EMBEDDED SYSTEM

AUTOMATIC NUMBER PLATE RECOGNITION

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Anuj Soni

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ABOUT THE PROJECT

What is Automatic Number plate Recognition ?

It is a software based solution implemented on raspberry pi to recognize the number plate automatically by accomplishing intricate optical character recognition on images to read the license plates of any vehicle.

This system works in a very unique way. First, it takes the image of the vehicle as input and then returns the decoded vehicle plate, timestamp, and confidence status of the decoding algorithm. You will be amazed to know that it can analyze the image in 50 to 100 ms to allow real-time management.

MAJOR REQUIREMENTS

Things required for this particular projects are as follows :-

- **Raspberry Pi** - It is an SoC microprocessor basically for the computation of our algorithm i.e., number plate extraction and optical character recognition.
- **Camera Module** - Camera for capturing number plate of vehicles that are further go for preprocessing.
- **Monitor** - Laptop monitor for screen casting shared by raspberry pi via wireless lan using vnc viewer.
- **Speaker** - Produce beep sound for registered vehicle captured by camera.

Project Goals

The issue of security is very paramount in any organisation, especially such organisations as college institutions. Therefore we intend to aid in security of the institution by bringing up a hardware solution on ANPR (Automatic Number Plate Recognition) using Raspberry pi that involves individual's vehicle to get recognised by the system via their respected vehicle number that is further stored on database to check whether the vehicle is registered one or not.

The system does not require any user interaction rather it automatically captures the numbers written over the number plate through the camera module. From this project, we hope to build an alternative security system for institutes.

SNEAK PEEK

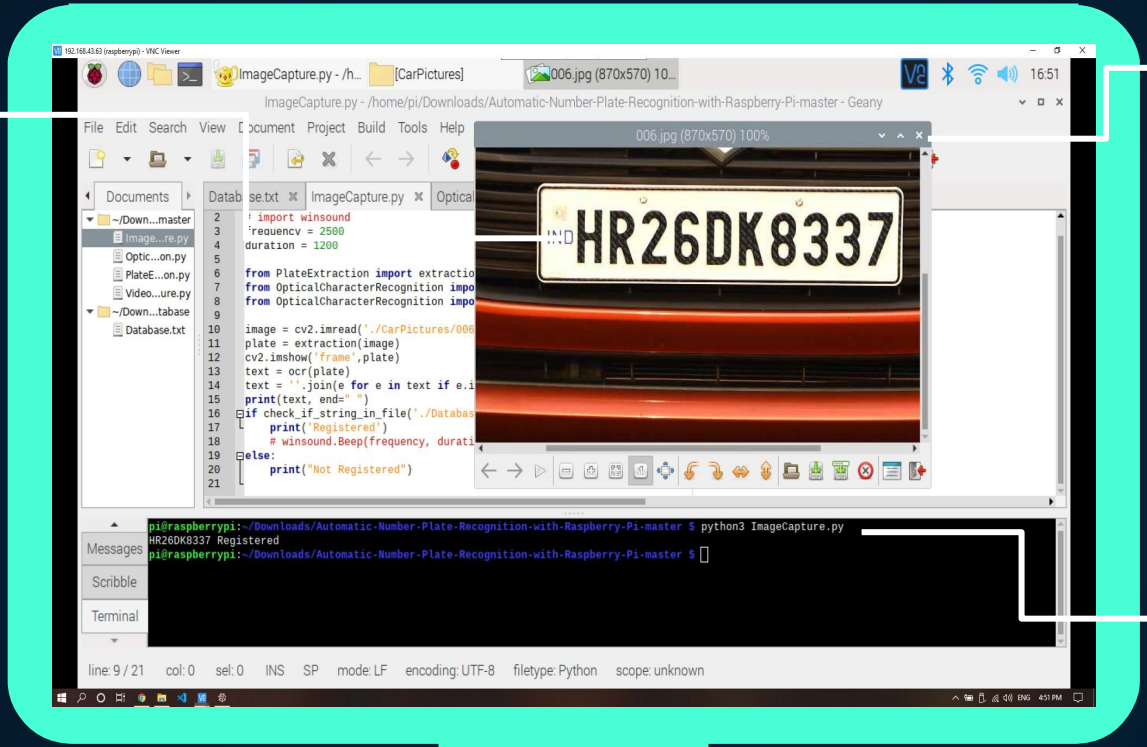


Figure showing input vehicle is registered in clicked image

SNEAK PEEK

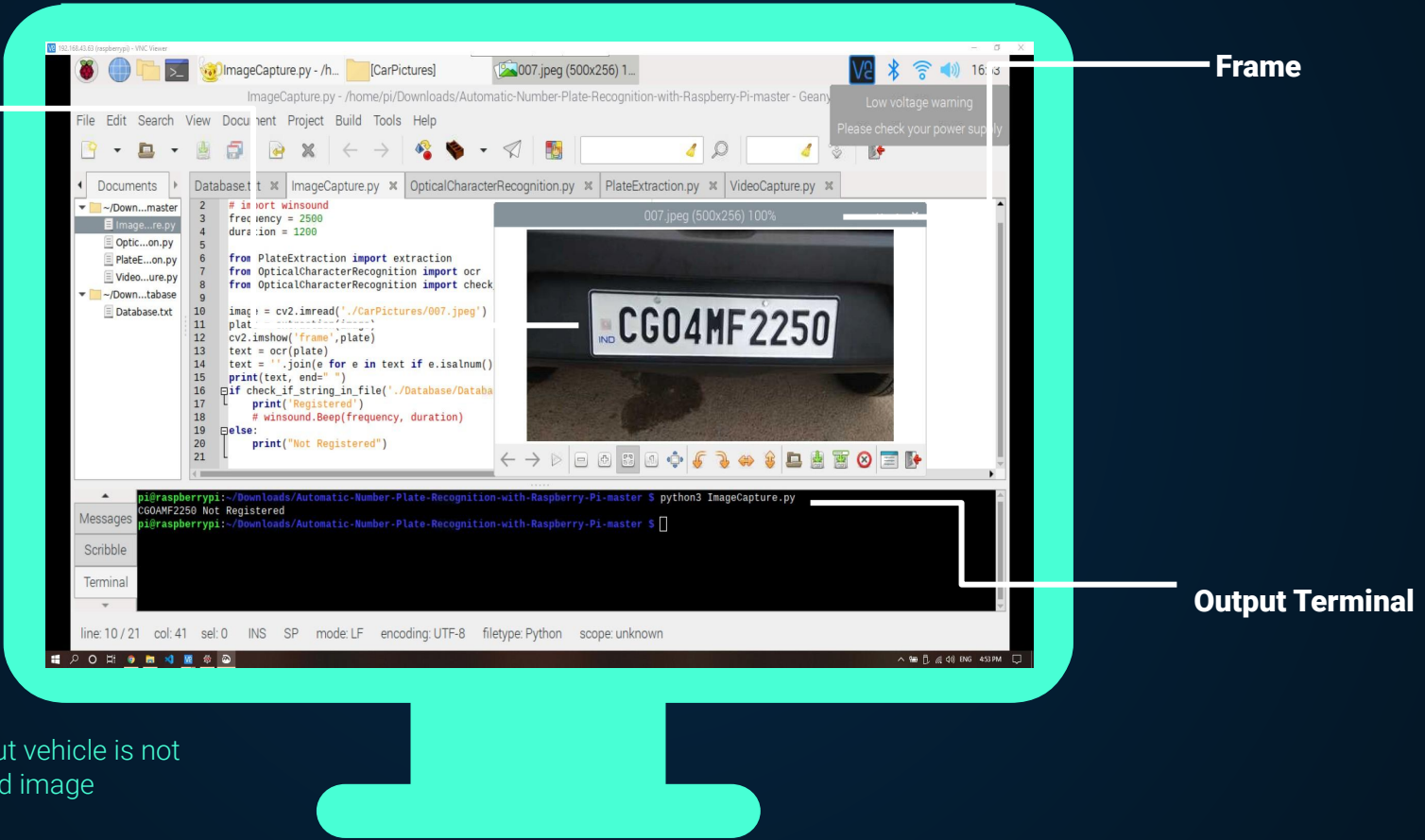


Figure showing input vehicle is not Registered in clicked image

SNEAK PEEK

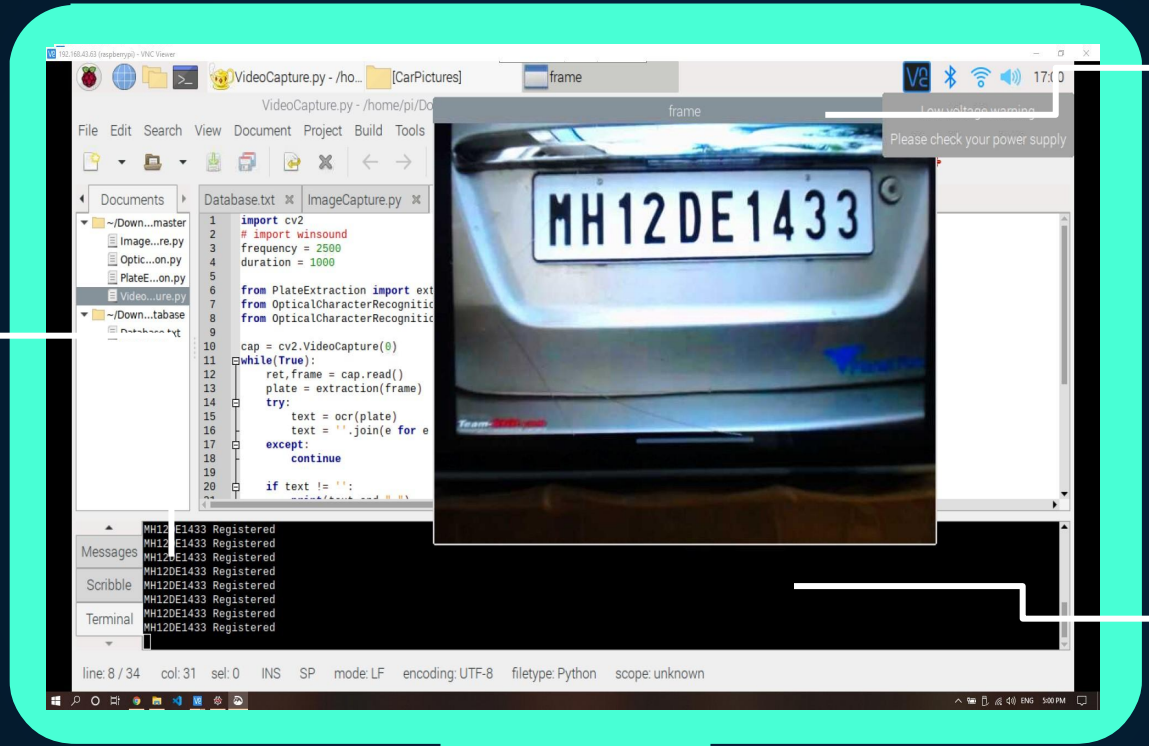


Figure showing input vehicle is registered in realtime stream

SNEAK PEEK

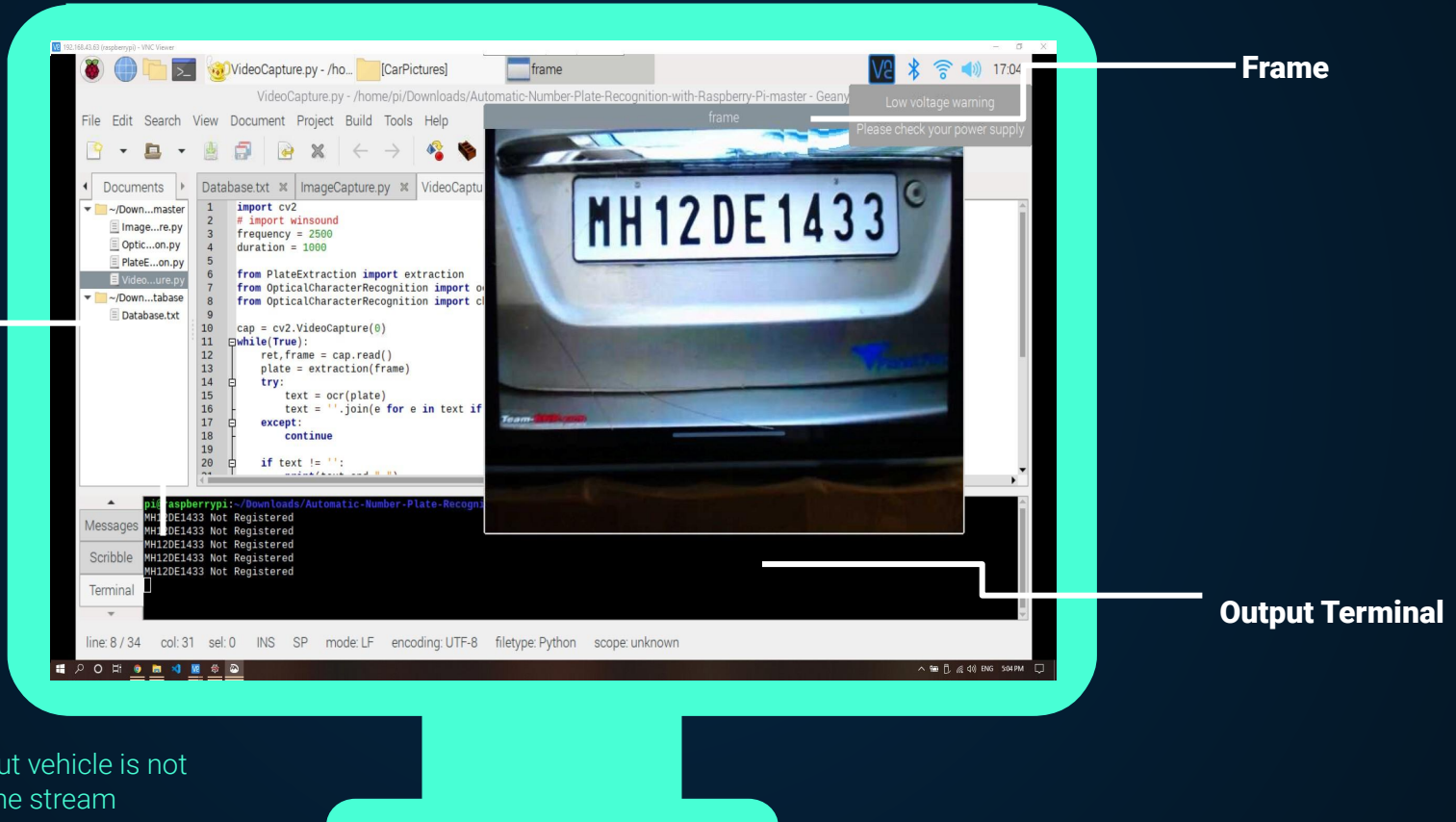


Figure showing input vehicle is not registered in realtime stream

SNEAK PEEK

Camera Module

Raspberry Pi

Complete Setup

OUR GOALS

USABILITY

This technology is used in various security and traffic applications,such as the access-control system. While the vehicle approaches the gate, the LPR unit automatically “reads” the license plate registration number, compares to a predefined list, and opens the gate if there is a match.

POSITIONING

It could be positioned in the parking area,for access control, entrance gates for vehicle monitoring or at toll road.

EXPANSION

Expand
their collection of relevant data, and expedite the tedious and time consuming process of manually comparing vehicle license plates with lists of stolen, wanted, and other vehicles of interest.

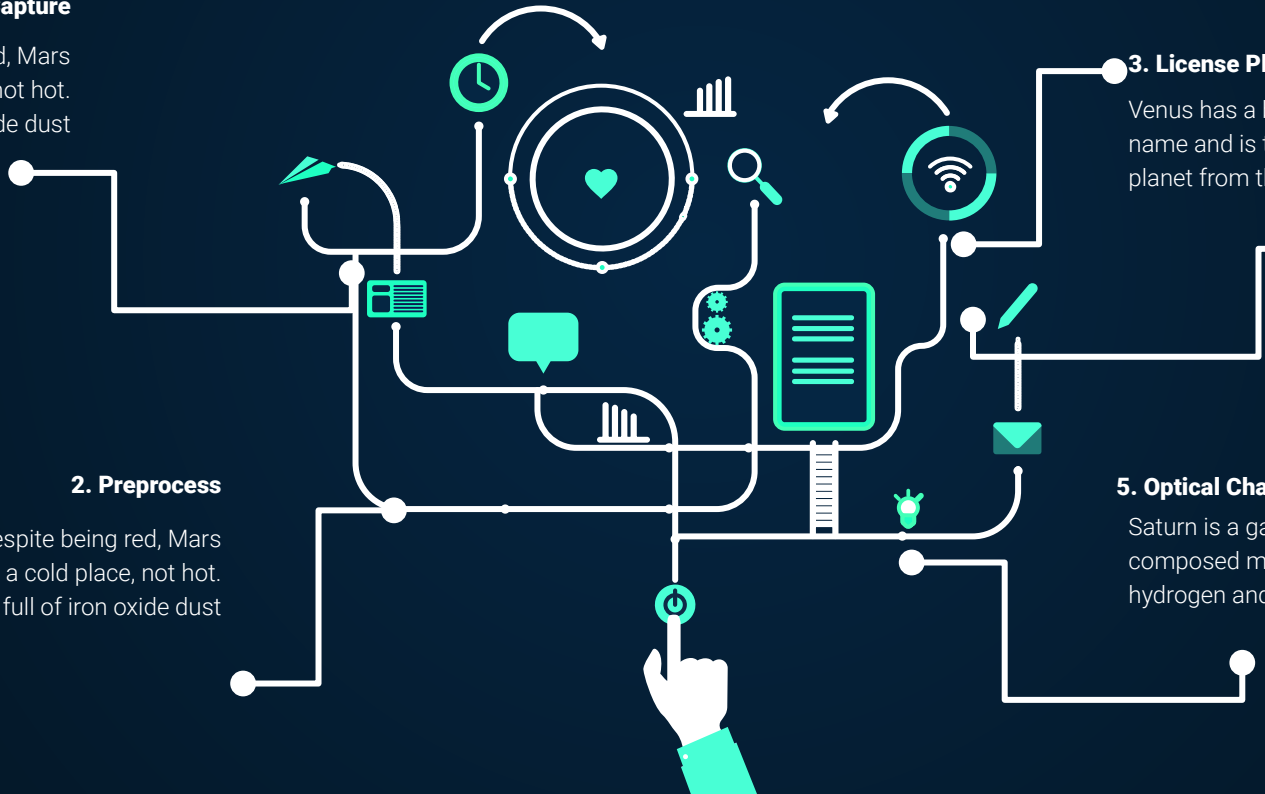
PROJECT STAGES

1. Capture

Despite being red, Mars is a cold place, not hot. It's full of iron oxide dust

2. Preprocess

Despite being red, Mars is a cold place, not hot. It's full of iron oxide dust



3. License Plate Extractor

Venus has a beautiful name and is the second planet from the Sun

4. Character Segmentation

Despite being red, Mars is a cold place, not hot. It's full of iron oxide dust

5. Optical Character Recognition

Saturn is a gas giant, composed mostly of hydrogen and helium

Stages

- **Capture**
  - The image of the vehicle is captured using a high resolution photographic camera.
- **Preprocessing**
  - Preprocessing is the set algorithms applied on the image to enhance the quality.
  - It is an important and common phase in any computer vision system.
  - For the present system preprocessing involves two processes: Convert color space and resizing.
- **License Plate Extractor**
  - This process includes different techniques on image to detect and extract license plates.
  - This process is divided into two parts, license Plate Detection through Haar-like Features and License Plate Detection through Edge Detection.

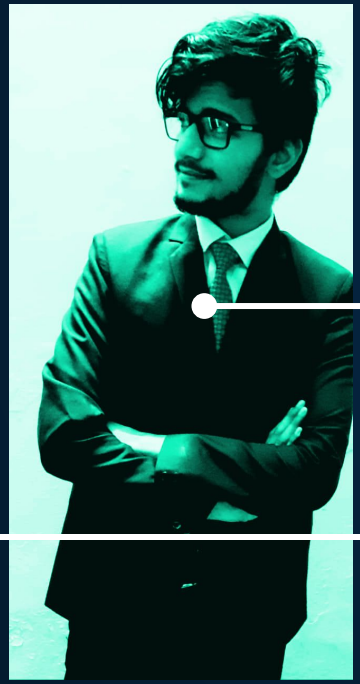
Stages (contd.)

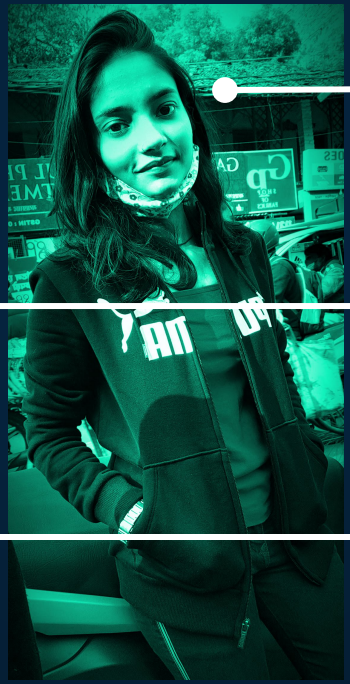
- **Character segmentation**
  - Image processing is done on the extracted license plate to remove unnecessary data.
  - After character segmentation, the extracted license plate has only those characters that belong to the license number.
- **Optical Character Recognition**
  - The selected blobs are sent to a Optical Character Recognition (OCR) Engine, which returns the ASCII of the license number.

FUTURE SCOPE

- The system can be enhanced using sensors at the entrance. As any vehicle enters the gate it first captures the image of its number plate.If the number plate matches then the gate would open, else it will send an alert.
- ANPR can be further exploited for vehicle owner identification, vehicle model identification traffic control, vehicle speed control and vehicle location tracking.
- It can provide various benefits like traffic safety enforcement, security- in case of suspicious activity by vehicle, easy to use, immediate information availability- as compare to searching vehicle owner registration details manually and cost effective for any country
- Most of the ANPR focus on processing one vehicle number plate but in real-time there can be more than one vehicle number plates while the images are being captured.
- It can be further extended as a multilingual ANPR to identify the language of characters automatically based on the training data.

THE TEAM





Laxmi Vishwakarma

Manages the Plate Extraction and numbers segmentation.

Anuj Soni

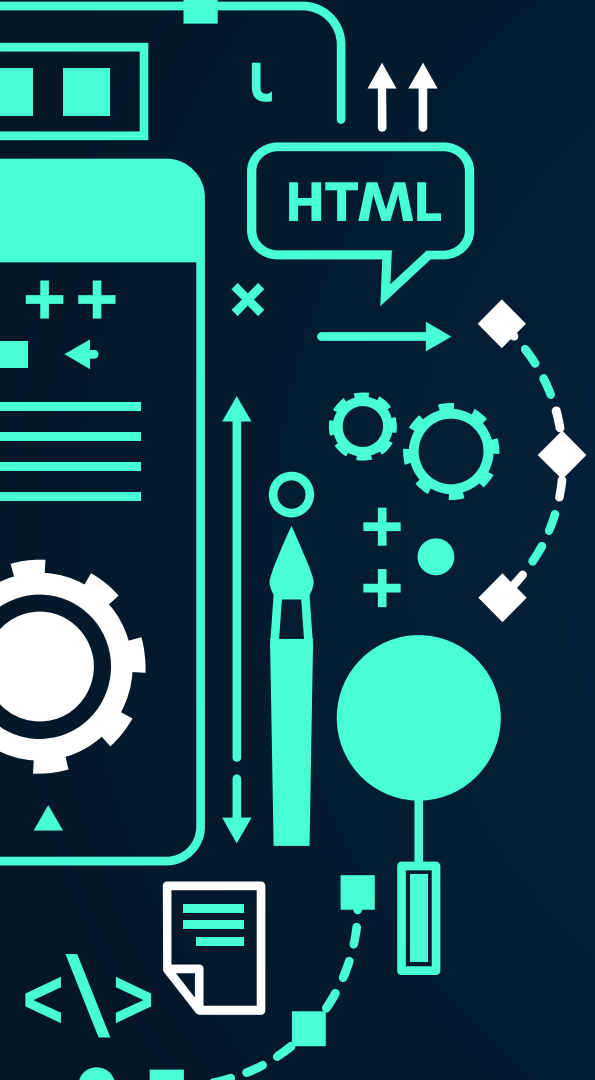
Mainly focuses on Hardware components and implementation.

Tejasvita Pandey

Handles the recognition and database part.

Instructions for use

- The distance between the camera and the vehicle should not be greater than a particular distance in order to capture number plate clearly.
- Position of the camera, brightness for capturing, clarity of camera lens are the factors that should be taken care for better outcome.
- The raspberry pi requires sufficient power supply of 5.1V with micro USB connector.
- Raspberry pi should be placed safely and in such a way that it’s performance does not get affected by the weather conditions.
- The speaker(from which beep sound is to be heard) should be close enough to the user.



THANKS!

Questions are welcome

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Youtube Link -
https://www.youtube.com/watch?v=rBKnR693Sto&feature=youtu.be&ab_channel=AnujSoni
Github Link -
https://github.com/sonianuj287/Automatic-Number-Plate-Recognition-with-Raspberry-Pi