



TRAFFIC RULES VIOLATION DETECTION SYSTEM USING MACHINE LEARNING TECHNIQUES

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Abstract - Due to the growing population and people's need for comfort, more automobiles are being purchased, particularly in urban areas. This can result in heavy traffic, indicating that traffic violations are becoming more dangerous in every corner of the world. As a result, people's awareness decreases, and there are more accidents, which may result in the loss of many lives. These situations necessitate the need to develop traffic violation detection systems to automate traffic regulations and eliminate the unawareness among human population. The proposed traffic violation detector can identify signal violations, and the individuals are informed that they will be apprehended if they break a traffic law. The proposed system is faster and efficient than human, as known already traffic police is the one who captures the image of individuals violating traffic rule but the traffic police will not be able to capture more than one violation simultaneously. The proposed system can detect most common types of traffic violations in real-time through computer vision techniques and it also leverages good results with great accuracy.

Key Words: Automobiles, Traffic violations, Signal Violations, Computer Vision Techniques.

1. INTRODUCTION

Due to ever-increasing traffic volume, it is evident that, it is becoming tough to monitor every individual under these conditions and also it is difficult to maintain the road traffic under control as it is demanding more manpower. This problem can also lead to accidents, traffic rules violation and other dangerous situations. Hence, this research work proposes an automated system for maintaining these violations under control by developing a system with the help of computer vision, which detects the violations caused by vehicles and identifies the registration number of violated vehicles in order to send an alert to the host. In general, Computer Vision is concerned on how a system can obtain high-level capabilities from the input images or videos. This project entails the process of locating and identifying a certain car's registration number. Further, it uses Convolutional Neural Networks (CNN's), which is a class of Deep learning that comes under deep neural networking are used for analyzing visual imagery. This project is built on TensorFlow, and it relies on various libraries to perform the required actions. This system can detect three types of traffic violations.

2. LITERATURE SURVEY

Madhuravani.S *et al.* [2019] passenger compartment violation detection in HOV/HOT lanes is used to enforce occupancy requirements and deter single-occupancy vehicles from illegally using high-occupancy vehicle lanes. [1].

P.Srinivas Reddy *et al.* [2019] video-based traffic violation detection system is used to automatically detect and document traffic violations using video footage, in order to improve traffic safety and enforce traffic laws. [2].

Samir A Elsagheer Mohammed [2019] An automatic traffic violation recording and reporting system based on vehicular Ad Hoc networks is used to increase traffic safety and reduce accidents by detecting and reporting traffic violations in real-time using vehicle-to-vehicle communication and intelligent transportation systems technology. [3].

Mukremin zkul *et al.* [2018] A police-less multiparty traffic violation detection and reporting system with privacy preservation is used to detect and report traffic violations in a decentralized and privacy-preserving manner, without the need for police intervention, in order to improve traffic safety and reduce the workload of law enforcement agencies. [4].

Uthsav Shetty *et al.* [2019] a cloud-based intelligent traffic system is to use cloud computing and data analysis techniques

to provide real-time traffic information, optimize traffic flow, and enhance transportation safety and efficiency. [5].

X. Zhang *et al.* [2012] Macro-block-level discriminating knowledge asymmetry coding toward surveillance video is used to improve the efficiency of video compression and reduce storage requirements for surveillance videos by leveraging knowledge asymmetry and macro-block level processing. [6].

Dat Tarn [2021] Training your own object detector with TensorFlow's Object Detector API is used to create a custom computer vision model that can accurately detect and classify specific objects or patterns in images or video for various applications, including object recognition, surveillance, and automation. [7].

Soumya G *et al.* [2021] Active learning strategies in engineering education, as discussed in the Journal of Advanced Research in Dynamical and Control Systems, is used to improve students' engagement and understanding of complex engineering concepts by promoting hands-on and problem-based learning approaches. [8].

Rhen Anjerone Bedruz *et al.* [2019] A robotic model approach for an automated traffic violation detection system with apprehension is used to develop a computer vision system that can detect traffic violations and automatically apprehend offenders using a robotic model, with the goal of improving traffic safety and reducing the workload of law enforcement agencies. [9].

Y.Artan *et al.* [2015] Passenger compartment violation detection in HOV/HOT lanes is used to enforce car occupancy requirements and discourage single-occupancy vehicles from illegally using high-occupancy vehicle lanes, with the aim of reducing traffic congestion and improving air quality. [10].

3. PROPOSED METHODOLOGY

To design and develop a traffic rules violation detection system using Machine Learning with a application through website.

4. WORKING MODEL

The proposed model necessitates two things in particular -Vehicle detection process, Graphical User Interface [GUI]. The CCTV camera footage that was recorded from different areas will be sent to the system. Vehicles will be detected from the footage. Whenever the proposed software tests the footage, the violation will be detected. The proposed software supports signal violation by involving the algorithm called R-CNN algorithm. A system flowchart 1 shows how the software works. We use tkinter for Graphical user interface and tkinter is very interactive for the user. Police officer can take care and track the traffic footage and get the details of violation with the captured vehicle image. User can take further action like manually noting license numbers which violates traffic rules and send to nearby police stations to take further actions. Overexposure, reflection, or shadows result in poor lighting and low contrast.

1. Take live video from traffic cams.
2. Detect traffic rule violated vehicle.
3. Extract the traffic rule violated vehicle image.
4. Save the image of the vehicle.

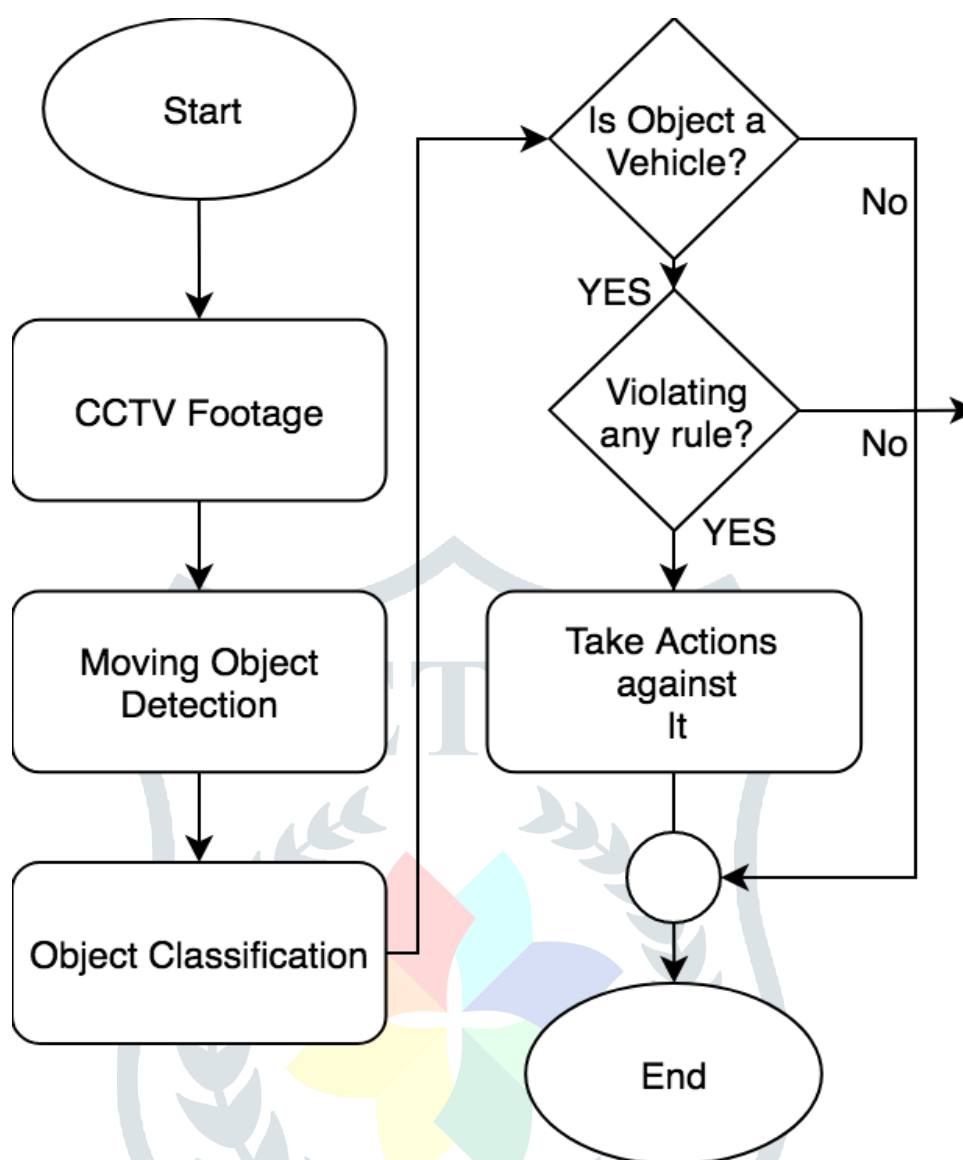


Figure 4.1: Block Diagram

5. RESULT AND DISCUSSION

In this study, a programme is being created to identify motorcyclists who do not follow the helmet laws. Motorcycle identification, helmet identification, and license plate recognition of motorcyclists riding without a helmet are the three main components of the programme. The main criterion is to use CNN to see if the A helmet is worn by the rider. When a rider is discovered without a helmet, the number plate of the motorcycle is recognised using tesseract OCR (Optical Character Recognition). The motorcycle/non- motorcycle categorization is 93 percent accurate, the helmet/non-helmet classification is 85 percent accurate, and license plate recognition is 51 percent accurate, for a total accuracy of around 76 percent. The accuracy will improve by increasing the training data collection and image quality.

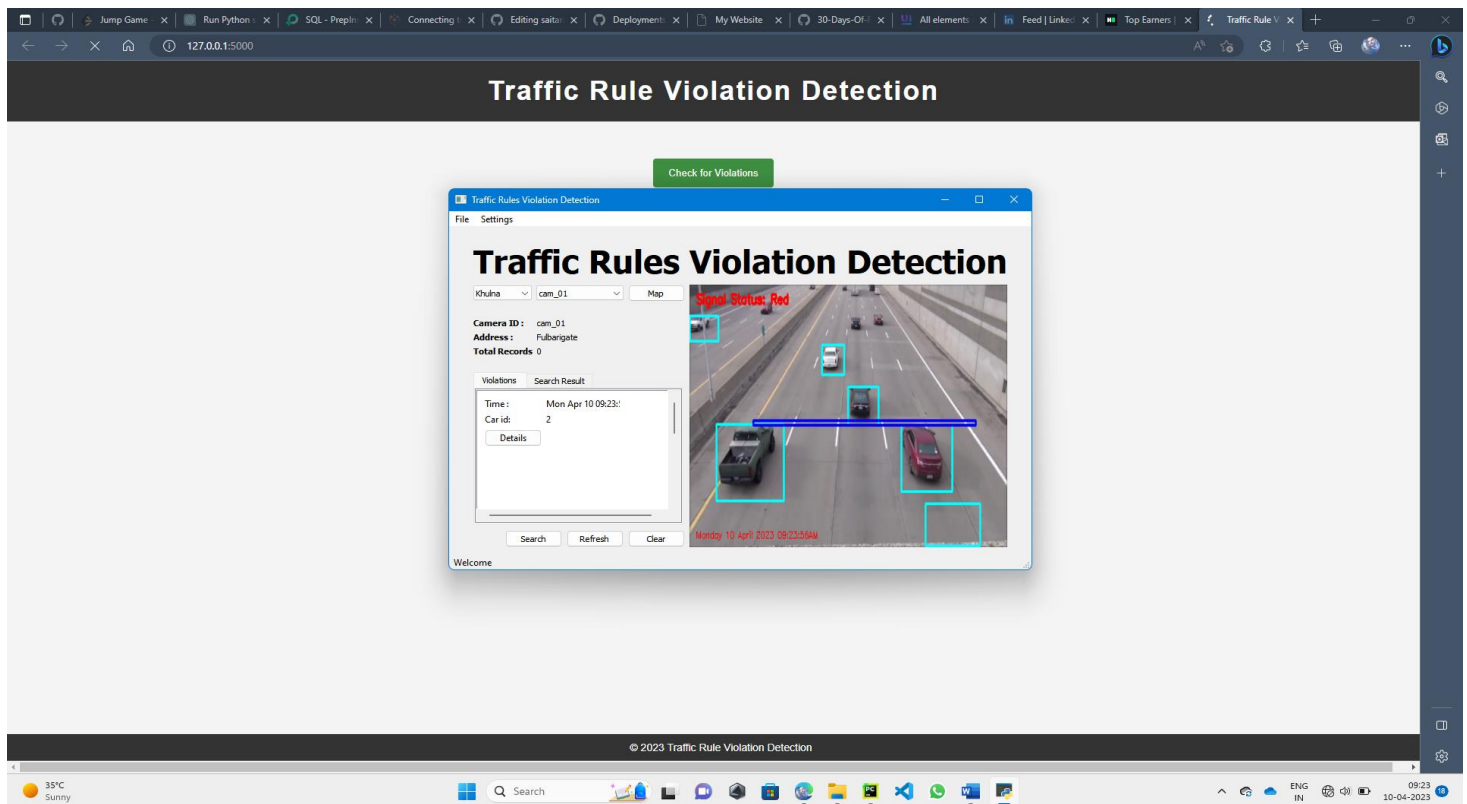


Fig. 5.1. Home Page

The home page allows the users to access the application.

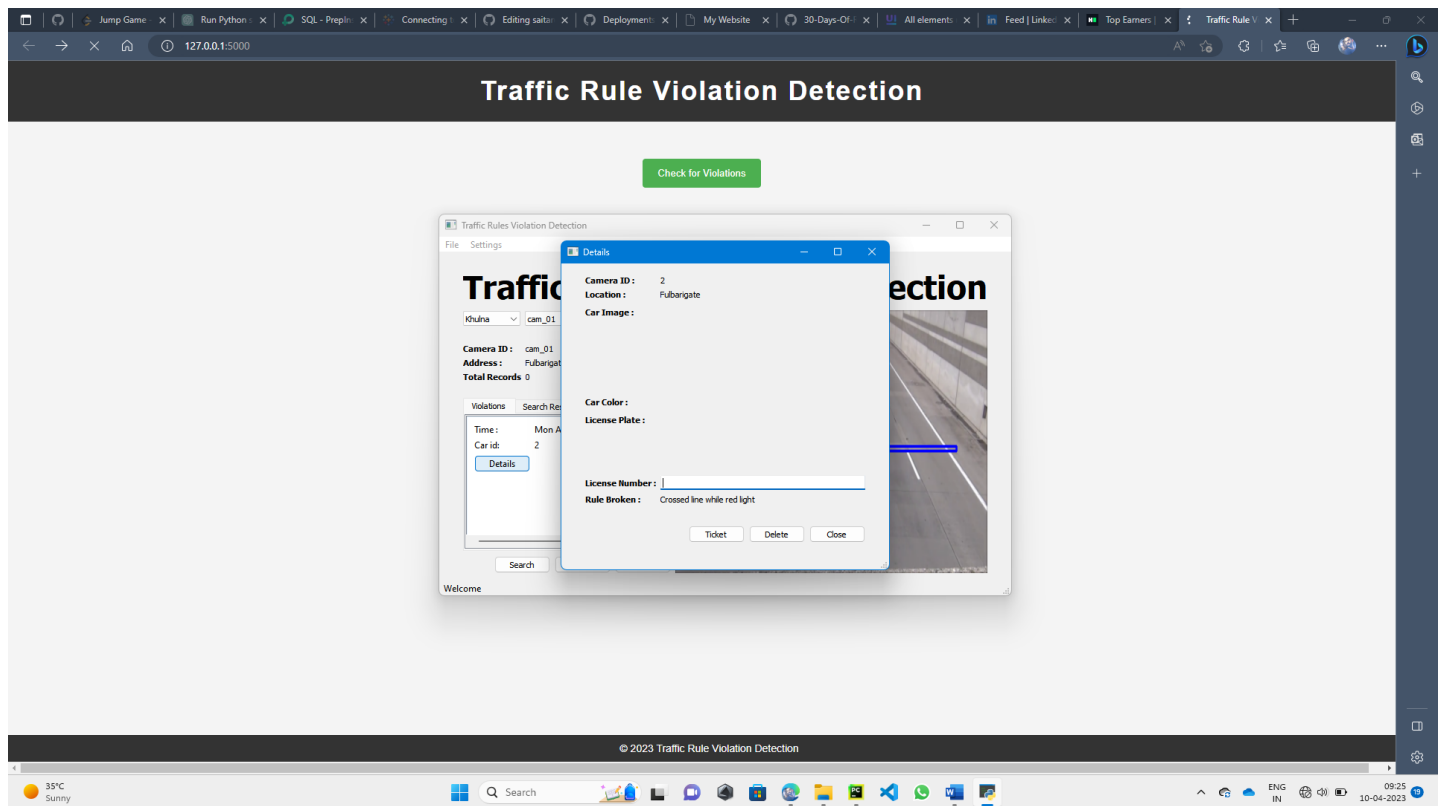


Fig. 5.2. violated vehicle details.

6. CONCLUSION

The designed algorithm which is used can ready to detect the sort of violation mentioned on this project which is denying traffic signal that is signal violation. The goal of the project is to decrease the work for traffic police officers and automatically detects the violation in the absence of traffic police and to make it easy for the traffic police department to control and observe the traffic and take measures against the violated vehicle owner in a quick and effective way. To reduce the work for the traffic police and avoid accidents. To create awareness, so that it is important for each and every individual to follow the traffic rules.

7. FUTURE SCOPE

When a signal is violated, the proposed system detects it. Further, the program runtime can be improved by using a computer with high-speed processor specifications or GPU. Future research about the software of the designed algorithm can also utilize other advanced image processing techniques. In future, we can add penalty points, where we can detect which vehicle has more challan. Due to ignoring the not required steps at backend we can boost the program runtime of the system. A computer vision algorithm used instead of providing more intelligence in the system. Our future plan is to implement the number plate detection with OCR and penalty points, support to make this system more robust. We are going to implement all the traffic rules violation detection and all we will come with the concept called penalty points, whenever the license plate is detected, on top of the vehicle we will able to find penalty point, Penalty point of vehicle is the number of challans till now the vehicle didn't paid, This concept can make easy to police officer while going through camera and can take immediate action on vehicle which has more penalty points. severity. Future work involves considering region from latitude and longitude and this problem can be turned to regression problem. We can then predict the risk of accident in the given region .If the risk is higher than immediate actions can be taken.

8. REFERENCES

- [1] Y. Artan, O. Bulan, R. P. Loce, and P. Paul, "Passenger Compartment Violation Detection in HOV/HOT Lanes," 2015.
- [2] X. Zhang, Y. Tian, L. Liang, T. Huang and W. Gao, "Macro-Block-Level Discriminating Knowledge Asymmetry Coding Toward Surveillance Video," 2012.
- [3] P.Srinivas Reddy, Ramesh O., "A Video-Based Traffic Violation Detection System," Sep 2019.
- [4] Dat Tran, To train your own Object Detector with TensorFlow's Object Detector API | 2021 | Towards Data Science.
- [5] Madhuravani S., Deepthi N. B., Umar S., Gouse "Passenger Compartment Violation Detection in HOV/HOT Lanes," in Aug 2019.
- [6] Sowmya G., Divya Jyothi G., Shirisha N., Navya K., Active learning strategies in engineering education, Journal of Advanced Research in Dynamical and Control Systems, Jan 2021.

- [7] [7]Mukremin Ozkul , Ilir Capuni(2018).” Police-less multiparty traffic violation detection and reporting system with privacy preservation”, IET Intelligent Transport Systems, Vol. 12 No. 5, pp. 351-358.
- [8] Rhen Anjerome Bedruz, Aaron Christian P. Uy, Ana Riza Quiros, Robert Kerwin Billones, Edwin Sybingco, Argel Bandala, Elmer P. Dadios (2019). “A Robotic Model Approach of an Automated Traffic Violation Detection System with Apprehension” 2018 IEEE 10th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment and Management (HNICEM), pp. 1-4.
- [9] Samir A. Elsagheer Mohamed (2019).“Automatic Traffic Violation Recording and Reporting System to Limit Traffic Accidents: Based on Vehicular Ad-hoc Networks (VANET)”.2019 International Conference on Innovative Trends in Computer Engineering (ITCE), pp. 254-259.
- [10] Siddharth Tripathi, Uthsav Shetty, Asif Hasnain, Rohini Hallikar (2019), „Cloud Based Intelligent Traffic System.

