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PROJECT REPORT

on

“Number Plate Detection”

Submitted in partial fulfillment of the requirements for the IV Semester
Digital Image Processing using MATLAB (UE18CS257E)

Bachelor of Engineering
IN

COMPUTER SCIENCE AND ENGINEERING

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BY

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CERTIFICATE

Certified that the project work entitled “**Number Plate Detection**” is a bonafide work carried out by **Waris KR** bearing USN: **PES2201800315**, **Tushar Dixit** bearing USN: **PES2201800138**, **Tejus D** bearing USN: **PES2201800148**, students of **PES University EC CAMPUS** in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the **Pes University, Bangalore** during the year 2019-2020.

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Declaration

We hereby declare that the project entitled “**NUMBER PLATE DETECTION APP**” submitted for Bachelor of Engineering in Computer Science and Engineering of Pes University, Bangalore is my original work and the project has not formed the basis of the awards of any degree, associate ship, fellowship or any other similar titles.

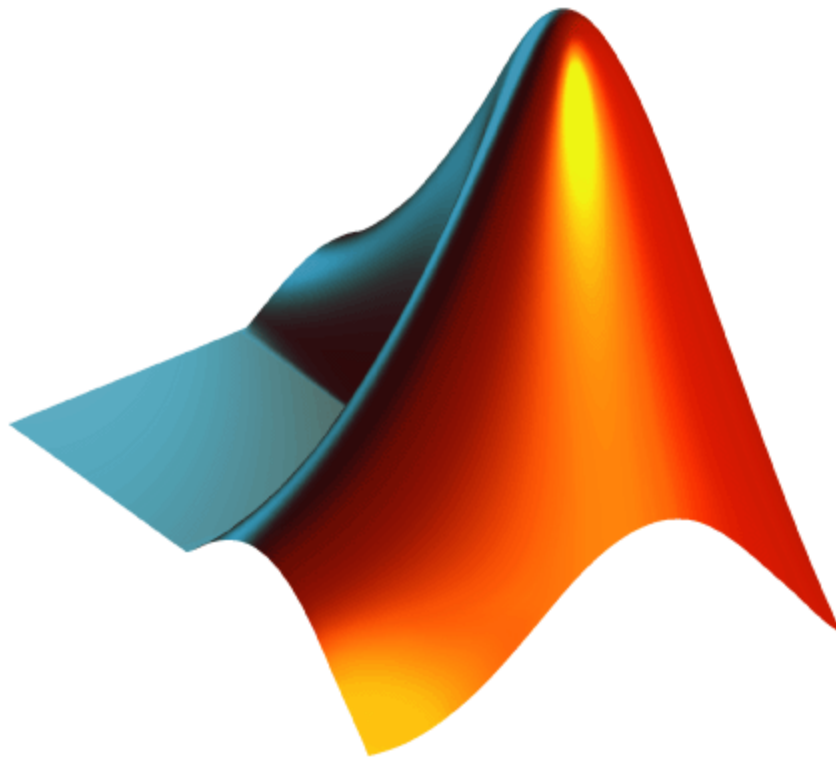
Signature of the Students:

Place: Bangalore

Date:

DIGITAL IMAGE PROCESSING USING MATLAB

Vehicle Number Plate Recognition



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-Sem 4, Section - B

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Abstract

Automobile Number Plate Recognition and Extraction System using Optical Character Recognition Methodology is one of a kind Intelligent System and is of considerable interest because of its potential applications in highway electronic toll collection and traffic monitoring system. This type of application puts high demands on the reliability of the System. A lot of work has been done regarding license plate recognition systems for Korean, Chinese, European and US license plates that generated many commercial products. However, little work has been done for Indian license plates recognition systems.

The purpose of this research is to develop an application which recognizes license plates from vehicles. The system takes images of automobiles as input and processes them. Once a license plate is detected, its digits are recognized and displayed on the User Interface. This work focuses on the design of a single algorithm used for extracting the license plate from a single image, isolating the characters of the plate and identifying the individual characters.

1. Introduction

Automobile number plate recognition and extraction is an image-processing technology used to identify automobiles by their license plates. The vehicle number plate recognition was invented in 1976 at the Police Scientific Development Branch in the UK. This technology is gaining popularity in security and traffic installations.

In a sense, the automobile number plate recognition with OCR is a combination of integrated hardware and software that will read vehicle license plates without the need of humans to do it. The concept of the system is to identify properly and locate the vehicle they are looking for.

It is a type of technology, mainly software that enables computer systems to read automatically the registration number (license number) of vehicles from digital pictures. Reading automatically the registration number means transforming the pixels of the digital image into the ASCII text of the number plate.

1.1 Project Description

It is a vehicle's number/license plate recognition algorithm based on the very elementary technique of Templates matching. The algorithm takes an input image of the number plate (number plate should be dominant in the image) and after filtering the image, it performs region based operations. Then it tries to capture the characters regions in a processed binary image and with the aid of template matching outputs the string of number plate characters.

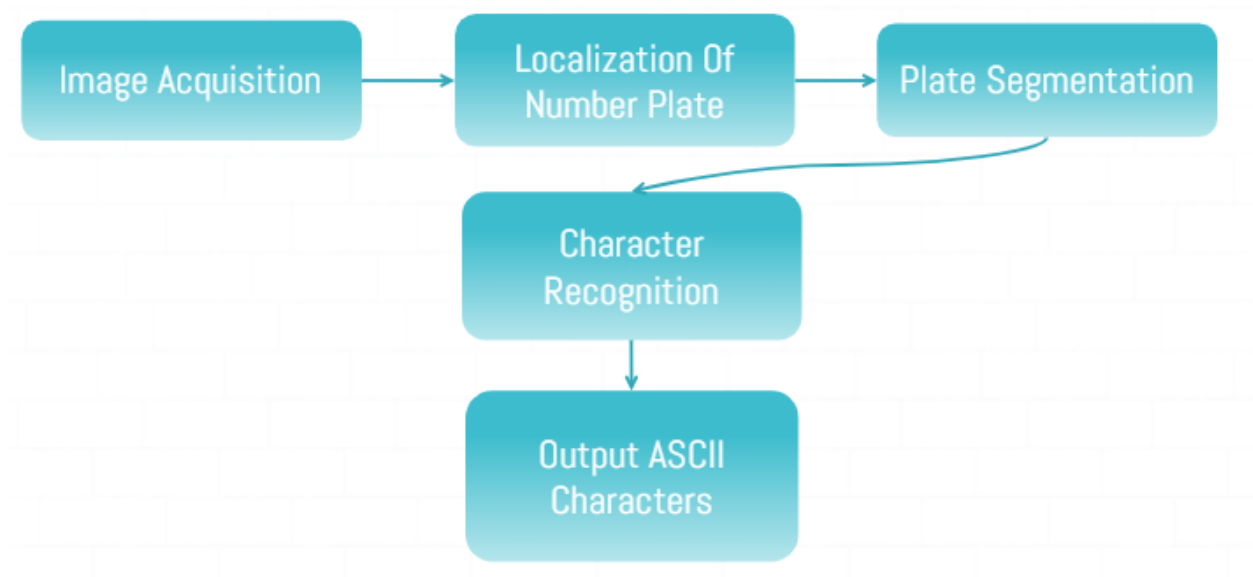
The system presented is designed to recognize number from license plates from the front and rear of the automobile. Input to the system is an image sequence acquired by a digital camera that consists of a license plate and its output is the recognition of characters on the license plate.

The system consists of the standard four main modules in the Automobile Number Plate Recognitions and Extraction System viz. Image acquisition, Automobile Number plate extraction, Automobile Number plate segmentation and Automobile Number plate recognition.

1.2 Team Members

1. Waris KR (PES2201800315)
2. Tushar Dixit (PES2201800138)
3. Tejus D (PES2201800148)

2. Proposed System



2.1 Module Description

1. Image Acquisition: This phase deals with acquiring an image using an appropriate method for acquisition.
2. Localization Of Number Plate: It finds the object with the largest area in the image and localize it.
3. Plate Segmentation: In the localized image it finds all separate objects as characters to process them separately.
4. Character Recognition: Now, each character is matched against the stored templates and whichever has the most correlation is stored in output string.

Process:

1. Template Creation: The file `template_creation.m` creates a `NewTemplates.mat` file which contains all the templates of characters of uniform size. During the Character Recognition, these templates are matched against all the characters to recognize them.
2. Plate Detection: The file `Plate_detection.m` is the main file responsible for processing all the input images, finding edges, finding objects and resizing them. It then sends the processed objects obtained from an image for character recognition.
3. Letter Detection: The file `Letter_detection.m` is the file responsible for matching the templates against the characters. The `Plate_detection.m` file after processing calls `Letter_detection` for each character one by one and it finds all the correlation values against all templates and stores them. Then it identifies the character template matching the correlation value and recognizes that character.
4. Finally, `Plate_detection.m` stores all the characters returned from `Letter_detection` in an output string.

Note: During the pre processing of the image, we have used Prewitt operator for Edge Detection but, after testing with multiple images results show that Canny Edge Detection works equally well for all the images.

2.2 Hardware And Software Requirements For Development

1. Hardware Requirements:

- Ram: 8 GB
- Processor: AMD Ryzen 5
- Hard Disk space: 20GB

2. Software Requirements:

- Operating System: Windows 10
- MATLAB 2020a

Screenshots

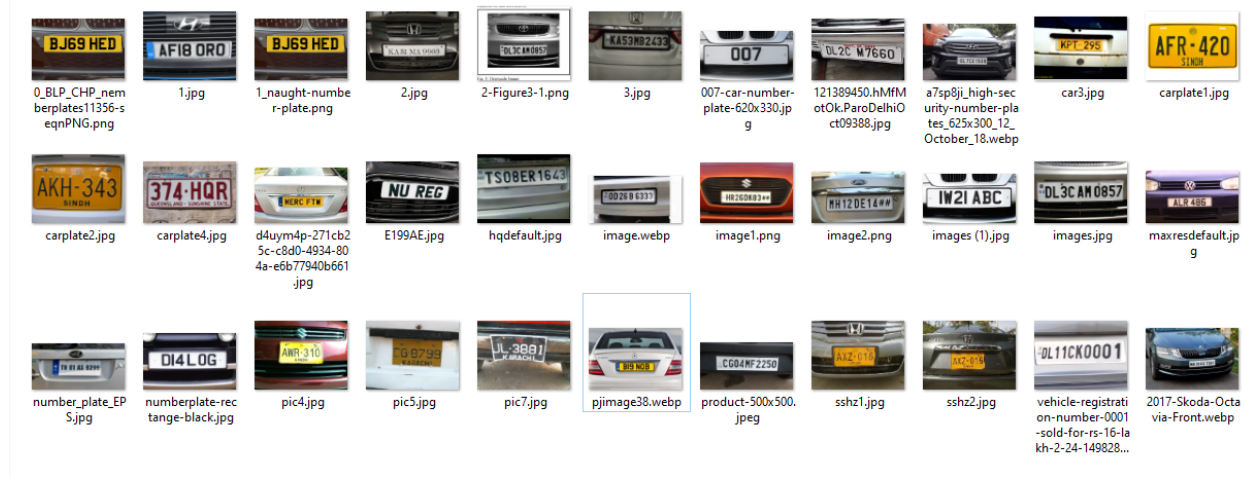
1. Template characters:



2. Creation of templates:

```
34
35 %Creating Array for Alphabets
36 letter=[A Afill B Bfill C D Dfill E F G H I J K L M...
37 N O Ofill P Pfill Q Qfill R Rfill S T U V W X Y Z];
38 %Creating Array for Numbers
39 number=[one two three four fourfill five...
40 six sixfill sixfill2 seven eight eightfill nine ninefill ninefill2 zero zerofill];
41
42 %NewTemplates=[letter number];
43 character=[letter number];
44
45 NewTemplates=mat2cell(character,42,[24 24 24 24 24 24 24 24 ...
46 24 24 24 24 24 24 24 ...
47 24 24 24 24 24 24 24 ...
48 24 24 24 24 24 24 24 ...
49 24 24 24 24 24 24 24 ...
50 24 24 24 24 24 24 24 ...
51 24 24 24 24 24 24 24]);
52
53
54 save ('NewTemplates','NewTemplates')
```

3. Images For Testing:



4. Pre-processing



Original Image



Grayscale Image

Binary Image

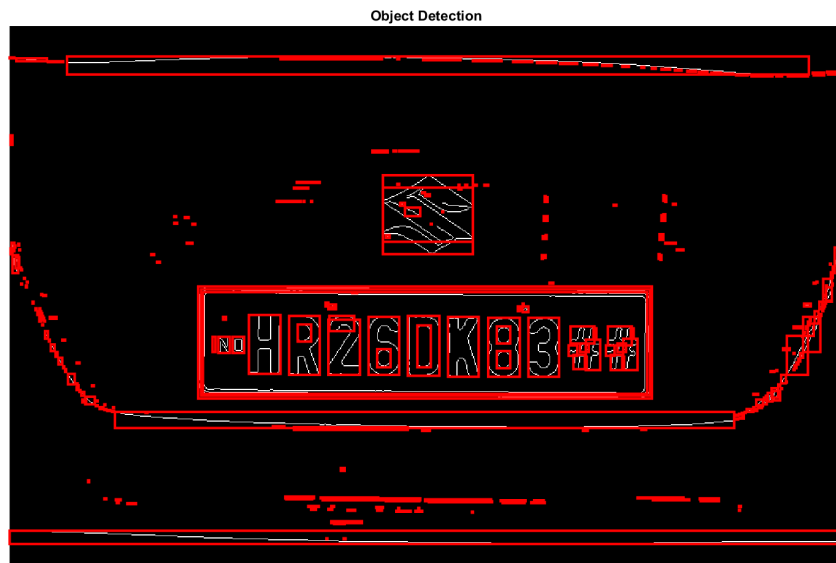


Binary Image

Detected Edges Using Prewitt Operator



Edge Detection Using Prewitt Operator



Object Detection Using Bounding Boxes

5. Image Segmentation:

Cropped image



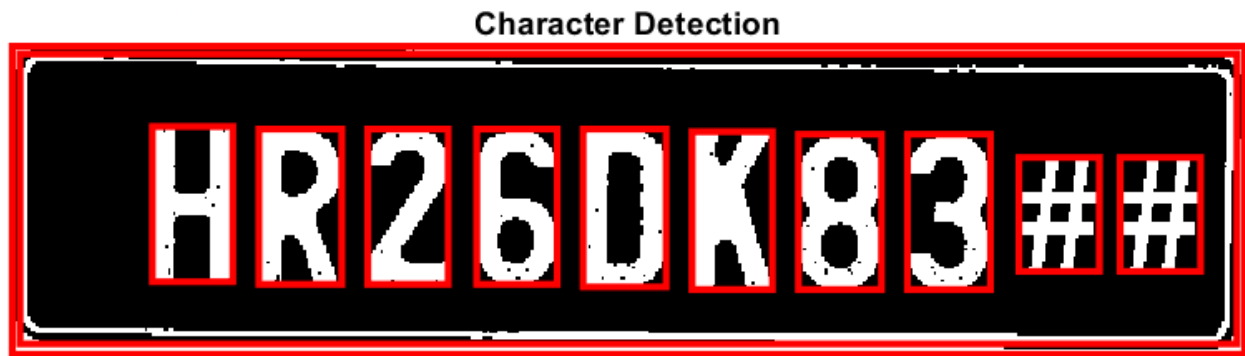
Cropping around the largest area found in the image

After complementing and removing smaller objects



Complementing the image to match the characters with templates

6. Character Recognition:



Object/Character Detection using Bounding Boxes

```
Command Window
New to MATLAB? See resources for Getting Started.

noPlate =
    'HR26DK8300'

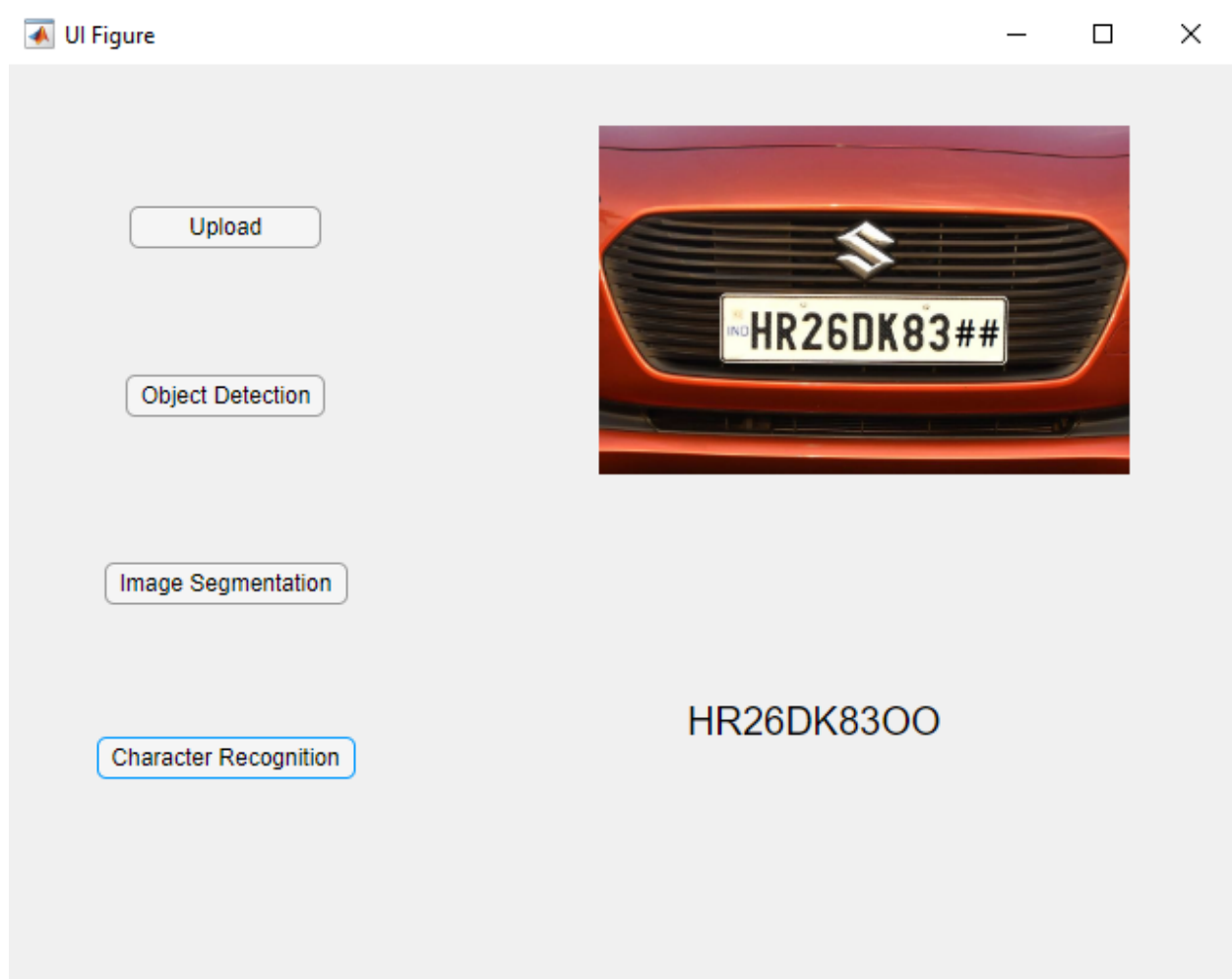
fx >>
```

Activate Windows
Go to Settings to activate Windows.

UTF-8 script Ln 42 Col 1

Final Output String

7. GUI Using MATLAB App Designer



Conclusion

The process of Automobile Number Plate Recognition and Extraction System implemented in this system has successfully optimizing the speed and efficiency of the system by reducing the image recognition algorithm for alphabets and number reading into one algorithm only which easily and efficiently reduces the complexity of splitting and merging the image of the extracted number plate. It has also reduced the noise from the final output image and provides an output which is noise free and the background suits the font color of the number on the automobile license plate.

We get an overall efficiency of 90% for this system. Though this accuracy is not acceptable in general, but still the system can be used for vehicle identification. It may be concluded that the project has been by and far successful. It can give us a relative advantage of data acquisition and can provide a much faster automobile number recognition as compared to previously available systems.

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