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IDENTIFICATION OF HELMET AND NUMBER PLATE USING CNN MACHINE LEARNING

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Abstract:-Road accidents are becoming more common. With more people buying cars, motorcycles are becoming the main mode of transportation in many countries. Every day, road accidents are increasing. People are also more cautious now, especially with helmetless riders. Serious injuries can result from motorbike accidents. Traffic police are the most common method of ensuring motorcyclists have helmets. They monitor motorcyclists at intersections and through CCTV footage. This requires more human intervention and is a slow process. This paper aims to create an automated system that can detect helmetless riders using concepts such as ML, CNN, and OCR. The vehicle number plate of the helmetless rider is automatically recognized and the characters are extracted. Convolutional Neural Networks are used in this proposed system, which allows for higher accuracy.
Keywords: CNN, OCR, Convolutional Neural Networks, Number plate Recognition, Helmet detection

1 INTRODUCTION

The primary safety equipment for motorcyclists is the helmet. It protects the cyclist from accidents. While helmets are obligatory in several countries, there are some motorcyclists who do not wear it or wear it improperly. In the last few years, a variety of researches have been done in the field of traffic analysis, such as the detection of vehicles and their classification, as well as helmet recognition. Smart traffic analysis systems have been created by using computer vision algorithms like the detection of foreground and background images, which divide the moving objects in the scene, and also image descriptors to determine characteristics. Computational intelligence algorithms are employed in conjunction with machine learning

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algorithms that classify the objects. Machine Learning (ML) refers to the term used to describe the field of Artificial Intelligence in which a trained model can operate by itself, using the inputs it receives during the time of training.

Machine learning algorithms create mathematical models of the samples of data, also known by the name of "training data" to aid in making predictions or take decisions. They are used in application of detection of objects. Thus, through training using an appropriate dataset and a Helmet detection model is able to be developed. With this model, helmet-less riders can easily be identified. Based on the classes that are detected, each rider's license number is cut out and stored in the form of an image. The image is then passed to an Optical Character Recognition (OCR) model which detects the text and provides its License Plate number as output as Machine encoded text. It can also be applied in real time with webcams.

The goal of this research paper is to design an approach to ensure helmet-wearing with the aid camera surveillance. The system is aimed at altering unsafe behavior and, consequently, decreasing the amount of accidents and their severity.

2 RELATED WORK

In the last few time, several methods have been suggested to address the issue that helmets are not detected. The authors of [7] employed a background subtraction technique to identify and distinguish between vehicles moving. They also used Support Vector Machines (SVM) to distinguish between helmets and human heads that do not wear helmets. Silva et al. in [9] suggested an hybrid descriptor model built on geometric shape and texture characteristics to recognize motorcyclists with no helmet automatically. They applied Hough transforms and SVM to determine heads of motorcyclists. They also extend their work from [10] with a multi-layer perception model to classify of different objects.

Wen et al. [10] use a circular algorithm for detecting arcs based on the Hough transform. They used it to identify helmets in the security system. The downside of this research is that they use geometric features to determine whether there is a safety helmet in the collection. Geometric features aren't enough to locate helmets. In [11], it suggests computer vision systems that aim to recognize and classify motorcycles in part. An automatic helmet detector is employed to detect the presence of helmets, which ensures the presence of an actual motorcycle. To detect helmet's presence the edges are calculated over the potential helmet area. Edge detectors such as Canny [12] are employed.

Waranusat et al. [11] developed a system that can detect moving objects by using a kNN classifier above the motorcyclist's head , to classify helmet. These models were developed using statistical data from images and were restricted in the accuracy that could be attained.

With the development of neural networks and deep-learning models there was a further

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improvement in precision of classification. Alex et al. [13] proposed the convolutional neural network (CNN) developed method for the classification of objects and for detecting them. A. Hirota et al. (12) use A. Hirota et al. [12] use CNN to classify helmeted and non-helmeted cyclists. While they do use CNN for helmet recognition, their accuracy isn't great due to their restrictions on color of the helmet and the possibility of multiple motorcyclists riding on the same.

3 CORPUS CHARACTERISTICS

This study suggested a computer vision method for the detection of helmet-wearing by motorcyclists riding on public roads. The research has been divided into two phases that are vehicle segmentation and classification and the identification of helmet usage. The process of segmentation and classification has following goals: determining what objects are moving within the scene, and then classifying these objects. Like the majority of computing vision devices, this system requires a calibration phase. At the time of calibration, the parameters necessary to operate the system are set. At the time of calibration of the proposed system an equilateral crossing line (CL) is established. The line will be outlined by the system's administrator and will be in the direction of the public road, where the system is accountable for recording the vehicles. Moving objects that cross the CL are then taken out of footage.

The next step is to extract the specific features of the segments. Wavelet transformation (WT) was used [10,18The next step is to extract the features of the segmented objects [10, 18]. The vectors are input parameters to the classifier. Random forest classification was used to classify vehicles [44. The images are classified into two categories either nonmotorcycle or motorcycle. The classification is based on the fact that it's sufficient to determine whether an object belongs to a motorcycle within the proposed system. The second step is the identification of helmet usage. To lower the computational costs and increase the accuracy the region that is of particular interest (RoI) was identified.

This HOG descriptor was used during this phase. The descriptor generates various vectors to represent the representation of a motorcyclist who wears helmet or without helmet. The extraction of features to aid in the identification of helmet usage is considered to be a crucial aspect of this study because it is the principal purpose for the system proposed. It was the MLP classification method was applied to categorize pictures into two categories either with or without a helmet. This diagram for the proposed algorithm shows every stage and substages of the issue as shown in Fig. 1. The diagram covers all the steps beginning with the acquisition of images until the identification of the helmet.

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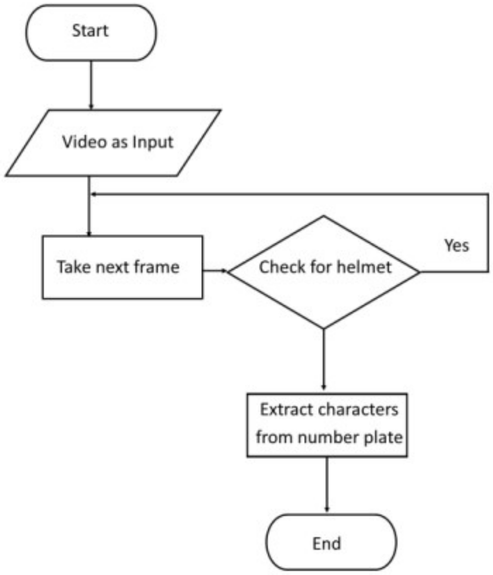

Fig 1: Basic Flow Chart model

Phases of Development

1 Designing a module to identify the helmet inside the frame.

2 Designing a system to find the number plate and remove the vehicle's number from frame.

3 Connecting all the modules and verifying the accuracy and reliability that the systems has.

Implementation

1. Using a camera or video as input.
2. Take a single frame of the input.
3. Check if the frame is equipped with the helmet.
4. If the helmet is in place, then go back to the 2 2 stage

5 If the helmet isn't present, then give this frame to the program that finds the number plate and extracts the characters from it.

6. Repeat this process until the input isn't empty or null.

Impletation Using YOLOv3

The YOLOv3 algorithm begins by separating the fame into grid. Each grid cell can predict a quantity of border boxes (sometimes called anchor boxes) around objects that rank high in the pre-defined classes.Each boundary box comes with an associated confidence score that reflects the accuracy it believes that prediction will be. It also can only detect one object per bounding box. These boundary boxes were constructed by using the dimensions of ground truth boxes in the original dataset in order to determine the most commonly used dimensions and shapes. The problem of detecting objects is considered to be an issue of regression in the YOLO algorithm. The image is split in the form of an S grid. S grid. If the center of a target is the grid, it is the one responsible for identifying the target.Each grid will produce bounding boxes as well as a confidence and a class probability map. They are among them. The bounding box is comprised

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of four numbers: x, the y, the w, and the h, (x, y) defines the center that is the centre of the box. (W, the number) is the height and width that the box has. Confidence is the probability of having objects within this prediction box that can be defined as the IoU value that is the difference between the box that is predicted and the actual box. The class probability tells you the probability of class for the object. YOLOv3 employs a two-class approach.

Extraction of features

Before the calculation of the descriptor, a pre-processing step is carried out to produce the sub-window which corresponds to the head that the cyclist wears. The first step was to create a grayscale image was determined. A second filter that has a 5 x five neighborhood was used to cut down on the noise in the image. Thirdly third, the Otsu threshold was determined.

Fig 2: Examples of RoIs calculated from images of motorcyclists which were captured in the segmentation stage of objects

License Plate Extraction

When the helmetless cyclist is identified, the associated person class is identified. This is accomplished by determining the coordinates of the person class without helmet are within that person's class. The same procedures are used to identify the motorbike that is associated with the license plate. When the coordinates of the license plate are located the image is cropped and stored as a new image.

Fig 3: Detecting the number plate.

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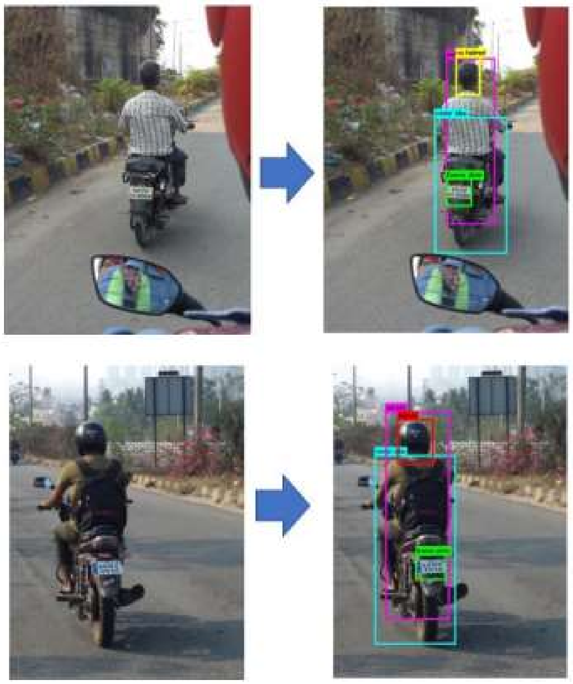

Fig 4: This code removes the license plate from the output of the Object detector. The License plate extraction program is only extracted from motorbikes that have riders who are not wearing a helmet. The code then removes the license plate of motorbikes whose riders wear a helmet.

4 CONCLUSION

Based on the above results, it is clear that YOLO object detection system is equipped for real-time processing and has the ability to accurately define and identify all objects classes. The model that was proposed for the end-to-end process was successfully developed and is able for automation and utilized to monitor. To extract the number plates, there are a variety of methods that are used when looking at different scenarios like multiple riders with helmets, and are designed to deal with the majority of cases. All of the software and libraries that we use in our project are open-source and therefore extremely flexible and cost effective. The project was designed to address the issue of inefficient traffic management. So at the end we can conclude that if the project was used by any traffic management department they would find their work easier as well as more effective.

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