

License Plate Recognition for Vehicle Surveillance

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Abstract - License plate recognition system plays very important role in various security aspects which includes entry monitoring of a particular vehicle in commercial complex, traffic monitoring, identification of threats and many more. In past few years many different methods has been adopted for license plate recognition system but still there is little more chance to work on real time difficulties which come across while license plate recognition like speed of vehicle, angle of license plate in picture, background of picture or color contrast of image, reflection on the license plate and so on. The combination of object detection, image processing, and pattern recognition are used to fulfill this application. In the proposed architecture, system will capture a small video and using Google's OCR(Optical Character Recognition) system will recognize license number, if that number get found in database gate will get open with the help of Arduino Uno.

Keywords — Arduino Uno, Camera, CP210x USB to UART bridge VCP(Virtual Com Port) driver, Google OCR, OpenCV-Python, Python IDE 3.5, Servomotor

I. INTRODUCTION

Considering day to day incidences of theft and illegal entry in private campuses, License Plate Recognition(LPR) have major area for research. Nowadays, ALPR (Automatic License Plate Recognition) system have a great impact on industries. Many industries, government or private campus, toll systems, transportation systems are using license plate recognition system for security purpose. Also number plate recognition system can be implement to monitor traffic on the road and can be useful to monitor road accidents [8]. License plates of the vehicles is for the identification of the vehicle. Also KNN algorithm also gets used for character segmentation used in automatic number plate recognition. From the license plate of any vehicle we can get to know information about vehicle like vehicle owner, vehicle model, vehicle engine number. So if this proposed system will able to identify number plate of any vehicle which passes through any building or campus so we could able to keep track of vehicles which get inside of any campus without any human effort. License plate detection can be implemented using different edge detection methods like sobel edge detection or canny edge detection. Mostly camera vision techniques are used for this system. Contour finding is one of the step used to find region of interest that is number plate of vehicle. Still now there is lot of work that should be done to effective recognition of license plate recognition. Accuracy, processing time, information maintenance are the different aspects in the license plate recognition on which improvement is needed. While

working on the system designing for number plate detection and character recognition, there are some points that should be take care of like blur captured input signal, weather conditions, reflection on number plate, background of number plate etc. Also system must be able to find ROI that is region of interest and should be able to tolerate noise in the input signal.

II. METHODOLOGY

A. Block Diagram

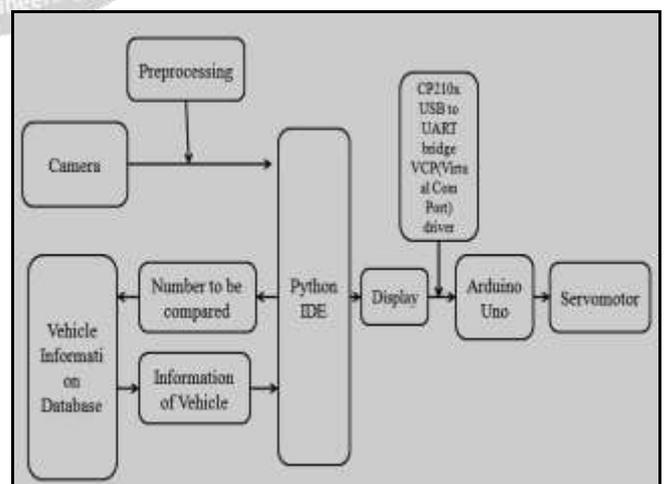


Fig. 1 Block Diagram of Proposed System

Camera

Once user will click on record button present in GUI as shown in Fig 3. camera will turn on for 4 seconds and proposed system will capture input video with the help of

camera. After that camera will get turn off automatically. Captured video will get stored into folder which path is given. Generally high resolution camera gets used so that captured input will be clear.

Preprocessing

Once video gets captured, in this process video will get converted into frames. Generally 30 frames gets generated per second. While converting video into the frames grayscale conversion takes place on input video .Here is the sample python code for converting video into frames:

```
cap = cv2.VideoCapture(0)
ret, frame = cap.read()
frame = cv2.resize(frame, (640, 480))
gray = cv2.cvtColor(frame, cv2.COLOR_RGB2GRAY)
out.write(frame.astype('uint8'))
cv2.imshow('frame', frame)
if cv2.waitKey(1) & 0xFF == ord('q'):
    break
```

Above program has been used in proposed system to convert input video into frames.

Python IDE

With the help of Google's OCR (Optical Character Recognition) used in python IDE license number will get extract from the input frames.

Google OCR

Google OCR is used to character recognition and extraction from images. Every frame will get passed under the algorithm and then license number get recognised once clear image is processed.

Comparison

Generated frames will get pass through Google's OCR algorithm one by one and when the extracted license number will get matched with the one of the numbers present in the database , access will be given to the vehicle.

CP210x USB to UART bridge VCP(Virtual Com Port) driver

CP2102 is used as USB to UART connector. It is used to drive different devices with the help of virtual com port. In proposed system CP2102 is used to establish serial communication between python and arduino uno.

Display

Once license number matched with database respective details of the vehicle will get displayed on the console.

Arduino Uno

High input pulse is given when license number is found in database and motor will give access to vehicle by opening the gate. Here is the code for opening the gate:

```
#include<SoftwareSerial.h>
SoftwareSerial espSerial = SoftwareSerial(2,3);
```

```
#include <Servo.h>
int servoPin = 4;
Servo Servo1;
const int LED13 = 13; // The on-board Arduino LED, close to PIN 13.
void setup()
{
  Serial.begin(9600); //
  espSerial.begin(9600);
  Servo1.attach(servoPin);
}
void loop()
{
  if (espSerial.available() > 0)
  {
    char inByte = espSerial.read();
    Serial.println(inByte);
    if (inByte == 'A')
    {
      Servo1.write(0);
      delay(5000);
      Servo1.write(90);
      delay(1000);
    }
    Servo1.write(0);
    delay(1000);
  }
}
```

Servomotor

Servomotor is used to operate gate if Arduino Uno receives high pulse.

B. Flowchart

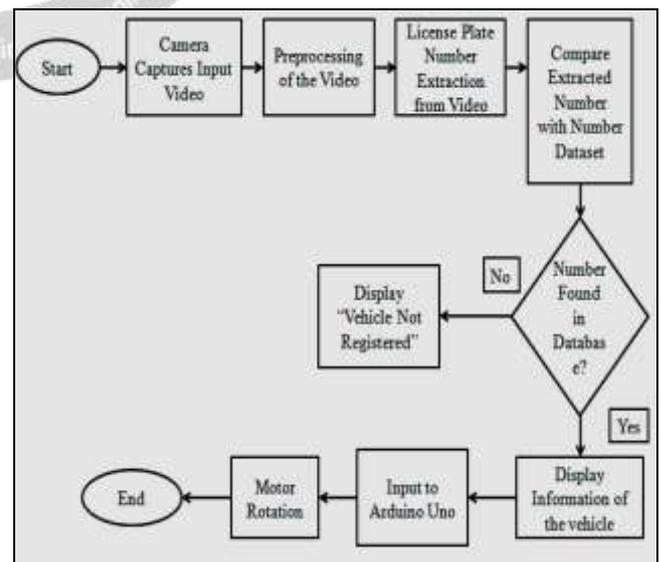


Fig. 2 Flow Chart of Proposed System

When system gets start high resolution camera made for automatic number plate detection will start capturing input

video signal. As input video capturing is done , preprocessing of video is done which involves video to frames conversion and grayscale conversion of input. Once input video is captured, colored video is converted to gray using "COLOR_RGB2GRAY" function in python and video gets converted into frames and frames are converted back to colored frames and gets stored. License number gets detected from number of frames obtained. Detected number from every frame gets compared with the number dataset. System will check if detected license number found in database or not. If detected number found in database and respective information gets displayed on console and a high input pulse signal is passed to arduino uno and motor will get rotate. If detected number plate is not found in database "vehicle not registered " message gets display on console.

III. RESULTS

Following are results obtained after successful compilation of proposed system.

Following fig is GUI that gets appeared on the screen after starting execution.



Fig. 3 GUI of Proposed System

Following picture represents recording of input video when end user will click on record button.



Fig. 4 Recording of Input Video

Once input video captured completely video will get converted into frames automatically.



Fig. 5 Video to Frames Conversion

Each frame will get recognised while processing. Once number is recognised it will get matched with database. Following is the dataset created in DB Browser SQLite.

PLATE	OWNER	CONTACT	MODEL	
1	MH13BK8100	UMESH THAKUR	9292929292	CRAMY
2	MH14BR6899	PRATIK RATH...	9797979797	ELANTRA
3	CG04MF2250	SACHIN GAW...	8686868686	CRETA
4	MH20EJ0365	PRATIK JOSHI	7979797979	BMW
5	HR26DK8337	SHUBHAM JA...	8787898990	SUZUKI
6	MH12DE1433	Sharayu Salu...	6756754356	Ford
7	MH04JM8765	Jethalal Ram	7384347974	Mahindra
8	MH13BN8454	Ajay Gandhi	3735272887	Audi
9	MH01AV8866	Sachin Nehra	8656543537	Wolkswagen
10	DL3CAM0857	Arun Kesarlal	7647443368	Toyota
11	MH01AV6275	Anand Gawali	8978754567	Wagonr
12	TN01AS9299	Shreya Patil	7854677565	Mahindra
13	MH01AE8017	Abhijit Patil	8977534566	Alto
14	HR26DA2330	Abhijit Telran...	8668586543	Suzuki

Fig. 6 License Number Database in DB Browser SQLite

And match results will be displayed on console as shown in figure below.

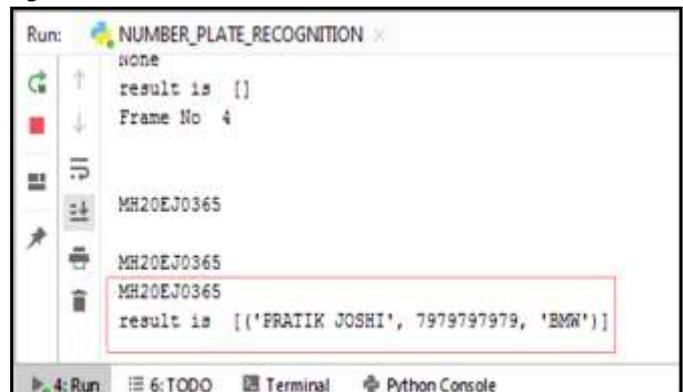


Fig. 7 Final Result

IV. OTHER EXPERIMENT RESULTS

The proposed system has also been implemented using pytesseract OCR. When one of the frames is passed through multiple preprocessing operations like grayscale conversion, canny edged thresholding, contour finding, etc. Results of the proposed system using pytesseract OCR are as follow:



Fig. 8 Image Under Process



Fig. 9 Grayscale Image



fig. 10 Threshold Image



Fig. 11 All Contoured Image



Fig. 12 ROI in Image

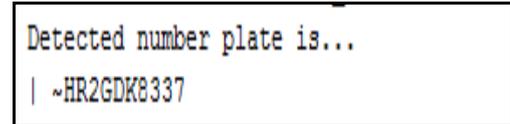


Fig. 13 Final Result using Pytesseract OCR

In the above method, found that accuracy of number plate recognition is quite poor as compared to Google's OCR.

V. CONCLUSION

In the proposed system, accurate recognition of license plate is prioritized. Reduced processing time while maintaining the accuracy of the information captured during vehicle surveillance is achieved. As per the above experiments using tesseract OCR accuracy of number plate recognition is not so good as it introduces errors while detecting license number. It results in garbage values if clear input data is not provided to the algorithm. In the proposed system, Google character recognition algorithm is used to improve accuracy and processing time of license plate recognition system. Also, the proposed system is able to process input number plates having different color backgrounds as well as different conditions like reflection in number plates.

ACKNOWLEDGMENT

We acknowledge our Project guides, for the guidance and valuable suggestions during the entire Final Year Project titled "License Plate Recognition for Vehicle Surveillance". We also acknowledge with thanks to Dr. M. T. Kolte for the support and providing facilities which helped us in the successful completion of this project. We also thank Dr. N. B. Chopade Sir for his continued support and encouragement and motivating us. We record our thanks to our friends in our class for interaction and help during the Final Year Project.

REFERENCES

- [1] P. Meghana, S. Sagar Imambi, P. Sivateja, K. Sairam, "Image Recognition for Automatic Number Plate Surveillance" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-4, February 2019

- [2] Devesh Khaparde , Heet Detroja, Jainam Shah,Rushikesh Dikey, Bhushan Thakare, "Survey on Automatic Number Plate Recognition System" International Journal of Computer Applications, Volume 180 – No.15, January 2018.
- [3] Prof.Amit Kukreja 'Swati Bhandari, Sayali Bhatkar, Jyoti Chavda, Smita Lad," Indian Vehicle Number Plate Detection Using Image Processing ",International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 04 Issue: 04 ,Apr -2017
- [4] G. Naveen Balaji & D. Rajesh," Smart Vehicle Number Plate Detection System for Different Countries Using an Improved Segmentation Method",Imperial Journal of Interdisciplinary Research (IJIR) Vol-3, Issue-6, 2017,ISSN: 2454-1362.
- [5] Muhammad Attique Khan , uhammad Sharif ,uhammad YOUNUS Javed, Tallha Akram, Mussarat Yasmin, Tanzila Saba M ," License number plate recognition system using entropy-based features selection approach with SVM" 2017.
- [6] K.H.Pavan Akshay lepcha, S.R.Adithya, G.Anuraag, K.Sathish ," A Novel Methodology for License Plate Detection Using KNN Classifier" 2016. IEEE, Chennai, India.
- [7] Saran K B, Sreelekha G, "Traffic Video Surveillance: Vehicle Detection and Classification "2015. Thuckalay, Trivandrum, India.
- [8] Shan Du, Mohamed Shehata, Wael Badawy, " Automatic License Plate Recognition (ALPR):A State of the Art Review" 2013. Jinan, China.
- [9] Mrs. J. V. Bagade, MSukanya Kamble, Kushal Pardeshi, Bhushan Punjabi, Rajpratap Singh," Automatic Number Plate Recognition System: Machine Learning Approach ",IOSR Journal of Computer Engineering (IOSR-JCE) ISSN: 2278-0661, ISBN: 2278-8727.