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Detection of Non-Helmet Riders and Extraction of License Plate Number using Yolo v2 and OCR Method

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ABSTRACT: ***The goal of this project is to automate the detection of traffic offences, such as failure to wear a helmet, as well as the retrieval of a vehicle's licence plate number. Using Deep Learning, there are three phases to Object Detection. YOLOv2 and YOLOv3 recognise a motorcycle or moped, a helmet, and a rider. The licence plate number is extracted using optical character recognition (OCR) (Optical character recognition).***

I. INTRODUCTION

According to India Today, bicyclists are killed in traffic accidents at a rate of more than 48,746 every year in India. By chance, 73.8 percent of them were not wearing a protective helmet. These data are correct, according to India Environment Portal [25]. Every year, a large number of people are killed in car accidents. Poor road conditions, cars that aren't working, and so on, this is exacerbated by careless driving and riding, as well as a disregard for traffic laws. However, there are ways to avoid some of them. Proper safety precautions, for example, ensure a lower accident rate and, as a result, a lower fatality rate. Despite the fact that wearing a helmet is mandatory for motorcyclists, many do not. Automatic helmet recognition and fine-tuning are among the goals of this research. When it comes to enforcing traffic laws, there is currently no automation. Certain people may be exempt from paying a fee even after infringing a traffic law due to their own negligence or other conditions. As a result of automated processes, fewer incidents like this will occur, and tougher efforts will be taken to prevent them.

1.1 Motivation:

According to the WHO's "Global Status Study on Road Safety 2018," more than 1.35 million people die and 50 million are injured each year as a result of automobile accidents around the world. A large share of this expense is borne by motorcycles, bicycles, and pedestrians. According to this research, in order to save lives, a comprehensive plan of action must be implemented. India is first in the world in terms of the number of people killed or injured in automobile accidents. According to experts, urbanization and a widespread disdain for safety precautions like as wearing a helmet and seat belt while driving are to blame.

1.2 Goal: To read the license plate of any two-wheeled vehicle, all you have to do is scan the rider's face in this project's features An OCR model is used to get the license plate information. The YOLOV2 and YOLOV 3 versions of a motorcycle can detect whether a rider is wearing a helmet and whether passengers are present.

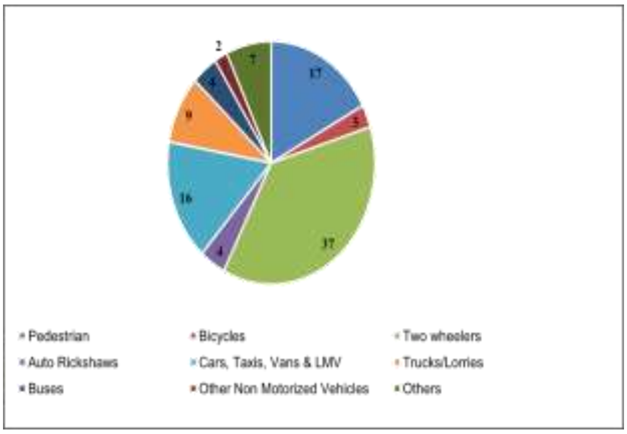

Fig. 1(a): share of persons killed in 2019 by victim/victim vehicle categories

II.METHODOLOGY

This section explains the various processing procedures. Frames from video are captured at regular intervals during the early phase. The frames are collected and placed in a folder. They are given names that include the frame number, such as frame 7 50, frame 7 100, and so on... The frame number 50, 100, etc.... shows that this is the seventh video file input. Many frames are superfluous, as seen in the diagrams. As a result, the last frame or second frame is chosen for further processing based on the movement of the vehicle in relation to the camera.

For two scenarios, the complete job can be divided into the five phases listed below:

III.MOTORBIKE AND PERSON DETECTION

The chosen frame is fed into the YOLOv2 object detection model, which is looking for "Motorbike" and "Person" classes. As illustrated in Fig. 3(a) and Fig. 3(b), the image with needed class classification, confidence of detection by bounding box, and probability value is obtained at the output (b).

Fig. 3 (a): Frame with 'person' and 'motorcycle' classes detected (Case 1)

Fig. 3 (b): Frame with 'person' and 'motorcycle' classes detected (Case 2)

Fig. 3 (c): Extracted motorcycle and person images (Case 1)

Fig. 3 (d): Extracted motorcycle and person images (Case 2)

Only the identified objects are extracted using functions provided by the Image AI library, as shown in Fig. 3 (c) and Fig. 3 (d), and stored as independent images with class names and image numbers in order. If the extracted object is a motorcycle, for example, it will be recorded as motorcycle-1, motorcycle-2, etc.... If the extracted image is of a person, it will be saved as person-1, person-2, etc.... The details of these extracted images are saved in a dictionary that can be utilised for further processing in the future.

IV. HELMET DETECTION

Fig. 4(a): Cropped images (Case 1 & Case 2)

After obtaining the person-motorcycle pair, the person photos are fed into the helmet detection model. Some false detections were discovered when testing the helmet detection model. As a result, the person image was cropped so that only the top one-fourth of the image was visible, as shown in Fig. 4. (a). This ensures that false detection cases are avoided, as well as circumstances when the rider is holding the helmet in his hand or retaining it on the motorcycle while riding instead of wearing it.

Fig. 4(b): Helmet Detection

The output of applying the cropped image to the helmet identification model is displayed in Fig. 4. (b). Figure 4 shows the bounding box around the helmet, as well as the detection probability (b). No further processing is required because the rider in Case 1 is wearing a helmet. No bounding box is constructed in Case 2 since the rider is not wearing a helmet.

V. LICENCE PLATE DETECTION

This step is unnecessary if the helmet is discovered. If the helmet is not found, the licence plate detection model is given the motorcycle image as input. 832 photos of bikes, mopeds, and their licence plates were collected as a dataset for training purposes. The licence plate in those photographs was then annotated with the abelling tool, i.e., a bounding box was formed around the licence plate in those images so that the model could learn. The bounding box information is saved in an.xml file with the same name as the image name. The trained model for detecting licence plates is then built using the annotated photos.

Fig. 5(a) : License plate detection

The bounding box is constructed across the licence plate in the supplied input image using the trained model. The top-left and bottom-right bounding box coordinates, class name, and confidence of detection are all stored in a.js file. The bounding-box co-ordinates provided in the.js file is then used to extract only the licence plate image, and the resulting photographs are saved. More than one bounding box was detected for a single motorbike image, as illustrated in Fig. 5(a). In that situation, a confidence of detection threshold of 0.5 is used. The bounding box with confidence greater than the threshold is picked when reading the contents of the bounding box in the.js on file.

Fig. 5(b) : License plate extraction and rotation

Fig. 5(c): License plate image after increasing brightness and rescaling

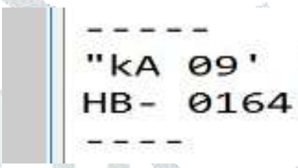

Fig. 5(d): Output after applying OCR

Pre-processing is required before applying OCR straight to the retrieved licence plate image in order to obtain more accurate results. As a result, the image was rotated. Figure 5(b) depicts the licence plate image after it has been removed and rotated. Because the camera will be fixed in relation to the motorcycle, the angle at which the retrieved licence plate image must be rotated must be determined once by trial and error, and that value must be used in all subsequent cases. It was discovered to be 6 degrees in this example.

The rotating image was rescaled so that OCR could accurately detect the strings. The size of the rescaled image was set by a scaling ratio, i.eThe ratio of the rescaled image's width and height to the original image's width and height. Let w, h be the original image's width and height, and w', h' be the rescaled image's width and height. Let r denote the ratio.

The rescaled image size is then calculated:

$$w` = w * r \quad \text{(1)}$$

$$h` = h * r \quad \text{(2)}$$

where r is a variable that is dependent on the frame selected during frame extraction. It was discovered to be between 1.4 and 1.47 in this example. The image's brightness is then boosted to make black plate numbers against a white background more visible. The image's h,s,v (Hue, Saturation, Value) values were acquired. v(Value) is a term that represents the brightness or intensity of a colour. If the "v" value is more than that limit for a given pixel, 255 is assigned as "v" in that case. If the pixel's "v" value is less than the limit, a constant value is added to the pixel's "v" value. In this case, the constant value chosen was 30, and the limit is 225 (255-30).

value = 30

limit=255 –

value if v ≥

limit :

v = 255
else:
v = v + value

VI. RESULT AND DISCUSSION

Sl. No	Detection model	Number Plate Detection	Threshold value
1	YOLO v2(Without Helmet)	Yes	0.5
2	YOLO v2(With Helmet)	No	0..87

Table 1. Details of Threshold value with model

The outcomes of two cases are discussed here. They are, indeed. Case 1: When the user of a motorcycle or moped wears a helmet, as indicated in fig.4 (b).

Case 2: When the user of a motorbike or moped is not wearing a helmet and a licence plate is identified, as shown in Figure 5. (a).

CONCLUSION

A video file is used as the input for a Non-Helmet Rider Detection system. The licence plate number of the motorcycle is retrieved and shown if the motorcycle rider in the video clip is not wearing a helmet while riding the motorcycle. For motorbike, person, helmet, and licence plate detection, the object detection principle with YOLO architecture is applied. If the cyclist is not wearing a helmet, OCR is utilised to extract the licence plate number. Not only are the characters taken, but the frame from which they are extracted as well, so that they can be used for other reasons. All of the project's objectives have been met satisfactorily.

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