

Number Plate Recognition For Society Security Using Image Processing

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Abstract : This is Automatic Number Plate Recognition is used to detect the number plate automatically. In this project for number plate recognition, the most popular image processing technique is used. This number plate recognition is used for security purpose in many applications. With the process of some tasks on the image by the following algorithm as detection, segmentation, pre-processing, features extractions and recognition for detection of the number plate is used. In features extraction HOG (Histogram Oriented Of Gradient) method is used. For number plate detection the different classifier of machine learning such as KNN, SVM, etc is used. From this classifier KNN classifier of machine learning which gives an accuracy of 93% is used. This detection technique can recognition many different fonts, character, and number but the problem occurs for detection number plate when the number plate is covered with dirt on the plate, etc.

Index Terms - HOG, Image processing, KNN, Machine learning, Number plate recognition.

I. Introduction

Automatic Number Plate Recognition is used to detect the number plate automatically by using less human resources and become more important in recent years. The importance of automatic number plate recognition is increased because of increasing the number of vehicles in India.

The number plate is having a standard pattern in India shown below.

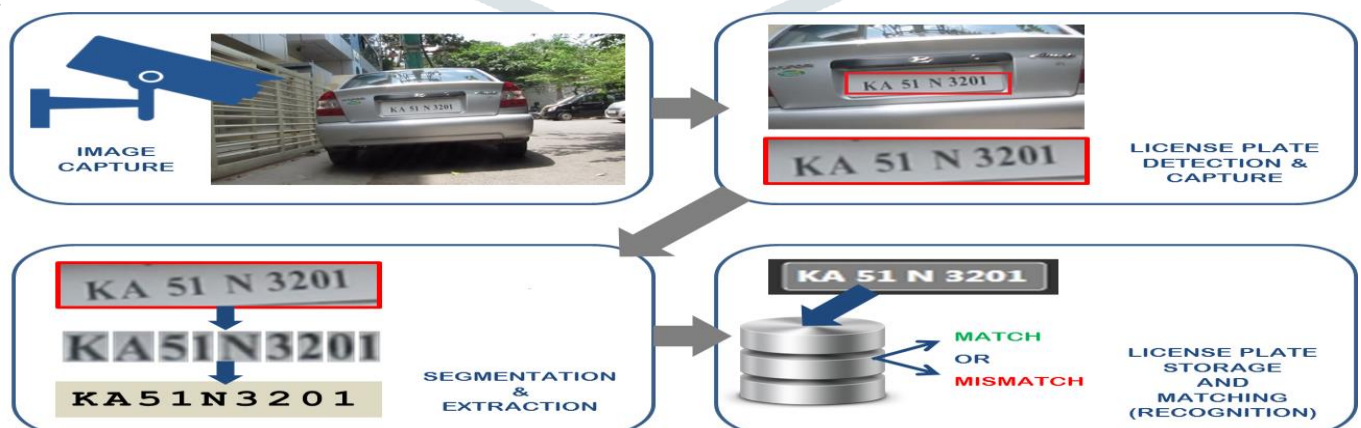
XX-MM-YYYY

Where XX represents the state or Union Territory in initial letters MM represents sequential number of a district and YYYY represents a unique vehicle number.

The Automatic Number Plate Recognition uses three main parts which are shown in Fig 1.

1. Number plate detection: which detects the number plate
2. Number plate segmentation: Extract the numbers and character front number plate
3. Number plate recognition: recognize each character and number.

Figure 1. Example of number plate with processing



In this paper, firstly Image is detected which consist of a number plate. After Image detection, the number plate is segmented which extract the number and characters. For features extraction HOG (Histogram Oriented of Gradient) method is used. With the help of machine learning techniques i.e. KNN classifier for recognition the number plate characters and numbers.

II. Literature survey

This paper suggest the technology use for vehicle number plate recognition in society for security .In this initially image is capture and preprocessing on image of number plate is done. In this for detection various techniques are use like detection through Haar like features and detection through edge detection . This approach presents system takes less time to execute. For number plate recognition OCR (Optical Character Recognition) technique is proposed which returns ASCII value of characters [1].

The number plate is localized by contour tracing method. For detection of number plate edge detection technique is proposed in which morphology and number plate identification is done. The segmented characters are compared with the training set and best similarity is measured and displayed. In this approach, NetBeans, OpenCV, MySQL, these software tools are suggest for managing the storage and windows, to fill the information of owner[2].

This paper suggest OCR (Optical Character Recognition) technique for character recognition. The main task is to measure the distance using ultrasonic sensor, if vehicle comes in range then capture the image convert it into text using OCR, compare this image with the existing number plate if number plate matched then gate will open otherwise it will remain closed [3].

In this for segmentation ROI (Region of Interest) method is use. PCA (Principle Component Analysis) method is use for feature extraction of segmented characters which is based on parameters and matrix values of character. To recognize the segmented image Convolution Neural Network (CNN) classification is use in which train our system and use same modal for recognition [4].

In [5] character is segmented with the help of location matrix. For recognition template matching and neural network technique is proposed and approximately matching take as an output. MATLAB GUI is software tool which is used in this paper for interfacing.

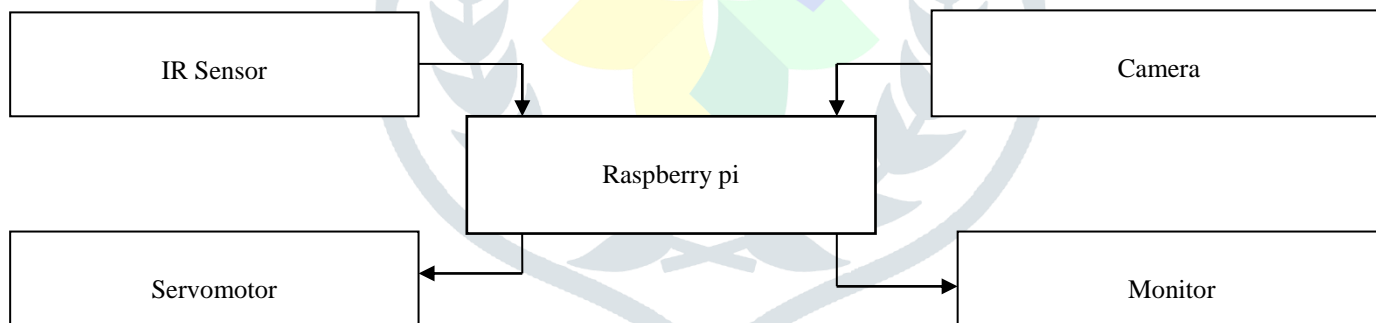
III. Proposed System

Basically, the main aim of this project is for security purpose. This system has four major parts i.e. Number plate detection, segmentation, Feature extraction, character recognition. In this project the first step is vehicle number plate detection. Fig. shows the block diagram of vehicle number plate detection.

A. Hardware Block Diagram

The Image or Frames are usually captured from the camera. In this system, first stage is captured the image of the vehicle number plate from the camera and output of this stage is portion of the vehicle number plate. The number plate can be classified by its features like Boundary of the edges, color, and size. Resolution of the camera is 640 x 480 pixels.

Figure 2. Block Diagram



- **Raspberry Pi -**

Raspberry Pi is the heart of this processing system. It is the low-cost computer and pocket-sized electronic board that might find inside a PC or laptop but not much in large size. Instead of using the whole processing unit or a computer ,Raspberry Pi is used which has inbuilt operating system. Raspberry Pi has total 40pins in which 27 pins are of GPIO pins(General Purpose Input and Output) and remaining pins are used for Power supply (VCC) and ground (GND).Raspberry Pi requires a micro SD storage and HDMI port for video output.

- **Camera -**

The Image or Frames are usually captured from the camera. The vehicle number plate can exist anywhere in an image. In this system, first stage is captured the image of the vehicle number plate from the camera and output of this stage is portion of the vehicle number plate. The number plate can be classified by its features like Boundary of the edges, color, and size. Resolution of the camera is 640 x 480 pixels.

- **IR Sensor -**

IR sensor means infrared sensor is an electronic device in order to sense the some objects of surroundings as well as detects the motion of the object. In this project, IR sensor is used only for sense the presence of vehicle.

- **Servo Motor -**

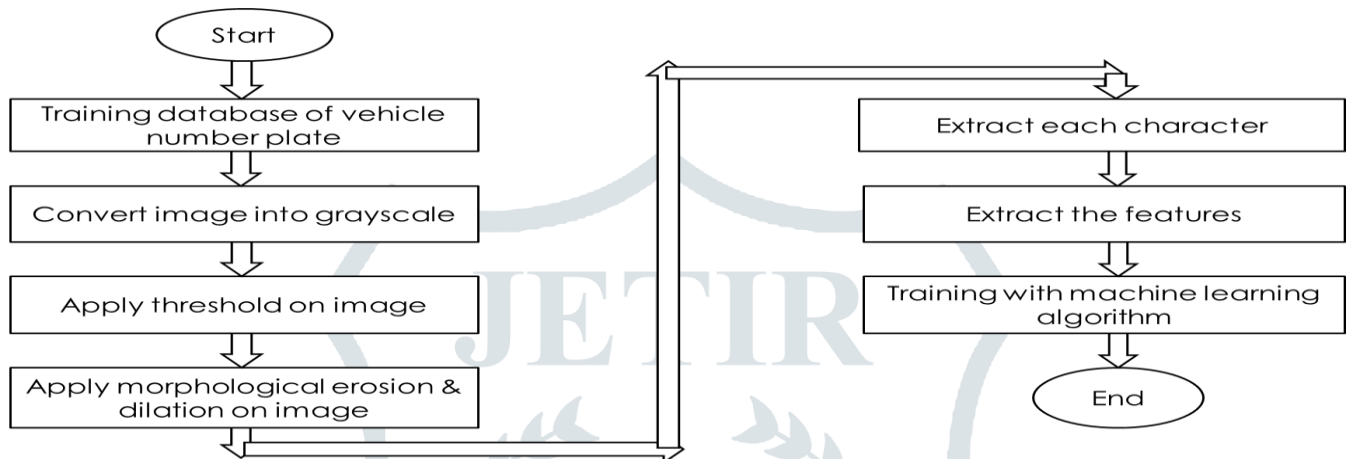
Servo motor is a DC motor which has three pins is of VCC,PWM and ground(GND) respectively. It is basically works on a PWM signal controlled by sending a PWM signal (Pulse Width Modulation). It actually rotates in 0 to 180 degree. It is used in robotics, solar tracking system, CNC machine, textiles, and printers. In this project servo motor is mainly used for gate opening and closing.

- **Monitor –**

Monitor is a screen which shows the information or pictures. It is mainly used for whether the number plate is matched or not in the project.

B. Methodology

Flowchart -

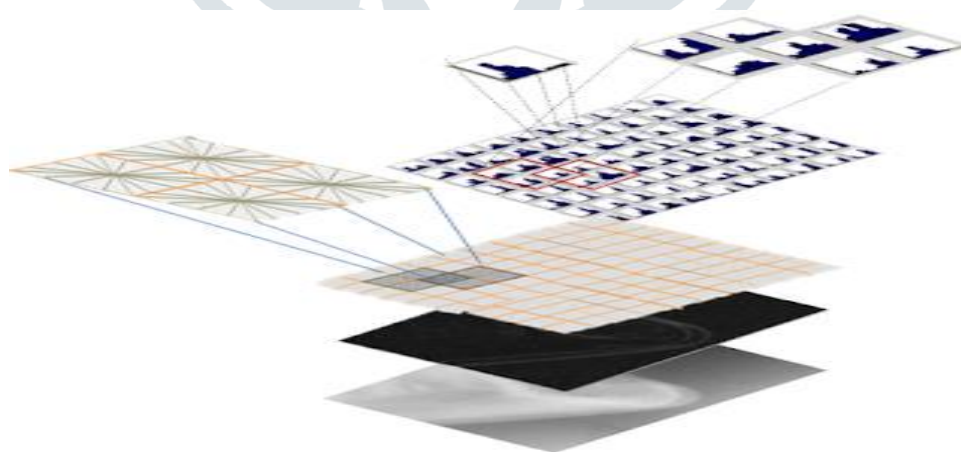


Initially camera capture the image of vehicle, that image is converted into binary image. Apply preprocessing method on binary image i.e. morphology, detection, segmentation. After segmentation extract the features of image. For extraction, HOG (Histograms of oriented gradients) technique is use in which 8x8 pixel cell is use to generate gradient vectors which represents as histogram. At each pixel image gradient(x-direction and y-direction) and magnitude is calculated.

$$\text{Gradient magnitude} = \sqrt{x^2 + y^2}$$

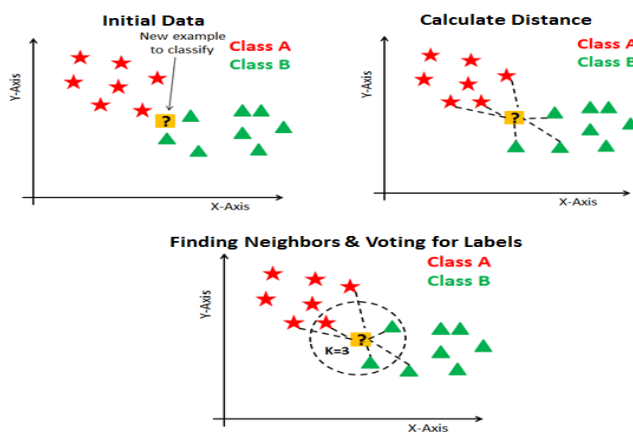
$$\text{Gradient angle} = \tan^{-1}(x/y)$$

Figure 3. HOG Descriptor



In character recognition, KNN is a learning algorithm which means K nearest neighbors. KNN is a method which is used for classification. This algorithm consist of database which will used for identifying classes. Using these classes the future input data will be classified into the classes that were created using the database. Thus this will be helpful for prediction.

Figure 4. KNN Classifier



IV. Results

- 1) When number plate is matched

Figure 5. Original Image



Figure 6. Dilation Image



Figure 7. Result Window

```
Shell
out is:
out is:
out is:
out is:
out is:
out is:
Predicted license plate:
AP27CR6193
Number Plate Matched
```

V. Conclusion

This paper is helpful for detection and recognition of number plate. In this paper the recognition is not accurate compared to ideally. Based on SVM and KNN classifiers of machine learning the KNN classifier accuracy is better than SVM classifier. In this system the KNN classifier gives accuracy of 93% and SVM gives accuracy of 91%.The recognition will be difficult when there is dirt on the number plate in rainy season.

VI. References

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