**TRAFFIC VIOLATION DETECTION SYSTEM-OVERSPEED, SIGNAL JUMP, NO HELMET, TRIPLE RIDE**

**ABSTRACT**

In recent time surveys, the deaths and injuries due to traffic violations have increased chiefly in Indian roads. So, this needed the assistance of an automated computer visionbased object detection model, as manually identifying the vehicles violating traffic is hectic. The principle of this paper is to detect multiple violations using single video frames. The input video stream obtained from the surveillance camera is processed and annotated to carry out multiple processes. The dataset used for red-light jumping is COCO and the dataset for over boarding is created by annotating the images obtained from google. The model is trained and the output is visualized using tensorboard. The parameters used are Precision, Recall, Fmeasure and P-measure. The accuracy for red light skipping is 93% and the mAP value for over boarding is 0.5:0.95. This system utilizes the video stream at its maximum to detect various violations.

**INTRODUCTION**

The traffic on the roads have been complex nowadays. Sometimes this leads to traffic jams and pollution. Amidst these side effects the violation of traffic rules has been getting worse on Indian roads due to increased population and constantly changing world. To overcome this in numerable traffic detection systems are being developed. Dr.M. Suguna Assistant professor CSE Department Thiagarajar College of Engineering Madurai-15 mscse@tce.edu Gokila Harini Krishna UG Student IT Department Thiagarajar College of Engineering Madurai-15 gokilaharini@student.tce.edu The preeminent traffic violations in India are red light skipping, rash driving and over boarding pillion riding. The breaking of these traffic rules leads to various road accidents and other crises in both rural and urban areas of Indian roads [1]. The government has taken immense efforts to reduce this, but checking the vehicles manually is tedious and mistakes are associated due to blackouts and carelessness.

In consequence, there is always a necessity for a traffic violation detection system to deal with this issue. This can detect violations such as, signal jump, rash driving and vehicle count [2]. The primitive way to avoid traffic violations is to manually appoint administrators who check the vehicles. This process is troublesome and requires enormous human resources. When things become automated the next method used to detect traffic violation is Automated Traffic Monitoring System Using Computer Vision [3]. This system used cameras to monitor vehicles instead of regular cops.

This provided greater scope for automation and has been the most sought problem statement in the field of computer vision, which is especially related to AI & ML, image processing and deep learning. This detects semantic objects and class instances within digital images and videos. Most of the attempts have been made for rash driving and red light skipping. But the blindside was the over boarding pillion riding has also been a striking cause for many accidents around the country. According to the recent studies of Times of India the districts of India are witnessing deaths and injuries due to over boarding. This requires real attention and paved way to develop an over boarding detection system using YOLOv7 [4] and object detection algorithm. This is carried out using object detection models and neural network models which classifies the dynamic objects. The video is passed as input stream, combining with red light skipping the over boarding pillion riding is also detected.

The primary objective of this work is detecting multiple vehicle traffic violation detection and it gives a detailed view of theories and technologies involved in creation of traffic violation detection systems using image processing and object detection. It also focuses on some of the latest developments made in various fields and throws light on various applications, one among which is multiple vehicle violation detection

**SYSTEM ANALYSIS**

**EXISTING SYSTEM**

In the paper , the object detection for traffic violation is implemented using object detection algorithm YOLOv3[5] and neural network which is used for grading of vehicles deviating the traffic rules. This tool is dexterous in reducing the violations by tracking and chastising. The red light skipping is detected when the captured object is on the direct line. The video is shot and fed into the model and classified using neural network [6]. The object detection and tracking can also be done by system DSP board Embest Dev Kit 8500D using MBS algorithm for object detection [7] as preferred by Suraj K Mankani in the paper. In the model proposed by Krishna [3], “Automated Traffic Monitoring System Using Computer Vision”, the video stream is received from the surveillance camera and it measures the vehicle count and vehicles violating the speed limit.

In the work proposed by Mohana [8], the performance and efficiency of the object detection model is evaluated using algorithms such as GMM(Gaussian Mixture Model) and SOBS (Selforganizing Background Subtraction), implemented in MATLAB. They have used false positive rate, Percentage of Wrong Classification (PWC), Recall, specificity, false negative rate, and F-measure as parameters. The paper [9], presents the juxtaposition of capsule neural networks in various applications.

**LIMITATIONS OF EXISTING SYSTEM**

**False Positives:**

Existing systems may suffer from false positives, where the system incorrectly identifies normal driving behavior as a traffic violation. This can lead to unnecessary alerts or resource wastage.

**Limited Dataset Diversity:**

The accuracy of a traffic violation detection system heavily depends on the diversity and representativeness of the training dataset. If the dataset used is not comprehensive enough, the system may struggle to generalize to real-world scenarios.

**Real-time Processing Challenges:**

Depending on the hardware and computational resources available, real-time processing of video streams for traffic violation detection may pose challenges. Delays in detection could affect the system's effectiveness.

**Weather and Lighting Conditions:**

Environmental factors such as adverse weather conditions or varying lighting can impact the performance of computer vision systems. Existing systems may struggle to maintain accuracy under such conditions.

**Limited Violation Types:**

Some systems might be specialized in detecting specific types of traffic violations, such as red-light jumping or speeding. However, they may not cover a comprehensive range of violations. Expanding the system to handle a broader set of violations could be a potential improvement.

**PROPOSED SYSTEM**

The work is proposed as an appendage of the existing object detection model for traffic violation [17] using computer vision and YoloV3.The main objective of this work is to detect multiple traffic violations of vehicles using the same video stream. The techstack used in the proposed work is YoloV7 for object detection and OpenCV for real-time computer-vision.

**ADVANTAGES OF PROPOSED SYSTEM**

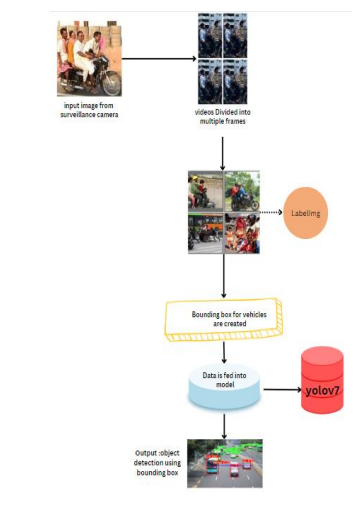
The traffic violation detection using has two sub modules:

● To detect the red light jumping

● To detect over boarding pillion riding on vehicles

The object detection algorithm used is YoloV7.The overview of the whole process is that the video streams obtained from the surveillance camera are divided into multiple frames using OpenCV so that multiple operations can be performed over the frames. The frames are then evaluated by creating bounding boxes over the object of appraisal. The coordinates are marked as the threshold line, if the coordinate of the object is greater than that of the threshold line the object violates the signal.

**SYSTEM ARCHITECTURE**

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**MODULES**

The COCO dataset is used for red light skipping. The same bounding box is used to detect over boarding and is trained using the dataset created from annotated google images. The parameters used are Precision, Recall, P-measure and F-measure.

**MODULE 1:**

Red Light Jumping The COCO dataset is used to detect red light skipping. The dataset is mounted over the Yolov7 model which is cloned from the original model. Every vehicle in the lane is identified and the bounding box is created over the vehicles. The bounding boxes are marked using logistic regression or bounding box regression. In which the overlap of the bounding boxes represents true objects. The threshold line is marked by defining the position or coordinates of the line on the image video frame. If the object crosses the line, then it is marked as violated. It is also refined that the model even detects the vehicles on and above the marked line unlike the previous solutions which detects only the objects on the line.

The assumptions are:

● The object is static and is the video streams of particular time interval is processed

● The vehicle violating at a particular time can only be detected.

**MODULE 2:**

Over boarding of pillion riding The over boarding of vehicles is detected by training the yoloV7 model using the dataset created by annotating the images. The images are annotated using the tool LabelImg and is divided into train, test and validation.70% of data is labeled as Training data, 20% as testing data and 10% for validation.

**HARDWARE REQUIREMENTS**

|  |  |  |
| --- | --- | --- |
| MINIMUM (Required for Execution) | | MY SYSTEM (Development) |
| System | Pentium IV 2.2 GHz | i3 Processor 5th Gen |
| Hard Disk | 20 Gb | 500 Gb |
| Ram | 1 Gb | 4 Gb |

**SOFTWARE REQUIREMENTS**

|  |  |
| --- | --- |
| Operating System | Windows 10/11 |
| Development Software | Python 3.10 |
| Programming Language | Python |
| Domain | Image Processing & Cloud Computing |
| Integrated Development Environment (IDE) | Visual Studio Code |
| Front End Technologies | HTML5, CSS3, Java Script |
| Back End Technologies or Framework | Django |
| Database Language | SQL |
| Database (RDBMS) | MySQL |
| Database Software | WAMP or XAMPP Server |
| Web Server or Deployment Server | Django Application Development Server |
| Design/Modelling | Rational Rose |

**REFERENCES**

[1] Abdulrasheed A Nasir, Jibrin O Bello, Chima K P Ofoegbu, Lukman O Abdur-Rahman, Saheed Yakub, Babatunde A Solagberu, “Short report-Childhood motorcycle-related injuries in a Nigerian city – prevalence, spectrum and strategies for control”, SAJCH JULY 2011

[2] Dr. S. Raj Anand, Dr. Naveen Kilari, Dr. D. Udaya Suriya Raj Kumar,” Traffic Signal Violation Detection using Artificial Intelligence and Deep Learning “,International Journal Advanced Research Engineering and Technology (IJARET) of in Volume 12, Issue 2, February 2021