IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

REAL TIME TRAFFIC MANAGEMENT

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Abstract: In the new evolving world, traffic rule violations have become a central issue for majority of the developing countries. The numbers of vehicles are increasing rapidly as well as the numbers of traffic rule violations are increasing exponentially. Managing traffic rule violations has always been a tedious and compromising task. Even though the process of traffic management has become automated, it's a very challenging problem, due to the diversity of plate formats, different scales, rotations and non-uniform illumination conditions during image acquisition. The principal objective of this project is to control the traffic rule violations accurately and cost effectively. The proposed model includes an automated system which uses camera to capture video. The project presents Automatic Number Plate Recognition (ANPR) techniques and other image manipulation techniques for plate localization and character recognition which makes it faster and easier to identify the number plates. After recognizing the vehicle number from number plate the SMS based module is used to notify the vehicle owners about their traffic rule violation. An additional SMS is sent to Regional Transport Office (RTO) for tracking the report status

Index Terms **– Real Time Traffic Mangagement, , Machine learning, YOLO,dataset.**

I. INTRODUCTION

In the modern world, managing traffic rule violations has become a significant challenge for many developing countries. With the rapid increase in the number of vehicles, traffic rule violations have also risen exponentially. Despite the advancements in traffic management technologies, ensuring compliance with rules remains complex and labor-intensive. Factors like varying license plate designs, non-standardized plate sizes, diverse lighting conditions, and image distortions make it difficult to implement effective solutions.

The current manual and semi-automated approaches to detect and address violations are time-consuming, prone to errors, and resource-intensive. There is a need for a robust, efficient, and scalable system that can automate traffic rule violation detection and penalization while providing real-time notifications to the relevant stakeholders.

The conventional OCR based methodology for number plate acknowledgment doesn't work for the varieties in painting style of the number plates. In this paper creators have exhibited a picture recovery based strategy to perceive the vehicle number plate caught utilizing an advanced cell to encourage the Car the executives arrangement of a Smart office premise. In the proposed strategy and vanced mobile phone isutilized to catch The pictures and concentrate highlights of the vehicle number plate. These highlights are coordinated against predefined set of same vehicle number plate pictures in the database.

As effectively expressed, the framework utilizing fiber optics naturally has countless issues separated from the principle worries of significant expense and support. Albeit an IR blind framework decreases the expense essentially, it is still very costly and less expensive options are desired .As practically every one of the tollbooths utilize cameras This is sample paper format only please use this format and follow this structure as per your requirement

As for vehicle wellbeing, India meets just two out of the seven vehicle security guidelines by the World Health Organization (WHO). Bikes represent 25% of all out street crash passing. About 75%motorcycle riders engaged with mishaps kept on wearing head protectors, crash records appear. The primary driver of these fatalities is individuals riding bikes affected by liquor results and infringement of traffic rules which later on brings about genuine mishaps.

The business requires a programmed vehicle grouping framework in India not to decrease or wipe out human intercession or work, yet to guarantee that human mediation doesn't bring about any budgetary acts of neglect. The business requires a framework that runs out of sight and simply keeps a cross-beware of the manual

II. LITERATURE SURVEY

Several advancements in Automatic Number Plate Recognition (ANPR) and computer vision technologies have paved the way for innovative traffic management solutions:

Amirgaliyev Beibut, Kairanbay Magzhan, Kenshimov Chingiz

Effective Algorithms and Methods for Automatic Number Plate Recognition

Published in: IEEE 2018

An automatic number plate recognition (ANPR) system is a key aspect in traffic congestion. This will help to minimize the different kind of violations on the road. Advanced systems for tracking and identifying stolen, unauthorized vehicles are based on automated number plate recognition technology. This paper’s main objectives are to review other methods and propose our own algorithm. A short review is performed on the various methods of number plate recognition algorithms. Further explanations of the proposed algorithm are illustrated in graphical forms to show how the algorithm works.

Merits – The car number plate pictures were taken from different sides and in different climate conditions and the accuracy of proposed algorithm is 90%.

Demerits - The distance from camera to the vehicle and the weather conditions decreases the performance of the system. Segmentation part as well as optical character recognition can be improved using other popular algorithms like Artificial Neural Network

Yuan Jing, BaharYoussefi, MitraMirhassani, RobertoMuscedere

An Efficient FPGA Implementation of Optical Character Recognition for License Plate Recognition

Published in: 2017 IEEE 30th Canadian Conference on Electrical and Computer Engineering (CCECE) Optical Character Recognition system (OCR) can be used in intelligent transportation systems for license plate detection. However, most times the systems are unable to work with noisy and imperfect images. In this work, a robust FPGA based OCR system has been designed and tested with imperfect and noisy license plate images. The OCR system is based on a feed forward neural networks, which uses an efficient and precise neuron. The neuron transfer function is based on an approximation of the Hyperbolic Tangent Activation Function.

The neuron is utilized in a 189 160 36 feed forward neural network configuration. The network parameters were optimized and then tested with noisy images of license plates numbers. The network was able to maintain a 98:2% accuracy in recognizing the characters despite the image imperfections.

Merits: A robust FPGA based OCR system has been designed and tested with imperfect and noisy license plate images. It was able to maintain a 98:2% accuracy in recognizing the characters despite the image imperfections.

Demerits: It requires a proper system with selection of network size, and the optimized and efficient setup of the neuron activation function.

Farid Bounini, Denis Gingras, Vincent Lapointe, Herve Pollart

Autonomous Vehicle And Real Time Road Lanes Detection And Tracking

Published in: 2015 IEEE Advanced Driving Assistant Systems, intelligent and autonomous vehicles are promising solutions to enhance road safety, traffic issues and passengers' comfort. Such applications require advanced computer vision algorithms that demand powerful computers with high-speed processing capabilities. Keeping intelligent vehicles on the road until its destination, in some cases, remains a great challenge, particularly when driving at high speeds. The first principle task is robust navigation, which is often based on system vision to acquire RGB images of the road for more advanced processing. The second task is the vehicle's dynamic controller according to its position, speed and direction. This paper presents an accurate and efficient road boundaries and painted lines' detection algorithm for intelligent and autonomous vehicle.

It combines Hough Transform to initialize the algorithm at each time needed, and Canny edges' detector, least square method and Kalman filter to minimize the adaptive region of interest, redict the future road boundaries' location and lines parameters. The scenarios are simulated on the Pro-SiVIC simulator provided by Civitec, which is a realistic simulator of vehicles' dynamics, road infrastructures, and sensors behaviors, and OPAL-RT product dedicated for real time processing and parallel computing

Merits -Robust against exogenous perturbations and different constraints, but good enough to control the vehicle with a simple couple of fuzzy logic laws.

Demerits – The fuzzy controller handles the vehicle's steering, which has a limitation for a maximum speed of 70 km/h in sharp turns.

Mahesh Babu K,M V Raghunadh

Vehicle Number Plate Detection and Recognition using Bounding Box Method

Published in: 2016 International Conference on Advanced Communication Control and Computing Technologies (ICACCCT) The use of vehicles in our life is increasing exponentially day by day and as increasing vehicles are violating the traffic rules, theft of vehicles, entering in restricted areas, high number of accidents lead to increase in the crime rates linearly.

This paper has four major steps as follows: Preprocessing of captured image, Extracting license number plate region, Segmentation and Character Recognition of license plate. In pre-processing the desired vehicle imageis taken through the digital camera, brightness of image is adjusted, noise removal using filters and image is converted to gray scale. Exactions of license plate region consist of finding the edges in the image where exact location of licenses plate is located and crop it into rectangular frame. Segmentation plays a vital role in vehicle licenses plate recognition; the legibility of character recognition completely relies on the segmentation done. The approach which we have used is simple but appropriate. First we segmented all characters in the image (LP) using Bounding box method. Finally, recognition of each character is done. The template matching method is used for recognition each character in the vehicle license plate.

Merits - After noise removal, character segmentation and recognition the algorithm gives an accuracy of around 91.11%.

Demerits - Blur Images, Broken Number Plate, Similarities between some characters such as O and D; 5 and S; 8 and B, E; O and 0 etc.

Worawut Yimyam, Mahasak Ketcham

The Automated Parking Fee Calculation Using License Plate Recognition System Published in: 2017 2nd International Conference on Telecommunication and Networks (TEL-NET 2017) Design automated parking fee calculation with license plate recognition in order to reduce manual license plate identification that is mostly employed at parking area of other leading malls where the vehicle circulation is high.

Merits - It decrease manual operation including license plate identification and fee calculation, cut off the staff wage, and save time for identifying plate and figuring out parking fee as well.

Demerits - It requires the license plate images are clear, sharp, no reflection and the background should be white or light color and no pattern.

P.Meghana, S. SagarImambi, P. Sivateja, K. Sairam

Published in: International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-4, February 2019 Automatic number plate recognition is a well known proposal in todays world due to the rapid growth of cars, bikes and other vehicles. This automatic number plate recognition system uses image processing technology for identification of the vehicles. This system can be used in highly populated areas and higly restricted areas to easily identify traffic rule violated vehicles and owners name, address and other information can be retrieved using this system. This system can be automated and it is used to recognize vehicles without authorization ,vehicles that violated rules at populated areas like malls, universities, hospitals and other car parking lots. This can also be used in the case of car usage in terrorist activites, smuggling, invalid number plates, stolen cars and other illegal activities.

It can also be used in highway electronic toll collection.Image of the car number plate is captured and detection is done by image processing ,character segmentation which locate the alpha numeric characters on a number plate.

Then the segmented characters are translated into text entries using optical character recognition (ocr). ANPR systems are already available but efficiency is not gained thoroughly. These systems are developed using different methodologies but some factors like vehicle speed, different font styles, Font sizes, language of vehicle number and light conditions are required to be explored . These can affect a lot in the overall recognition rate. ANPR systems use (ocr) optical character recognition to scan the vehical number plates, and it can be retrieved whenever required The other details of the owners of the vehicles like address and mobile number can be manipulated whenever necessary by contacting the system administrative. The purpose of this paper is to recognize a car number plate using ann, image segmentation. We intended to develop a system in mat lab which can perform detection as well as recognition of a car number plate.

Merits - Efficient and first computing technique for identifying vehicle number plate. Computationally very inexpensive as compared with most of the conventional methods.

Demerits - Limited area coverage.

Muayad Ali Hamood Bakhtan, Dr.Munaisyah Abdullah,Dr.Aedah AbRahman

A Review on License Plate Recognition System Algorithm

Published in: IEEE 2016 Image enhancement (preprocessing) and number plate extraction. This is a review paper hence no merits and demerits are listed.

Y. Y. Nguwi, W. J. Lim

Number Plate Recognition in Noisy

Image Published in: IEEE 2016 The system is able to tolerate noise level up to 20% with recognition rate of 85%.

Merits - This system is able to tolerate noise level up to 20% with recognition rate of 85%. It utilizes a combination of filters and morphological transformation for segmenting the number plate.

Demerits - It caters only to same font and size number plates

Riazul Islam, Kazi Fatima Sharif, Satyen Biswas

Automatic Vehicle Number Plate Recognition Using Structured Elements

Published in: IEEE 2015 An efficient and first computing technique for identifying vehicle number plate. Limited amount of computations are employed.

Merits -. Efficient and first computing technique for identifying vehicle number plate. Computationally very inexpensive as compared with most of the conventional methods

Demerits- Limited area coverage.

I. Sina, A. Wibisono, A. Nurhadiyatna, B. Hardjono.

Vehicle Counting and Speed Measurement Using Headlight Detection.

Published in: 2018 IEEE We can use a few methods to detect and estimate vehicle speed at night by using CCTV Camera. Normalized cross-correlation has given us better detection accuracy.

Merits - Better detection accuracy than the area-centroid-difference method. Pin-hole model has given us a better accuracy.

Demerits - The miscalculation of the vehicle counting happens because of the high density of the read.

Wei Wang

License Plate Recognition System Based on the Hardware Acceleration Technology on the ZYNQ

Published in: IEEE 2017

For the disadvantage of high cost and poor practicability of traditional license plate recognition technology based on PC, apply this technology on the ZYNQ to implement the hardware acceleration of the license plate recognition algorithm. The platform consists of programmable logic (PL) and a processing system (PS). The hardware acceleration of the algorithm of license plate location is completed through the part PL; On the PS runs the Linux system. In terms of license plate recognition algorithm, we use the edge detection algorithm, vertical projection method and template matching method respectively for the location of license plate image, character segmentation and recognition.

III. FUNCTIONAL AND NON FUNCTIONAL REQUIRENENTS

FUNCTIONAL REQUIREMENTS

Real-Time Traffic Monitoring

Detect and track traffic flow using sensors, cameras, and GPS data.

Traffic Signal Control

Dynamically adjust traffic signals based on real-time traffic conditions.

Incident Detection and Alerts

Detect accidents, roadblocks, or unusual congestion and notify authorities and drivers.

Vehicle Counting and Classification

Identify number and types of vehicles (cars, trucks, buses, etc.) on different routes.

Route Optimization and Guidance

Provide alternate routes to drivers based on traffic data to reduce congestion.

Data Collection and Reporting

Store traffic data for analysis, trend detection, and reporting.

NON-FUNCTIONAL REQUIREMENTS

Performance

Must process traffic data and respond (e.g., update signals) within a few seconds.

Scalability

Should handle increasing data and geographical areas without performance degradation.

Reliability and Availability

System should be up 24/7 with minimal downtime.

Security

Secure access for operators, encrypted data transmission, and protection from cyber threats.

Maintainability

Easy to update software, add new features, or modify configurations.

Usability

Intuitive UI for traffic operators with minimal training required.

Hardware and Software Requirements:

HARDWARE REQUIREMENTS

- System : intel i3/i5 2.4 GHz.
- Hard Disk : 500 GB
- Ram : 4/8 GB

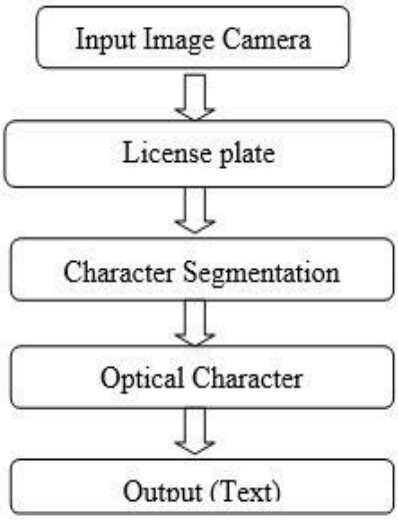
SOFTWARE REQUIREMENTS

- Operating system : Windows XP/ Windows 7.
- Software Tool : Open CV Python
- Coding Language : Python
- Toolbox : Image processing toolbox

IV. METHODOLOGY

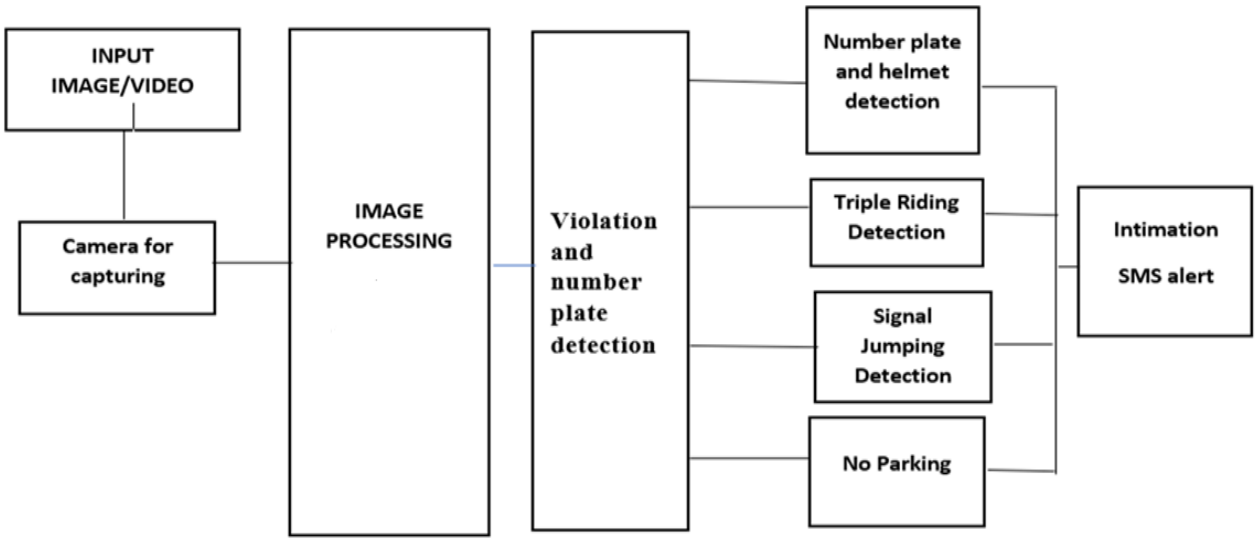
License plate recognition (LPR) is one form of ITS (Intelligent Transport System) technology that not only recognizes vehicles but also differentiates them. For some applications, such as electronic toll collection and red-light violation enforcement, LPR records license plate alphanumerically so the vehicle owner will be assessed the appropriate amount of fine. In other cases, like commercial vehicle operations or secure-access control, a vehicle's license plate is compared against a database of acceptable ones to determine whether a truck can bypass a weigh station or a car can enter a gated community or a parking lot.

DATA FLOW DIAGRAM:



A license plate is a unique identification of a vehicle. Quality of algorithms used in license plate detector determines the speed and accuracy of the license plate detection. In the past a number of techniques have been proposed for locating the plate through visual image processing. A video is taken from a camera, and then each frame of the video is processed as the image. In this stage the license plate region from the given image is located and isolated. Quality of the image plays an important part hence prior to this stage, pre-processing of the image is necessary. So first each frame is pre-processed by linearization, noise reduction and edge detection. Then, the license plate is located by different image processing technique.

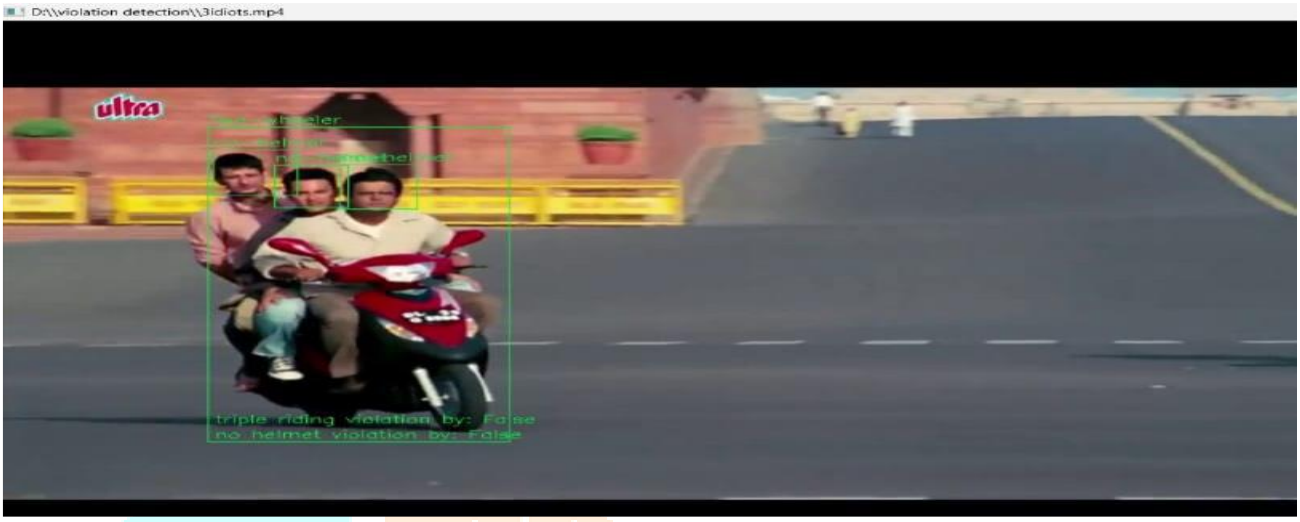
SYSTEM ARCHITECTURE :



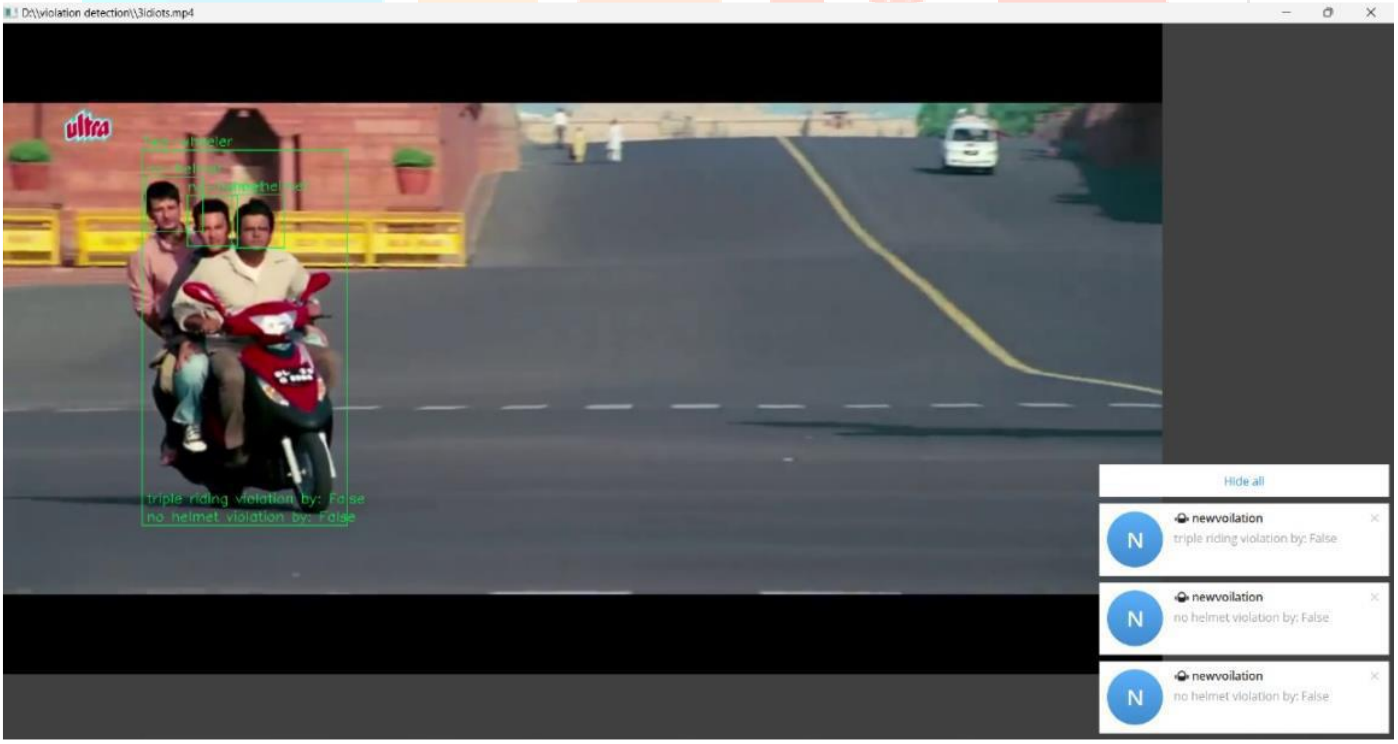
V. RESULTS

A program is being developed in this research to identify the motorcyclists who violate the laws of wearing the helmet. The program consists primarily of three parts–motorcycle identification, helmet identification, and license plate recognition of motorcycle.

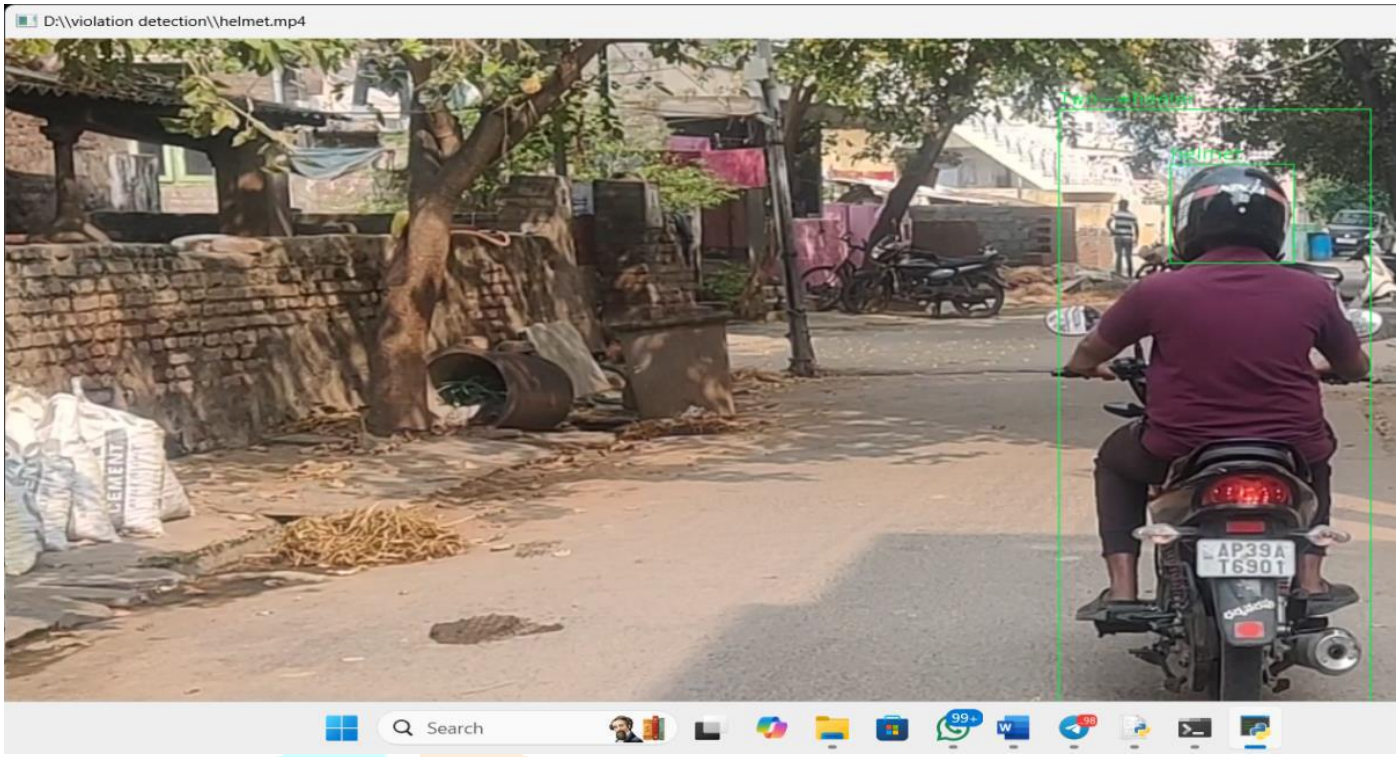
Figures:



Result FIG.1- Triple Ridding Violation By Flase



Result Fig No.5.1.2 : Triple Riding Violation By Flase With Message



Result Fig No.5.1.3: Indicating The Helmet With Bike Number

VI. CONCLUSION AND FUTURE SCOPE

The proposed framework is a replacement to human traffic cop. The strategies for traffic observation have been introduced and the work on movement identification, tag extraction and character acknowledgment is done. The proposed framework catches the picture in rush hour gridlock signal extraction and character acknowledgment of tag will be considered during rule infringement. Order of the traffic rule infringement will be done and the message will be send to the proprietor of the vehicle to illuminate them about the sort regarding ruleabused and furthermore about the fine that must be paid. The improvement of this model prompts the examination of new regions of robotization of traffic checking. The more precise component plan and increasingly hearty discovery strategy investigate will be executed in future. Shrewd bicycle can likewise be proposed which thus neglects to begin without wearing head protector. We can stretch out this framework to discover the quantity of traffic in a An automated violation detection and Intimation System is achieved i.e., SMS will be sent to the rule violator and the fine amount will be deducted from their bank account.

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