MOVING VEHICLE REGISTRATION PLATE DETECTION AND ANALYSIS

A

Mini Project Report

Submitted in partial fulfilment of the

Requirements for the award of the Degree of

BACHELOR OF ENGINEERING

IN

INFORMATION TECHNOLOGY

By

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DECLARATION BY THE CANDIDATE

We, **APURU ROHAN, VARKALA SUJITH ATESH,** and **GUMIDELLI SANDEEP,** bearing hall ticket numbers, **1602-20-737-098, 1602-20-737-114, 1602-20-737-102**, hereby declare that the project report entitled **"MOVING VEHICLE REGISTRATION PLATE DETECTION AND ANALYSIS "** is submitted in partial fulfilment of the requirement for the award of the degree of **Bachelor of Engineering** in **Information Technology**

This is a record of bonafide work carried out by us and the results embodied in this project report have not been submitted to any other university or institute for the award of any other degree or diploma.

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1602-20-737-098

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ABSTRACT

Automatic number plate detection system aims to create an anti-theft auto security system in mining places which are generally spread over a vast area in remote locations and harsh environments. This system collects the data from both the entry and exit gates of a mining station. The vehicles entering and exiting the mine are recorded by detecting the number plate and stored in a database. This information is analysed to detect the duplicate trucks illegally entering the mine. All this information can be used for further analysis of theft and proof reading. The system has a feature to check whether a particular vehicle is inside or outside at any point of time.

INTRODUCTION

Automatic number plate detection system is a system which takes live video feed as input and detects the number plate of the vehicle. This detection takes place at entry and exit gates. According to the detection the data is modified.

This project requires a machine with graphical processing unit(preferable) to run and compute the data. This data is stored in the database. The data includes number plate of the vehicle entering or exiting and the time of entry/exit. We need the processor to be fast to compute the things so that the live feed is properly executed.

The process starts with registering the vehicle to gain access through the gate. Any vehicle can be registered with its number plate into the database. Once the vehicle gets registered, the vehicle will be allowed to enter the gate and go inside. The system will not allow any duplicate entry into the database. We will be using a local excel sheet as a database.

The detection process is done using YOLOv5 model of object detection. The training is done on 200 plus of images of cars, bikes, trucks and autos. The data consists of images of number plates of all states of India. The model detects the number plates with a good accuracy.

Once the detection is done, the system extracts the dimensions of the number plate which have been detected with more than 90 percent to make sure that the accuracy is high. Once the number plate is detected, the coordinates of the number plates are extracted and a mini-image is formed. This mini-image is sent to the reader object of EasyOCR. The reader will read through the image's number and return a string of the number. This number is not perfectly accurate as EasyOCR works at an accuracy of 95% only and the accuracy and result differ with the type of the image sent. In order to maintain high accuracy, we will be checking with the Levenshtein distance with all the available registered

number plates to know the number plate registration number accurately.

After detection at the entry gate, the vehicle will be checked, if it is registered. It will be allowed only if it is registered. Then, the duplicate test will be applied on the vehicle number plate. The status of the vehicle against its number plate will be checked. If the status is outside, the vehicle will be allowed to enter or else it will be alarmed that a duplicate vehicle is trying to enter the place. If it passes the test, the vehicle will be allowed to enter and status is changed to inside.

At the exit gate, the vehicle's number plate will be detected and read. Similar to the entry gate, the duplicate test will be applied and the status is changed if everything is fine.

RELATED WORK

IEEE paper referred –

Automatic Vehicle License Plate Recognition Using Optimal K-Means with Convolutional Neural Network for Intelligent Transportation Systems.

By IRINA VALERYEVNA PUSTOKHINA, DENIS ALEXANDROVICH PUSTOKHIN, JOEL J. P. C. RODRIGUES, (Fellow, IEEE), DEEPAK GUPTA, ASHISH KHANNA, K. SHANKAR, (Member, IEEE), CHANGHO SEO, AND GYANENDRA PRASAD JOSHI

Similar systems –

- Automatic (or automated) license-plate recognition (ALPR)
- Automatic (or automated) license-plate reader (ALPR)
- Automatic vehicle identification (AVI)
- Car-plate recognition (CPR)
- License-plate recognition (LPR)
- Mobile license-plate reader (MLPR)
- Vehicle license-plate recognition (VLPR)
- Vehicle recognition identification (VRI)

Limitations of existing systems -

1. All these systems require a lot of hardware in order to compute the result.
2. Do not come with the feature of recording data.
3. Does not support multi gate detection.
4. Does not support duplicate detection.
5. Does not alert on unauthorized entry.

Areas of improvement –

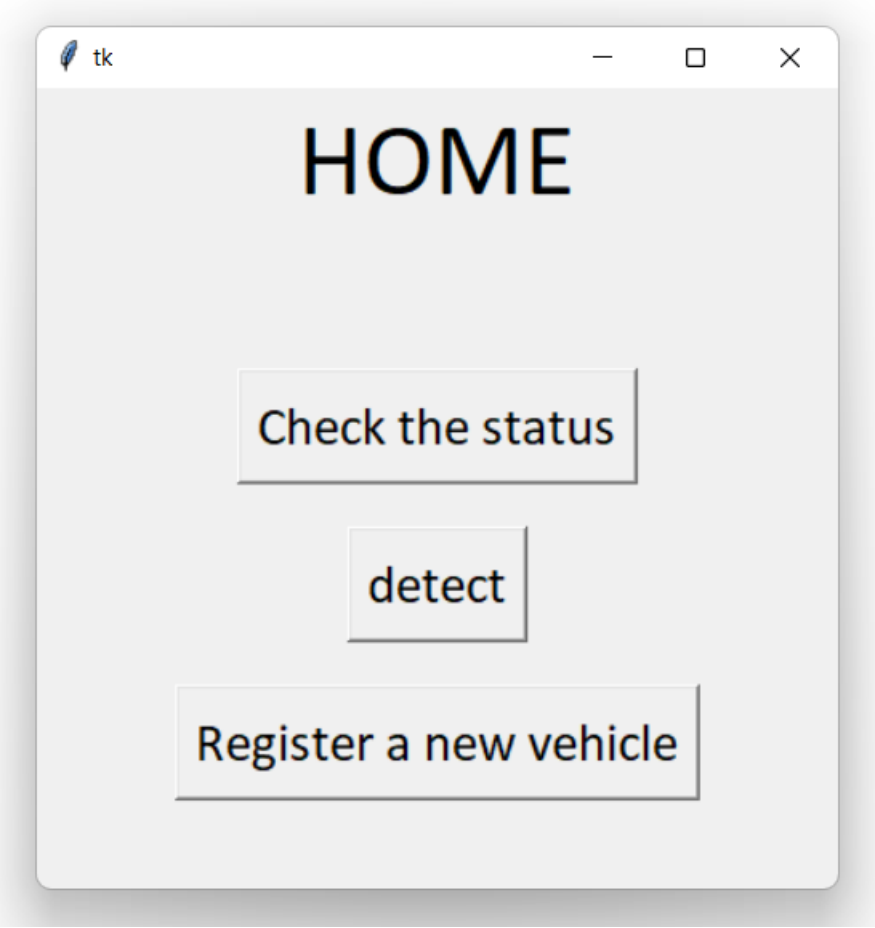
1. Our system will accomplish this task without much hardware requirement.
2. Apart from the detection, our system computes information about the time of entry/ exit of the vehicle.
3. The detection is carried simultaneously at the entry and exit gates.
4. Our system can detect any duplicate vehicle trying to enter the gate.
5. The system will be alert on unauthorized entry into the gate, that is it will siren if any not registered vehicle tries to enter the gate.

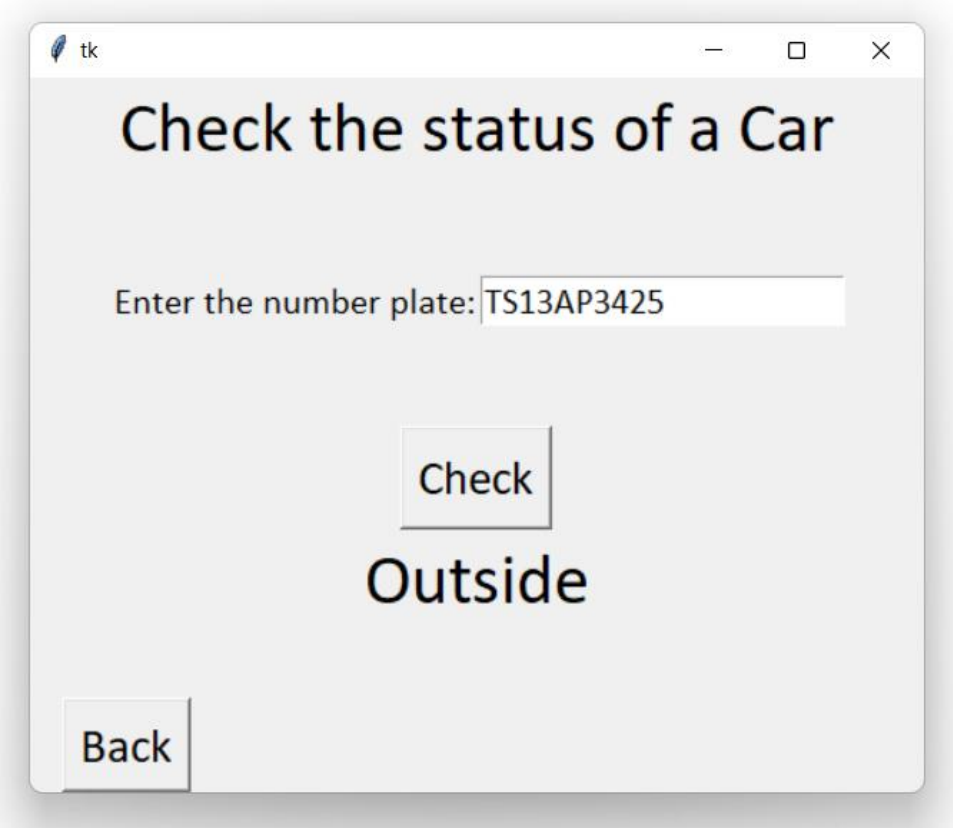
PROPOSED WORK

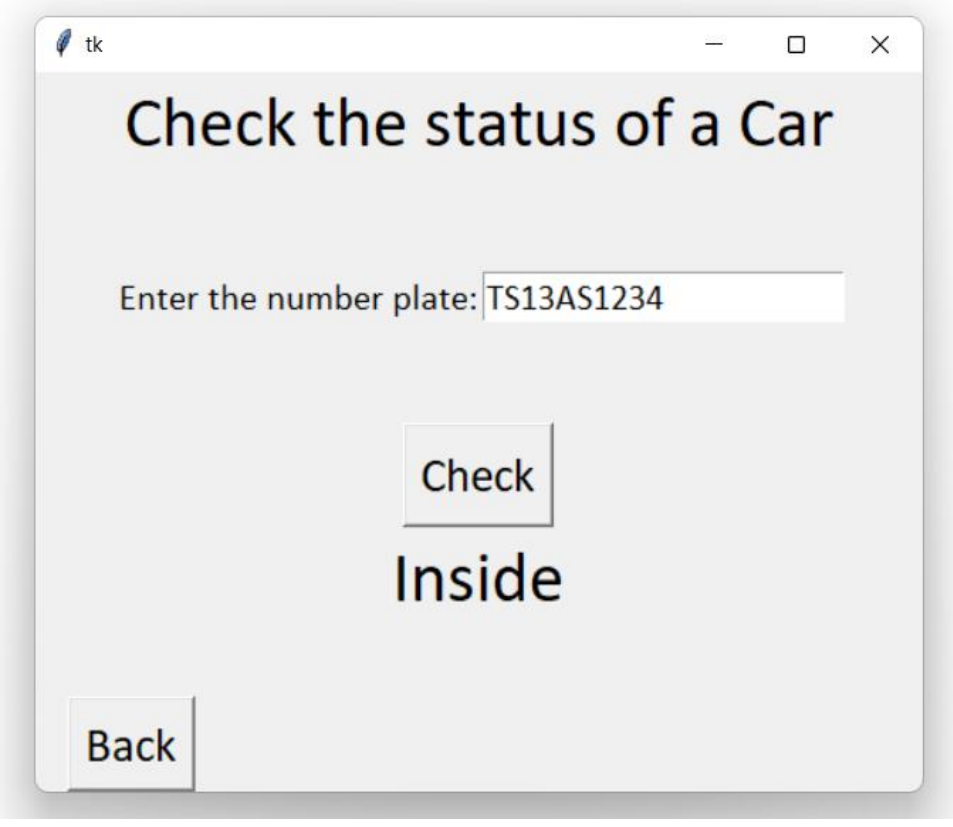
(a)Use cases –

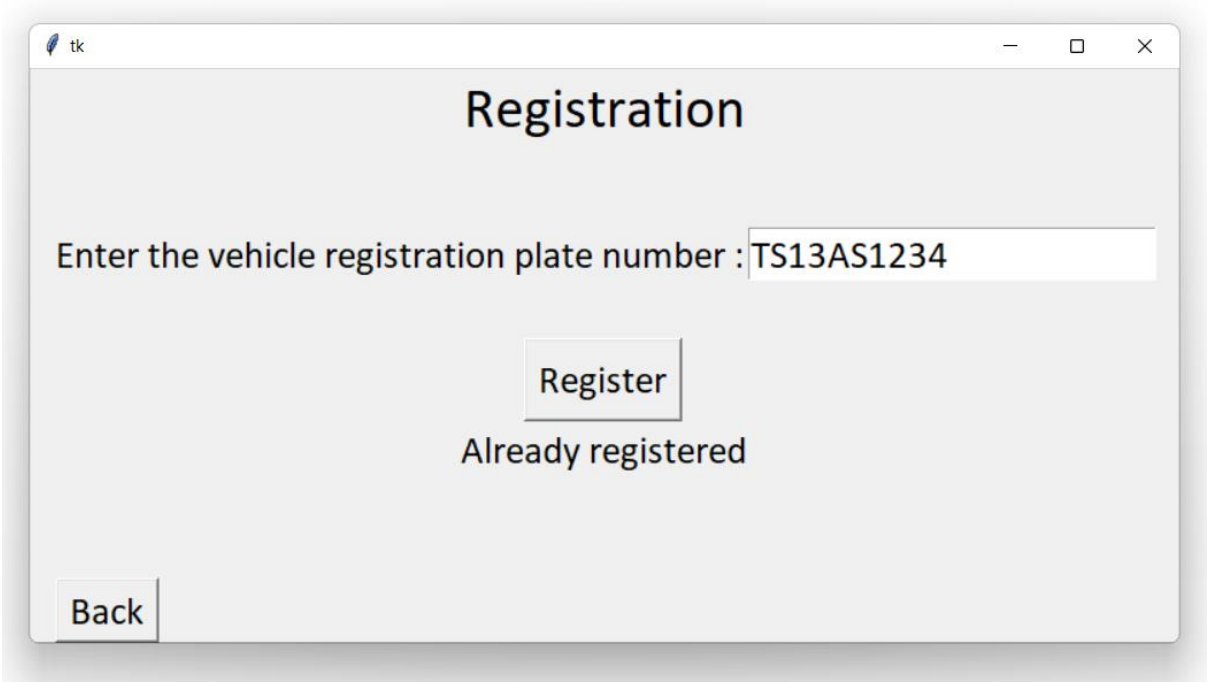
1. License plate detection.
2. Duplicate license detection.
3. Entry and exit logs.
4. Check for the status of the vehicle.
5. Registered vehicles.

(b) UI prototypes or screenshots –




tk
Check the status of a Car
Enter the number plate: TS13AP3425
Check
Outside
Back

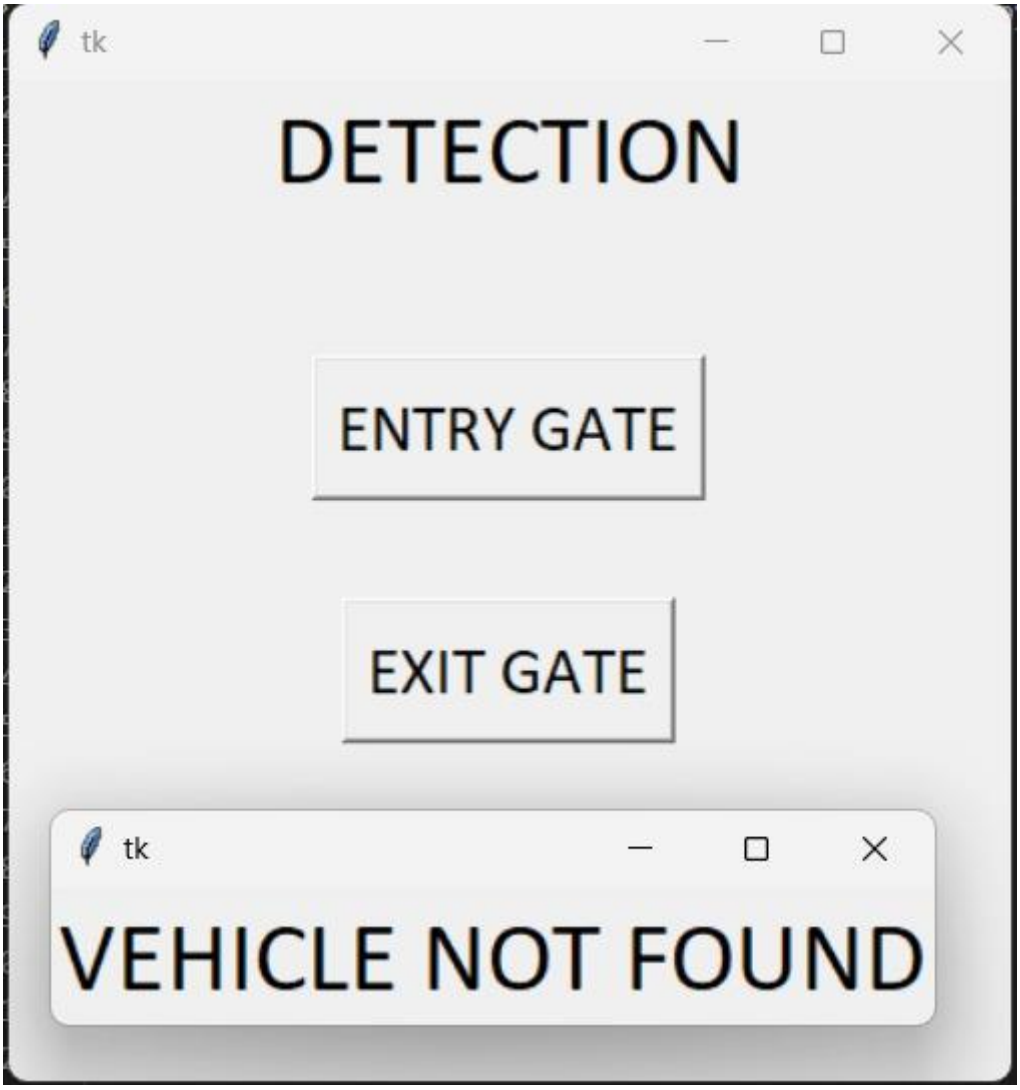

tk
Check the status of a Car
Enter the number plate: TS13AS1234
Check
Inside
Back


tk
Registration
Enter the vehicle registration plate number : TS13AS1234
Register
Already registered
Back


tk
Registration
Enter the vehicle registration plate number : TS12AP9876
Register
Successfully resgistered
Back


tk
DETECTION
ENTRY GATE
EXIT GATE
Back


tk
DETECTION
ENTRY GATE
EXIT GATE
tk
DUPLICATE VEHICLE TRYING TO ENTER

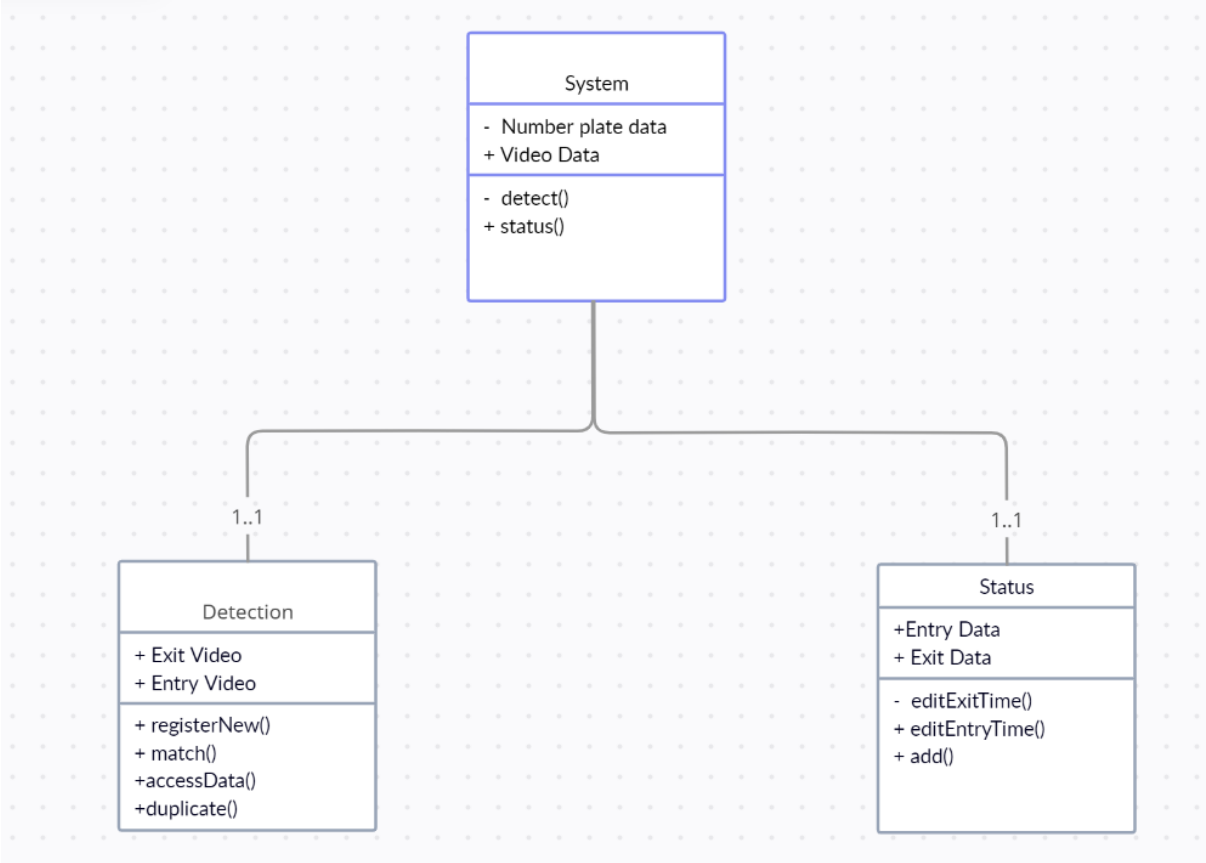

tk
DETECTION
ENTRY GATE
EXIT GATE
tk
VEHICLE NOT FOUND

(c)Architecture and Technology used –

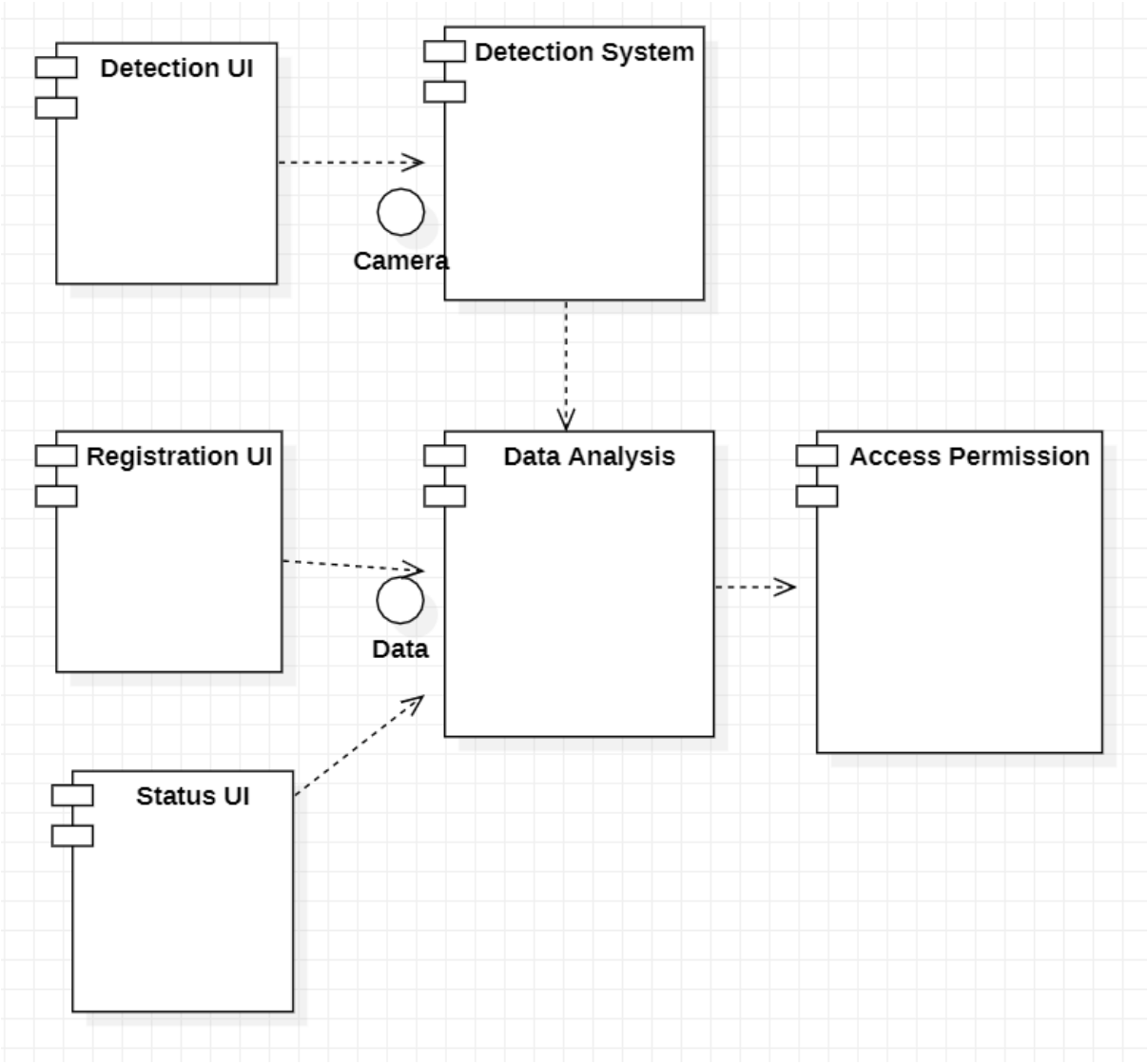
- Detection of number plates –
  Detecting the number plate using YOLO Algorithm. YOLO is an abbreviation for the term 'You Look Only Once'. This is an algorithm that detects and recognizes various objects in a picture (in real-time). YOLO algorithm employs convolutional neural networks (CNN) to detect objects in real-time. As the name suggests, the algorithm requires only a single forward propagation through a neural network to detect objects.
- Reading Number plate –
  We read the number plate in the frame with help of EasyOCR. EasyOCR is a font-dependent printed character reader based on a template matching algorithm.
- Authenticate –
  - Check if the truck which is entering is registered in the database.
  - If it's a new truck and is needed to be registered, we register it
  - If it's an old truck, then we analyze it.
  - If it's not an old truck nor registered then the truck is an anomaly and the user is alerted.
- Analysis –
  - When the truck is entering into the mine, we log it into a database on cloud.
  - When the truck is entering or leaving the mine, we monitor it and log the time and update it to the cloud.
  - If the truck is entering the mine, it's flagged as "inside".
  - If the truck is leaving the mine, then it's flagged as "outside".
  - If another truck which has a duplicate number plate enters/exits the mine then we check its status in the database. We can know it's a duplicate as a single truck can either be outside or inside at a particular time.

(d) Design –

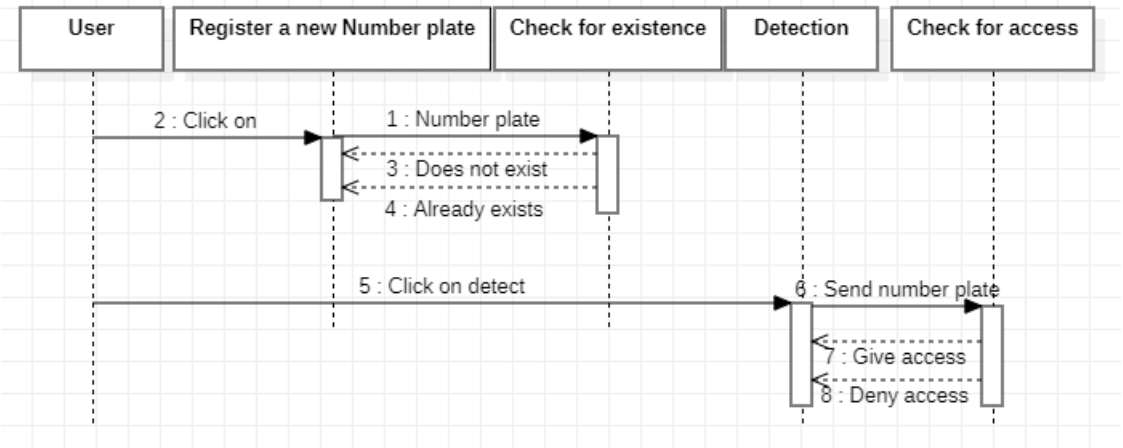
- Class diagram –



- Component diagram –



- Sequence Diagram –



(e)Implementation –

I. Description of main modules/classes/components -

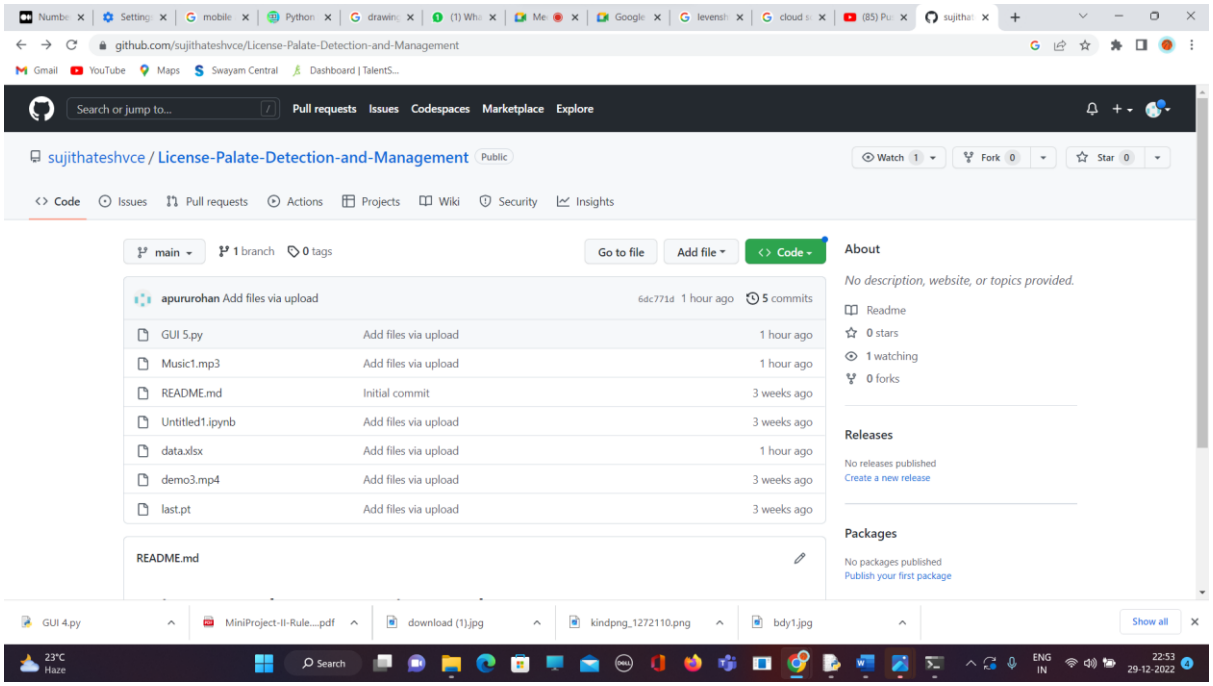
The main module of our system is detection. For completing this program, we derive a result interface from the trained model of the detecting the number plate using yolo v5 version. The live feed read frame by frame will be sent to this model to detect the number plate. The model returns the dimensions of the number plate. The frames are cut to its dimensions and this photo are given to EasyOCR. EasyOCR returns the text on the number plate. This data extracted is matched with the registered number plates and data is analysed.

II. Any specific algorithm/logic to be highlighted.

We used YOLOv5 model to train on the number plate sets. YOLOv5 is a family of compound-scaled object detection models trained on the COCO dataset, and includes simple functionality for Test Time Augmentation (TTA), model assembling, hyperparameter evolution, and export to ONNX, CoreML and TFLite. Our dataset included 200+ images containing number plates of all states across India. This image included number plates of cars, bikes and trucks.

III. GitHub links and folder structure.

https://github.com/sujithateshvce/License-Palate-Detection-and-Management



(f) Testing -

We tested the system built by starting the data from null.

We tried to make an entry into the gate at entry gate detection. It alarmed saying the vehicle was not registered. Then, we have registered the vehicle in the database. We repeated the above process of entering the vehicle at the gate. This process did not throw any error now.

Now quit the detection at entry, and start the process again with the same number plate as the number plate is already detected at the entry gate, it will show inside. But we are trying to enter with the same number plate, so it will throw an error with alarm as duplicate entry.

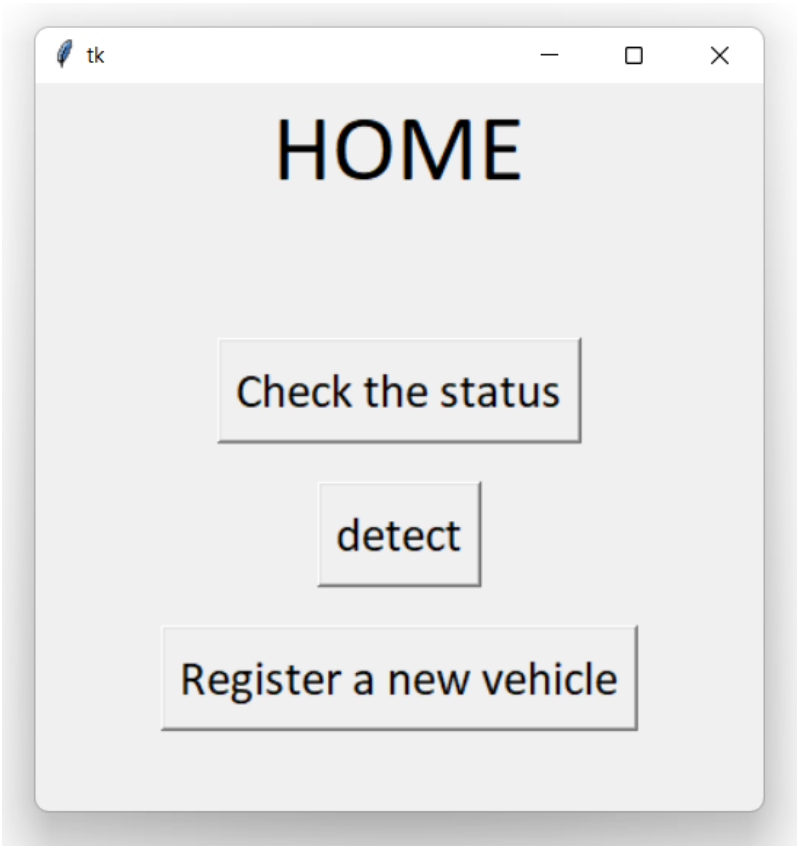
Then come back to home and restart the system. Then click on the check status button. Now, enter any vehicle number. If the vehicle is inside, it displays inside otherwise outside.

Now, click on detection at exit gate, then give slide a number plate which has not entered or not registered. It fires the alarm and displays the corresponding text. Repeat the above process using a number plate

which has entered properly at the entry gate. Now it does not fire any alarm. The exit is smooth.

After the above process has completed, quit the system using ‘q’. Then check the status of the number plate which just exited. It will show that the vehicle is outside.

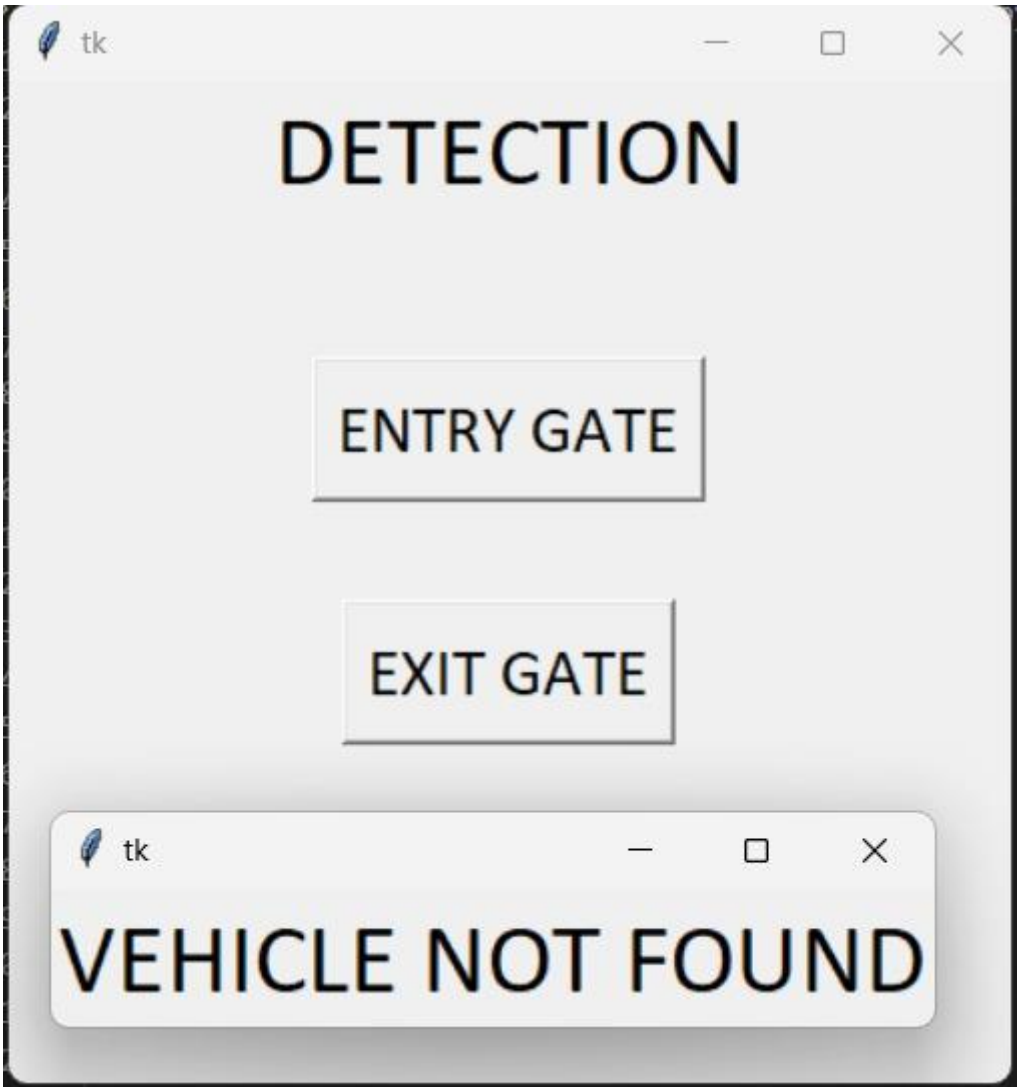
RESULTS


tk
HOME
Check the status
detect
Register a new vehicle


tk
DETECTION
ENTRY GATE
EXIT GATE
Back


YOLO
numberplate 0.91
IND
GJ03L
K0563


tk
DETECTION
ENTRY GATE
EXIT GATE
tk
DUPLICATE VEHICLE TRYING TO ENTER


tk
DETECTION
ENTRY GATE
EXIT GATE
tk
VEHICLE NOT FOUND

DISCUSSION AND FUTURE WORK

- We like to extend our system as a web application where user can maintain a record on the vehicles moving in and out of his house.
- This project can be extended to work on Night vision video cameras to detect the number plates in dark also.
- This project can be made as a mobile application and work as an apartment management system by linking the system with the CCTV camera.
- The system can be made to connect to CC cameras using IOT and function without the need of capturing every time.
- We can maintain a cloud database to store all the details of number plate, exit and entry times.

REFERENCES

- https://www.youtube.com/watch?v=GRtgLlwxpc4&ab_channel=DeepLearning
- https://pytorch.org/
- https://www.youtube.com/watch?v=ag3DLKsl2vk&t=68s&ab_channel=codebasics
- https://www.youtube.com/watch?v=IfRMV2MY9n0&ab_channel=codebasics
- https://opencv.org/
- https://www.jaided.ai/easyocr/tutorial/
- https://github.com/ultralytics/yolov5
- https://www.youtube.com/watch?v=hTCmL3S4Obw&ab_channel=WhenMathsMeetCoding
- https://openpyxl.readthedocs.io/en/stable/