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Detection of Non-Helmet Riders And Extraction of LicensePlate Number Using Yolo V2,V3 And OCR

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ABSTRACT

Motorcycle accidents have been on the rise in a number of nations in recent years. Over 37 million Indians ride motorcycles. As a result, for road safety, a system for recognising diverse helmet usage is necessary. As a consequence, a machine learning technique is employed to build a bespoke way to identify and recognise motorbike riders. When a helmetless cyclist is discovered, the numberplate is retrieved and the Licensing Plate number is determined using a Character Recognition Recognizer.

Tags: You Only Look Once (YOLO), Automatic Number Plate Recognizing (ALPR), Mean Average Precision (MAP), Deep Neural Network (DNN), Face Shield Detection (FSD), Machine Learning (ML), Optical Character Recognition(OCR).

1.INTRODUCTION

The headgear is a motorcycle cyclist's most essential component of safety devices. The motorcyclist's head is secured by the helmet. Although wearing a helmet is mandated in many countries, some motorcyclists neglect to do so or do it poorly.Several studies in traffic analysis have been undertaken in recent years, including vehicle detection and categorization, as well as helmet recognition. Computer vision approaches such as low contrast image detection to differentiate moving objects in a scene and picture descriptions to extract attributes were used to construct smart traffic systems.Computational intelligence approaches are used to categorise the items using machine learning algorithms.

Machine learning (ML) is an artificial intelligence discipline in which a trained model acts independently based on the inputs it receives during the training phase. Machine learning algorithms develop predictions or judgements by creating a mathematical model using sample data, referred to as "training data," and they are also used in object identification applicationsAs a conclusion, a Helmet detection model may be created by training it on a certain dataset.Riders who do not wear helmets may be easily spotted using our helmet detection model.The rider's licence plate is clipped out and saved as an image based on one of the detected classes. This image is analysed using an optical character recognition (OCR) model. It identifies the text and outputs the License Plate number as Machine encoded text. It's also possible to use a Webcam to implement it in real time.

The goal of this study is to create a system that uses CCTV cameras to enforce helmet use. The proposed approach is aimed at modifying risky behaviours and, as a result, lowering the number and severity of accidents.

2. REALATED WORK

Several techniques to solve the problem of helmet detection have been developed in recent years.Abackground subtraction method is used to detect and differentiate between moving vehicles. And they used Support Vector Machines (SVM) to classify helmets and human heads without helmets. In [9], Silva et al. introduced a hybrid descriptor model based on geometric shape and texture data for automatically detecting bikers without helmets. To detect the motorcyclist's head, they combined Hough transform with SVM. They also add a multi-layerperception model for distinct item categorization to their earlier work.

The Hough transform is used by Wen et al. [10b] in their circular arc detection method. On the surveillance system, it was used to detect helmets. The downside of this approach is that it relies exclusively on geometric aspects to determine whether or not the collection contains any safety headgear. In order to locate helmets, geometric features are insufficient. In [11b], a computer vision system is proposed with the goal of partially detecting and segmenting motorcycles. The existence of a helmet validates that there is a motorcycle, according to a helmet detecting system. To detect the presence of a helmet, edges are calculated on the likely helmet region. It is accomplished using the Canny edge detector.

Using a k-NN classifier, Waranusat et al. developed a method for identifying moving objects over the motorcyclist's head. [12]These models were developed using picture statistical data, although their accuracy was restricted.

The accuracy of categorization has improved considerably further since the development of neural networks and deep learning algorithms. Alex et al. proposed an object classification and identification method based on convolutional neural networks (CNNs). For helmeted and non-helmeted riders, A. Hirota et al. employ a CNN. [13]Despite employing CNN, the accuracy of their helmet recognition is poor because to helmet colour limitations and multiple riders on a single motorcycle.

3.PROPOSEDMETHODOLOGY

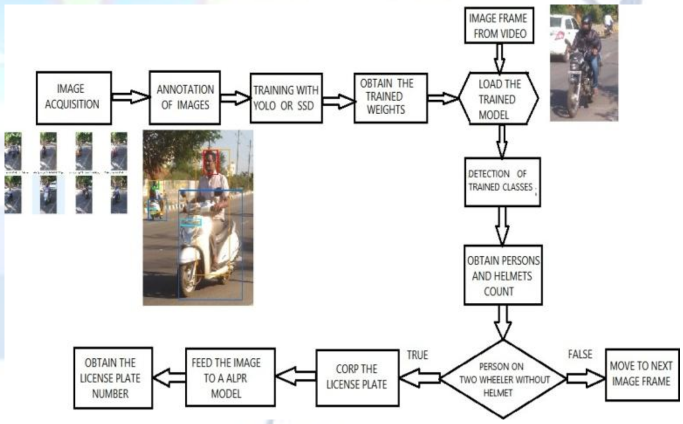
Real-time helmet detection requires precision and quickness. As a result, the DNN-based YOLO model was chosen. YOLO is a cutting-edge real-time object detecting system.

YOLOv3 is extremely fast and accurate when compared to previous YOLO versions. It makes predictions based on a single network assessment, as opposed to R-CNN, which requires hundreds of network assessments for a single image. It is over 1000 times quicker than R-CNN and 100 times faster than Fast R-CNN as a result of this.

Detecting instances of a specific class in an image or video, such as animals, humans, and others, is known as object detection. Using pre-trained object identification models, the Pre-Existing Object Detection API makes it simple to recognise items. These models, however, identify a lot of things that are unrelated to us, necessitating the creation of a bespoke object detector in order to uncover the needed classes.

Five things must be recognised in order to achieve helmet detection and number plate recognition and extraction. The items are a helmet, no helmet, a motorcycle, a person (on the bike), and a licence plate.

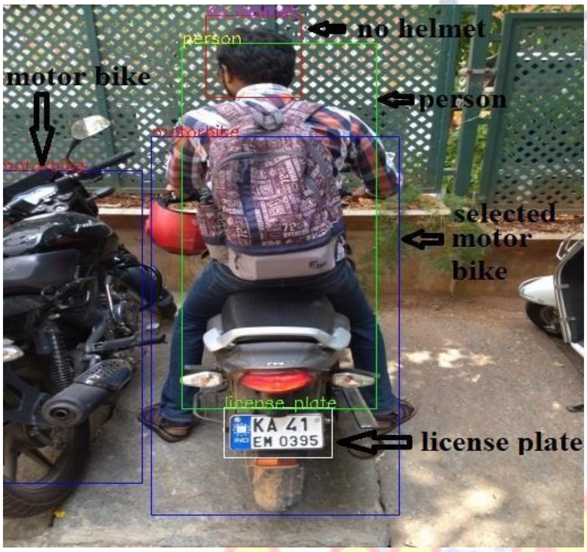
A bespoke object detection model that can detect these objects is required. A Dataset is a collection of photos that contain objects from the classes to be detected. Following that, the custom model is trained using this dataset. The model may be used to detect these custom objects after it has been trained.



All of the collected images and their annotations are fed into the training system. The model retrieves each class's features from each image using ground truth for the required classes. We utilise a deep learning, convolutional neural network-based classifier to extract the characteristics and store them so that we can recognise those properties in other photographs. The detection of the pretrained class is necessary when an image is submitted to this trained model. The detecting capacity of the custom trained model is demonstrated using a few photos as an example.

3.1 Helmet Detection

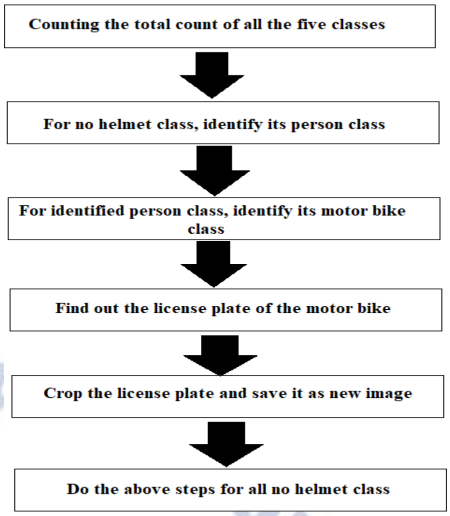
To prepare for the custom classes, the annotated photographs are fed into the YOLOv3 model. The model is loaded with the weights collected during training. Following this, a picture is provided as input. All five trained classes are recognised by the model.



We can learn about motorbike riders from this. If the rider is not wearing a helmet, we can just acquire his or her other class information. This approach may be used to get the licence plate.

3.2 LicensePlateExtraction

The corresponding person class is determined once the helmetless biker has been identified. This is done by checking whether the no helmet class's coordinates are contained inside the person class's coordinates.The same procedures are used to detect the connected motorbike and licence plate. The licence plate is cropped and saved as a new image after the locations are determined.



3.2 LicensePlateRecognition

An Optical Character Recognition (OCR) model is fed the retrieved licence plate. OCR recognises text in a photo and converts the recognised strings into machine-readable text. The OCR module will output a list of projected licence plate numbers along with a confidence value.The confidence value reflects how certain it is of correctly identifying the provided licence plate. The licence plate with the greatest confidence value is then saved in a text file for further usage.

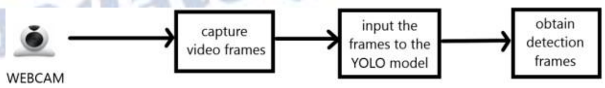
Plate #1

	Plate	Confidence
-	KA41EM0395	89.353058
-	KA41M0395	80.161301
-	KA416M0395	79.876579
-	KA41KM0395	79.874893
-	KA41BM0395	79.874687

4 REALTIMEIMPLEMENTATION

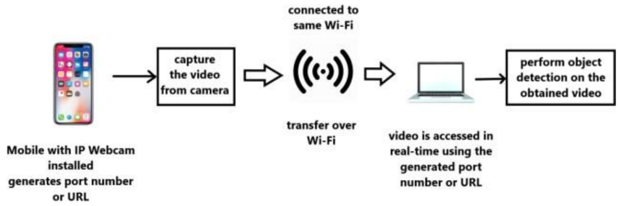
4.1 UsingWebcam

The camera could be used to receive picture frames in real time for object detection.The YOLOv3-tiny model can process at up to 220 frames per second.



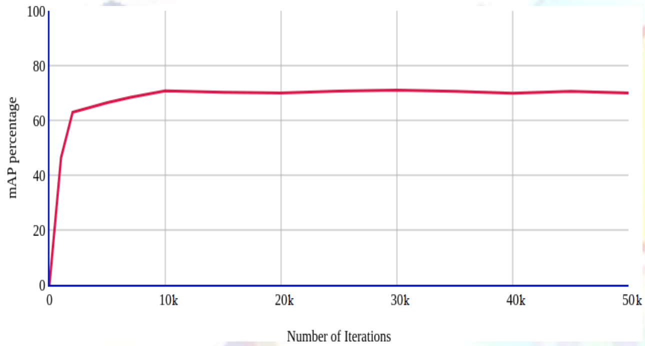
4.2 UsingIPWebcamforMobile

Instead of using a webcam, a mobile camera can be used as the input.Because the mobile phone may be carried and cover a broad variety of angles, this offers up a lot of possibilities. It's an added bonus to be able to do all of this in real time. As a result, not just CCTV footage but also footage obtained from a handheld device can be obtained from this. Furthermore, close-up film for mobile phones can provide a clearer and more visible number plate for OCR to generate an exact number.

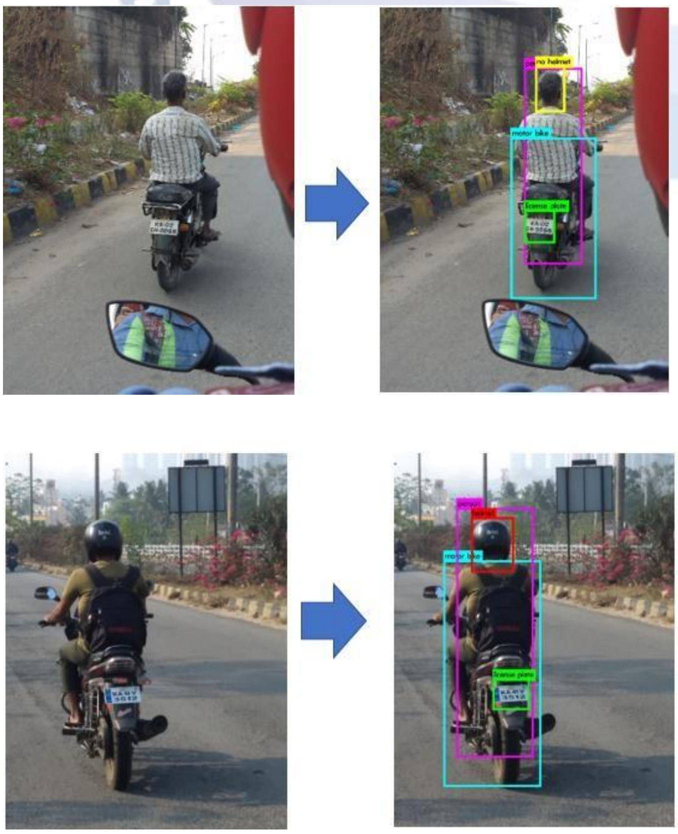


5. RESULTS

The model was trained for 11,000 photos across 5 classes for 50,000 cycles on a small YOLOv3. The training was stopped after 50,000 iterations since all of the object classes had high precision detections and the mean average precision (MAP) attained a constant maximum value of 75%.

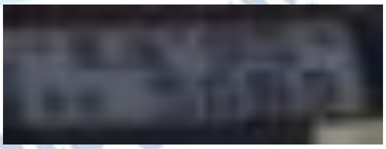


A few examples of the input image and the output object detector are shown in the below diagram.



The code obtains the License plate from the Object detector output. The License plate extraction code exclusively harvests licence plates from motorbikes with no helmeted riders and ignores licence plates from helmeted riders.

With an accuracy of up to 85 percent, the OCR model can detect and recognise License plates in an image. The following illustration shows an example of a recognisedlicence plate.



6.CONCLUSION

The YOLO object detection is well-suited for real-time processing, as evidenced by the data above, and can correctly categorise and localise all object categories. The planned end-to-end model was successfully developed. provides all of the monitoring functions that can be automated and delivered Some procedures are used to extract the number plates by taking into account various conditions, such as a large number of riders without helmets, and are intended to handle the majority of cases. Because all of our project's libraries and software are open source, it is incredibly versatile and cost effective. The programme was established largely to resolve the issue of inadequate traffic management.As a result, we can say that any traffic control department implementing it would make their job easier and more efficient.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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