International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

NUMBER PLATE DETECTION WITHOUT HELMET

Dr.T.Ram Kumar[1], Gajjala Rishika[2], Jeedi Anusha[3], Katama Vaishnav [4]

[1]Assistant Professor, School of CSE, Malla Reddy Engineering College For Women (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad,Telangana-500100

[234]UG Student, School of CSE,Malla Reddy Engineering College for Women, (UGC-Autonomous), Maisammaguda, Dhulapally, Secunderabad,Telangana-500100

t.ramkumarmail@gmail.com

ABSTRACT

Ensuring motorcyclist safety is a key priority for traffic authorities, particularly when it comes to the enforcement of helmet use to reduce accident risks. However, during the recent epidemic, a concerning shift occurred where some individuals began prioritizing the use of masks over helmets, which could lead to safety hazards and potential traffic violations. In response to this issue, we launched a project designed to automatically identify and penalize riders not wearing helmets in accordance with traffic laws. Our approach integrates advanced technology, such as AWS Rekognition's number plate recognition, combined with Faster R-CNN for object detection in images. This system enables accurate helmet detection by generating bounding boxes around the helmets, offering detailed spatial and proportional data relative to the motorcyclist's body. These separate data points allow for precise identification of helmet usage. The project employs image or video footage to automatically detect helmetless riders and capture their motorbike license plate numbers using Easy OCR, streamlining the enforcement of helmet regulations.

Keywords-Motorcyclist safety ,Helmet detection, Number plate recognition ,Object detection ,Helmetless riders

I. INTRODUCTION

All over the world around 1.35 million lives are lost each year, 50 million people are getting injured due to road accidents, according to a report titled “The Global status report on road safety 2018” released by world health organization. It is very hard to imagine that this burden is unevenly borne by motorcyclists, cyclists and pedestrians. This report noted that a comprehensive action plan has to be set up in order to save lives. Worrying fact is that India ranks number one 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. Policy makers first have to acknowledge the problems that persist in India before halving road crash deaths. When a two-wheeler meets with an accident, due of sudden deceleration, the rider is thrown away from the vehicle. If head strikes any object, motion of the head becomes zero, but with its own mass brain continues to be in motion until the object hits inner part of the skull. Sometimes this type of head injury may be fatal in nature. In such times helmet acts as life savior. Helmet reduces the chances of skull getting decelerated, hence sets the

motion of the head to almost zero. Cushion inside the helmet absorbs the impact of collision and as time passes head comes to a halt. It also spreads the impact to a larger area, thus safeguarding the head from severe injuries.

II.LITERATURE SURVEY

1.Meharchand Dasgupta, Oishila Bandyopadhyay, and Sanjay Chatterjee

In their work, Dasgupta et al. focus on the importance of helmet usage among motorcyclists, particularly in high-density urban areas like India. They highlight the significant role helmets play in reducing head and brain injuries during accidents. Despite this, many motorcyclists avoid wearing helmets, either in city traffic or on highways. The paper presents an automated system to detect violators who are not wearing helmets. The proposed framework uses YOLOv3, a state-of-the-art object detection model, to identify motorcycle riders. A Convolution Neural Network (CNN) is then employed to detect whether these riders are wearing helmets. The system's performance was evaluated on traffic videos, and the results showed promise when compared to other CNN-based approaches.

2. Fahad A. Khan, Nitin Nagori, and Dr. Ameya Naik

In their work, Khan, Nagori, and Naik tackle the growing issue of motorcycle accidents caused by riders not wearing helmets. Traditionally, human intervention is required to check whether riders are wearing helmets, either through physical checks at junctions or by analyzing CCTV footage. To address this, they propose an automated system based on the YOLO-Darknet deep learning framework, combined with computer vision techniques. The model is trained on the COCO dataset and modified to detect three specific classes (including helmet detection). The system uses a sliding window process to detect objects, and the model achieved a Mean Average Precision (MAP) of 81% during validation.

3. Dikshant Manocha, Ankita Purkayastha, and Yatin Chachra

In their study, Manocha, Purkayastha, and Chachra focus on the real-time detection of helmet violations by two-wheeler riders. Their system captures real time images of road traffic and differentiates between two-wheelers and other vehicles. It then processes the images to check if the rider and pillion passenger are wearing helmets, using OpenCV. If any rider is found without a helmet, the vehicle's number plate is captured using Optical Character Recognition (OCR). The system generates a challan (fine) and sends the details to the violator via email and SMS. The authors also propose a user interface (app and website) to facilitate payment of fines.

4. Sri Harshini Popuri, Gottam Gowtam Sai Sankar, and Tejesh Chandra Kuppili

Popuri, Sankar, and Kuppili highlight that traffic control systems heavily rely on human intervention, which can be inefficient, especially when managing large volumes of vehicles. To tackle this, they propose an automated system to detect two-wheeler riders without helmets using YOLOv2. The system extracts frames from surveillance videos to detect riders without helmets. After identifying the violators, it captures their number plates and generates fines. The system updates the server with the fine details and sends a notification to the registered phone number, ensuring timely communication with the violator.

5. Bhavin V. Kakani, Divyang Gandhi, and Sagar Jani

In their work, Kakani, Gandhi, and Jani focus on improving Automatic Number Plate Recognition (ANPR) systems for traffic law enforcement. They propose an improved OCR-based license plate recognition system using neural networks trained on

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

a dataset of vehicle features. The system is divided into three modules: License Plate Localization, Plate Character Segmentation, and Plate Character Recognition. Their technique is tested on 300 national and international motor vehicle license plate images, and the results show an improvement in accuracy over existing methods.

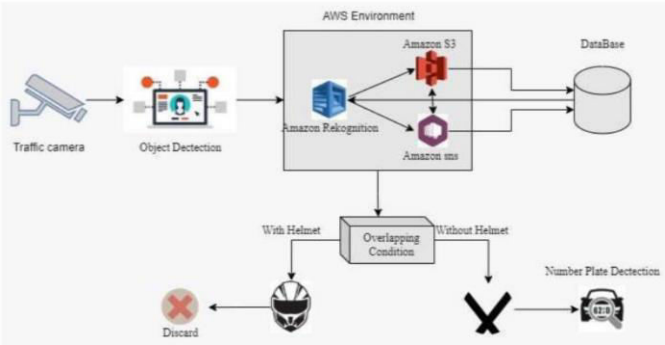


Fig:1.Architecture

III.IMPLEMENTATION

1. Video Input Preprocessing

The first step in the system involves receiving video input. This could be from a live camera feed or pre-recorded traffic footage. The system processes each frame individually for analysis.

Extract Frames: The video is broken down into individual frames, which are the units of analysis for object detection and OCR.

2. Object Detection Using YOLO

Object detection is a key part of this system. YOLO (You Only Look Once) is a deep learning algorithm that is capable of detecting multiple objects within a frame. For this specific use case, YOLO will be applied at different stages:

Motorcycle Detection: YOLOv2 is used to detect motorcycles or mopeds within the frame. The system identifies and labels the detected motorcycles with bounding boxes.

Helmet Detection: YOLOv3 is used to detect helmets worn by the riders. If a helmet is detected, it marks the bounding box around the rider's head.

License Plate Detection: YOLOv2 is again used to detect the license plates of vehicles, marking the bounding box around the plate.

3. Helmet Check

Once the motorcycle and helmet are detected, the system checks if the rider is wearing a helmet. This is done by evaluating whether a helmet is detected within the bounding box of the rider:

Helmet Detected: If the rider is wearing a helmet, the system will ignore this frame for license plate extraction and continue to the next frame.

No Helmet Detected: If no helmet is detected, the system proceeds to the next step, which is license plate extraction.

License Plate Recognition Using OCR

For riders who are not wearing helmets, the system proceeds to extract the license plate number. This is done in two stages:

Region of Interest (ROI) Extraction: The system crops the image around the detected license plate.

Optical Character Recognition (OCR): Once the license plate region is isolated, OCR (Optical Character Recognition) software like **Tesseract** is used to extract the text (the license plate number) from the image.

5. Post-Processing and Output

After detecting the non-helmet rider and extracting the license plate, the results are displayed or stored:

Bounding Boxes: The system draws bounding boxes around the detected motorcycle, helmet, and license plate for visualization.

License Plate Display: The extracted license plate number is displayed on the screen or logged for further processing

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

IV.ALGORITHM USED

1.Convolutional Neural Networks (CNNs):

CNNs are used for object detection in images, including detecting helmets and distinguishing them from other objects or people. CNNs excel at extracting spatial hierarchies and features from images, making them ideal for recognizing helmets on motorcyclists.CNNs automatically detect patterns such as edges, textures, and shapes, which are crucial for identifying the presence and location of a helmet relative to the rider.

2.Easy OCR (Optical Character Recognition): Easy OCR is used for extracting text from the number plate of the motorbike.The Easy OCR algorithm processes the image of the license plate and extracts the alphanumeric characters, enabling the identification of the motorbike based on its registration number.

3.YOLO (You Only Look Once)

YOLOv2 is used in the first and third stages (for motorcycle/moped detection and license plate detection). YOLO is a state-of-the-art object detection algorithm that uses a single convolutional neural network (CNN) to predict bounding boxes and class labels directly from full images in one evaluation, making it fast and efficient for real-time processing.

YOLOv3 is used in the second stage for helmet detection. YOLOv3 improves upon YOLOv2 by using a more advanced network architecture, offering better performance in terms of accuracy, especially for smaller objects such as helmets.

Object Detection Algorithms :

Deep Learning (Convolutional Neural Networks - CNNs): YOLOv2 and YOLOv3 are both based on CNNs, which are used to identify and localize objects in images (person, helmet, motorcycle/moped, and license plate).

Region-based CNN (R-CNN):

While not specifically mentioned, R-CNN or similar techniques can be part of the object detection framework for ensuring accurate bounding boxes and object identification before applying OCR for number plate recognition.

V.RESULTS

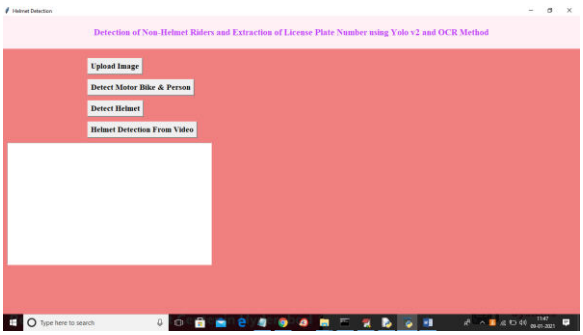


Fig 1 : Helmet Detection from Video

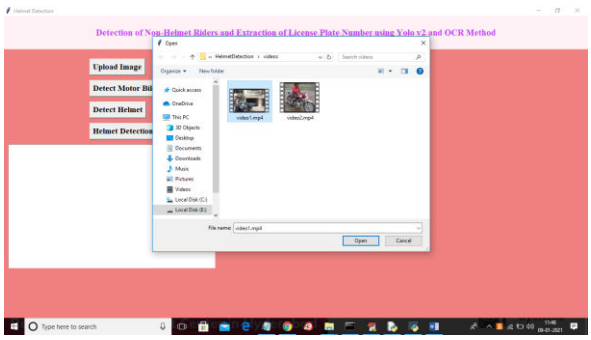
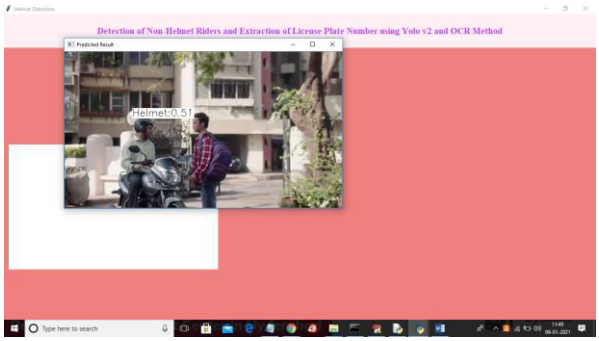


Fig 2 : Upload Video



International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

Fig 3 : Helmet will detect

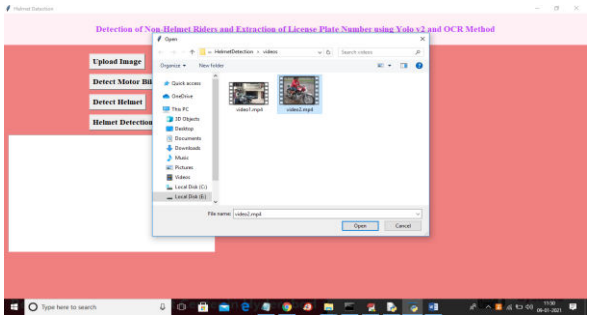


Fig 4 : Upload Another Video

Fig 5 : No helmet

VI CONCLUSION

A Non-Helmet Rider Detection system is developed. A video file taken as an input. The rider in a video shot, riding motorcycle is not wearing a helmet while riding it, then here we upload the image to identify that the license plate number of that motorcycle is obtained from image and it is shown. Object detection principle with YOLO architecture is used for motorcycle, person, helmet and license plate detection. OCR 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 is achieved satisfactorily.

REFERENCES

[1] J.Chiverton, "Helmet Presence Classification with Motorcycle Detection And Tracking",IET Intelligent Transport Systems, March 2012.

[2] Rattapoom Waranusast, Nannaphat Bundon, Vasan Timtong and Chainarong Tangnoi, "Machine Vision techniques for Motorcycle Safety Helmet Detection", 2013.

[3]. Romuere Silva, Kelson Aires, Thiago Santos, Kalyf Abdala, Rodrigo Veras, Andr´e Soares, "Automatic Detection Of Motorcyclists without Helmet",2013.

[4]. Romuere Silva, "Helmet Detection on Motorcyclists Using Image Descriptors and Classifiers", 2014.

[5]. Thepnimit Marayatr, Pinit Kumhom, "Motorcyclist"s Helmet Wearing Detection Using Image Processing", May-2014.

[6]. Amir Mukhtar, Tong Boon Tang, "Vision Based Motorcycle Detection using HOG features",2015.

[7]. Abu H. M. Rubaiyat, Tanjin T. Toma, Masoumeh Kalantari-Khandani, "Automatic Detection of Helmet Uses for Construction Safety", 2016.

[8]. XINHUA JIANG "A Study of Low-resolution Safety Helmet Image Recognition Combining Statistical Features with Artificial Neural Network"

[9]. Kunal Dahiya, Dinesh Singh, C. Krishna Mohan, "Automatic Detection of Bike-riders without Helmet using Surveillance Videos in Real-time", 2016.