Automated Vehicle Recognition and Parking Control System

PROJECT BY:
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INTRODUCTION

Efficient parking management is a significant challenge in institutional and urban environments, often resulting in time wastage, congestion, and security issues.

To address these concerns, emerging technologies such as IoT and Automatic Number Plate Recognition (ANPR) provide innovative solutions for enhancing parking systems (Smart Divergence).

The system is designed to optimize campus parking operations. Smart Divergence utilizes OCR technology to effectively direct faculty and students to their assigned parking spots, ensuring a smooth and organized parking experience.

PROBLEM STATEMENT

Unauthorized vehicle access and inefficient parking allocation on campus create security risks and inconvenience for staff and students, highlighting the need for an automated, optimized parking solution.

Challenges

- DATA MANAGEMENT ISSUES
- MANUAL VEHICLE MONITORING
- UNAUTHORIZED ACCESS
- INEXPERIENCED PERSONNEL

Need for automation

- EFFICIENT PARKING ALLOCATION
- ENHANCED SECURITY
- IMPROVED USER EXPERIENCE

OBJECTIVES

User Experience

Providing a convenient and smooth parking experience

Smart Divergence

Smart Divergence efficiently direct faculty and students to their designated parking spaces.

Time Efficiency

ensures faster number plate detection, reducing processing time compared to other models

Security Enhancement

Preventing unauthorized access to the campus

Real-Time Monitoring

Ensuring timely detection and access control

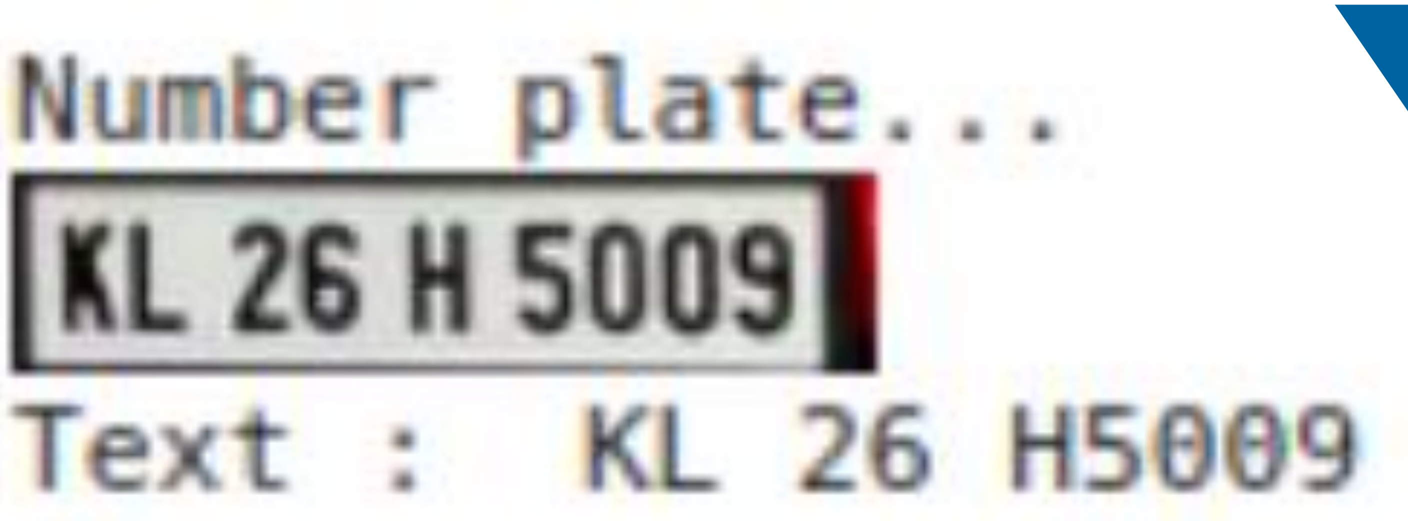
HOW IT WORKS

BEFORE

AFTER

IMAGE PREPROCESSING

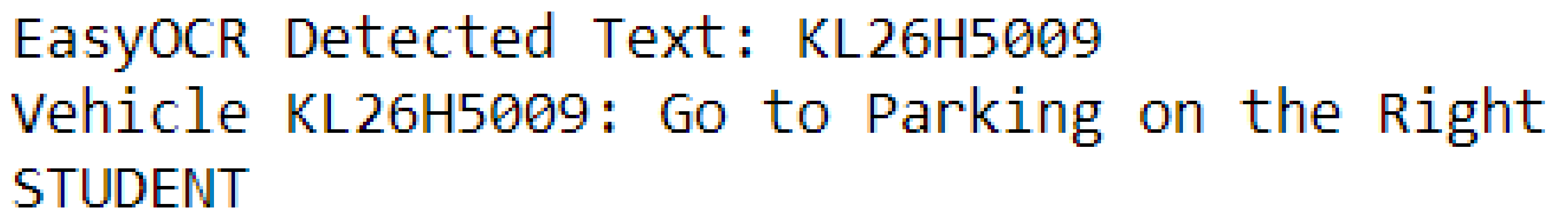
NUMBER PLATE DETECTION



```
Number plate...
```

```
Text :  KL 26 H5009
```

NUMBER PLATE RECOGNITION



```
EasyOCR Detected Text: KL26H5009
Vehicle KL26H5009: Go to Parking on the Right
STUDENT
```

SMART DIVERSION

How It Works - Key Techniques Used

01

Preprocessing

STEPS INVOLVED:

1. NOISE REDUCTION
2. RGB TO GRAY SCALE CONVERSION
3. BILATERAL FILTERED IMAGE
4. CANNY EDGES

02

Detection

STEPS INVOLVED:

1. APPLY CONTOURS
2. FILTER CONTOURS AND EXTRACT ROI

03

Recognition

STEPS INVOLVED:

1. PRE-PROCESS REGION OF INTEREST
2. NUMBER PLATE TEXT RECOGNITION

04

Smart Divergence

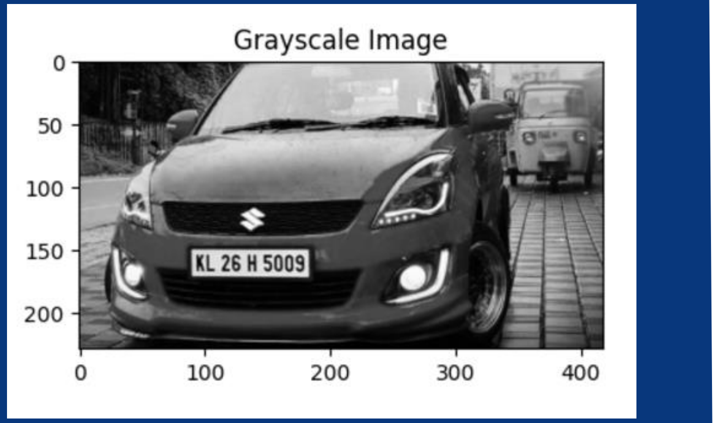
STEPS INVOLVED:

1. EFFICIENTLY DIRECT FACULTY AND STUDENTS TO THEIR DESIGNATED PARKING SPACES.

Techniques Used

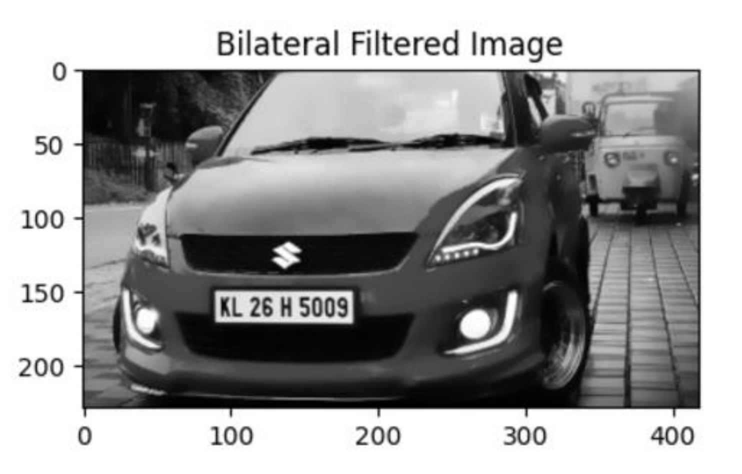
Image Processing Techniques:

Grayscale Conversion:

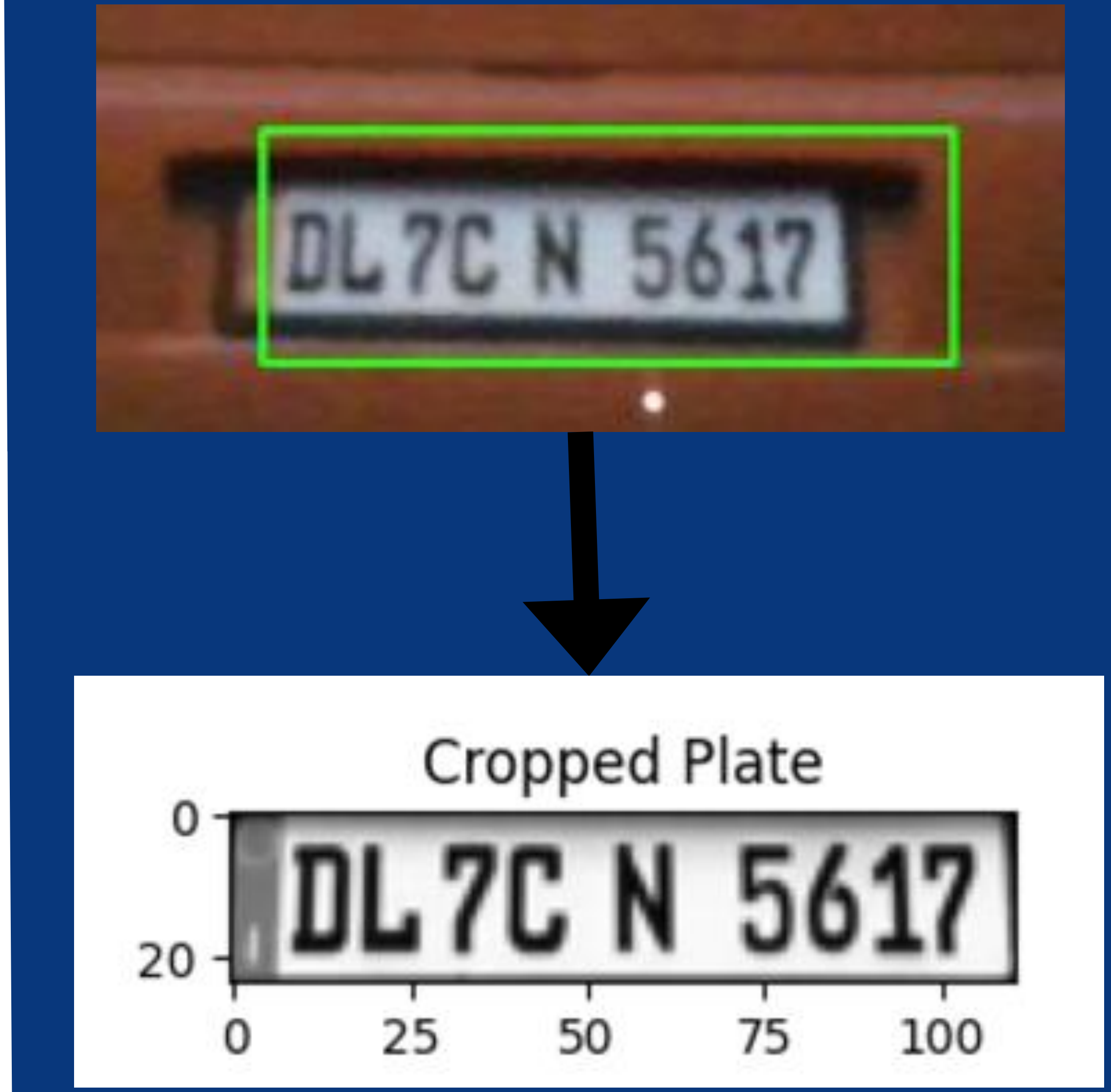


CANNY EDGES:

Bilateral Filtering:



FILTER CONTOURS AND EXTRACT ROI

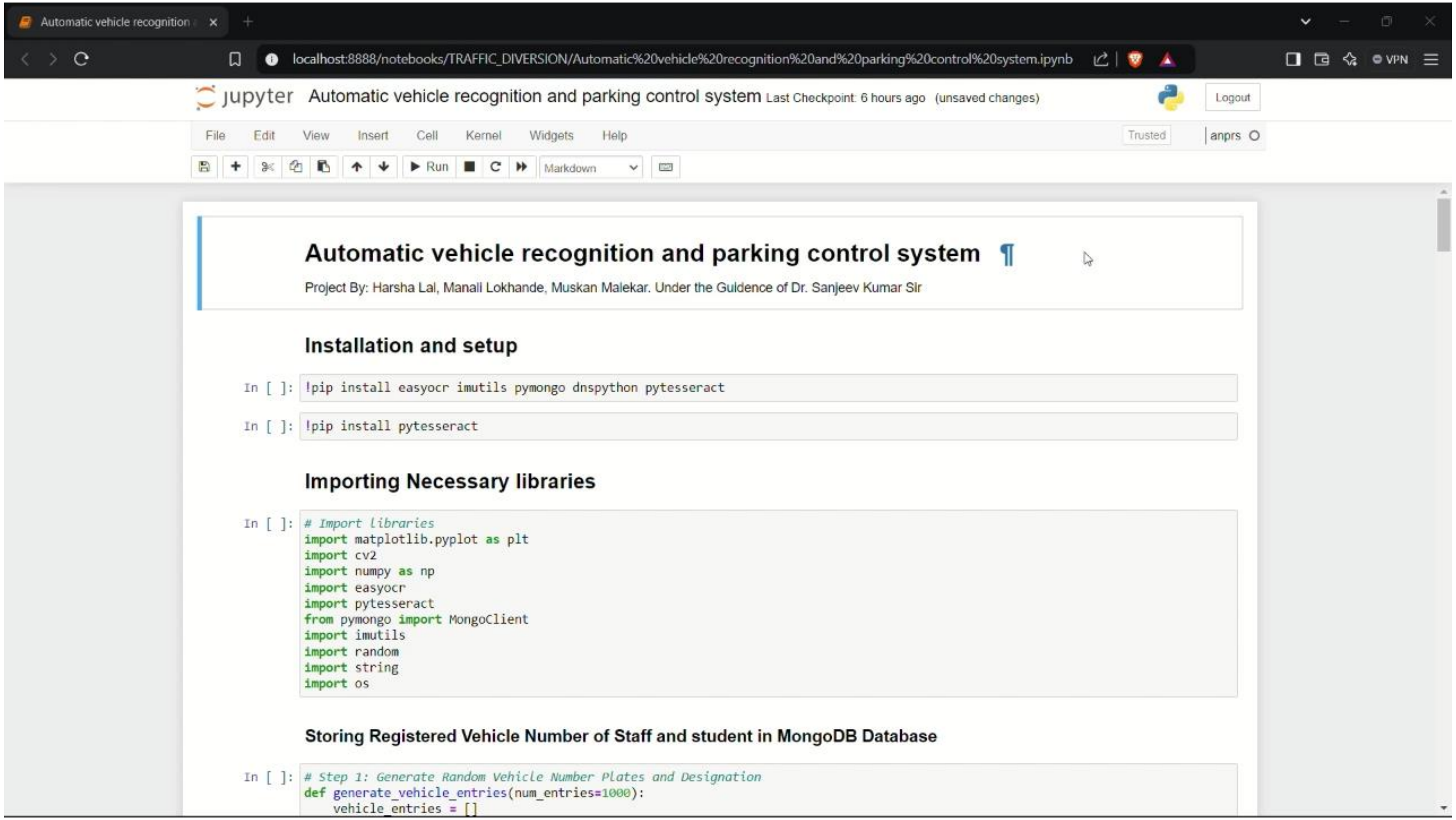


OCR AND DATABASE MANAGEMENT

- **OCR (Optical Character Recognition):** The extracted image of the number plate is processed to identify the characters, using tools like Python-Tesseract.
- **Database Management:** Detected characters are stored in a database.

Implementation

LINK:	https://drive.google.com/file/d/1jezin41d2VJ_kDJaO858FicWX8nenFjh/view?usp=drivesdk


Automatic vehicle recognition
localhost:8888/notebooks/TRAFFIC_DIVERSION/Automatic%20vehicle%20recognition%20and%20parking%20control%20system.ipynb
VPN
jupyter
Automatic vehicle recognition and parking control system Last Checkpoint: 6 hours ago (unsaved changes)
Logout
File
Edit
View
Insert
Cell
Kernel
Widgets
Help
Trusted
anprs
Run
Markdown

Automatic vehicle recognition and parking control system ¶

Project By: Harsha Lal, Manali Lokhande, Muskan Malekar. Under the Guidence of Dr. Sanjeev Kumar Sir

Installation and setup

In [ ]:
```
!pip install easyocr imutils pymongo dnspython pytesseract
```

In [ ]:
```
!pip install pytesseract
```

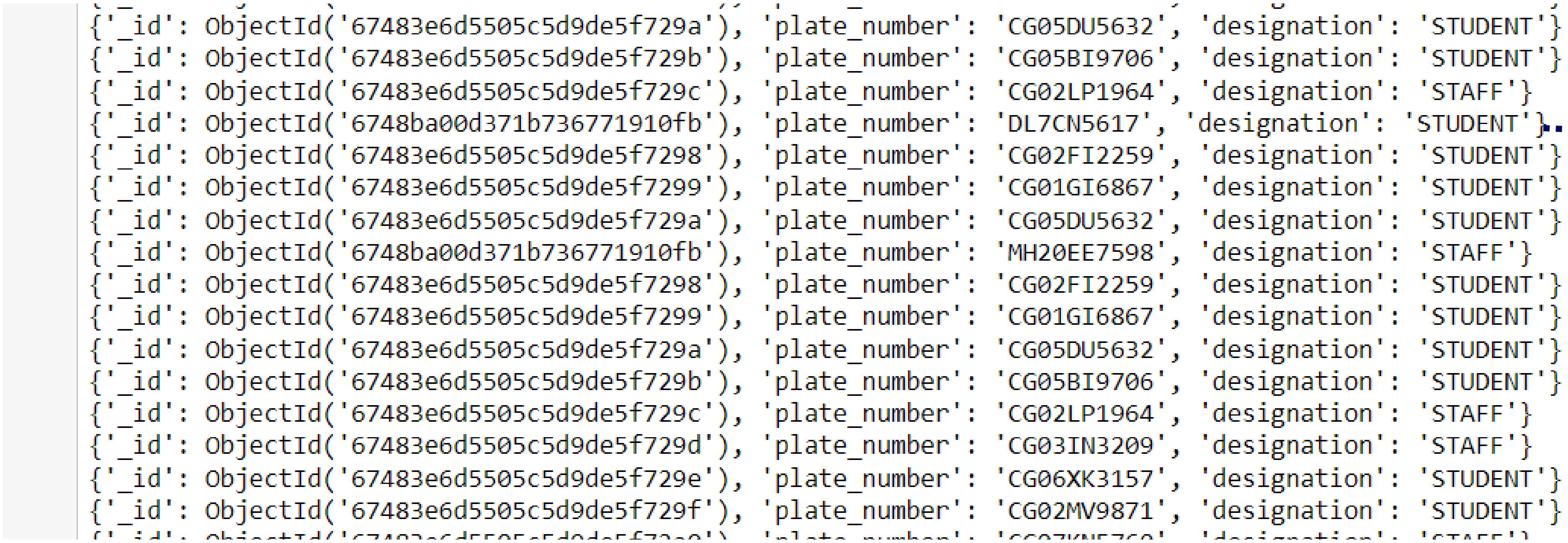
Importing Necessary libraries

In [ ]:
```
# Import libraries
import matplotlib.pyplot as plt
import cv2
import numpy as np
import easyocr
import pytesseract
from pymongo import MongoClient
import imutils
import random
import string
import os
```

Storing Registered Vehicle Number of Staff and student in MongoDB Database

In [ ]:
```
# Step 1: Generate Random Vehicle Number Plates and Designation
def generate_vehicle_entries(num_entries=1000):
    vehicle_entries = []
```

Results



```
{'_id': ObjectId('67483e6d5505c5d9de5f729a'), 'plate_number': 'CG05DU5632', 'designation': 'STUDENT'}
{'_id': ObjectId('67483e6d5505c5d9de5f729b'), 'plate_number': 'CG05BI9706', 'designation': 'STUDENT'}
{'_id': ObjectId('67483e6d5505c5d9de5f729c'), 'plate_number': 'CG02LP1964', 'designation': 'STAFF'}
{'_id': ObjectId('6748ba00d371b736771910fb'), 'plate_number': 'DL7CN5617', 'designation': 'STUDENT'}
{'_id': ObjectId('67483e6d5505c5d9de5f7298'), 'plate_number': 'CG02FI2259', 'designation': 'STUDENT'}
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{'_id': ObjectId('67483e6d5505c5d9de5f729a'), 'plate_number': 'CG05DU5632', 'designation': 'STUDENT'}
{'_id': ObjectId('6748ba00d371b736771910fb'), 'plate_number': 'MH20EE7598', 'designation': 'STAFF'}
{'_id': ObjectId('67483e6d5505c5d9de5f7298'), 'plate_number': 'CG02FI2259', 'designation': 'STUDENT'}
{'_id': ObjectId('67483e6d5505c5d9de5f7299'), 'plate_number': 'CG01GI6867', 'designation': 'STUDENT'}
{'_id': ObjectId('67483e6d5505c5d9de5f729a'), 'plate_number': 'CG05DU5632', 'designation': 'STUDENT'}
{'_id': ObjectId('67483e6d5505c5d9de5f729b'), 'plate_number': 'CG05BI9706', 'designation': 'STUDENT'}
{'_id': ObjectId('67483e6d5505c5d9de5f729c'), 'plate_number': 'CG02LP1964', 'designation': 'STAFF'}
{'_id': ObjectId('67483e6d5505c5d9de5f729d'), 'plate_number': 'CG03IN3209', 'designation': 'STAFF'}
{'_id': ObjectId('67483e6d5505c5d9de5f729e'), 'plate_number': 'CG06XK3157', 'designation': 'STUDENT'}
{'_id': ObjectId('67483e6d5505c5d9de5f729f'), 'plate_number': 'CG02MV9871', 'designation': 'STUDENT'}
```
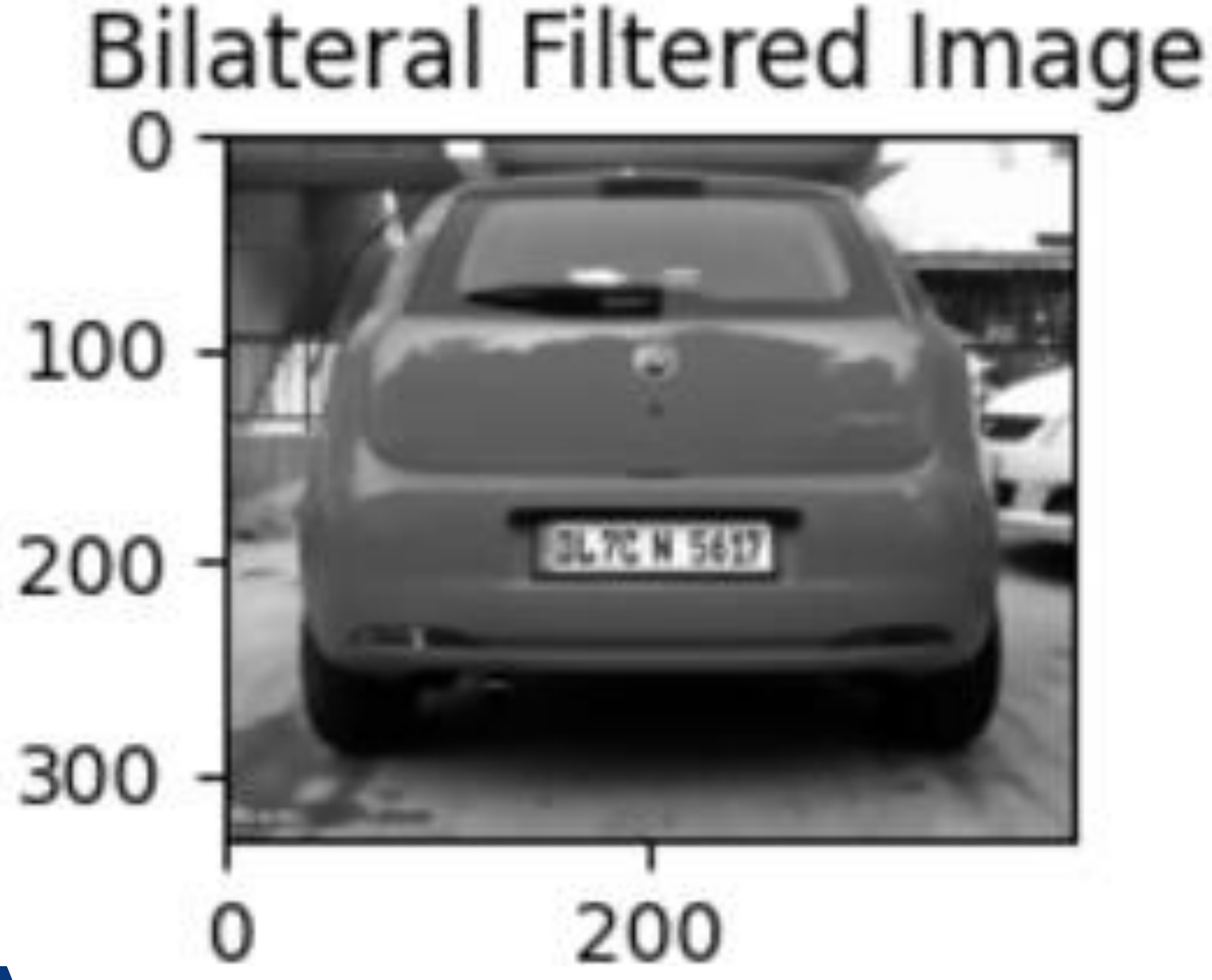
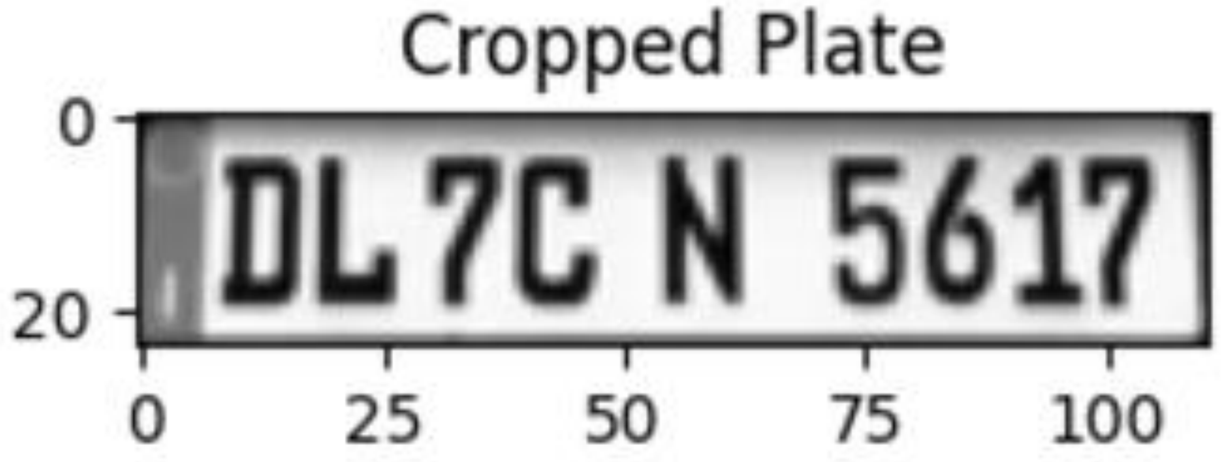
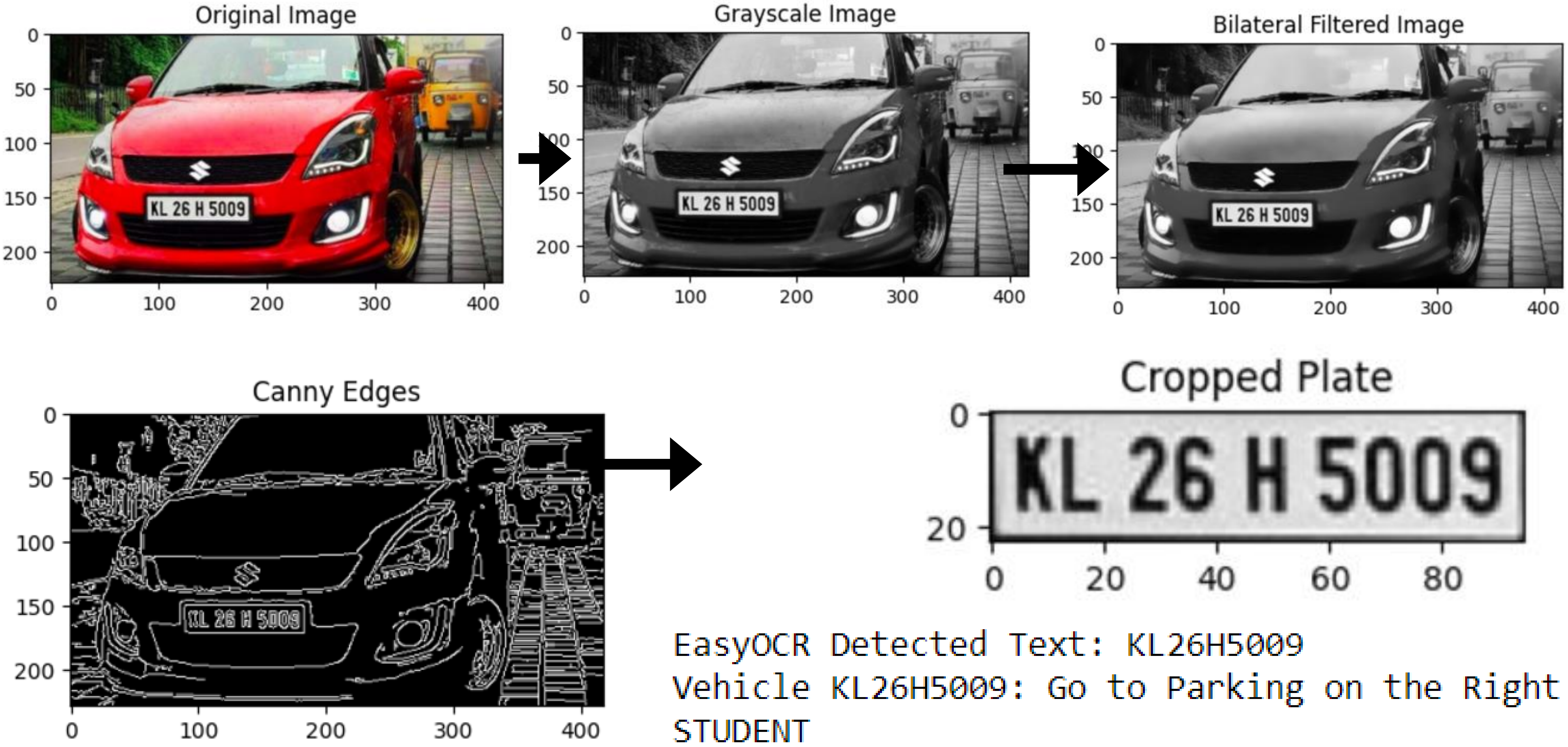

DL7CN5617





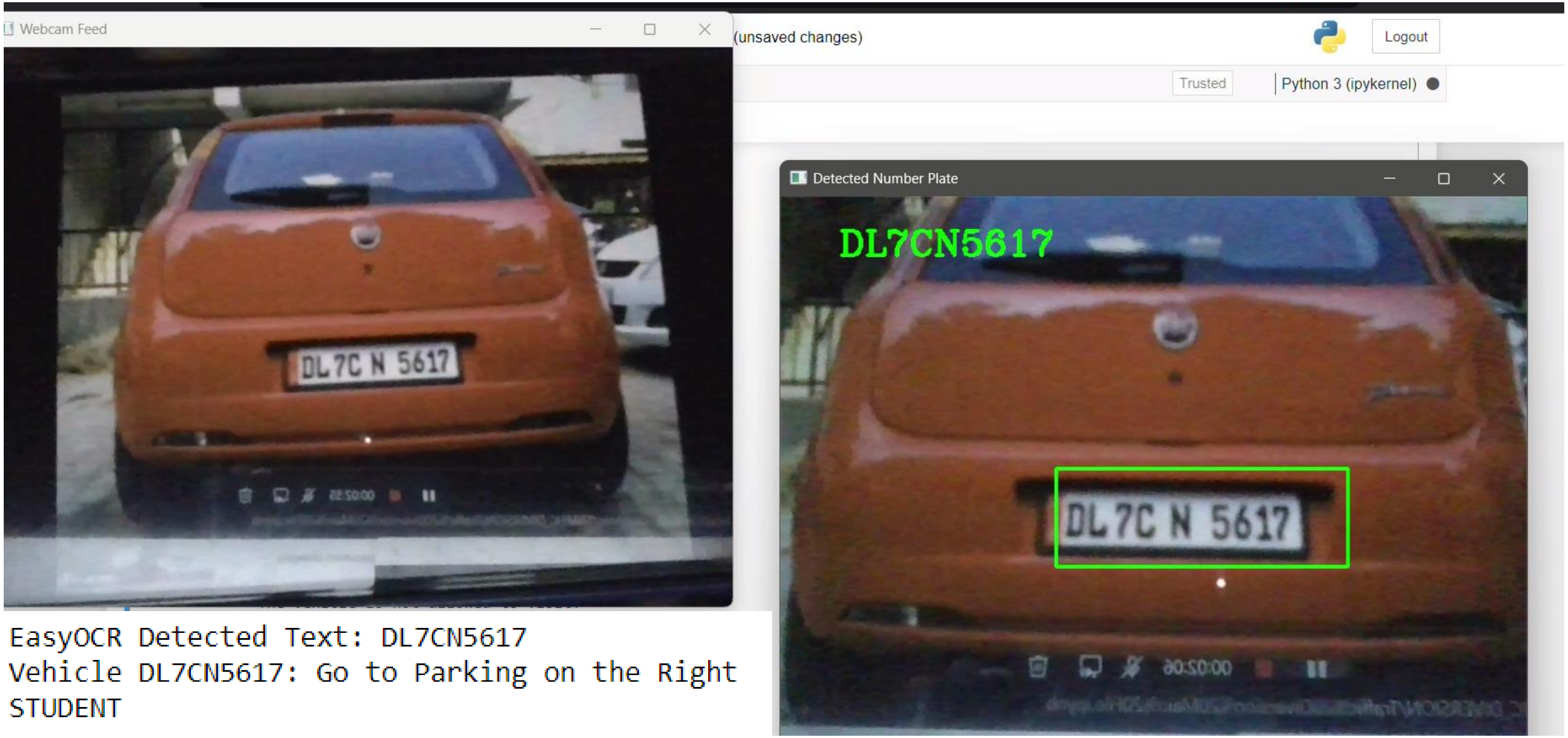
```
EasyOCR Detected Text: DL7CN5617
Vehicle DL7CN5617: Go to Parking on the Right
STUDENT
```

RESULT



```
EasyOCR Detected Text: KL26H5009
Vehicle KL26H5009: Go to Parking on the Right
STUDENT
```

Results



```
EasyOCR Detected Text: DL7CN5617
Vehicle DL7CN5617: Go to Parking on the Right
STUDENT
```

CONCLUSION

1. **Solves Inefficiencies, Unauthorized Access, and Security Issues**
2. **Utilizes Advanced Technologies (EasyOCR, Python Tesseract, MongoDB, etc.)**
3. **Traffic Control and Prevention of Unauthorized Vehicle Entry**
4. **Improved Organization, Security, and Efficiency**
5. **Sets a New Standard in Parking Solutions**

Future Scope

IoT Integration

CONNECTING THE SYSTEM WITH IOT DEVICES FOR REAL-TIME DATA EXCHANGE AND ENHANCED AUTOMATION.

Face Detection

ADDING FACE DETECTION FOR DUAL AUTHENTICATION, VERIFYING BOTH VEHICLE
AND DRIVER IDENTITY.

Thank You!