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Helmet and Number Plate Detection Using AI

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ABSTRACT: Riding motorcycles without wearing a helmet is one of the violations of important traffic rules 'Mandatory Wearing of Helmet by motorcyclists'. The mortality/death rate is higher in bike accidents when compared to that of other types. The current methods include conventional methods which involve traffic officers who observe traffic rule violators by patrolling roads or traffic surveillance CCTVs. This requires more time and also manpower. It is tough to find and impose fines on each violator by using these approaches.

This project includes a method to detect helmet wearing or not and also license number plate recognition for detecting and identifying two-wheeler riders with or without helmet and thereby penalizing them who do not wear helmets. Object detection using YOLO is the main method to detect human and helmet presence in the given video. Object detection is carried out at various levels to find the helmet rule violators and their license plate number. The dataset is collected with both helmet and non-helmet wearing bike riders videos. The video data is converted into grayscale data and stored in csv files. During the test video data checking, the videos are converted into grayscale values and checked with available training data set videos grayscale values. In addition, this project develops a new CNN architecture to classify helmet types and checks whether the video is having a helmet or not. With i) good execution speed and ii) good generalization capability, this newly developed CNN architecture is used as an effective decision-support method to detect rule violators for the traffic department. Python 3.7 is used for development of the project.

KEYWORDS: Deep Learning, Convolutional Neural Network, Helmet Detection.

1. INTRODUCTION

Artificial intelligence (AI) is the ability of machines to replicate or enhance human intellect, such as reasoning and learning from experience. Artificial intelligence has been used in computer programs for years, but it is now applied to many other products and services. For example, some digital cameras can determine what objects are present in an image using artificial intelligence software. Optical Character Recognition is an application, which will be used to make a soft copy with the hard copy. (Optical Character Recognition or OCR is concerned with the automatic conversion of scanned and digitized images of characters in running text into their corresponding symbolic forms. This application will be capable enough to provide a complete solution of conversion of data in any organization. YOLO is an algorithm that detects and recognizes various objects in a picture (in real-time). Object detection in YOLO is done as a regression problem and provides the class probabilities of the detected images. The YOLO algorithm employs CNN) to detect objects in real-time. As the name suggests, the algorithm requires only a single forward propagation through a neural network to detect objects. This means that prediction in the entire image is done in a single algorithm run. The CNN is used to predict various class probabilities and bounding boxes simultaneously. The YOLO algorithm consists of various variants. Some of the common ones include tiny YOLO and YOLOv3.

A Convolutional Neural Network is a Deep Learning algorithm which can take in an input image, assign importance to various aspects/objects in the image and be able to differentiate one from the other. CNNs are used for image classification and recognition because of their high accuracy. The CNN follows a hierarchical model which works on building a network, like a funnel, and finally gives out a fully connected layer where all the neurons are connected to

each other and the output is processed.

II. RELATED WORK

The objective of this project is to develop a system to enforce helmet wearing and detect the riders without helmets using pre recorded videos. The bike rider's license plate is extracted and their information is gathered. The developed system aims in changing unsafe behaviors and consequently reducing the number of accidents and its severity. The main objectives of the system are to reduce the number of helmet violation cases, continuous surveillance of motorcyclists without helmet, generation of message and storage of violator details with little or no manpower.

III. METHODOLOGY

Most of the existing systems use the You Only Look Once (YOLO) algorithm. Here Convolutional neural network (CNN) algorithm is used for greater accuracy. CNNs are highly efficient for image processing, since a feature may occur anywhere in the image.

When we convert an RGB image to a grayscale image, only 8 bits are required to store a single pixel of the image. So we will need 33 % less memory to store grayscale images than to store an RGB image. Grayscale images are much easier to work within a variety of tasks in many morphological operations and image segmentation problems, it is easier to work with a single layered image (Grayscale image) than a three-layered image (RGB color image). So the input RGB image is taken and converted to a grayscale image. Then all the images are resized into the same size. When an image is resized, its pixel information is changed. This data is saved in a comma separated file. A Comma separated values (CSV) file is a delimited text file that uses a comma to separate values. Each line of the file is a data record. Each record consists of one or more fields, separated by commas. The use of the comma as a field separator is the source of the name for this file format. A CSV file typically stores tabular data (numbers and text) in plain text, in which case each line will have the same number of fields.

The object detection is performed at three levels. Firstly, a motorcycle(s) with a person on it is identified and then the helmet is detected. If the model identifies that the person is not wearing a helmet, then the license plate recognition is done. After object detection, the number plate of the vehicle is extracted using an Optical Character Recognition (OCR) API. The cropped image of the license plate is fed to the OCR. The number plate is extracted and violator details are obtained and a message to pay the penalty is sent to the violator.

IV. EXPERIMENTAL RESULTS

Figure a) Shows the Motorcyclist with helmet input from the pre recorded videos. Figure b) Shows the Motorcyclist without helmet input from the videos.



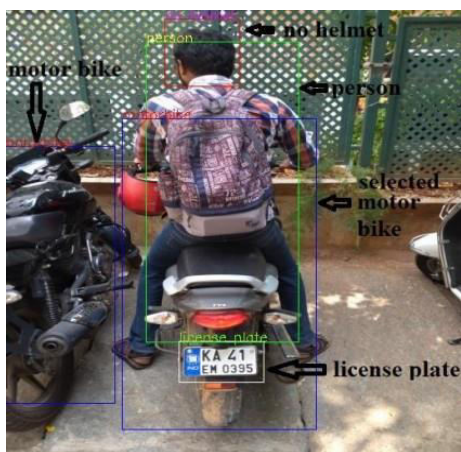


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Figure c) Shows the Helmet found output from the given input image. Figure b) Shows the Helmet not found output from the given input imageE

Figure e) shows the Recognizing number plate and figure f) shows the detecting the number plate using text format



e)

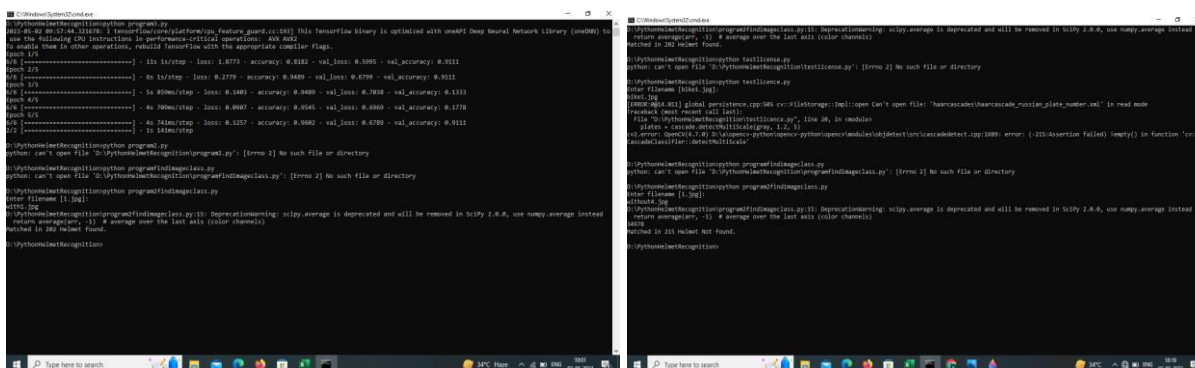


f)

Plate #1	Plate	Confidence
-	KA41EM0395	89.353058
-	KA41M0395	80.161301
-	KA416M0395	79.876579
-	KA41KM0395	79.874893
-	KA41BM0395	79.874687

V. CONCLUSION

This project develops a new Convolutional Neural Network method to classify riders with and without helmet and checks if the picture captured is having helmet or not. With a good generalization ability and execution speed, the proposed architecture can be used as an most effective decision-support tool for administrators/traffic officers to find the helmet presence in pictures. If the coding is developed as a web service, integration with many network applications is possible. The coding is made such that the above said improvement can be integrated with present modules.



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