Automatic License Plate Recognition System

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Abstract

ANPR System is provide solution of traffic jam in Toll Tax,use by Traffic police and also for security purpose. The main purpose of ANPR System is to control traffic management system. Number plate detecting system use different technique Like (R-CNN) Convolutional Neural Network, Image Processing, Edge detection technique and OCR Technology.

 # Image Proceesing done with help of Opencv python module in which all the unwanted is clear from the image.

 # Edge detection done with help of algorithm of machine learning such as (Haar cascade classifier, Canny edge detection algorithm).

 # OCR Technology is used to character Recognisation from the image is done with the help of Pytessract module provide by python.

Keyword:Automatic-Number-plate-recgnization (ANPR), Optical-character-recgnization (OCR)

1.INTRODUCTION

In this research paper,we are trying to test two different machine learning algorithm for edge detection in order to increase the accuracy of the system on both real-time-videos and Images we have try to detect number plate from different angles like from right side , left side , from far distance and on moving vechile also so that in Toll plaza it not need to stop the vechile it can detect the number plate and get the information in result traffic jam is reduce and time also be reduce.We have design the system according to Toll stations so we attach database with our system.

We have work on images and real-time-videos as dataset we are take image of our car and try to classifie it. For real-time-video we create card board model of number plate with help of laptop web cam we try to detect at different angle.

1. **For image classification** we have use canny edge detection algorithm for edge detection process.
2. **For video classification** we have use haar cascade classifier algorithm for edge detection process. In haar cascade classifier train machine in xml format in four different stages such as haar feature selection, create an internal image, ada boost training and cascading classifier (describe in section 3).

PYCHARM

PyCharm is best IDE software for python programing . This software is used for python project development. It is developed by Czech company jetbrains. It providing features like code analysis and debugger .It have Coding assistance and analysis and error highlighting .
Project and code navigation provide file management which allows us to jumping between the files in a project.

2.LITERATURE SURVEY

Sheetal mithun 2014 [1]morphological operation and and edge detection method was implemented.

Edge detection process implemented but it can detect only from front side in image and algorithm use by them smearing algorithm. In which accuracy result is 65%.

Suyog shah 2015 [2] character segmentation implemented but was not giving accurate result.

They are using character extraction using column segment which is not give accurate result upto 60%.

Anirudh Puranci 2016 [3] Template matching process implemented by them in which they have set some templates in database.

They some template of number plate by matching them they detect the plate .

Naveen Balaji Gowathaman 2017 [4] Template matching process is implemented with correalation of recognition of each character.

They have implemented template matching with character recognition process side by side and they get much better result from previous one.

Vedika kamble 2018 [6] morphological Image Processing was implemented by them.

The system proposed is used morphological process which is a collection of non-linear operation related to image .They are work on pixel values not on numerical values [8].

R.Prithvi 2019 [7] RFID system was implemented by every toll station.

In this paper we observe that in toll station at every hiway RFID system was implemented .RFID system is allow non-contact reading and writing data with the help of electromagnetic waves it is identical to wireless communication [9].

Disadvantage of this system are [7]

1. It is time consuming and therefore causes congestion at the toll station.
2. It is an inefficient toll collection method since some vehicle owner can negotiate with operator.
3. It is highly susceptible to human errors since it is manually operated and dependent on operator speed.
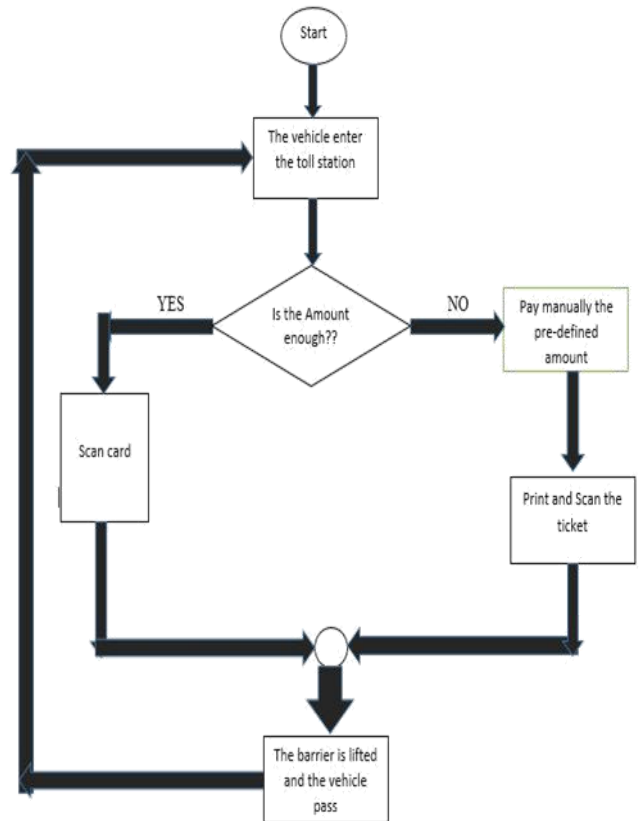

Figure 1 : Architecture design of existing system

RESEARCH GAP

After research work we make conclusion like all the existing system not able to detect number plate from far distance ,from different position like from left or right it can only detect from front of the vechile so we have to try improve this ,moving vechile's number plate also not detect by old system and in 2019 research paper we found that in toll station RFID system can only work which have different advantage like [7] car should stop only then it can detect number plate ,it take lots of time to detect one car which result in huge traffic jam.

So resolve this all problem we design new system in which we apply machine learning algorithm which are haar cascade classifier which we use for real-time-video detection (we create a card board model of number plate as a data set which we detect by laptop web cam) and canny edge detection algorithm for image classification.
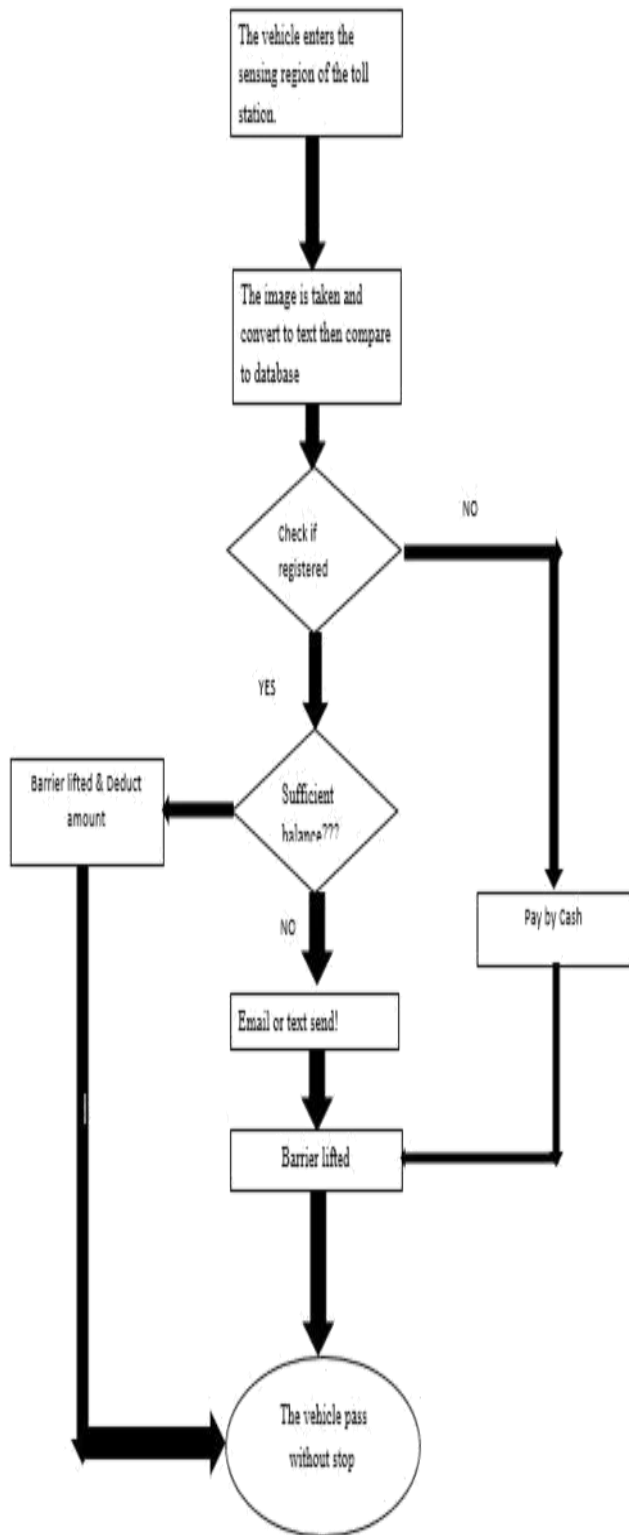
ARCHITECTURE DESGIN
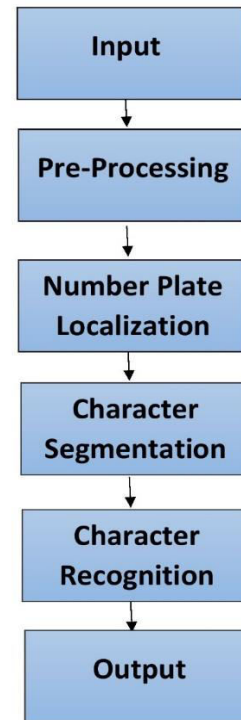

Figure 2 : Architecture design

FLOW CHART

Figure 3: flow chat for new system

Input-

The input dataset of our project is in form of image in (jpg, jpeg) or any other form and in form of real-time-videos which we classifies from machine learning algorithms.

Pre-processing-

In pre-processing step image and videos are converting from RGB to GRAY scale by removing all the unwanted noise and make image ready for number plate localization [2].

Number plate localization-

Now its time to apply edge detection algorithm for finding the different edge from car. Algorithm which we have to apply for image classification canny edge detection algorithm is applied and for

videos haar cascade algorithm is applied for better results.

Character Segmentation-

When the number plate is recognize then character segmentation process is implemented in which OCR technique is used with the help of pytesseract module of python we can convert image into string array form [8].

Character Recognition-

After character segmentation we got a string with the help of regular expression we recognize all the valid character from the string and remove all unwanted character.

Output-

After completion of all the steps we get license number in the form of string array which we can use further process.

3.METHODOLOGY

We have design the system according to Toll Station we have work on images and real-time-videos of vehicles and attach whole system with database.

Two types of machine learning algorithm used for edge detection.

1. **Canny edge detection algorithm(for image classification)-**
   Canny edge detection algorithm is multi stage algorithm to perceive the extensive range of edge in image. It use for filter based on derivative of Gaussian [5]. It was developed by John F. Canny in 1986 canny also produce computational theory. This algorithm give structural information of the image create different points on the image[9].
   The general criteria used in canny algorithm for edge detection are

1. Detection of edge with low error rate,which mean detection should catch accurate points.
2. Edge point detected from the operator should accurately.
3. A edge given in image should marked as once.

Canny algorithm work in 5 steps [5]:

1. Apply Gaussian filter.
2. Itensity gradient find in the image
3. Gradient magnitude thresholding is applied.
4. For finding potential edge use double threshold.
5. Track edge by hyteresis.

Gaussian filter smooth the image for proper result it is essential for filter out the noise in the for preventing false detection [5].

Hyteresis is a loop process in which there different values of one variable depending on the direction of change of another variable [9].

2. **Haar cascade classifier algorithm(for video classification)-**
   It is an object detection algorithm which is used to detect various object in real time videos it is an machine learning approach where machine is trained for lots of positive and negative images. For this algorithm machine is trained in xml file. We define the feature of object like number plate which we want to detect from real time videos.
   Positive image : machine is trained according to object.
   Negative image: machine is trained against the object.

   The haar cascade classifier implemented in four different stages which are
   1. **Haar feature selection**- In this phase we define all the feature of number plate like width and height colour of the number plate.

2. **Creating an internal image**-In this phase by collecting all the features it create an internal image of number plate.

3. **Ada boost training**-After the both steps we get a set of weak classifiers from that we have to combine all the classifier to form a single strong classifier

   Input – Dn={(x1,y1),….(xn,yn)}

   Output – Hi(xi)

   Where Dn= set of weak classifiers

         Hi= strong classifiers

         x= is a features

         y= is a class (-1,+1)

4. **Cascading Classifiers**- After getting strong classifier we have to remove all the error filter all the classifier.

3.1 Download and explore the dataset

We have create dataset of images from tenserflow , we take image of our car and collect 443 set of images on which we work and to test real-time videos we create a card board model of number plate and test throw web cam of laptop with different angle.

Figure 4: Image of car as dataset

3.2 Image pre-processing step-

Image pre-processing part is done by the converting images and videos from RGB

to GRAY scale by removing all the noise from the image make it clear for further process

Gray level images contain an enormous amount of data, much of which is irrelevant. The general edge detection involves three steps: filtering, differentiation and detection[2].
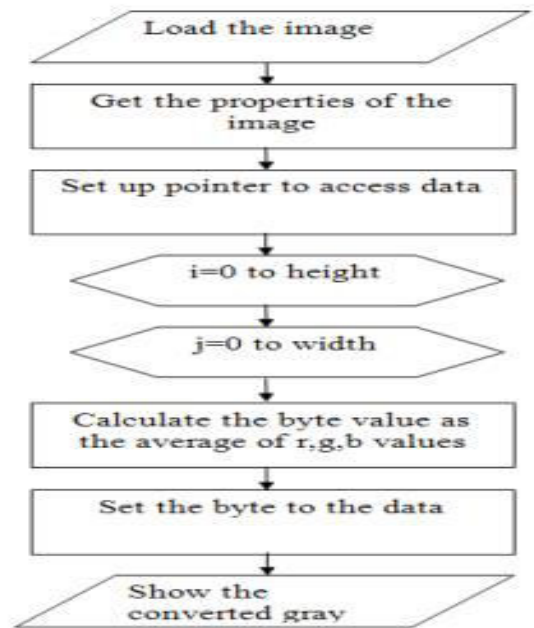
Firgure 5 : RGB to GRAY scale

3.3 OCR process-

OCR process done for recognize character from the cropped image of number plate .It convert the image into the string array form .It is done with the help pytesseract module of python this process very accurate to find characters from image [2].
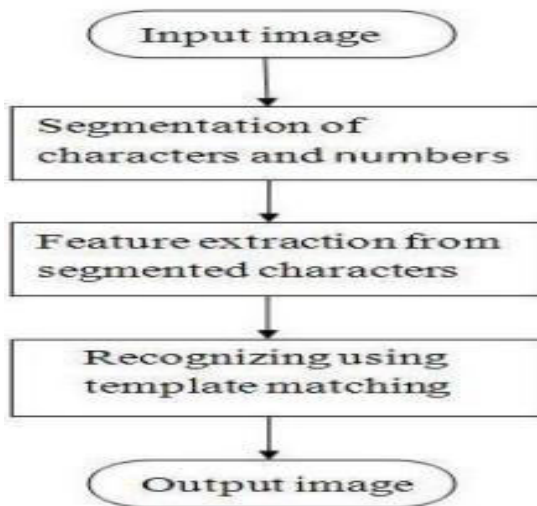
Figure 6 : OCR process

Figure 8 : edge draw in GRAY scale image

Edge are the points which are in the form(x,y).

4.3 Results for draw counter process-

Figure 9 : counters are draw on image

When we join all the edges we get counters.

When we give image as output first step is to segment all the characters one by one from the image .Second step is feature extraction in which all character are taken and third and last step is to match with templates which is already stored in database hence final output in string array [2].

4 RESULTS-

4.1 Result of Image processing-

Figure 7 : RGB to GRAY scale

4.2 Result of edge detection process-

4.4 Result for finding approximate number plate-
Applying loop on the counters we are finding the approximate number plate and the selected counters are draw in the image.

Figure 10 : selected counter

4.5 Output-

When we get selected counter we cropped the image in the form of number plate so we can apply OCR process on the cropped image.

Figure 11 : cropped image

4.6 Result of OCR step-

Number plate is- DL14CC8621

5 CONCLUSION-

This research paper made for the purpose of security, reduce traffic jam violence in Toll station and for traffic police by detecting the licesence plate of vechile in images or real-time video .We tried make more efficient system as compare to previous year research.We have use two machine learning algorithm haar cascade classifier for the edge detection in real-time-videos and canny edge detection algorithm for image. We have work on 443 images we got 80% accuracy and we also make model of number plate with the help of card board which we test with help of laptop web cam in order to test real-time-videos and we got 85% accuracy.

For this project we required PyCharm software for coding platform different module of python like opencv , pytesseract , imutlis , pymysql and GUI components for design layout of register and final output screen.

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