IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 14, May 2023

Helmet and Number Plate Detection & Recognition

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Abstract: *In this study, we proposed a method for automatically identifying bike riders who are using live surveillance videos while wearing a helmet. The suggested method initially uses backdrop removal and object segmentation to identify bike riders in surveillance video. The binary classifier and visual cues are then used to determine whether or not the bike rider is wearing a helmet. We also give a consolidation method for reporting violations, which helps to increase the validity of the suggested method..The paper presents an approach for automatic detection of helmeted and non-helmeted motorcyclists. The YOLO model, an improved version of YOLO for object detection, is used in this approach to detect motorcycle riders in the videos. The proposed model is evaluated on traffic videos, and its results are promising compared to other CNN-based approaches.*

Keywords*:* Helmet, Security System, Vehicle Riders, Number Plate

I. INTRODUCTION

In practically every nation, two-wheelers are a highly common means of transportation. However, because there is less protection, there is a considerable risk associated. It would be ideal to lower the danger involved. bike riders must wear helmets. Due to the importance of wearing a helmet, governments have made it illegal to ride a bike without one and have implemented manual enforcement methods to apprehend offenders. The negligence of bikers not wearing helmets is a major cause that frequently adds to the biker's head injury. Most nations have legislation requiring the usage of helmets for users of two-wheelers as a solution to this problem.In some countries, the government have installed a specialized sensor to check the presence of the helmet, but it is economically not reliable to buy sensors for every bikeWithout a comprehensive system, traffic police officers are sent out to determine whether or not motorbike riders are wearing helmets. However, some obstacles must be overcome in order to use such automated solutions: 1) Implementation in real-time: It can be difficult to process a large amount of information within a limited length of time. In order to reach the goal of real-time implementation, such systems require tasks like segmentation, feature extraction, classification, and tracking, which require processing a sizable volume of data quickly. We put forth a real-time approach for automatically identifying bike riders without helmets utilising video from active security cameras.

II. LITERATURE SURVEY

This chapter examines various research publications on helmet detection systems in order to provide a greater understanding of the project. This section documents the substantial literature reviews conducted by the earlier scholars. A real-time safety helmet recognition system for motorcycles was proposed by Rattapoom Waranusast et al. The system used a moving object identification approach and categorized heads using techniques consisting primarily of head extraction and classification. The extraction method is based on vertical and horizontal projection profiling techniques, while the classification method is based on the characteristics obtained from the head regions. Experimental findings indicate that the methods correctly detected the wearing of the helmet at a rate of 74% for both lanes. The identification of moving vehicles using the CNN model for helmet / no helmet classification. The author Matthew N. Dailey et al. has used image recognition to identify the license number plate. After the full analysis, we conclude that the AdaDelta model gives 87.10% accuracy of validity and 93.11% accuracy of the evaluation. Although we also observe that there are mistakes where a motorcyclist wears a cap when the front rider wears a helmet and the second person does not wear a helmet. The Feature Extraction from the video and image feeds for traffic density measurement. Pre-processing/ Moving Object Detection is done in order to distinguish between moving and static objects, background subtraction is applied on gray-scale frames and classify them. Consolidated Alarm Generation is there, the correlation between continuous frames is neglected. So, in order to reduce false alarms, consolidate local results. we infer that the precision is 95.3% and the computational time for the identification of motorcycles is 0.059 seconds per frame. However, multiple motorcycles can be mistakenly assigned to the same track or the same motorcycle can be mistakenly assigned to a different track. Madhuchhanda Dasgupta et al. [5] suggest a method to identify all motorbike riders who are not wearing helmets in traffic surveillance recordings. Motorcycles and people are both detected using the YOLOv3 architecture. It has been suggested to use a lightweight CNN architecture for the second stage of helmet detection.

III. RELATED WORK

Researchers have been working to find a solution to the problem of helmet identification in surveillance footage for a long time. A real-time safety helmet recognition system for motorcycles was proposed by RattapoomWaranusast et al. [1]. This strategy was in the early stages of development. A moving object recognition method was utilized in the system. It classified heads using a variety of procedures, the most common of which were head extraction and categorization. The extraction method consisted of the vertical and horizontal projection profiling techniques. The categorization approach, on the other hand, was based on the features found in the head regions. Vehicle counting and trajectory prediction was used in the model by Mohan et al. [2]. The focus of this paper was on distinguishing bike riders from the rest of the individuals. Using an advanced adaptive Gaussian mixture model, Object Classification using a Convolutional Neural Network, the background removal approach was used to extract moving objects from traffic recordings. A CNN model was created using these photos to detect motorcycle riders from the movement of other objects once all the items of non-motorcyclists and motorcycle riders were included.

IV. PROPOSED WORK

This paper uses YOLOv4 to perform an image classification experiment on input about motorcyclists wearing helmets and motorcyclists without helmets. And we use our deep learning approach for image detection to identify a biker from a video image with no helmet identification. System function necessitates the inclusion of features that identify and classify images and video. It is nearly hard to extract features by hand. So, a few years ago, CNN emerged as an essential tool for achieving high accuracy in image categorization. CNN has been found to outperform other detection and classification algorithms by learning the full picture and extracting features using a feature map

The suggested method for detecting bike riders without helmets in real-time, which consists of two phases, is presented in this section. In the initial stage, we spot a biker in the frame of the video. The second stage involves finding the bike rider's head and determining whether or not the rider is wearing a helmet. We combine the results from subsequent frames for the final forecast in order to minimise incorrect predictions.

Yolov4:

Even though single-stage detectors such as the YOLO illustrated in Fig.1 are accurate. Also they are two-stage detectors such as R-CNN, Fast R-CNN, and faster R-CNN. They are accurate but slow. Consider the following key components of a contemporary one-stage object detector. Backbone: Feature extractors include models like ResNet, DenseNet, VGG, and others. At first they will be pre-trained on image classification datasets like ImageNet. After that they are fine-tuned on the detection dataset. These networks, which give varying degrees of characteristics with greater interpretations as the network gets deeper (more layers), prove to be useful in the final phases of the object recognition network. Neck: There are some additional layers between the backbone and the head. These layers are employed in the extraction of various feature maps built on previous stages. The FPN, PANet, or Bi-FPN neck portion might be used.

Next, we present steps involved in background modelling:

Background Modeling: Initially, the background subtraction method is used to separate the objects in motion such as bike, humans, cars from static objects such as trees, roads and buildings. However, working with data from a single fixed camera presents several difficulties.

DOI: 10.48175/IJARSCT-10830

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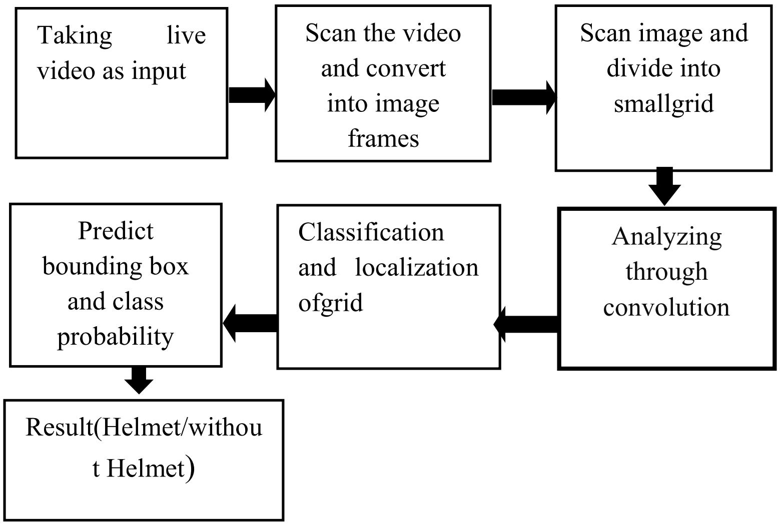
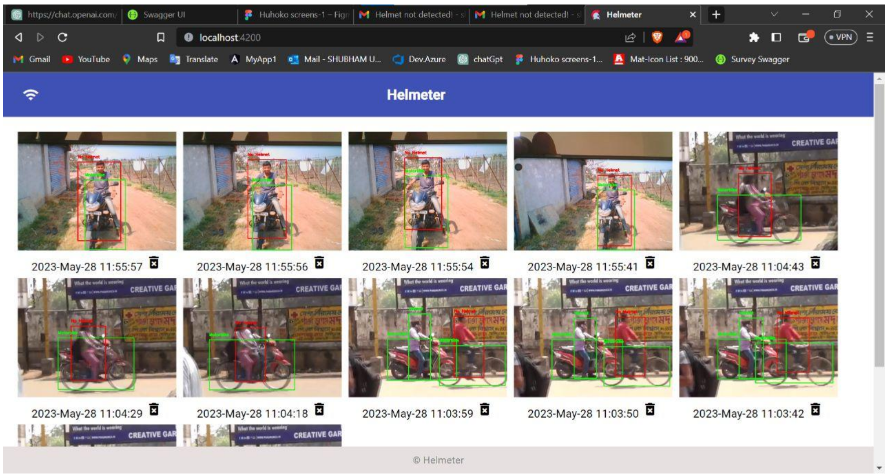
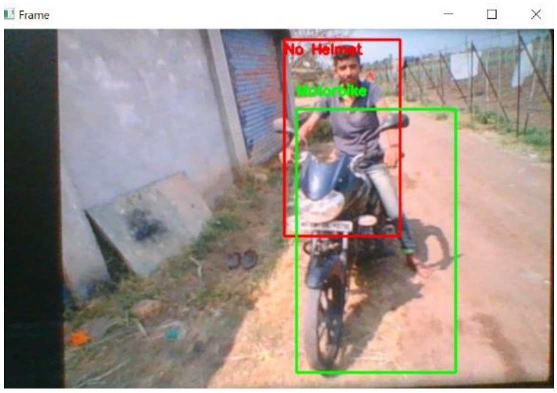
V. BLOCK DIAGRAM



VI. RESULT

In this section, the final results of the proposed model are demonstrated including phase wise outputs and figures. The model has been tested on different traffic scenarios which are showed in this section. For the testing of the model, a traffic video was recorded to detect motorbike riders. Motorcyclists' photographs from the internet are often used for testing purposes. to evaluate the system's algorithm for resilience. We have tested the system having motorcyclists with and without helmets as we can see in the fig The proposed system can also distinguish between the motorcyclists wearing a helmet or cap/hood, scarp, etc. as shown in the figure.





VII. CONCLUSION

In this paper, we proposed a framework for real-time detection of traffic rule violators who ride bike without using helmet. Proposed framework will also assist the traffic police for detecting such violators in odd environmental conditions viz; hot sun, etc. Experimental results demonstrate the accuracy of 98.88% and 93.80% for detection of bike-rider and detection of violators, respectively. Average time taken to process a frame is 11.58 ms, which is suitable for real time use. Also, proposed framework to detect and report number plates.

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