Generating Smart E-challan System for Violation of Traffic Rules

[1]Harshad Nikam, [2]Harshal Patil, [3]Ashwini Ghodeswar,
[4]Siddhant Rajput, [5]Prof. Amol Gosavi

Department of computer Science &engineering
MET Institute of Engineering Nasik.

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. The most common way to ensure that motorcyclists wear a helmet 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. Echallan will also be generated with offender details. A database will be generated with records to identify every offender accurately. The system implements pure machine learning in order to identify every type of helmet that it comes across with minimum computation cost.**

***Key Words*: YOLO V3, Tensorflow, OpenCV, Selenium Web Driver.**

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INTRODUCTION

To develop a platform to grease the motorists and the business police to manage the penalties for business violations. Smart E-challan system is one of the stylish ways for managing and covering the business system. Two wheeler riders should use helmets to reduce the risk. The main end behind this design is to stop or find those people. 17 Deaths and 55 Road Accidents Happen Every Hour In India. Two Wheelers reckoned For The Loftiest Share In Total Road Accidents About 28 Two-wheeler Riders die every day Because of ' No-Helmet '. The Age group of 18- 45 Times reckoned the Loftiest Share In The Total Road Accident Fatalities.The helmet is the main safety outfit of the bike rider, still, numerous motorists don't use it. The main thing of a helmet is to cover the motorist's head in case of an accident. In case of an accident, if the motorcyclist doesn't use can be fatal and it isn't possible for a business police force to watch every motorcycle and detects the persons who are wearing a helmet. So, there was the need to make an automated system that automatically cover bikes and detects the persons wearing helmets to correct those persons without a helmet..

LITURATURE SURVEY:

"Madhuchhanda Dasgupta, Oishila Bandyopadhyay, Sanjay Chatterji, from Computer Science Engineering IIT Kalyani West Bengal published a research paper on topic "Automated Helmet Detection for Multiple Motorcycle Riders using CNN". In which they try to proposed the method for Automated detection of traffic rule violators is an essential component of any smart traffic system. In a country like India with high density of population in all big cities, motorcycle is one of the main modes of transport. It is observed that most of the motorcyclists avoid the use of helmet within the city or even in highways. Use of helmet can reduce the

risk of head and severe brain injury of the motorcyclists in most of the motorcycle accident cases. Today violation of most of the traffic and safety rules are detected by analyzing the traffic videos captured by surveillance camera. This paper proposes a framework for detection of single or multiple riders travel on a motorcycle without wearing helmets. In the proposed approach, at first stage, motorcycle riders are detected using YOLO v3 model which is an incremental version of YOLO model, the state-of-the-art method for object detection. In the second stage, a Convolutional Neural Network (CNN) based architecture has been proposed for helmet detection of motorcycle riders. The proposed model is evaluated on traffic videos and the obtained results are promising in comparison with other CNN based approache. [1]

"Fahad A Khan, Nitin Nagori, Dr. Ameya Naik from Department of Electronics Telecommunication of K.J.Somaiya college of Engineering Mumbai published a research paper on the topic "Helmet and Number Plate detection of Motorcyclists using Deep Learning and Advanced Machine Vision Techniques". In this paper they proposed that in today's world, the increasing use of Motorcycles has prompted increment in road accidents and injuries. Helmet not used by the motorcycle rider is one of the major cause. Currently, one procedure is to physically check use of helmet at the pavement junction or through the CCTV footage video, which requires human intervention to detect motorcyclists without helmet. The proposed framework presents a computerization machine structure to distinguish the motorcycle rider with or with- out helmet from images. The system extracts objects class based on feature extracted. The system uses You Only Look Once (YOLO)-Darknet deep learning framework which consists of Convolutional Neural Networks trained on Common Objects in Context (COCO) and combined with computer vision. YOLO's convolutional layers are modified to detect specified three classes and it uses a sliding- window process. The map (Mean Average Precision) on validation dataset achieve using training data.[2]

"Dikshant Manocha, Ankita Purkayastha, Yatin Chachra, Namit Rastogi, Varun Goel from Department of Electronics and Communication Engineering Jaypee Institute of Information Technology Noida, published a research paper on topic "Helmet Detection Using ML IoT". Here they try to introduce techniques about detecting two-wheeler riders without helmet with the help of machine learning and provide them with a user interface to pay challans. The proposed approach first captures the real time image of road traffic and then differentiates the two wheelers from other vehicles in the road. It then processes to check whether the rider and pillion rider are wearing helmet or not using OpenCV. If any one of the riders and pillion rider found not wearing the helmet, their vehicle number plate is processed using optical character recognition (OCR). After extracting the vehicle registration number, a challan will be generated against respective vehicle and all the details of the challan will be sent via E-mail and SMS to the concerned person. An, user interface (an app and a website) will also be provided to pay their challans. Y Mohana Roopa, Sri Harshini Popuri, Gottam Gowtam sai Sankar, Tejesh Chandra Kuppili from Computer Science and Engineering Institute of Aeronautical Engineering, Hyderabad published a research paper on "Convolutional Neural Network-based Automatic Extraction and Fine Generation". In which they mention Numerous reasons lead to dangerous accidents. Lack of helmet is one of the major reasons for death during accidents. People are negligent regarding hel met usage. This needs to be controlled by proper surveillance. The present traffic control system is mostly based on human power. A police officer cannot manage the whole traffic and look out for rule-breakers. It would be a very tough job and will need a lot of human power to cover all the areas. This can be solved through our new automated system where two-wheelers with no helmets will be recognized through yolov2 and the respective frames are taken from the video from which the number plate of the particular vehicle is extracted and the fine for disregarding traffic rules. This fine detail will be updated over the server and message is sent to the phone number registered along with number plate. This paper is about an automated system where traffic surveillance videos are scavenged for vehicles, where extraction of number plates of vehicles with no helmet and generation of electronic fine management system takes place.[3]

"Bhavin V Kakani, Divyang Gandhi, Sagar Jani from EC Engineering Department of Institute of Technology Nirma University published a research paper with topic "Improved OCR based Automatic Vehicle Number Plate Recognition using Features Trained Neural Network". In this paper they mention some researches about OCR Technique. Significant research and development of algorithms in intelligent transportation has grabbed more attention in recent years. An automated, fast, accurate and robust vehicle plate recognition system has

become need for traffic control and law enforcement of traffic regulations; and the solution is ANPR. This paper is dedicated on an improved technique of OCR based license plate recognition using neural network trained dataset of object features. A blended algorithm for recognition of li- cense plate is proposed and is compared with existing methods for improve accuracy. The whole system can be categorized under three major modules, namely License Plate Localization, Plate Character Segmentation, and Plate Character Recognition. The system is simulated on 300 national and international motor vehicle LP images and results obtained justifies the main requirement. Rajesh Bardale, Rajeshwar Pate, Pradeep Dixit published a research paper on topic "Two Is Company, Three Is Crowd: Report of Fatality from Ridding Triple (Seat)". In this paper they proposed some theory related to Riding with triple seat. Road traffic accident deaths are preventive form of deaths. In India, about 30,624(22.4) deaths in year 2011 was reported due to two-wheeler accidents. In this case series, we are reporting fatalities while driving two-wheeler with triple seat reports pattern and distribution of injuries in such incidents. All were male and the age of individuals ranged from 30 to 55 years with mean age was 42 years. Analise the pattern of injuries in all cases there was head injuries. Two-wheelers are unstable vehicle require skill and balance while driving the vehicle. Riding the two-wheelers with three or more persons may cause crowding and increases the risk of accident.[4]

AIM & OBJECTIVES:

- To Enhance The Safety and Security,Improve Efficiency of City Administration.
- Monitoring the drivers with no helmet and riders breaking the basic traffic rules.
- Number plate detection for target motorcycle.
- Automatically generates E-challan for non-helmet riders.
-

PROPOSED SYSTEM:

Algorithm USE:

Yolov5:

YOLO v5 algorithm consists of fully CNN and an algorithm for post-processing outputs from neural network. CNNs are special architecture of neural networks suitable for processing grid-like data topology. The distinctive feature of CNNs which bears importance in object detection is parameter sharing. Unlike feedforward neural networks, where each weight parameter is used once, in CNN architecture each member of the kernel is used at every position of the input, which means learning one set of parameters for every location instead a separate set of parameters. This feature plays important role in capturing whole scene on the road. On Fig is presented the overview of YOLO v5 algorithm.

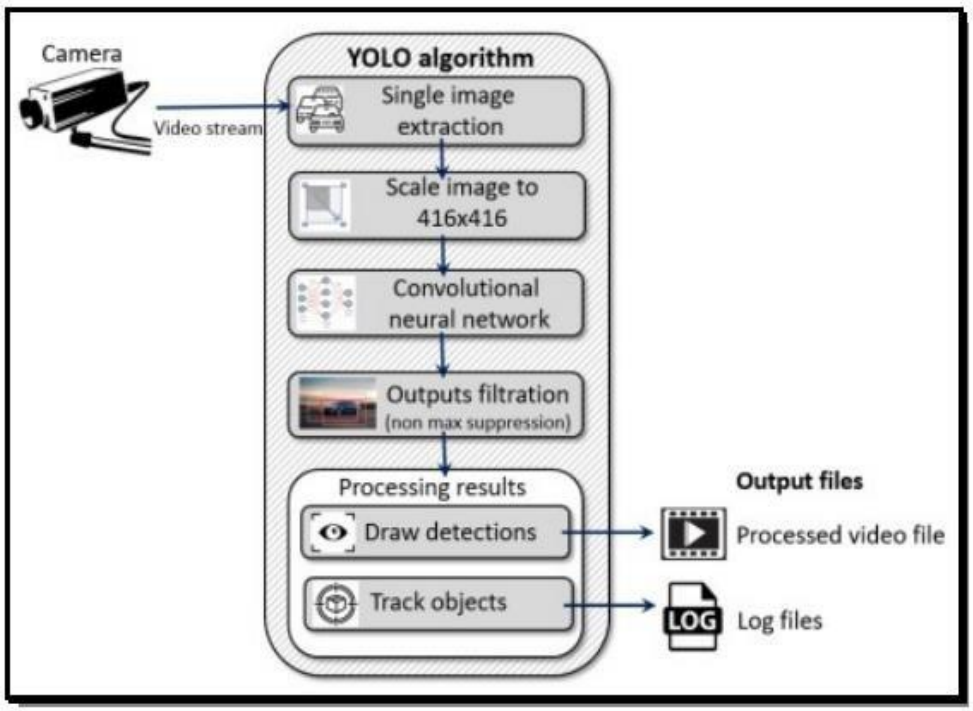

Fig1 : Yolov5 Architecture.

This algorithm starts with extraction single image from video stream, in a next step extracted image is resized and that represent input to Yolo network. YOLOv5 uses the same head as YOLOv3 and YOLOv4. It is composed from three convolution layers that predicts the location of the bounding boxes (x,y,height,width), the scores and the objects classes.

CNN takes an image as an input and returns tensor (see Fig 2) which represents:

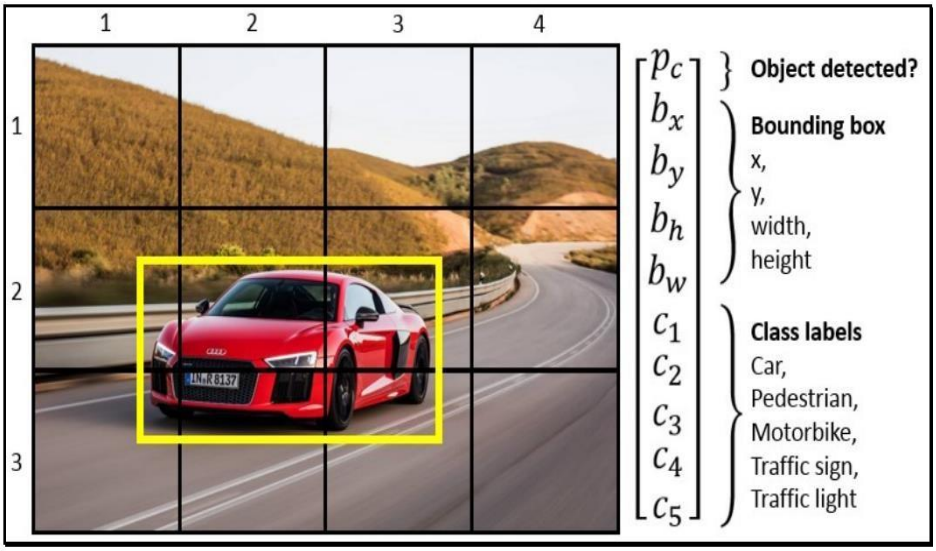

Fig. 2. Bounding box prediction.

SYSTEM ARCHITECTURE:

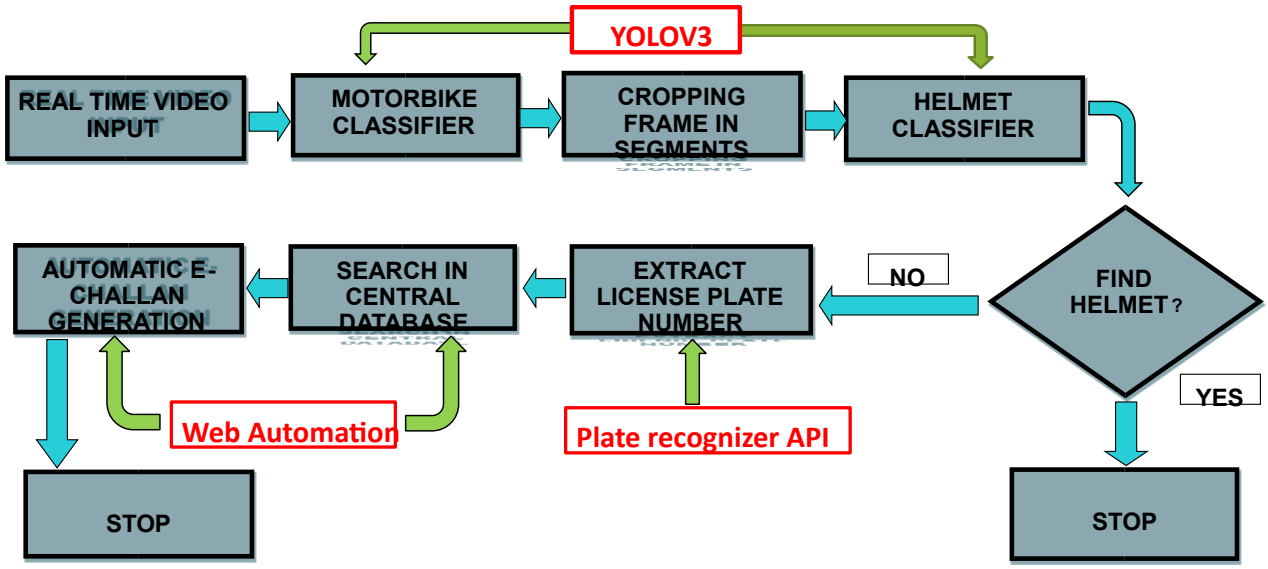

Fig -1: System Architecture Diagram

FUNCTIONAL & NON-FUNCTIONAL REQUIREMENTS:

Necessary Functions:

- Training Data Set.
- Surveillance Camera Quality
- Online registry of Traffic Violations

Desirable Functions:

- Data Extraction

- Data Pre-processing

SYSTEM REQUIREMENTS

Hardware Requirements

- AMD/Intel i3 Processor or above Processor
- 8GB RAM
- 80 GB or above Hard Disk.
- Camera Module.

Software Requirements

- ✦ Windows 7 or above
- ✦ Python
- ✦ Google Colab ▪ Selenium Webdriver

METHODOLOGY

One important element of deep learning and machine learning at large is dataset. A good dataset will contribute to a model with good precision and recall. In the realm of object detection in images or motion pictures.

- **For Motorcycle detection**: we used trained model with COCO Dataset with accuracy of 99%.
- **For Helmet Detection:** We created our own Yolov3 Model with our own dataset with 1000+ images of helmet and non-helmet riders.
- **For License plate:** We used API for extraction and web automation for getting details for E-Challan Generation.

PROCEDURE FOR TRAINING A YOLO V3 HELMET MODEL:

Gathering images (Creating data set): To detect a bike rider with helmet or without helmet. We need bunch of images of bike-riders with helmet, bike-rider without helmet and bike license plate. In this project, we used 1000+ images.

Label Images:

Label the all images with the help of **LableImg tool**. In this project, **Helmet class** was created with the help of LableImg tool. Create .xml file corresponding to each image with the above following categories of classes Now that our dataset labels are in the required format, we need to create a train-test split. I chose to create a test set containing 10% of the images in the dataset. Configuring YOLO with your dataset. Now that we have created our train and test sets, we need to make some changes to train the YOLO model on the dataset.

Training:

Now that our dataset is ready to use, we can begin training. Before we start, compile the darknet repository with the make command. To compile with specific options, such as GPU, CUDNN and OPENCV. This will create a darknet executable.

Trained weights for model. You can set other parameters (learning rate, momentum, weight decay etc by editing the corresponding lines). Finally, model is ready to use.

Fig 4: Helmet dataset

NUMBER PLATE DETECTION:
You can use our API to access our API endpoints, which can read license plates from images. Plate Recognizer provides accurate, fast, developer-friendly Automatic License Plate Recognition (ALPR) software that works in all environments.

The software can be used in many ways:
Recognize license plates from camera streams. The results are browsable, searchable, and can trigger alerts. The data repository can be in the cloud or stored entirely within your on-site network.
Recognize license plates from camera streams and send the results to your own application. Integrate license plate recognition into your application directly in-code.

AUTOMATED E-CHALLAN GENERATION:
Further this Detected LP Numbers are injected to RTO Database for extracting the further details of the Violator. Now, we do Automation of web Browser, to get the details of offender from RTO Database.

Selenium is an umbrella project for a range of tools and libraries that enable and support the automation of web browsers. Selenium supports automation of all the major browsers in the market using *WebDriver*.

WebDriver is an API and protocol that defines a language-neutral interface for controlling the behavior of web browsers. Web scraping is a technique which could help us transform HTML unstructured data into structed data in spreadsheet.

With Pillow Image Library, with extracted details saved in excel sheet an automatic E-challan is generated with details Including Date and time & further it can be sent through message, mail or post **CONCLUSION**

A Non-Helmet Rider Detection system is developed where a video file is taken as input. If the motorcycle rider in the video footage is not wearing helmet while riding the motorcycle, then the license plate number of that motorcycle is extracted and displayed. Object detection principle with YOLO architecture is used for motorcycle, person, helmet, and license plate detection. Web api is used for license plate number extraction if rider is not wearing helmet. Not only the characters are extracted, but also the frame from which it is also extracted so that it can be used for other purposes. All the objectives of the project are achieved satisfactorily.

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