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Smart E-Challan System for Two Wheeler Traffic Violators

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Abstract: *Motorcycles have always been the primary mode of transportation in developing countries. Motorcycle accidents have increased in recent years. One of the main reasons for fatalities in accidents is that a motorcyclist does not wear a protective helmet or travel as a triple seat. The most common way to ensure that motorcyclists wear a helmet or triple seat is by traffic police to manually monitor motorcyclists at road junctions or through CCTV footage and to penalize those without a helmet. But it requires human intervention and effort. So this System Proposes an automated system for detecting motorcyclists who do not wear a helmet and retrieving their motorcycle number plates from CCTV video footage .First, the system classifies moving objects as motorcycling or non-motorcycling. In the case of a classified motorcyclist, the head portion is located and classified as a helmet or non-helmet. Finally, for the motorcyclist identified without a helmet, the number plate of the motorcycle is detected and the characters on it are extracted by using the OCR algorithm.*

Keywords: Helmet Detection, plate detection, Image Selection, Extraction, Machine learning

I. INTRODUCTION

Two-wheeler is a very popular mode of transportation in almost every country. However, there is a high risk involved because of less protection. When a two-wheeler meets with an accident, due of sudden deceleration, the rider is thrown away from the vehicle. To reduce the involved risk, it is highly desirable for bike-riders to use helmet. Worrying fact is that India ranks in top as far as road crash deaths are considered. Rapid urbanization, avoiding helmets, seat belts and other safety measures while driving are some of the reasons behind this trend according to analysis done by experts. In 2015 India signed Brasilia Declaration on Road Safety, where India committed to reduce road crash deaths to 50 percent by 2020. Observing the usefulness of helmet, Governments have made it a punishable offense to ride a bike without helmet and have adopted manual strategies to catch the violators. However, the existing video surveillance-based methods are passive and require significant human assistance. In general, such systems are infeasible due to involvement of humans, whose efficiency decreases over long duration. Automation of this process is highly desirable for reliable and robust monitoring of these violations as well as it also significantly reduces the amount of human resources needed. Recent research has successfully done this work based on CNN, R-CNN, LBP, HoG, HaaR features, etc. But these works are limited with respect to efficiency, accuracy or the speed with which object detection and classification is done. In this Project Work, a Non-Helmet Rider detection system is built which attempts to satisfy the automation of detecting the traffic violation of not wearing helmet and extracting the vehicles' license plate number. The main principle involved is Object Detection using Deep Learning at three levels. The objects detected are person, motorcycle at first level using YOLOv3, helmet at second level using YOLOv3, License plate at the last level using Web API. Then the license plate registration number is extracted using Web Automation. Hence a database will be available for analysis for the police authority.

II. LITERATURE SURVEY

A detailed survey of existing projects and models was done to arrive on a fool proof and successful model.

1. The paper [1] discusses an electronic governance model of electronic challan and traffic penalty system using an integrated existing method of penalty in India.
2. A similar approach is followed by [2] which implements the model using an automatic challan system using

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MATLAB. The model captures the image of the vehicle and extracts the number plate of the vehicle whichbreaches the traffic law. The model further processes to generate an automatic E-Challan which can be directly paid by the driver at RTO office or can avail other online payments also. The project mainly focuses on the individual data extraction from multiple databases.

3. The paper [3] discusses the traffic violation detection using computer vision. The model extracts the license plate using a new deep learning network structure which is used to detect and locate the license plate automatically. The vehicle no is detected and the information of the owner is extracted. The information is used to generate an E-Challan and an instant appropriate fine message is sent to the owner. Implementation of the whole model is very efficient and requires very less human intervention.
4. A new approach is suggested by [4] using a picode suggesting an innovative e-challan application using encoding and decoding of the picode. The paper has discussed and illustrated an efficient method to read the picode and generate a challan for the traffic violators using QRcode encoder.
5. The paper [5] suggests a useful web- based application using a database program that records all the traffic offenses committed throughout the nation. It maintains a centralized database to keep the adequate record and provides an online payment facility to the violators. The project is developed using Python, Ajax, MySQL, Php and python.
6. A novel approach is discussed in the paper [6] proposing an efficient e-challan generation technique using OCR, generating challan using android application. The application works by detecting the plate, then fetching the details from the database and generating the challan.
7. A similar approach is used by [7] suggesting the need of an efficient and smart automated traffic penalty generation system. The authors suggest the retrieval of information of vehicles from the official database using smartphones, by scanning the QR code. The officer can then generate an e-challan with the app and the challan will be sent to the driver using SMS.
8. A new IOT based automatic penalty charging approach is suggested by [8].
9. The authors have used the IOT based approach for development of the solution for violation of traffic rules using microcontrollers, RFID, LCD interfaced with AVR. The proposed system will continuously monitor the vehicles using RFID readers and transceivers, and will automatically generate a challan for violation of any traffic rules. If the driver fails to pay the charges in a given period of time, the regional transport office (RTO) may suspend the license of the driver.
10. The paper [9] presents a system called TRuVIS (Traffic Rule Violation Information System) which is basically an alert system developed using Arduino, which regulates, monitors and takes action against rule violation by the driver. The system generates a challan and sends the notification to the driver's phone. The application is developed mainly for regulating the horn violation.
11. The paper [10] discusses the disadvantages of manual e-challan generating process, the problem of fake challan, loss to the government and inconvenience caused to the driver. The author suggests a smart automatic e-challan system based on RFID and GPS modules. The system can locate the vehicle using the GPS and the official can generate a challan using the information of the vehicle saved in the database, which will be then sent to the owner of the vehicle using SMS.

III. METHODOLOGY

In this paper, it is discussed about the online platform for E-challan system, which is a web-application the system allows the access to stakeholders, vehicle and license details for challan. This system provides three users that are traffic police person, drivers and system administrator in this the traffic police have been provided login details by the administrator. The drivers of the vehicles can sign-up with their details asked and can generate the login ID and password for self and the system administrator also can login using their ID and password, the administrator can get the details of personnel. The system provides personnel login page, challan page and payment by driver page[1].The aim of this paper is to develop challan by using Optical Character Recognition (OCR) which is an android application as well as a web application. The system detects the violations and creates the e-challan then it stores and transfers the data to

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the readers and the owner of vehicle can pay the fees either to RTO office or online payment. So, therefore for carrying out the management for the system the database is kept for reducing paper work and corruption of traffic police.

In android application the system provides login page for officer and to create a challan it catches the image of violator's number plate then collects data from database and creates challan, the violator can pay online as well as going to RTO. In web application system provides dashboard page for the officers.[2].

There is rapid growth in urbanisation and causes a vast migration to the cities. And so that gradually growing population results in growing vehicle numbers. And due to the increasing number of vehicles there are increasing in traffic and violations will occur more. This result in a lot of accidents on road and grief in society. So to reduce such a type of problem in our city we can make an automatic e challan generation system by detecting no plates of vehicles. And it helps to be more careful about driving and strictly allow to follow the traffic rule and will reduce the number of accidents on roads. So, this paper presents a discussion of various no plate detection, object detection and e challan generation methods [3]. In the digitization process we can converts anything which is in hardcopy into digital format. means that, it can convert a format of moving paper copies of patient records into a digital format which can be processed by machine or the computer. another hand automation improves the processes which are already offered. it holds the devices such as software and count it in a series of rules which are written by experts (business subject matter) to fulfil the various tasks without any human involvements.[4]. This project of Our E-challan generation system is based on PLC (programmable logic controller). the main of our project is to control the violation of vehicles correctly penalising the vehicles violators. so this will reduce the workload of traffic police departments. In this proposed system, there are two types of vehicles violation. one is traffic signal violation and another is Toll collection lane rule violation. in the first step the vehicles which will run red light will be detected by using RFID (radio frequency identification) reader and by using this RFID reader it will input the PLC by scanning that tag placed on vehicles.

The database will be created in the program whenever RFID scanner inputs the vehicles, then PLC will suddenly compare the detected barcode with that input which is fill in the Database and in the second step those vehicles will breaking the toll-collection line rule will be accurately detected .so likewise the first step the difference will be started with the data which will inputted in the database. The Database contains the details of the Vehicles.[5].In this paper,in daily life people face many problems, caused due to Traffic Rule violations by Public, traffic rule neglected. The major reason of road accidents is people not following traffic rules. The road side corruption also increases and the receipt which is used by police is also fake. They are not used as Government receipts. Lots of paper is wasted. Our E-challan system solves all those problems. The automatic E-challan is generated and sent to that owner who breaks the traffic rules, in this process no man power is used. They are fully automatic so the aim of our system is to reduce them. Accident, to reduce corruption and to reduce the paperwork[6]. The E-challan system is focusing efforts on characterising these violations in India cities. In this work, system present characterization of the traffic violation and Automated E-challan. Generating this system for police department and our own use. It can be easily installed in any system. It is easy to use against public who violate the traffic rules and it can store details of traffic rules and it can store details of traffic rules and fines collected from public. We can get the total fines collected per day or week. In this system we can get direct challan to mobile number and owner of vehicle can pay online and they receive receipt online. It reduces paper work.[7]. The E-Challan Generation System project is about paying online challan. Manual challan includes paperwork which is difficult to provide challan to driver and maintain the records. So, here comes the E-challan platform which has a very effective amount, violation record of the driver and monitoring the other traffic penalties. This results in reducing difficulties faced by the manual process and increasing the effectiveness of the user-friendly E-challan platform [8].This system involves automatic detection of vehicle that break the rules of traffic at signals.

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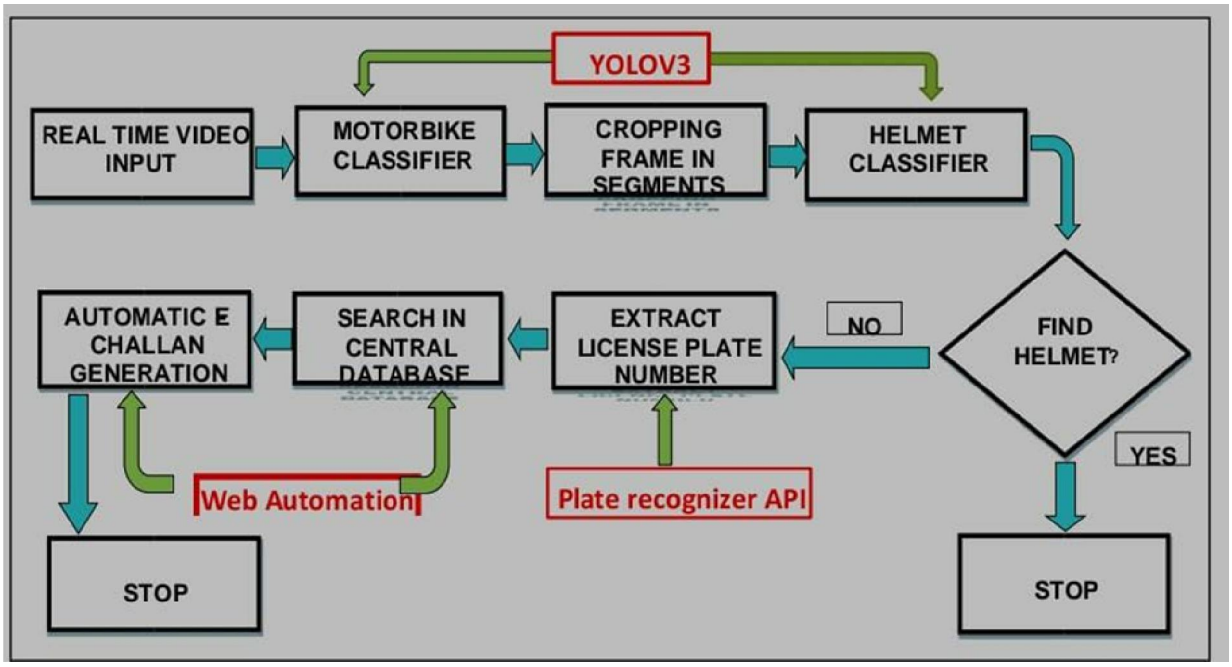
IV. WORKING SYSTEM



4.1 Model for Motorcycle Detection

Will initialize for about 10 seconds and then display a window showing any objects it's detected in the image The frame chosen is given as input to YOLOv3 Motorcycle detection model, where the classes to be detected are "Motorcycle"

At the output, image with required class detection along with confidence of detection through bounding box probability value is obtained with the help of functions given by Image AI library, only the detected objects are extracted as shown below, and stored as separate images and named with class name and image number in order.

We crop these detected frames in 3 formats: Coco Dataset for Motorcycle Detection: COCO is a largescale object detection, segmentation, and captioning dataset. This version contains images, bounding boxes "and labels for the 2017 version. Coco defines 80 classes. COCO stands for Common Objects in Context. As hinted by the name, images in COCO dataset are taken from everyday scenes thus attaching "context" to the objects captured in the scenes. COCO was an initiative to collect natural images, the images that reflect everyday scene and provides contextual information. COCO dataset provides the labelling and segmentation of the objects in the images. It is fast, easy to install, and supports CPU and GPU computation.

If everything is working properly, the object detector

1. Full Image with motorbike and rider
2. Bike Image
3. Rider Image

For example, it will be saved as Full-1, Full-2, etc. || Bike-1, Bike-2…etc. || Rider-1, Rider-2…etc

4.2 License Plate Detection (YOLOv3)

You Only Look Once or more popularly known as YOLO is one of the fastest real-time object detection algorithm (45 frames per seconds) as compared to R-CNN family (R-CNN, Fast R-CNN, Faster R-CNN, etc.) The R-CNN family of algorithms uses regions to localise the objects in images which means the model is applied to multiple regions and high scoring regions of the image are considered as object detected. But YOLO follows a completely different approach. Instead of selecting some regions, it applies a neural network to the entire image to predict bounding boxes and their probabilities [14] [15]. In our system, we feed the screenshot of the vehicle to our API which runs the object detection Model in the background and then the model detect the license plate and draws a bounding box around those plates and returns the coordinates of the bounding box. YOLOv3 offered us a good balance between speed and accuracy without

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the use of any GPU.YOLO v3 performs at par with other state of art detectors like Retina Net, while being Considerably faster, at COCO map 50 benchmark. It is also better than SSD and its variants [13].

4.3 Helmet Detection

Once the Motorcycle class is obtained, the Rider images is given as input to Helmet detection model. While testing the helmet detection model, some false detections were observed. So, the person image was cropped to get only top one-fourth portion of image, as shown in Fig. 2 (Rider.jpg). This ensures that false detection cases are eliminated as well as avoid cases leading to wrong results when the rider is holding helmet in hand while riding or keeping it on motorcycle while riding instead of wearing.

Now two cases Arise:

- Case 1: When the motorcycle rider is wearing helmet
- Case 2: When the motorcycle rider is not wearing helmet

After applying cropped image to helmet detection model, The bounding box around helmet along with the detection probability As the rider wearing helmet in Case 2, no further processing is necessary. Since in Case 1, rider is not wearing helmet, no bounding box is created.

V. CONCLUSION

In this project we have described a framework for automatic detection of motorcycle riders without helmet from CCTV video and automatic retrieval of vehicle license number plate for such motorcyclists. The use of Convolutional Neural Networks (CNNs) and transfer learning has helped in achieving good accuracy for detection of motorcyclists not wearing helmets. The accuracy obtained was 98.72%. But, only detection of such motorcyclists is not sufficient for taking action against them. So, the system also recognizes the number plates of their motorcycles and stores them. The stored number plates can be then used by Transport Office to get information about the motorcyclists from their database of licensed vehicles. Concerned motorcyclists can then be penalized.

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