

# Vehicle Detection System

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**Abstract** - Tracking vehicles for a purpose is very important and can be very useful for many purposes. The Number Plate Recognition technique is the most popular technique that is used for identifying vehicle Attributes such as Vehicle name, model, etc. Most countries do have advanced technology to detect number plates but when it comes to the most populated county especially in India, we do face issues. As the demand for automobiles is gradually increasing which tends to increase the demand for new innovations. But Considering the RTO rules in 2020-2021. India would slowly and steadily come into consideration for a single format only noticing the fine and required knowledge is being given to n number of people at toll centers Using computer vision and machine learning. We can solve the issue, our project deals with the concept of real-time-based vehicle tracking on a continuous video stream from a CCTV camera to track the vehicles.

**Key Words:** tracking vehicles, vehicle recognition, cctv camera, track.

## 1. INTRODUCTION

Individual vehicles also as public transportation frameworks, the power to follow or track vehicles is extremely helpful. Using computer vision and machine learning we can solve complex problems and with effective outcomes. The main purpose of our project is to deal with the concept of real-time-based vehicle tracking on a continuous video stream from a CCTV camera to track the vehicles. Object detection is applied to realize faster object detection for real-time tracking. We would focus on the type

of vehicle i.e. car or bike, for instance, also the number plate detection and the color of the vehicle. Firstly, the software would slice the frames from the streaming video so that would be easier to detect the attributes precisely. Secondly, slice the area of the required part (for instance if we take the car; the number plate of it would be cropped for focusing on the required output as correctly as possible. Lastly, the software would store the required data in the database for future usage.

## 2. PROBLEM STATEMENT

Nowadays technology has vastly increased productivity since the ability of computers to solve complex problems has improved performance in all tasks. Our main focus in this project is to find an alternative solution to reduce resources with the optimized results. We would focus and capture various attributes of vehicles (Type of vehicle, the model of vehicle, Color, Number Plate of vehicle, Peculiar attachments, accessories, marking including dent marks) captured from various CCTV Systems through the distributed intelligence (software) along with time and location stamp. The database is so compiled to be used to identify suspects from video clips of crime-related CCTV footage located on routes and close to the scene of the crime. The vehicle detection method would be based on images from the day and night cameras. The main challenge in this application is the data accuracy of a particular vehicle and applying the optimistic algorithm to it. The whole process can be done again till the location of the suspected vehicle is found.

## DIAGRAM

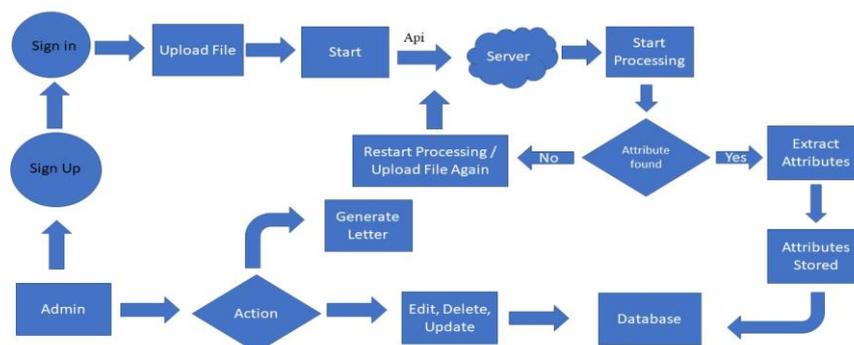


Figure 1. Proposed System Diagram

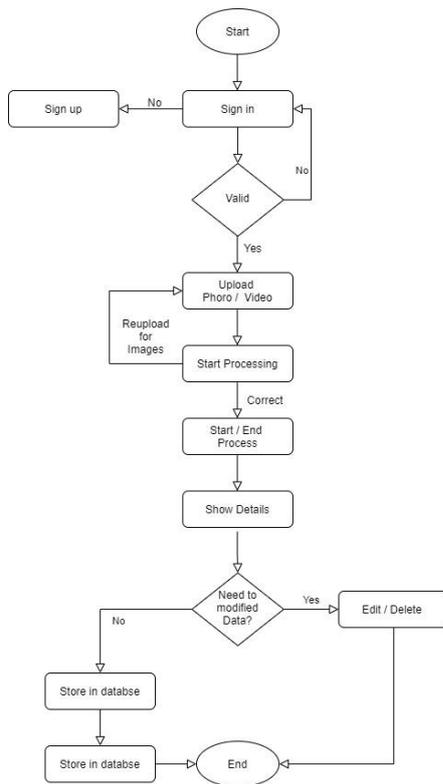


Figure 2: Proposed System Flow chart

### 3. PROPOSED SYSTEM

The proposed system is used for navigating the suspected vehicle. The system would store the attributes of the vehicle in the database. The system tracks the location of a particular vehicle and sends it to the database for reference if needed. The system allows only admin to check or track the details of the vehicle. One can also check the color of the car or the type of vehicle. In our system, we created a dashboard for monitoring the victim/criminal/suspected based on video /image and process the data to find the victim/suspect vehicle attributes. In this process, Machine learning and AI play an important role and responsibility for Natural Language Processing (NLP) and conversion. When we move to the procedure, the first thing would be to identify the user input and start storing the image frame-by-frame and the dataset system recognizes the vehicle and extracts vehicle attributes using API. The accuracy of confidence level depends on the trained dataset. The system is trained to identify the model of the car, type of vehicle, i.e., car/bike, color of the car. Extracted entities such as type of vehicle, number plate, etc. are stored into the database for future references.

### 4. IMPLEMENTATION DETAILS

In this section, we present the design details of the proposed Vehicle Detection System. We describe the network architecture, provide the corresponding formulations and algorithms, and present the training algorithm. Our purpose

of this model is to detect the moving object in a video as illustrated in the image above. The moving car/bike is recognized. There are multiple ways to solve this problem. We train a deep learning model using TensorFlow using multiple images from different models for object detection and use a trained model for attributes or car detection. However, these are supervised learning approaches, and they require labeled data to train the object detection model. In the last few years, Automatic License Plate Recognition (ALPR) or license plate recognition (LPR) has been one of the useful approaches for vehicle surveillance. It can be applied at a number of public places for fulfilling some of the purposes like traffic safety enforcement, automatic toll tax collection, Automatic vehicle parking system, etc [9]. ALPR algorithms are generally divided into four steps:

- A) Preprocessing
- B) Algorithm
- C) Character recognizing

i.e., to capture an image of the vehicle looks very easy but it is quite an exigent task as it is very difficult to capture an image of a moving vehicle in real-time in such a manner that none of the components of a vehicle, especially a vehicle number plate, should be missed. [3] Secondly, the project also includes capturing some additional attributes of the car, which include the color of the car, model of the car, brand name of the car, and vehicle type.

#### A. Preprocessing

During the process of number plate detection, it is essential that the quality of images/video should be comparatively better enough to process further. The accuracy of character detection is not only dependent on the training model but also on the quality of input. The first step is to preprocess the image and enhance the image by filtering noise in the image to make the character visible. Increasing the saturation of the image will help to separate between colors and exposure. Then the image is converted to grayscale. Then increasing the image contrast to separate the background from highlights.



Figure 3: Sample stationary vehicle image

### B. Algorithm

The processing of frames in the software has multiple steps in image processing algorithms. To find out the faster results algorithms have been tested with multiple brands, camera angle, and angle of approach of the vehicles. Deep computer vision algorithms are used to detect and recognize license plates as well as recognize the country/state of origin, vehicle model, etc. In addition, it also provides confidence scores for every of the above. It provides comparatively faster result without compromising performance.

### C. Character recognizing

This stage is meant for recognizing the characters from the plate. the output would be to recognize characters from the image of the number plate of the vehicle. The first step in this stage is From Input file Frame is capture (frame-by-frame) and Save multiple frames to Frame folder And Find car function find Frame to process the binary image and read frame and decode base64 to image data. Image data parse to a JSON object and send to API parameter for recognition. We use sighthound API for vehicle detection and recognition from its Sighthound Cloud API service. we request vehicle and license plate by passing dump JSON image data as parameter and in response JSON object is returned.

The paired object Type “vehicle, license plate” is required. Uploading of images and Object Management have not supported Vehicle and car place Recognition.

The vehicles in a picture should be a minimum of 200 pixels wide, and license plates in a picture should be a minimum of 80 pixels high permanently results.

The confidence for the string springs from the arrogance of every individual character, therefore the confidence value also doesn't indicate missed characters.

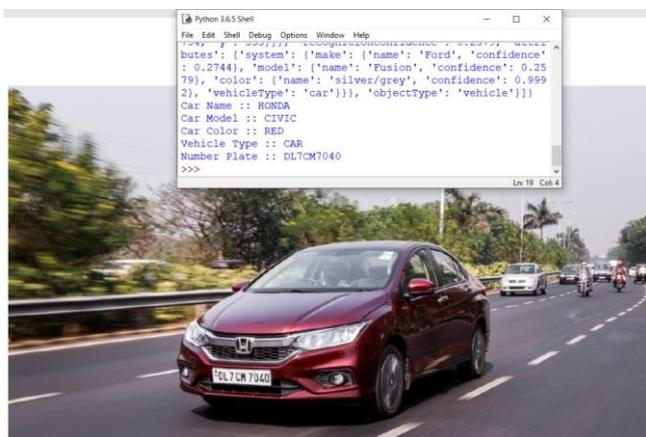


Figure 4: Vehicle recognition result on the python shell

Response as object from server is saved to response variable and convert to JSON\_response.render JSON function return

all vehicle object and extract object from array to find Attributes of vehicle like data ["car model"], data["color"] etc.

## 5. Design and Structuring of the Project

We implemented the UI design of our project, which consist of three sections named Vehicle recognized, Logging and Monitoring.

### Vehicle recognition section

a. There would be a CCTV camera i.e., live streaming video, software would perform car detection and recognition. Software would capture a frame from the web camera or test video and the captured single frame from the video and using ML training and open cv the cars would be detected. The car photos would be cropped from the larger image furthermore from the cropped image it would recognize attributes needed. The license plate recognition and detection are implemented successfully. The attributes of the vehicle will be stored in the database.

b. The License plate detection and reorganization logic is looped through cropped images would crop the car image from the larger picture and would draw a rectangle to the car image to detect and recognize the license plate number.

c. The above features are connected to the database to fire a query to database and the relevant response is returned for future use or if emergency a pdf would be created to be given to an authorized person; for further investigation.

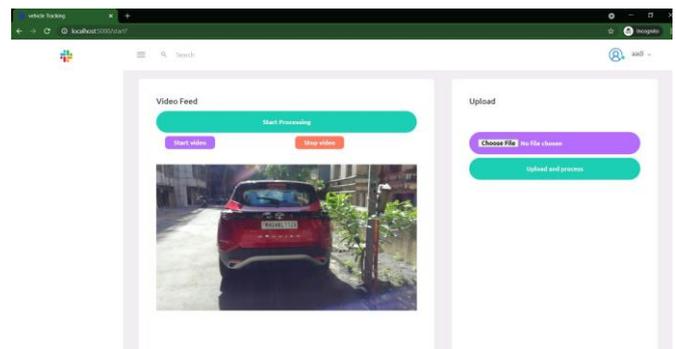


Figure 5. Vehicle Image Processing

### Monitoring section

In this section, the admin can monitor the suspected vehicle and have the privilege to edit or delete in case if the data of the vehicle is not required and also has the authority to edit any minor changes if required. Can also delete the data if the suspected vehicle is already in required action by the authority. Admin will be able to make a legal report just by adding the victim's identification details , place of the incident, time of the incident and the letter would be generated and can be sent directly to the authority

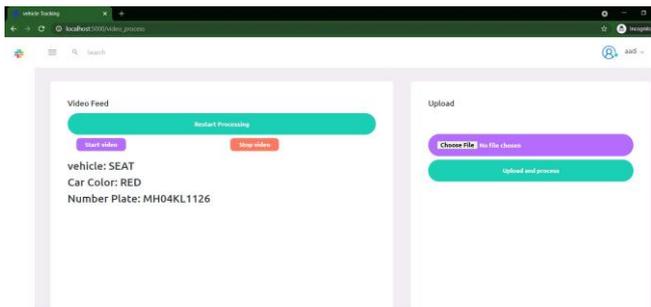


Figure 6. Recognized output

*Logging section*

We have created a dashboard using flask framework and bootstrap in which admin need to Login and Sign Up to use if he/she don't have account. In this system we provide feature to upload the suspected crime video or any images, so the system Application process the Frame and save to local storage before sending request to server. The Saved frame converted to JSON data before sending to API and proposed system send request to server to recognize vehicle. In response server return vehicle object after recognizing using our trained model. Extracted Attributes are automatically stored to database as clue for further Legal action. Admin also has access to additional features such as Edit or Delete Entry of Vehicle Data in case of not need and privilege to generate a legal letter for further investigation.

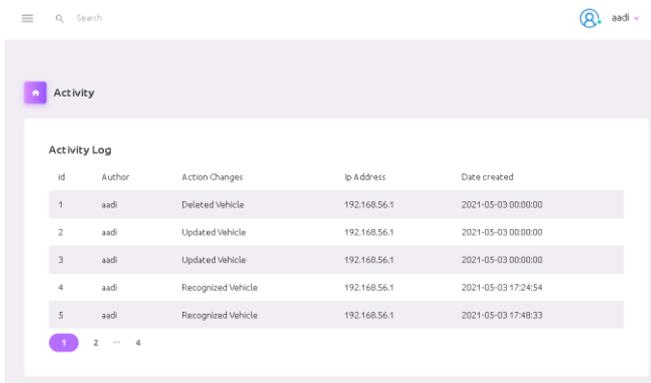


Figure 7. Activity log

**6. CONCLUSION**

Vehicle tracking systems are becoming increasingly important in large cities and it is more secured. Now a days vehicle theft is rapidly increasing, with this software we can have a comparatively better control in it. This technology can also help advance the system of transportation and can be used in many organizations for security purpose and tracking purposes.

**7. ACKNOWLEDGMENT**

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