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Sighted-Helmet Detection and E-Challan Application

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Abstract: ***Helmet detection is a technology that uses computer vision algorithms to automatically detect and identify individuals who are not wearing helmets while riding a two-wheeled vehicle. This technology is often used in conjunction with e-challan systems, which are electronic systems for issuing traffic violations and fines. By combining helmet detection with e-challan, law enforcement officials can more effectively enforce helmet laws and reduce the number of injuries and deaths caused by head injuries in motorcycle accidents. The technology can be used in various forms like CCTV cameras, drones, etc. The Helmet detection algorithm uses deep learning techniques like CNN, YOLOv8 etc to detect and classify the helmets in real-time video feed. We have developed an application "Sighted", which is used to track the current active challans issued in the name of the owner and easy payment of the fines. The main objective of the system is to identify riders without helmet and issue a challan with an application providing services to track the challan status and payment.***

Keywords: Helmet Detection, E-Challan, CCTV, Deep Learning, CNN, YOLOv8.

I. INTRODUCTION

Helmet detection and e-challan are two related technologies that aim to improve road safety and enforce traffic laws. Helmet detection uses computer vision and machine learning algorithms to automatically detect individuals who are not wearing helmets while riding a two-wheeled vehicle. The e-challan system, on the other hand, is an electronic system for issuing and managing traffic fines. When integrated, the helmet detection system can automatically generate and issue fines to individuals who are detected as not wearing helmets, helping to enforce traffic laws and reduce the number of accidents caused by individuals not wearing helmets.

II. LITERATURE SURVEY

Rising cases of accidental deaths due to not wearing the helmet are a serious concern and this concern should be solved by tightening the laws and imposing heavy fines on the ones disobeying it. To punish these rule offenders using the latest technology there were multiple approaches made to detect the helmets. L Allamki et al. [1] and his fellow researchers used yolov3 for detection of five classes, helmet, no helmet, person, motorbike, license plate. All these classes are identified using a single trained weight. And detection is run on frames of video. If no helmet classes are detected then it searches for its person classes and motorbike class and finally detects numberplate, crops it and then finally saves it.

But all this testing is done in sparsely populated riding environment. And according to us it is accuracy will decrease if it is done in a densely populated riding environment as there will be multiple detections overlapping each other. To tackle this issue what we did is that we divided the detection process in 3 parts first rider will be detected from video and its cropped image will be saved then another mode will detect the helmet if present else it will be saved also another mode will descry the helmet if present additional it'll further process the rider image to coming model that will descry numberplate and crop it and eventually it'll be transferred forward for E-Challan generation.

Researcher C. Vishnu et al. [2] used technologies like CNN, Gaussian mixture model. Their view was to detect motorcyclist without helmet in videos using CNN. They approached this problem by first separating the moving objects. Next they used CNN to find difference between motorcyclists and non-motorcyclists. Next they did head localization; this was done by cropping the motorcyclist's image one fourth from the top and then using CNN to separate without-helmet and with-helmet.

III. IMPLEMENTATION

While implementing our system we mainly divided into two parts, Part I and Part II. Part I majorly comprises of Detection Part i.e. Helmet Detection and Number Plate Detection and Extraction. Whereas Part II consists of payment of E-challan after generation of automatic E-Challan they are as follows:

A. Part I.

1) *Installation Of Cameras:* The first step is to install cameras at strategic locations on the roads, such as at intersections, toll booths, and other high-traffic areas.
2) *Development Of Computer Vision And Machine Learning Algorithms:* This involves using deep learning technique such as CNN. (CNNs) to train the system on a dataset of images and videos of individuals wearing and not wearing helmets.

B. Part 2.

1) *Integration With E-Challan System:* Once the helmet detection system is developed, it can be integrated with an e-challan system. Here we are sending SMS to the offender who is violating the RTO rules, linking the system to a database of individuals who have been issued fines for not wearing helmets, and automating the process of issuing fines.
2) *Deployment And Maintenance:* After the system is developed and integrated, it can be deployed on the roads, and regular maintenance and updates will be required to ensure that the system continues to function properly.
3) *Monitoring And Reporting:* Regular monitoring is required to ensure that the system is working correctly and to identify any areas for improvement.

IV. PROPOSED FLOW OF SYSTEM

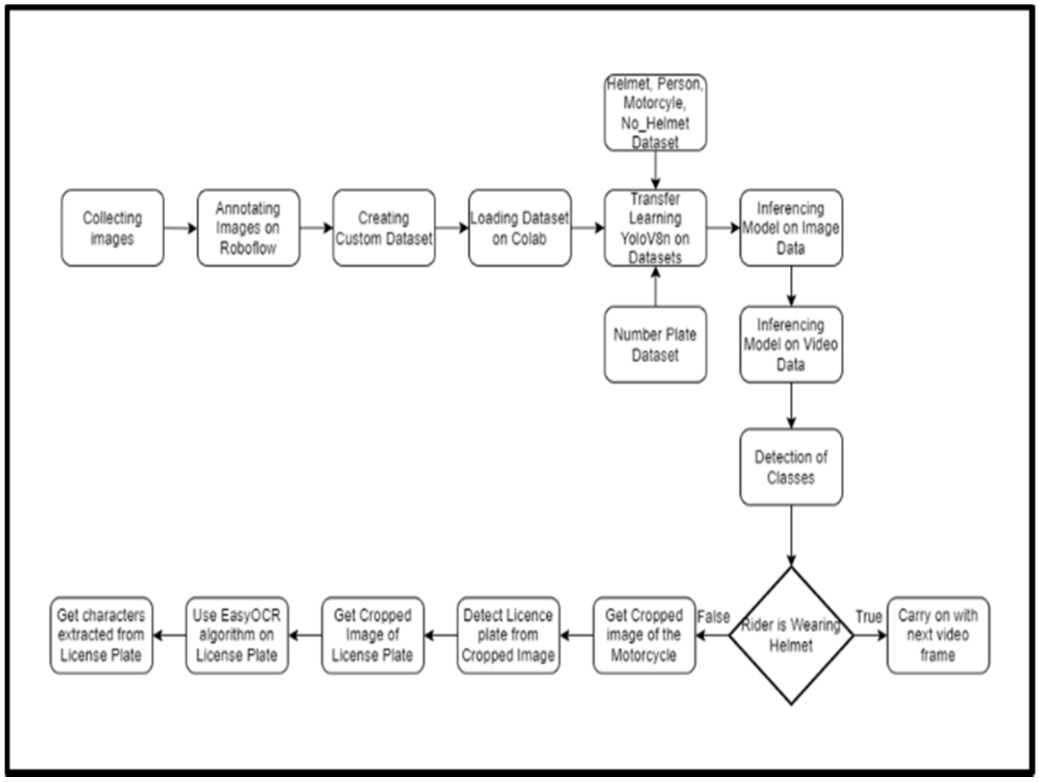

Fig1. Flow chart

V. METHODOLOGY

1) *Data Collection:* The first step is to collect a large dataset of images and videos of individuals wearing and not wearing helmets. This dataset is used to train the computer vision and machine learning algorithms that will be used for detection.
2) *Algorithm Development:* The next step is to develop the computer vision and machine learning algorithms that will be used for detection. This typically involves using deep learning techniques such as convolutional neural networks (CNNs) to train the system on the dataset of images and videos. The goal is to create an algorithm that can accurately detect individuals who are not wearing helmets in real-time.
3) *Model Validation:* Once the algorithm is developed, it is validated using a separate dataset, the goal is to ensure that the algorithm can accurately detect individuals not wearing helmets with a high degree of accuracy.

VI. RESULT

In this project firstly the system must classify between motorcycles and other vehicles. Then the system must check whether the rider is wearing helmet or not. Depending on the result, if the rider is found without helmet then the number plate will be extracted. The contact number of the rider will be extracted from the database and an SMS of E-Challan will be sent. The SMS will include app link through which the vehicle owner can easily track his E-Challans and can pay allotted fines.
Now we have provided the Sighted App link to the violator and they can login and pay their e-challan by using our app.

Fig2. Object Detection

Fig3. License Plate Detection

Fig4. Cropped License Plate

Fig5. Extracted License Plate Character

Here Violator can see their previous e-challans and vehicle information by clicking on my e-challans and payment status. By clicking on Pay e-challan here violator will be directed on payment page. Here they can see challan no, date, time, fine amount, evidence image and pay their E-challans. By clicking on 'Pay Now' payment status on database will get changed to paid from pending and database will get stored. After successful payment a popup message will say Thank you!

Fig6. High Fidelity Prototype of Application

Fig7. Autogenerated SMS

VII. CONCLUSION

The following proposed system helps the traffic department to detect multiple bike riders and pillion riders who are not wearing helmet from traffic surveillance videos. This is done by passing the surveillance video through multiple Machine Learning Models where the final output will the automated detection and generation of e-challan. The system also helps to automate the process of E-challan generation by carrying out the detection, identification and penalization process all under one project with each model interconnected with other, making the process swift and convenient.

Our project has also aimed to reduce corruptions and unethical practices conducted on the roads with a goal to include the everyone under the same spectrum and to abide by the rules set up by the government.

VIII. FUTURE SCOPE

1) We are planning to add linguistic OCR detection. As in some vehicles there are custom number plates in regional language so we would modify the model to detect regional language as well.

2) Find the best way to integrate the model with the local RTO's traffic cameras without decreasing the accuracy. By accessing the RTO's database we can implement the model for every registered rider. No rider will be excluded from the fine.

3) In advancement other traffic violations such as speed monitoring on highways which will reduce accidents. In India most of the riders do triple riding on two wheelers which is against the laws. So we can configure our model to detect it as well.

4) Riders using phones while driving which can be a reason for accidents can also be fined. Stopping your vehicle on zebra crossing or breaking a traffic signal can also be monitored. Monitor whether your parked vehicle is obstructing the road which may lead to traffic.

5) Riders driving on the wrong side of the road can be also fined. Repeated violation may lead to cancellation of driving license. If any pedestrian sees any rider violating the traffic law can report the incident through our app.

IX. ACKNOWLEDGEMENT

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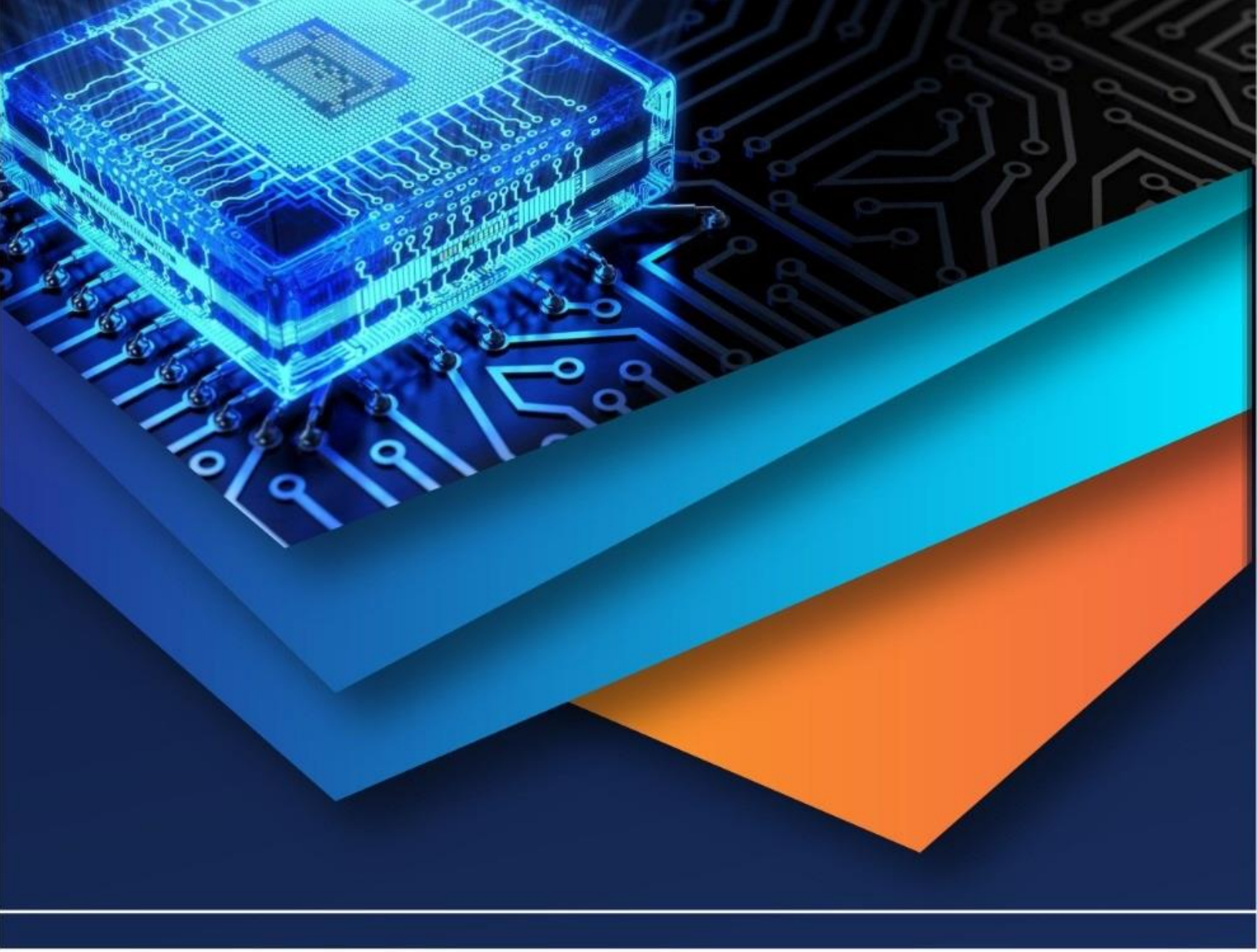

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