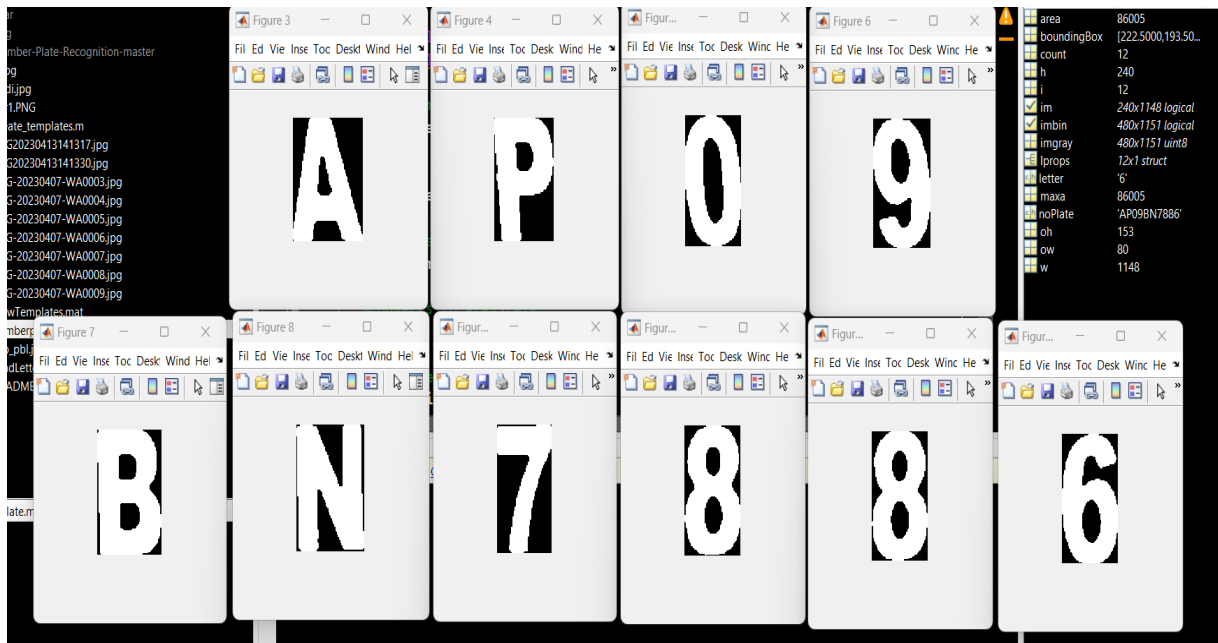


Fig 3.3 : Each Extracted Character

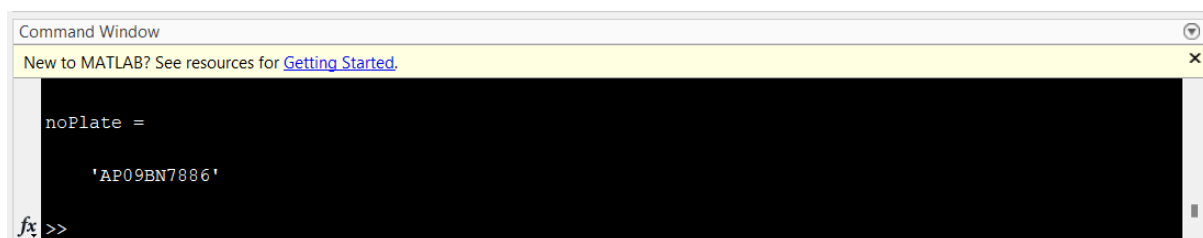


Fig 3.3 : Each Extracted Character in command window

## Experiment No. : 3

The experiment is further carried out with a few more images of varying sizes with some different to check either it can detect or not and then the same above mentioned steps are repeated to get the expected results. The figures below shows the results obtained for an input image of size 4608x3456 pixels.



Fig 4.1 : Input Image of 4608x3456 Pixels



Fig 4.2 : Extracted Number Plate and highlighted Numbers

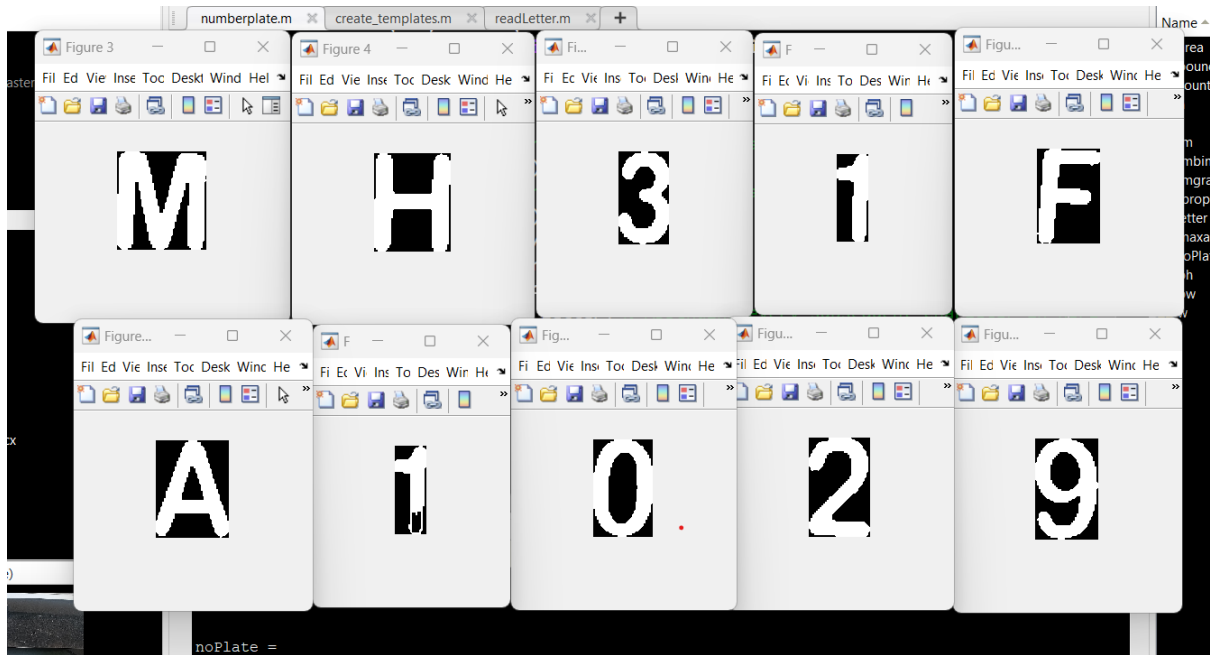


Fig 4.3 : Each Extracted Character



Fig 4.3 : Each Extracted Character in command window

# Conclusion

The Successful implementation of Vehicle Number Plate Detection is Done. The system takes an input image of a car with a number plate and processes it through a series of image processing steps. The input image is first resized, converted to grayscale, and binarized. Edge detection is performed on the grayscale image using the Sobel algorithm. The resulting edges are dilated and holes are filled, and the solid parts of the image are extracted. The largest solid area in the image is then identified as the location of the number plate. The number plate is cropped from the original image and further processed. Dust is cleared, and objects with widths outside a certain range are removed. The resulting image is then analyzed to detect individual characters of the number plate using regionprops. Each character is extracted and identified using the readLetter function, and the resulting characters are concatenated to form the final number plate string. The code outputs the final number plate string and displays the processed image with green boxes around the detected characters.

# Implementation as per plan

For the Implementation of this Project We have created the three m files which having different functions are as follows:

1. Template Creation(create\_template.m) : This is used to call the saved images of alpha-numeric and then save them as a new template in MATLAB memory.
2. Letter Detection(readLetter.m) : Reads the characters from the input image and find the highest matched corresponding alphanumeric.
3. Number Plate Detection(numberplate.m) : Process the image and then call the above two m-files to detect the number.

## Explanation of Functions Used

1. **imread()** – This command is used to open the image into the MATLAB from the target folder.
2. **rgb2gray()** – This command is used to convert the RGB image into grayscale format.
3. **imbinarize()** – This command is used to Binarize 2-D grayscale image or simply we can say it converts the image into black and white format.
4. **edge()** – This command is used to detect the edges in the image, by using various methods like Roberts, Sobel, Prewitt and many others.
5. **regionprops()** – This command is used to measure properties of image region.
6. **numel()** – This command is used to calculate the number of array elements.
7. **imcrop()** – This command is used to crop the image in the entered size.
8. **bwareaopen()** – This command is used to remove small objects from binary image.

## References

[1] Prof.Amit Kukreja<sup>1</sup> Swati Bhandari<sup>2</sup>, Sayali Bhatkar<sup>3</sup>, Jyoti Chavda<sup>4</sup>, Smita Lad<sup>5</sup> "Indian Vehicle Number Plate Detection Using Image Processing" Volume: 04 Issue: 04 | Apr -2017.

[2] Ragini Bhat<sup>1</sup>, Bijender Mehandia<sup>2</sup> "RECOGNITION OF VEHICLE NUMBER PLATE USING MATLAB" Vol. 2, Issue 8, August 2014

[3] Ravi Kiran Varma Pa \*, Srikanth Gantaa , Hari Krishna Bb , Praveen SVSRKc "A Novel Method for Indian Vehicle Registration Number Plate Detection and Recognition using Image Processing Techniques" 167 (2020) 2623–2633

[4] Ankit Tanna, Darshan Patel, and Dharmendra Patel.  
"Real-Time Vehicle Number Plate Detection and Recognition using Image Processing"

[5] S. S. Singh, S. K. Gupta, and S. K. Jain. "License Plate Detection and Recognition using Image Processing Techniques"



**THANK YOU**