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TRAFFIC RULES VIOLATION DETECTION SYSTEM

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ABSTRACT
Real time identification systems are very important and needful for safety, security rule following and socialism and also for own safety concerns. Traffic rules are important for safety as traffic laws are to prevent drivers of vehicles from causing accidents or hitting pedestrians. They are also to help control the flow of traffic so that it is more efficient. Traffic Rule Violations are leading cause of accidents, according to WHO India is a leading country in casualties occurring on road. The current system uses human interaction for rule violation detection, as it is a manual process it has some limitations, on multiple occasions we find the system gets corrupt. An alternative solution would be AI-developed System. With our system, we can detect multiple rule violations, for example, Vehicle crossing signal during red light or driving without a helmet, etc. Basic idea is to detect these violations through preinstalled cameras. We can do it by ML based algorithm where we can detect the violators by ImageProcessing, getting the number pate, categorizing violation accordingly and issuing fine. Which will help increase the efficiency of traffic rule enforcement.
Keywords: traffic, ML, vehicle

Introduction

The increasing number of cars in cities can cause high volume of traffic, and implies that traffic violations become more critical nowadays in Bangladesh and also around the world. This causes severe destruction of property and more accidents that may endanger the lives of the people. To solve the alarming problem and prevent such unfathomable consequences, traffic violation detection systems are needed. For which the system enforces proper traffic regulations at all times, and apprehend those who does not comply. A traffic violation detection system must be realized in real-time as the authorities track the roads all the time. Hence, traffic enforcers will not only be at ease in implementing safe roads accurately, but also efficiently; as the traffic detection system detects violations faster than humans. This system can detect traffic light violation in real-time. A user friendly graphical interface is associated with the system to make it simple for the user to operate the system, monitor traffic and take action against the violations of traffic rules.
The goal of the project is to automate the traffic signal violation detection system and make it easy for the traffic police department to monitor the traffic and take action against the violated vehicle owner in a fast and efficient way. Detecting and tracking the vehicle and their activities accurately is the main priority of the system.

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].

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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].

Existing System

The Idea of the System we have is using the infrastructure of these high surveillance systems and integrating them with Deep Learning to identify the violations. Through this System we will eliminate the human errors and system limitations.

Real time identification systems are very important and needful for safety, security rule following and socialism and also for own safety concerns. Traffic rules are important for safety as traffic laws are to prevent drivers of vehicles from causing accidents or hitting pedestrians. They are also to help control the flow of traffic so that it is more efficient. The severity of different kinds of punishment depends upon the nature of the offence committed with regards to breaking traffic rules citizens have to pay the fine, serve the jail term or be banned from driving any vehicle. It detects vehicles that do not obey traffic rules, such as breaking signal, driving in the wrong direction,

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making illegal turns, not wearing a helmet, and other violations. Basically, due to human errors or technical errors these violators escape and sometimes there are also chances of accidents occurring.

DISADVANTAGES OF EXISTING SYSTEM :

1) Less accuracy
2)low Efficiency

Proposed System

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are handengineered, with enough training, ConvNets have the ability to learn these filters/characteristics.[6] The architecture of a ConvNet is analogous to that of the connectivity pattern of Neurons in the Human Brain and was inspired by the organization of the Visual Cortex. Individual neurons respond to stimuli only in a restricted region of the visual field known as the Receptive Field. A collection of such fields overlap to cover the entire visual area. A ConvNet is able to successfully capture the Spatial and Temporal dependencies in an image through the application of relevant filters. The architecture performs a better fitting to the image dataset due to the reduction in the number of parameters involved and reusability of weights. In other words, the network can be trained to understand the sophistication of the image better.

ADVANTAGES OF PROPOSED SYSTEM :

1) High accuracy
2)High Efficiency

Results

In this project as per your requirement we have trained YoloV7 and YoloV5 algorithm to perform various detection such as Number of traffic vehicles, type of vehicle, vehicle speed and detecting weather biker has wear helmet or not. If biker wear helmet then system will show ‘helmet’ on bike detected object.

You ask to detect number plat and read it but in videos hardly we can see number plate as bike will look as small object so how we can detect and read number plate which is highly impossible.

To implement this project we have designed following modules

1) User sign up: using this module user can sign up with the system
2) User login: using this module user can login to system
3) Train YoloV7: using this module Yolov7 will be trained and loaded and then calculate accuracy on test data
4) Detect Traffic: using this module user can upload video and then Yolov7 will start detecting vehicles speed, helmet, and vehicle count

To run project install python 3.7 and then install all packages given in requirements.txt file and then install MYSQL database and then copy content from DB.txt file and paste in MYSQL console to create database.

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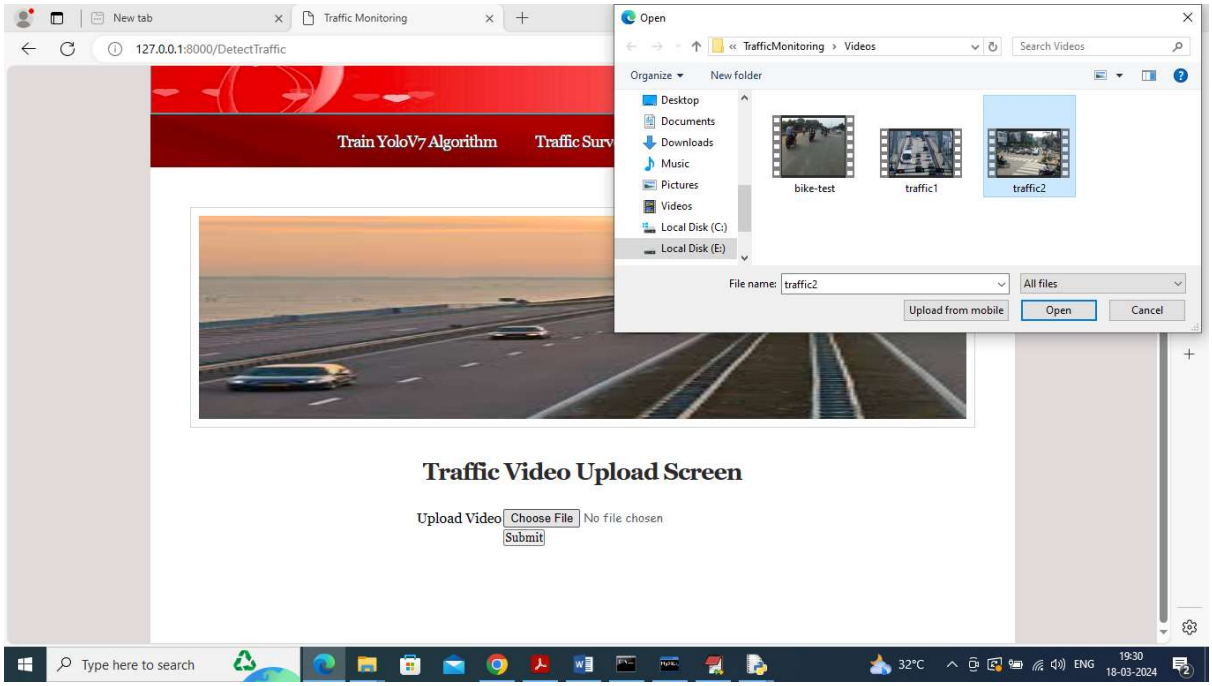
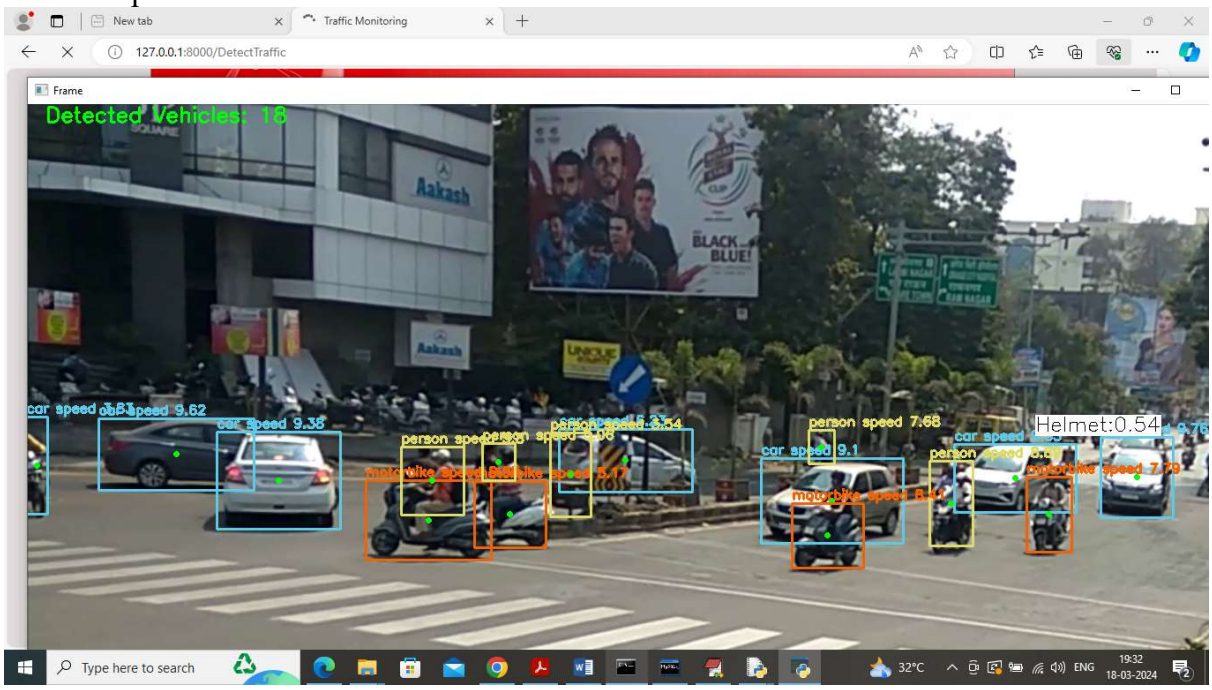


In above screen selecting and uploading video and then click on ‘Open’ and ‘Submit’ button to get below output



In above screen can see classify vehicles as Car, motor bike and can see Helmet class also in white colour text and in top in green colour text can number of detected traffic vehicles

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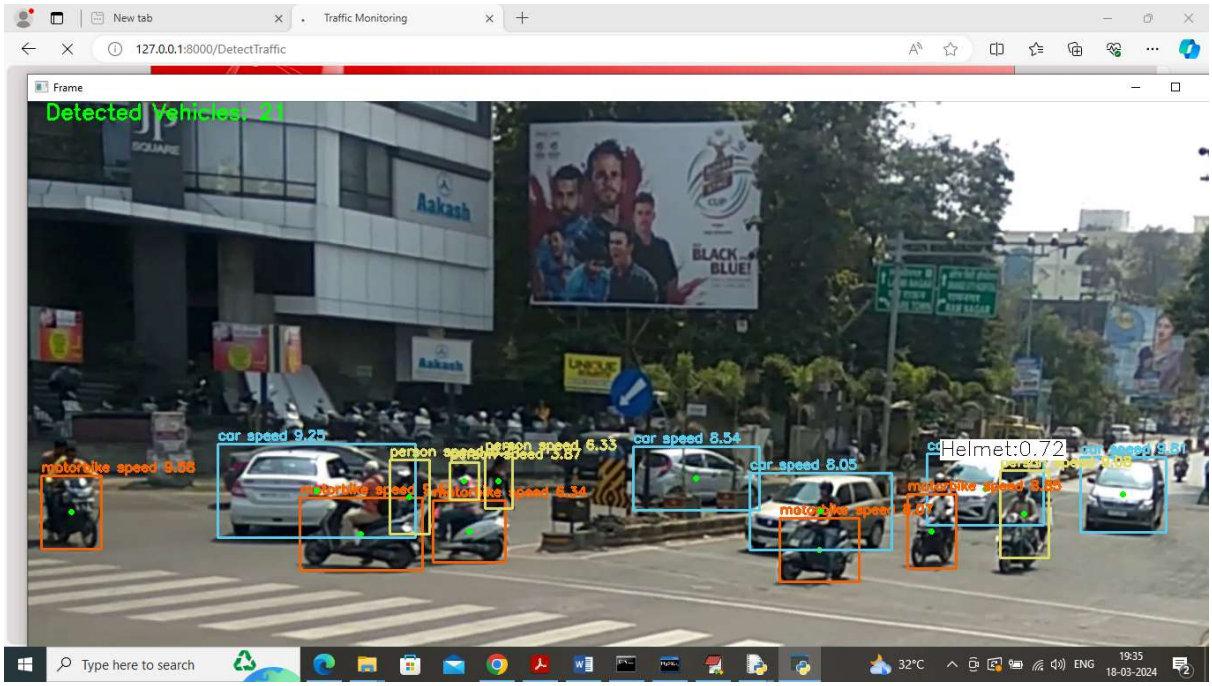

Conclusion

The designed algorithm was effectively able to detect the type of violation specified on this project which are denying traffic signal. The convergence of detection for the traffic violation mentioned is dissimilar, since it has a different threshold condition. The system provides detection for traffic signal violation. Further, the system is able to process one data at a time. Also, the program runtime is somewhat slow, and can be improved by using a computer with high speed processor specifications or GPU.

Future research about the application of the designed algorithm for other advanced image processing techniques. Since, this may improve the program runtime of the system by neglecting other unnecessary steps done in a background difference method. A computer vision algorithm may be done instead to provide more intelligence in the system. Our future plan is to implement the number plate detection with OCR support to make this system more robust.

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