A project report on

VEHICULAR ODD-EVEN COMPLIANCE AND E-CHALLAN GENERATION

Submitted in partial fulfillment for the award of the degree of

Computer Science and Engineering

for

CSE1901 - Technical Answers for Real Word Problems (TARP)

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Vellore Institute of Technology

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By

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SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

April, 2022

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DECLARATION

We hereby declare that the project report entitled "***Vehicular Odd-Even Compliance And E-Challan Generation***" submitted by us, for the award of the degree of Computer Science and Engineering, VIT is a record of bonafide work carried out by us under the supervision of Dr. MuthumanikandanV.

We further declare that the work reported in this project report has not been submitted and will notbe submitted, either in part or in full, for the award of any other degree or diploma in this instituteor any other institute or university.

Place: Chennai
Date: 28/04/2022

Signature of the Candidate

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CERTIFICATE

This is to certify that the report **entitled "VEHICULAR ODD-EVEN COMPLIANCE AND E-CHALLAN GENERATION"** is prepared and submitted by "**Wilson Vidyut Doloy(19BCE1603), Rishank Pratik(19BCE1606), Prashant Verma(19BPS1023)"** to VIT Chennai, in partial fulfillment of the requirement for 'J' component of CSE1901 – Technical Answers for Real Word Problems (TARP) subject is a bonafide record carried out under my guidance. The project fulfills the requirements as per the regulations of this University and in my opinion meets the necessary standards for submission.

Signature of the Guide:

Name: Dr. Muthumanikandan V

Date:

ABSTRACT

Pollution in India is a definite offshoot of many other environmental problems - be it air, water, land, or noise. One major source of environmental emissions are cars. India needs smarter transportation options as well, and this is where startups can pitch in apart from other ways to tackle pollution. We will be designing a system, based on an Odd-Even formula to control traffic. Odd- Even formula stated that vehicle with odd numbers license plate will ply on odd dates and those with even numbers license plate will ply on even dates.

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We thank our parents, family, and friends for bearing with us throughout the course of our project and for the opportunity they provided us in undergoing this course in such a prestigious institution.

Place: Chennai

Date:

Name of the student

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LIST OF ACRONYMS

QR – Quick Response

API - Application programming interface

ANPR – Automatic Number Plate Recognition

ALPR – Automatic License Plate Recognition

OCR – Optical Character Recognition

Chapter 1
Introduction

The odd-even rule is an emergency measure to control air pollution in the city by means of restricting the use of private vehicles. As per the rule, only even numbered vehicles (0, 2, 4, 6, 8) will be allowed on city roads. On odd dates, only vehicles having registration numbers ending with 1, 3, 5, 7 and 9 will be allowed.

This was first introduced in 2016, in Delhi, the odd-even scheme is a car rationing system. Under the scheme, only vehicles with even registration numbers will be allowed on roads today.

Implemented by Arvind Kejriwal-led Aam Aadmi Party (AAP) government, the odd-even scheme will apply to all non-transport four-wheeled vehicles plying on roads in Delhi.

Twenty-nine categories of vehicles, including those of President, Prime Minister, emergency and enforcement vehicles, cars carrying school children in uniform have been exempted from the odd-even scheme.

A challan is a piece of paper with an official text inscribed on it that is given to a certain individual. In India and adjacent countries, a challan is frequently issued for breaking traffic rules and regulations. If a challan is issued in your name, you must pay the fine specified under The Motor Vehicles Act, 1988. A traffic police officer has the authority to issue a challan in the name of anyone who violates one or more traffic laws. An E-Challan is a challan that is generated electronically using the Electronic Challan System. Physical pieces of paper have recently been replaced with e-Challan. Several phases of the procedure have been digitized in India, from a person breaching a traffic regulation to paying the appropriate fee, thanks to the advent of the e-challan check. We are generating E-challan on one click, for reducing time work. The management of E-challan record is done on online database. So, there is no need of any paper work. Therefore, we are reducing the minimal paper work and this concept is also useful for making corruption free and digital India. First the license plate is detected either in a photo or video input, then the number is extracted and last digit is checked for odd or even. If odd digit license plate is detected on even date or even digit license plate is detected on odd day, the license plate number will be sent to the web application. This web application which generates challan includes current challan amount, previous violation charges(if any) and taxes.

1.1 OVERVIEW

We will be designing an E-Challan system, based on an Odd-Even formula to control traffic. Odd- Even formula stated that vehicle with odd numbers license plate will ply on odd dates and those with even numbers license plate will ply on even dates and accordingly an E-Challan will be generated. The user has to pay the fees via UPI using the QR code generated.

1.2 CHALLENGES

The challenges that we face mostly include getting the vehicle owner details using and integrating a fixed payment based QR Code payment.

1.3 PROJECT STATEMENT

Pollution in India is a definite offshoot of many other environmental problems - be it air, water, land, or noise. One major source of environmental emissions are cars. India needs smarter transportation options as well, and this is where startups can pitch in apart from other ways to tackle pollution.

1.4 OBJECTIVE

We will be designing a system, based on an Odd-Even formula to control traffic. Odd- Even formula stated that vehicle with odd numbers license plate will ply on odd dates and those with even numbers license plate will ply on even dates.

1.5 SCOPE OF THE PROJECT

As air pollution levels are increasing day by day, especially in metro cities, this will serve an excellent way to aware people and minimize manual work and labour work.

Chapter 2
BACKGROUND

Introduction

Controlling visitors is a major concern in cities across the sector. Prepared traffic offence system is a reliable cellular-based software that tracks all traffic offences committed across the city. The application aids the traffic police in maintaining accurate records of all road offences committed, as well as the databases of the motive force and vehicle information.

In Mumbai, an automatic challan machine can be used to issue a price tag to visitors who violate the law. The facility will include a hand-held device for quality collection on the spot and a layout printed receipt. The goal of this facility's back end (connecting the e-challan system to CCTV cameras) is to relieve the burden on traffic police and help us go paperless while ensuring that no offender walks free.

Literature Survey

The technique used in [1] served as a base for us. The author in [2] suggested to place camera at airport entrances or random angles, at angles of right, left ~ 30° or straight. That being not an ideal position.

The segmentation module as in [3] extracts the license plate in the detected car image using neural networks as filters for analyzing the color and texture properties of the license plate. The recognition module then reads the characters on the detected license plate with a support vector machine (SVM)-based character recognizer.

Technique presented in [4] was a comprehensive review of the state-of-the-art techniques for ALPR. They categorize different ALPR techniques according to the features they used for each stage, and compare them in terms of pros, cons, recognition accuracy, and processing speed.

In [5] a new algorithm for vehicle license plate identification is proposed, on the basis of a novel adaptive image segmentation technique (sliding concentric windows) and connected component analysis in conjunction with a character recognition neural network.

The proposed system in [6] detects the number plate of a vehicle from video input and then performs the super resolution technique. Applying the Optical Character Recognition Technique it acquires the text from the super resolution image of vehicle number plate by means it compares with the RTO database and then it display the details of the vehicle such as owners name, vehicle registration etc.

The proposed system in [7] performs knowledge generation through data clustering mechanism. Further, the hidden information pattern within the database of detected number plates is used to provide insight into the vehicle information towards decision making and analysis.

The impact of odd-even rule on Delhi's environment before and during the implementation was studied in [8]. The concentrations of various pollutants at different locations were measured and their impact was evaluated quantitatively.

Assessment of the related vehicle presence on the road before and during odd-even implementation and their impact was provided in [9].

The proposed idea in [10] is the efficient e-challan generation using generation technique using OCR(Optical Character Recognition) in which the challan is created using an android application. It detects the variety plate and fetches facts from the database and generates E-challan.

A new technique about measuring distance between vehicles was presented in [11]. The camera in front of vehicles can capture images of the next vehicles. The process by Fast Fourier Transform(FTT) is there. The systems can check the position of the plate car with the properties of the picture.

A new error measure which quantifies the performance of an image segmentation algorithm for identifying multiple objects in an image was defined in [12]. This error measure is based on object-by-object comparisons of a segmented image and a ground-truth (reference) image.

The authors of [13] had mainly explored the related issue of vehicle licence tax payment

and four different techniques for classifying payment on taxation, including related studies of vehicle licence tax,

Challan system based on Raspberry modules such as gas sensor in [14] It has a challan system but being placed at the exhaust pipe of the vehicle, it is removable/modifiable by anyone.

The method used in [15] was OpenCV along with Radial Basis Function Neural Network in a Mobile App to detect Number plates. Mobile phones cannot be installed in a static position, proper camera has to be used.

The method used in [16] captures images of motorcycle riders without helmets and click the chassis number of vehicles. Though it is not feasible to click the chassis number of vehicles even if it is not moving.

The authors of [17] surveyed the work done in Automatic License Plate Detection and E-Challan generation systems for the past 5 years. For object detection, edge detection algorithms are most preferred, especially the Canny edge detection method. This is followed by OCR. e-challan generation is commonly hosted on websites and android applications and notification is sent via SMS.

The system proposed by the authors of [18] consists of integration of algorithms like: 'feature-based number plate localization' for locating the number plate, 'image scissoring' for character segmentation and statistical feature extraction for character recognition; which are specifically designed for Indian number plates.

The authors of [19] explored and analyzed the existing approaches and techniques used in ALPR solutions in recent literature. The single-stage deep learning-based solutions showed high performances with diverse datasets. The multi-stage object detection based deep learning solutions can be pre-trained on large datasets, how-ever, they showed less computational efficiency and accuracy than single-stage approaches. This paper has done an extensive comparison of the related studies and identified the requirements for benchmark datasets in practice.

Chapter 3
PROPOSED SYSTEM

3.1 SYSTEM DESIGN

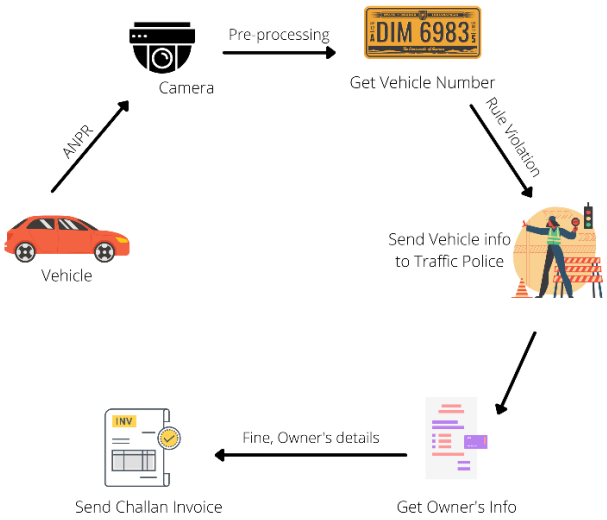

Fig. 3.1.1. Process of generating E-Challan

Traditional techniques for manually inspecting and confirming vehicle documentation, as well as monitoring and detecting violations, not only consume people and time, but also slow down traffic. The goal of this work is to propose a way for automatically issuing E challans for traffic violators utilizing an ANPR system that uses image processing and optical character recognition (OCR) to read the vehicle number plate using installed cameras and CCTV systems, as shown in Fig. 3.1.1.

These systems may work 24 hours a day, seven days a week, resulting in effective and simple detection of traffic rule violations and E challan handling, assisting officials with minimal user participation.

The existing system makes it impossible to keep track of traffic violations, which adds to the paperwork. As a result, the proposed approach can solve the aforementioned problem.

3.2 MODULES DESCRIPTION

3.2.1 Image Preprocessing:

This module talks about the processes that are to be performed upon the image before applying any character recognition technique, in order to make the recognition technique more feasible to work upon the image thus giving better recognition rate. The algorithm Line Grouping (LG) and the Edge Density (ED) are used which extracts the line segments and groups them based on a set of geometrical conditions. It detects a rectangle at the plate boundary accurately. If no rectangle group was made in LG, the image is rejected. The rejected image is given a second chance in which the ED method is used. The second algorithm finds plate regions at which the vertical edges appear densest. The double chance framework is evaluated with and without the verification process. The verification process is performed using the character segmentation module.

3.2.2 Number Recognition:

This module talks about the identification of the number written on the number plate by the system in order to perform further operations. Teseract OCR recognition technique is chosen here to do that task. This method has 3 stages of processes:

- Detecting the presence of text using the OpenCV's EAST text detection model.
- Extracting the text region required from the image.
- Passing the text to tesseract so that it can be converted to OCR.

3.2.3 Odd-Even Check and Challan generation:

This module checks the extracted number from the number plate and verifies whether it is ODD or EVEN and compares it with the date. If the conditions such as ODD number plate on Even day or vice versa are met , then the module generates a challan and displays it on a web application, where the user can verify and the final view is displayed.

3.2.4 QR Code generation:

This module creates the QR code after the challan is generated and verified, which will be used for the user to make payments. Once the user scans the QR code the user will be redirected to the payment platform with the challan amount filled in the fields that is to be paid.

3.3 ALGORITHM/ TECHNIQUE USED

Automatic Number Plate Recognition (ANPR)-based E-challan generation is a potential future technology for effective traffic rule infraction control. Authorities are finding it difficult to control and monitor traffic offences and apply appropriate sanctions as the population grows and more vehicles are added to the road.

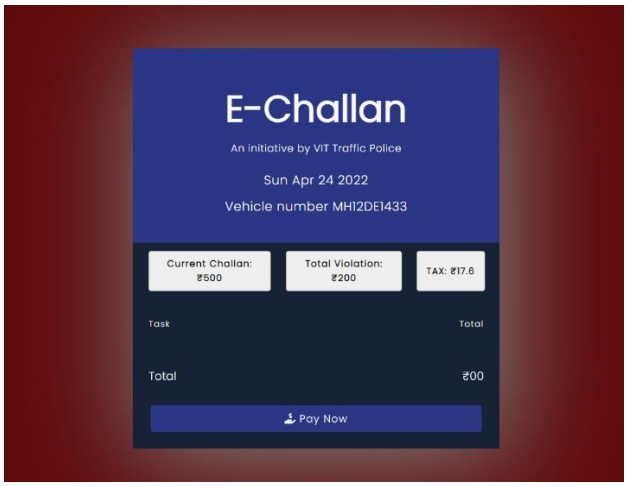

Fig. 3.3.1- E-Challan Web Application

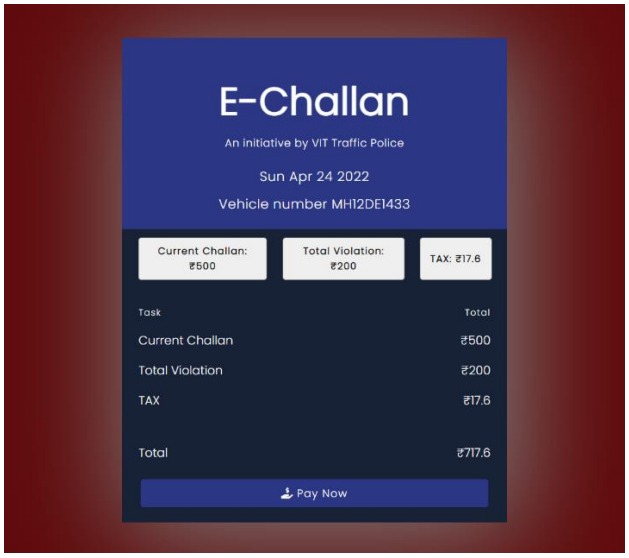

Fig. 3.3.2 - Web App Tabs and payment breakdown

We are developing a web application as shown in Fig. 3.3.1 and Fig. 3.3.2 which consists of tabs. Tab 1 will show current challan fees, Tab 2 will show previous challan fees (if any) and Tab 3 will show taxes.

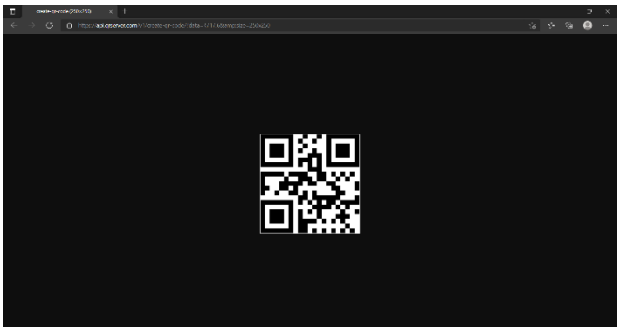

Fig. 3.3.3 – Generated QR Code for payment

After submitting the challan, the two messages is generated using API. First message contains the e- challan breakdown and second message contains the QR code as shown in Fig. 3.3.3. which is the challan payment method, which directly goes to the traffic police.

Fig. 3.3.4- Extraction of license plate number

Chapter 4

EXPERIMENTAL SETUP

4.1 SOFTWARE REQUIREMENTS

- Python 3
- IDLE Python
- Flask
- OpenCV
- Tesseract
- Imutils

4.2 HARDWARE REQUIREMENTS

- High Resolution Camera
- Personal Computer

Chapter 5

PERFORMANCE EVALUATION

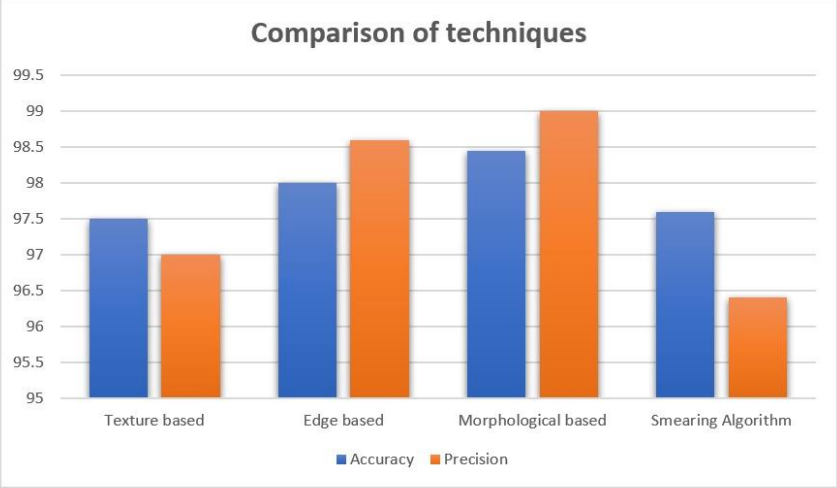

Fig. 5.1.1– Comparison of techniques

As per the data obtained from [20], [21] and [22] we plotted a graph, that is Fig. 5.1.1. We observe that Morphological based approach, that is the base for OCR technique, has the highest Accuracy and Precision.

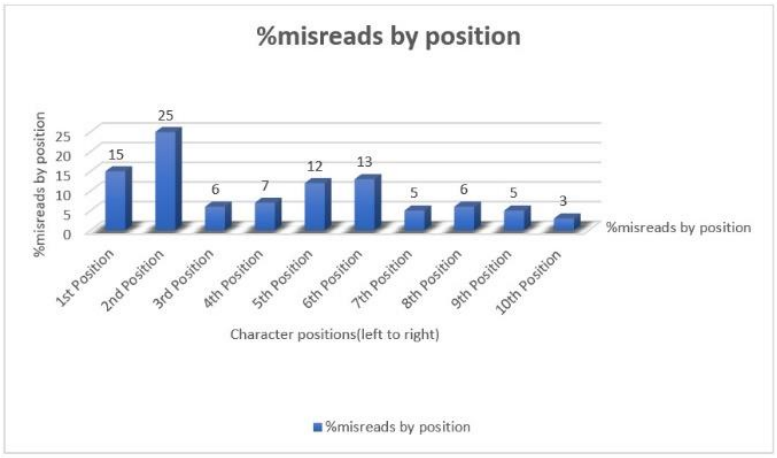

Fig. 5.1.2 – Percentage misreads by positions in ANPR Algorithm.

As shown Fig. 5.1.2, as the characters increase, misreads decrease, as the algorithm knows what characters are supposed to be next.

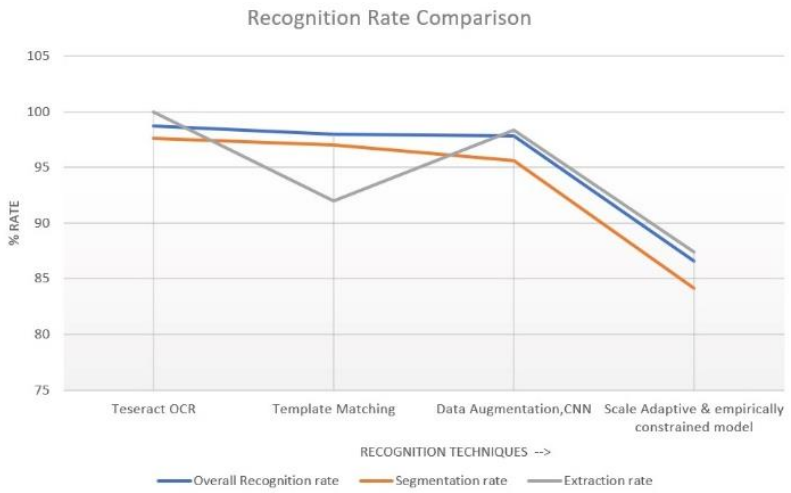

Fig. 5.1.3 – Recognition rate comparisons of different algorithms

As depicted in Fig. 5.1.3, the overall recognition rate, segmentation rate and extraction rate are the highest for Tesseract OCR.

Chapter 6

RESULTS AND DISCUSSION

As we can see the license plate number was recognized and odd and even was calculated.

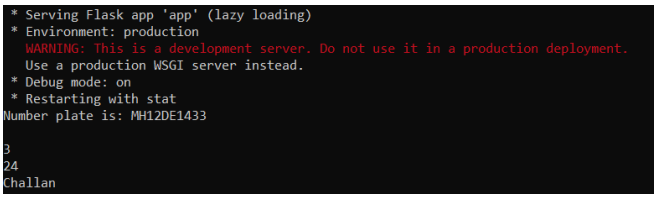

Fig. 6.1.1 – Calculation of odd and even

We can see the terminal screen in Fig. 6.1.1 for reference. Here, 3 denotes last digit of license plate which is odd, and 24 denotes date, which is even. Hence challan has to be collected.

Fig. 6.1.2– Calculation of Challan Amount

The user will be able to see his license number and date of challan as shown in Fig. 6.1.2. He will also be able to see any previous violations, if any and tax.

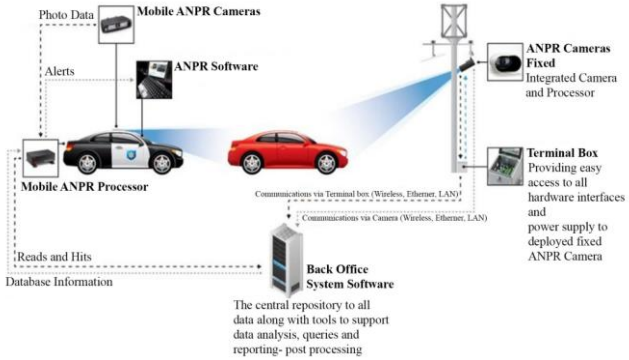

Fig. 6.1.3– Alternative method for capturing license plate image.

In Fig. 6.1.3 we described alternatives positions for placing the camera. Either on poles or on a police car.

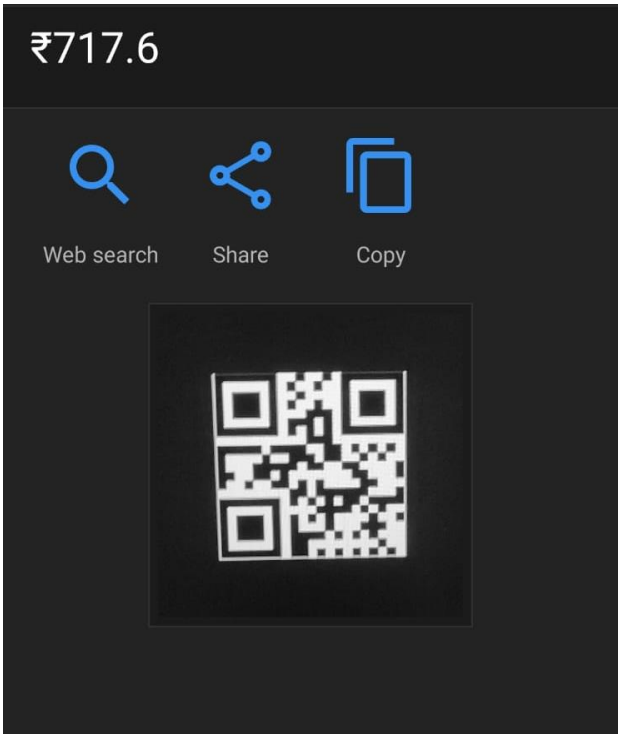

Fig. 6.1.4– QR Code showing total fees to pay

The user will then proceed to pay through UPI as per the QR Code that is generated. A sample QR code generated has been shown in Fig. 6.1.4.

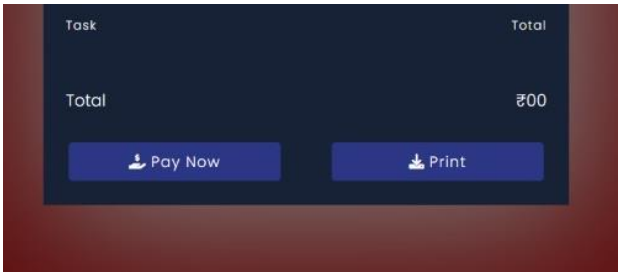

Fig. 6.1.5– Print Receipt option

Furthermore, print option is also added in case the user wants a hardcopy of the receipt, as shown in Fig. 6.1.5.

Chapter 7

CONCLUSION & FUTURE WORK

The QR Code Generated requires a UPI Recipient, that is, the UPI of some traffic police officer of that zone. The QR code here is automatically generated as per the amount but this is not a payment code.

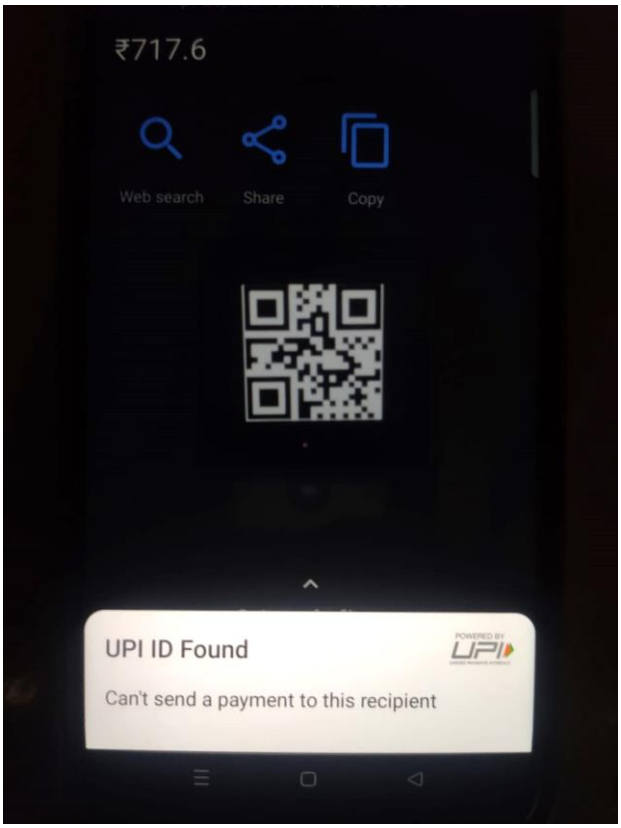

Fig. 7.1.1 – UPI of traffic police officer is needed

The QR Code has to be first linked with traffic police officer, as shown in Fig. 7.1.1 and for which license number it is being paid has to integrated.

Some methods that can be considered is Razor Pay, PayU, PayPal etc, but then amount will have to be manually entered then.

Also, we plan to create a login module so that user can see his or her own details only. This is an enormous work as vehicle owners all over India will have to create their login and upload their vehicle information.

Fig. 7.1.2 – Various types of license plates

There are various kinds of license plate shapes, color, font size, font style and other modifications. Common everyday examples are in Fig. 7.1.2. Although algorithm can be trained to be accurate but sometimes there is additional text in the license plate that may still interfere with the recognition. There is no absolute solution to this except to make modifications illegal and to adopt a standard license plate rule.

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APPENDIX

main.py

```
import cv2
import imutils
import pytesseract
import datetime

pytesseract.pytesseract.tesseract_cmd = 'C:\Program Files\Tesseract-
OCR\\tesseract'


image = cv2.imread(r'test\test8.JPG') #test4 test2 test12 test16 test18
test4.-3 test5 test8 test10 test11
image = imutils.resize(image, width=300 )
cv2.imshow("original image", image)
cv2.waitKey(0)

gray_image = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
cv2.imshow("greyed image", gray_image)
cv2.waitKey(0)

gray_image = cv2.bilateralFilter(gray_image, 11, 17, 17)
cv2.imshow("smoothened image", gray_image)
cv2.waitKey(0)

edged = cv2.Canny(gray_image, 30, 200)
cv2.imshow("edged image", edged)
cv2.waitKey(0)

cnts,new = cv2.findContours(edged.copy(), cv2.RETR_LIST,
cv2.CHAIN_APPROX_SIMPLE)
image1=image.copy()
cv2.drawContours(image1,cnts,-1,(0,255,0),3)
cv2.imshow("contours",image1)
cv2.waitKey(0)

cnts = sorted(cnts, key = cv2.contourArea, reverse = True) [:30]
#screenCnt = None
screenCnt = 0
image2 = image.copy()
cv2.drawContours(image2,cnts,-1,(0,255,0),3)
cv2.imshow("Top 30 contours",image2)
cv2.waitKey(0)
```

```
i=7
for c in cnts:
        perimeter = cv2.arcLength(c, True)
        approx = cv2.approxPolyDP(c, 0.018 * perimeter, True)
        if len(approx) == 4:
                screenCnt = approx
        x,y,w,h = cv2.boundingRect(c)
        new_img=image[y:y+h,x:x+w]
        cv2.imwrite('./'+str(i)+'.png',new_img)
        i+=1
        break


#cv2.drawContours(image, [screenCnt], -1, (0, 255, 0), 3)
cv2.imshow("image with detected license plate", image)
cv2.waitKey(0)


Cropped_loc = './7.png'
cv2.imshow("cropped", cv2.imread(Cropped_loc))
plate = pytesseract.image_to_string(Cropped_loc, lang='eng')
print("Number plate is:", plate)
#num = 0
num = int(plate[-2])
#print(len(plate))
print(num)

index = open("templates/index.html").read().format(p1=plate)

#Date
x = datetime.datetime.now()
date = x.strftime("%d")
date = int(date)
print(date)
if(date%2==0 and num%2!=0):
    print("Challan")
elif(date%2!=0 and num%2==0):
    print("Challan")
elif(date%2==0 and num%2==0):
    print("No Challan")
elif(date%2!=0 and num%2!=0):
    print("No Challan")

cv2.waitKey(0)
cv2.destroyAllWindows()
```

app.py

```
from flask import Flask, render_template, flash, request
import joblib as joblib
import os
import requests
import json
import base64
from main import num,plate

app = Flask(__name__)
#app = Flask(__name__, template_folder='foldername')
port = int(os.environ.get('PORT', 5000))

@app.route('/')
def homepage():
    return render_template('index.html',value=plate)

if __name__ == "__main__":
    app.run(host='0.0.0.0', port=port, debug=True)
```

****