

Automatic Number Plate Recognition System using Raspberry Pi



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Abstract : Automatic Number Plate Recognition System is an embedded system that acknowledges the vehicle number plate automatically. Automatic Number Plate Recognition is a technology for computer vision to find the number plates of vehicles from the images. There are many applications like parking, access control, security system, etc. In this paper, we propose a technique of implementing Automatic Number Plate Recognition System using Python and Open Computer Vision Library. The different stages that are involved in the implementation are conversion into gray scale, conversion into binary image, detects the edges of the image, to find the contours and finally displays the number plate of a vehicle.

Keywords : Automatic Number Plate Recognition, Computer Vision, Gray Scale Image, Binary Image, Contours.



Figure.1 Number plate of a vehicle

I. INTRODUCTION

With the increasing number of vehicles in today's world it may not be possible to keep a record of the entire vehicle manually. It requires manpower to note down the number and hence it is time consuming. Furthermore the data stored manually cannot be accessible after a long time. So in order to overcome all these problems we have developed a system which would automatically detect the number plate and store it in its database. Later on the information can be accessed when required. This process gives the correct result compared to manually one. The process of working involves that as soon as the vehicle enters the specific area the system automatically captures the images and stores it. The processing of the image is done through the number plate recognition (NPR) software which is stored in the system. If the vehicle matches the stored data then it allows to pass through the gate. And if the vehicle is not matched or if its marked in the blocked list then it do not allow to cross the gate and further checking process are followed.

There are many applications like parking , Toll collection, security system and etc. For identification purposes, a number plate is a metal or plastic plate connected to a vehicle. A vehicle's registration number is an alphanumeric code as shown in Fig 1..

II. PRELIMINARIES IN NUMBER PLATE RECOGNITION SYSTEM

Section II explains about the number plate recognition system, OpenCV, and Raspberry Pi in detail.

A. Number Plate Recognition

Number Plate Recognition is the process which uses the extracting method for recognizing the characters on the number plate. License plates in India generally may be black characters printed on either white or yellow plate [1] . So, the classification is based on the two types of Indian plates [2]. The proposed Automatic Number Plate Recognition (ANPR) could be a Computer vision technology used to extract image number plates using Open Computer Vision library (OpenCV) platform in Python [3]..

B. OpenCV

OpenCV is an image processing library for real time computer vision applications using python, C and C++. Open Source and free and may have some commercial packages [4]. It is easy to use and install. OpenCV provides a simple window manager with sliders, mouse, call backs etc, and uses Intel Integrated performance primitives to enhance image and video applications in computer vision .

C. Raspberry Pi

It is a low power based computer intended for multiple real-time applications. Raspberry Pi is an open hardware. The broadcom SoC (System on a Chip) provides the primary parts of the board, such as CPU, USB controller, memory and graphics.

Revised Manuscript Received on December 30, 2019.

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It offers all the capabilities needed to consume less power. It has in built facility for interfacing with noir camera module [5].

III. AUTOMATIC NUMBER PLATE RECOGNITION SYSTEM

In this section, we have described the proposed Automatic number plate recognition system in detail. The working of Automatic number plate recognition (ANPR) system can be classified into two sections namely software and hardware. The software model utilizes image processing concepts and OpenCV Python for implementation. The flow diagram implements in five stages: Capturing an image, preprocessing, edge detection, contour finding and number plate display in the image and is shown in Fig. 2.

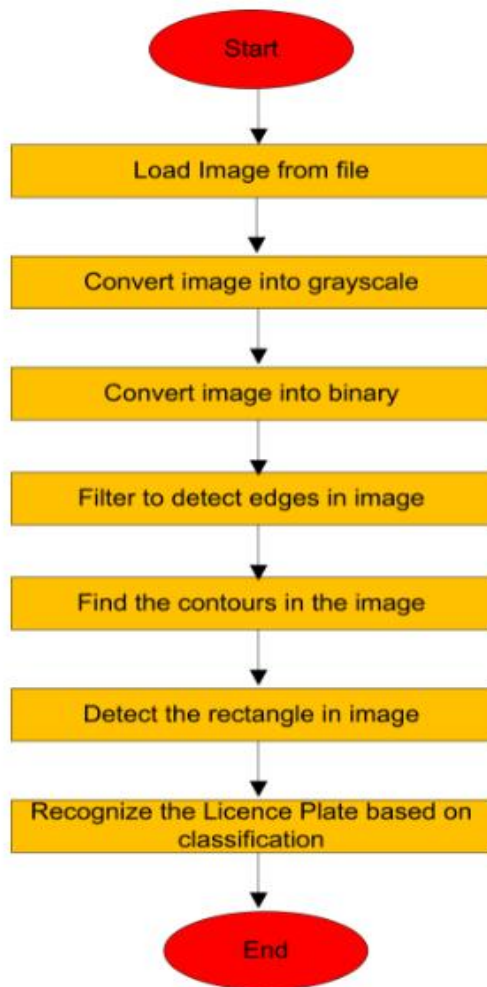


Figure. 2 Flow diagram of ANPR system

Raspberry pi and noir camera are hardware part of this implementation.

1. Capture an image : The first step is to capture an image. A raspberry pi noir camera captures the image in RGB and is stored in JPEG format. Later on it is converted into the gray scale image from RGB.

2. Preprocessing : The next stage performs pre-processing. Every image will have useful and useless information, in this case for us only the license plate is the useful information and the rest are pretty much useless for our program. This redundant or unwanted information is removed by a bilateral filter (Blurring). Later, for edge detection, the gray-scale image is converted into binary.

3. Filter to detect edges : The next step is interesting where we perform edge detection. The main objective of edge detection is to decrease the sum of information in the image and to maintain the structural features for the additional image processing. To detect the image discontinuities many techniques of edge detection are used. The edge is the extremity between two regions with comparatively distinct gray level characteristics. There are various ways to do it, in our proposed system, we have used canny edge method from OpenCV [6].

4. To Find the contours : This can be described merely as a line linking all points along the border of an image with the same color or intensity.



5. To display the region of the number plate in the image

IV. EXPERIMENTAL SET UP AND RESULTS

In our daily life, providing security using video surveillance cameras in schools, hospitals and every other public places are increasing day by day. According to a statistics there are 245 million security cameras installed catering 30 people on the planet. Proposed ANPR system utilizes Raspberry Pi to interface with noir camera and openCV is employed to do experimentation. The experimental results of loading an input image, conversion of the input image into gray scale, denoising the image using bilateral filtering, performing the edge detection using canny edge detection method and finally displaying the licenced image are shown in Table 1.

TABLE 1 : Fundamental steps of the proposed system are loading an input image, conversion of the input image into gray scale, de-noising the image using bilateral filtering, performing the edge detection using canny edge detection method and finally displaying the licensed image.

CAPTURED IMAGE	
RGB TO GRAY SCALE	
PREPROCESSING USING BILATERAL FILTER	

EDGE DETECTION USING CANNY	
FINAL IMAGE	

V. CONCLUSION

The Automatic number plate recognition system has been implemented. The implemented system effectively recognizes the number plate region in the image which consists of vehicle number. This algorithm is applied on several images and observed that it works successfully. The main objective to implement the system is to recognize the number plates of the vehicles in order to replace the current system of manual entry in security purpose. This system was a success in detecting the number plate of a vehicle.

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