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NUMBERPLATE DETECTION AND CHALLAN GENERATION FOR NON-HELMET RIDERS

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ABSTRACT

Over time, there has been an increase in motorbike accidents in a number of nations. The automated detection of traffic rule violators is a prerequisite for any intelligent traffic system.

With a high population density in all of the major cities, motorcycles are one of the primary modes of transportation in a country like India. In India, there are more than 37 million two-wheeler riders.

According to statistics, the majority of motorbike riders don't wear helmets in cities or even on highways. Wearing a helmet can reduce a rider's risk of incurring a head injury or catastrophic brain injury in the majority of motorcycle accident scenarios. For the sake of traffic safety, a system for automatically identifying helmets is therefore necessary. As a result, customized object detection models are constructed with a CNN-based algorithm (YOLO). When a helmetless rider is detected, the number plate is collected and the license registration number is identified using an optical character recognition system.

The objective of this project is to design a computerized CNN-based detection device with custom-trained models and datasets for helmet authentication. Additionally, the Challan System is a web-based interface intended to assist users with various matters pertaining to managing and tracking traffic infractions. Essentially, the Challan System makes it possible for bike riders and police to have straightforward conversations using a web- based interface. This project concept demonstrates how users can complete tasks more quickly when Challan is available online. The web-based approach aims to minimize paperwork and conventional procedures in order to improve customer satisfaction.

Keywords: YOLO (You Only Look Once) Object Detection Algorithm, CNN (Convolutional Neural Network), OCR (Optical Character Recognition), Challan.

I. INTRODUCTION

The helmet also known as "protective gear" is what keeps motorcycle riders safe from catastrophic injury to the head and traffic accidents. While most countries in the world require riders to wear helmets when riding a bike, some people choose not to wear them. Over the past few years, a lot of studies and research has been done in the areas of traffic analysis and road safety, which includes the identification and classification of vehicles as well as the detection of helmets. The technology used to ensure road safety has advanced significantly as a result of the research and analysis conducted. Manually implementing the helmet-wearing regulation takes a lot of time as well as is prone to mistakes.[1]

Although it requires sophisticated image processing techniques, we can create an automated enforcement system with two cameras that is more accurate and efficient. Convolutional neural networks (CNNs) are the technique by which the proposed system automatically recognizes non-helmet riders and their license plates. The area of artificial intelligence known as machine learning (ML) allows a trained model to function independently using the inputs provided during the training phase.[2]

Consequently, a Helmet detection model can be developed by using a specific dataset to train it. Our helmet detection model makes it simple to identify riders who are not wearing helmet. An optical character recognition (OCR) model receives this picture, followed by reading the text, it outputs the number plate number in a machine-readable text format. An online system titled E-Challan serves as a tool for regulating traffic, permitting traffic managers to handle infractions and motorists to handle penalties. A variety of solutions are offered by E- Challan to help people with handling and keeping track of traffic fines. It is also a sort of organized

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information system that makes the necessary information available to all parties at any time and from any location.[3]

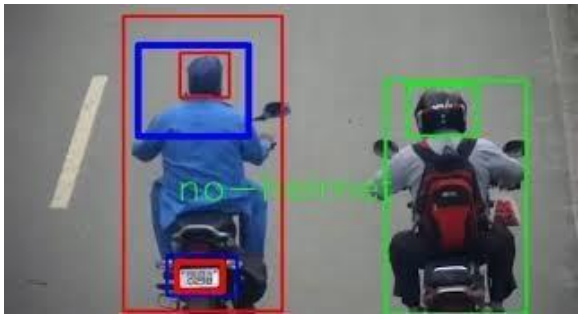

Fig:1-ROI for Helmet and Non-Helmet detection

II. REASEARCH METHODOLOGY

This section outlines a method for automatically identifying helmet-free motorcycle riders. Additionally, we will track down the vehicle's license plate if the motorcycle riders are not wearing helmets. The steps involved are as follow: -

1. Data Collection: Compile a dataset of pictures or videos that show people wearing and not wearing helmets. Make sure there is variation in the backdrops, lighting, and camera angles.[4]
2. Choosing the Right Object Detection Algorithm: Assess and choose relevant object detection algorithms, such as Faster R-CNN (Region-based Convolutional Neural Network) or YOLO (You Only Look Once).[6]
3. Preprocessing: To increase the model's capacity for generalization, preprocess the dataset by scaling, cropping, and enhancing photos.
4. Number Plate Detection: Use and assess various algorithms, including deep learning-based object detection (e.g., YOLO, Faster R-CNN), Haar cascades, and conventional computer vision methods, for number plate detection.
5. Helmet Detection: Create and assess algorithms for helmet detection using relevant methodologies, equivalent to number plate detection.[5]
6. Integration: Combine the modules for detecting helmets and number plates into a single, accurate system to identify riders who are not wearing helmets.
7. Challan Generation: Construct and put into place a system that will automatically produce challans for riders who are not wearing helmets that the system detects. Verify adherence to legal norms and regulations when assigning traffic infractions.
8. Evaluation of System Performance: Assess the system's performance using metrics including processing speed, false positives/negatives, detection accuracy, and challan creation accuracy.[9]
9. Ethical Considerations: Take into account ethical issues including data security, privacy, and any biases in the system's decision-making. Make sure all applicable laws and regulations are followed.
10. User feedback: To enhance and improve the system based on actual usage scenarios, collect feedback from users, law enforcement organizations, and others.
11. Reporting and Documentation: Keep thorough records of all research procedures, algorithms employed, test outcomes, and findings. Prepare reports or papers for conference presentations or publication in appropriate publications.

III. PROPOSED METHOD

To identify motorcycles and license plates, a pre-trained model called YOLO is utilized. Using TensorFlow, the Convolutional Neural Network (CNN) model is created. In order to identify riders who do not wear helmets, this model is trained on two distinct groups: helmet and non-helmet. A video of the road serves as the model's input; the video is regarded as a collection of frames. After each video frame is processed to determine the Helmet's Region of Interest (ROI), the trained CNN model is given the information.

In the end, the model makes an assumption about whether or not the motorcyclist is wearing a helmet.

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Model Training and Detection are the two phases of the methodology for putting the suggested system into practice. The block diagram of the system is shown in Fig 2.

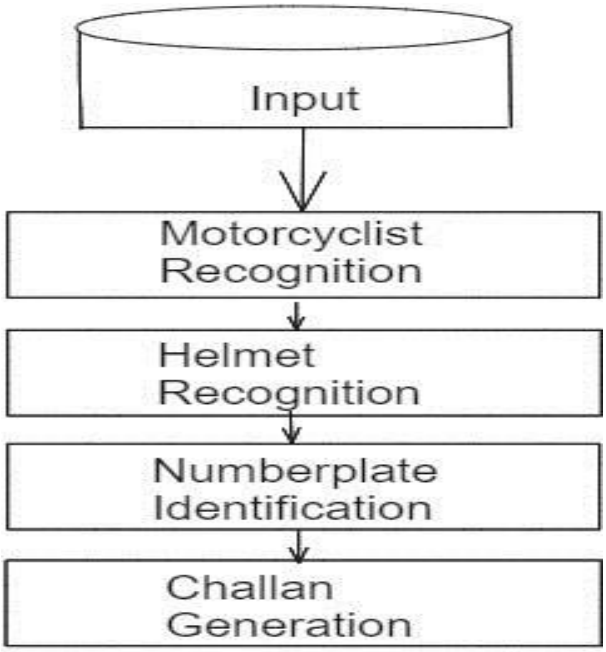

Fig:2-The proposed system block diagram.

The method consists of the following steps:

1. Motorcyclist Recognition: A video's motorists are identified frame-by-frame, trimmed, and stored for later use.
2. Helmet Recognition: If the detected motorists is not wearing a helmet, the image is stored for additional processing.
3. Number plate Identification: Motorcyclists without helmets are able to identify the number plates.
4. Challan generation: Lastly, an e-challan is generated as an entry in a challan database once the license number is extracted from the number plates that were detection.

IV. CONCLUSION

It is mandatory for riders motorcycles and bikes to wear helmets at all times; failure to do so is regarded as an offence against the law.

As a result, there are now more bike accidents and fatalities. Everyone must abide by the traffic laws when riding on public roads, and bike riders are required to wear helmets for their own safety. Licensing plate detection is done using the pre-trained Yolo weights file. The input is processed by the OpenCV module, which then outputs each frame as a clip in video format. For determining whether a helmet present or not, and (OCR) optical character recognition using a neural network to identify license plate information.

The suggested strategy is intended to identify and apprehend individuals who violate traffic laws by failing to wear a helmet, report the offending vehicle's license plate, and issue an automated challan.

V. FUTURE SCOPE

1. Implementation Transparency: Providing extensive information about the violation, the fine amount, and the channels for challenging the punishment to ensure transparency in the challan production process.
2. Smart number plates: These have technology such as RFID (Radio Frequency Identification) or QR codes integrated into the plate to make it easier to identify cars and their owners.
3. Integration with motor vehicle Registration Databases: To detect repeat offenders and monitor trends in traffic infractions, the system will be integrated with motor vehicle registration databases.
4. Accessibility considerations: Including features like voice commands, screen readers, and tactile feedback to ensure accessibility for all users, including those with disabilities.

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