USING MACHINE LEARNING TO IDENTIFY HELMET DETECTION AND AUTOMATIC LICENSE PLATE RECOGINATION

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Abstract

As a result of variations in social, economic, and transportation environments, the number of motorcycle accidents has increased worldwide throughout the years. Motorcycles are a popular mode of transportation among those in the middle class. The main purpose of a helmet is to protect the driver's head in the event of an accident or fall from a bike. To ensure road safety, a mechanism for the automatic identification of helmet use must be developed. A machine learning-based technique is used to construct a detection model that can identify helmetless motorcycle riders. When a rider without a helmet is spotted, the licence plate is retrieved, and an optical character recognition is used to read the licence plate number. With a webcam or a CCTV as input, this application can be used in real-time.

Keywords: Optical character recognition (OCR), You only look once (YOLO), Machine learning, Licence plate.

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1. Introduction

In the case of an accident, a motorbike lacks the structural support that a vehicle offers to keep drivers safe and protected, therefore driving without a helmet's like playing Russian roulette with your life. The main purpose of a helmet is to protect the driver's head in the event of an accident or fall from a bike. This is true even if the rider takes all reasonable efforts to avoid harm. The number of people who really wear helmets is rather small nowadays. The planned work aids in determining whether bikers are using protective headgear while on the road. The goal of the suggested YOLOv3 technique is to employ real-time surveillance footage to automatically identify helmetless bikers. Many studies in traffic analysis, including those on vehicle detection and categorization and helmet detection, have been conducted during the past few years. Computer vision

algorithms were used to construct intelligent traffic systems, such as background and foreground image detection to separate the moving objects in the scene and image descriptors to extract features. In order to categorise the objects, computational intelligence algorithms are also applied. In the area of artificial intelligence known as machine learning (ML), a trained model can function independently using inputs provided during the training phase. Object detection applications also use machine learning algorithms, which create a mathematical model from sample data known as "training data" in order to make predictions or decisions.

Related Work

"Motorcycle identification and tracking capable of classifying the presence of a helmet,"

A motorcycle rider's safety depends on wearing a helmet, yet enforcing this policy is a laborious, time-consuming process. Thus, we present and evaluate a system for the automated identification and monitoring of motorcyclists, both with and without protective headgear. The method employs conventional neural network taught to recognize motorbike riders based on the histograms of images of their heads taken from still pictures and moving videos. Incorporating the developed classifier into a tracking system, motorbike riders are extracted from video data through automated background removal. Isolating the riders' heads allows the trained classifier to sort them into several categories. There are "tracks" created for each motorcyclist, which are essentially sequences of areas in successive time periods. The classification of these files is then averaged across all classifiers. Experiments have shown that the classifier can reliably determine, from still images, whether or not a cyclist is wearing a helmet. The categorization method's validity and utility are also confirmed through tracking system testing.

"Detection of helmetless bikers automatically,"

More and more people are being hurt on motorcycles every year. This kind of car is gaining popularity for a number of societal and economic reasons. The motorcycle helmet is the most important piece of safety gear for riders, yet surprisingly few riders actually use them. In the event of an accident, a biker who isn't wearing a helmet greatly increases their risk of serious head injury or death. The purpose of this work is to describe and provide examples of an automated approach for detecting and classifying motorbikes on public roads, as well as a system for automatically detecting motorcyclists who aren't wearing helmets. Camera views of traffic were utilised. In terms of accuracy, the best results were achieved with a classification accuracy rate of 0.9767 and a helmet detection accuracy rate of 0.9423.

Existing System

The current method largely uses CCTV recordings to monitor traffic offences. The traffic police are required to zoom in on the licence plate to determine whether the rider is wearing a helmet by looking into the frame where the infringement is occurring. Nonetheless, a lot of labour is necessary. And as more and more individuals use motorcycles every day, there are more and more traffic offences. What if there was a system that would automatically scan the road for drivers who weren't wearing helmets when riding motorcycles or mopeds and, if any were found, would immediately retrieve the licence plate number of the offending vehicle. The licence plate extraction code only extracts from motorcycles whose riders are not wearing helmets and discards the licence plates from motorcycles whose riders are wearing helmets.

Disadvantages of Existing System

- Inaccuracy is higher.
- Time and labour intensive due to the high frequency of traffic violations.
- It is impossible for cities with millions of residents to have so many vehicles on the roadways. afford to use this ineffective manual helmet detection technique.

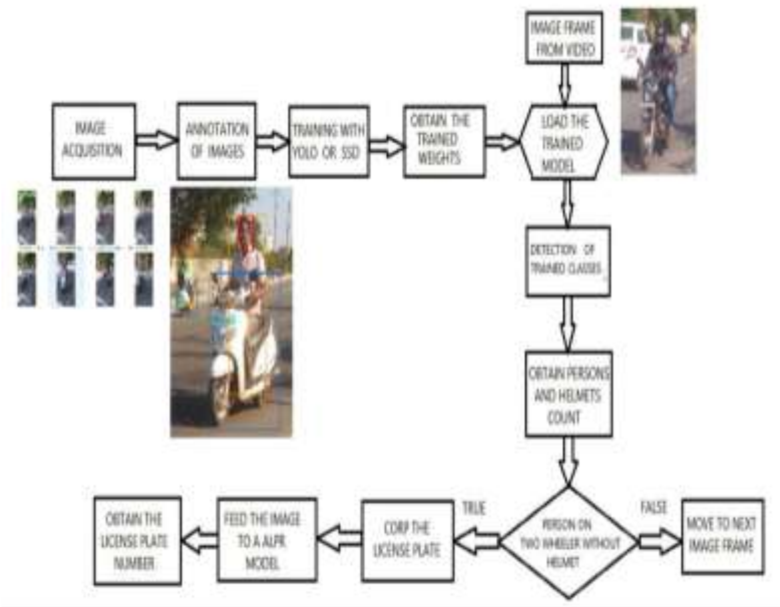

Figure.No:1

Proposed System

To that end, this initiative will use an automated system to determine whether or not a driver is wearing a helmet. In order to do this, we use a YOLOv3 descriptor to extract features. Camera-captured pictures are processed in real time using a method based on YOLOv3 feature Extraction. Classification yielded the greatest results (accuracy rate of 0.995), helmet detection yielded the best results (accuracy rate of 0.96).

Over the motorcycle rider's head, we developed a method to identify helmets by detecting moving objects using a KNN classifier. The degree of accuracy that could be attained by these models, which were proposed based on statistical data of images, was constrained. The accuracy of classification has increased further as a result of neural network and deep learning model development. introduced a method for classifying and detecting objects that is based on convolutional neural networks (CNN). To distinguish between riders wearing helmets and those who are not, use a CNN.

Even though they make use of CNN, their accuracy in detecting helmets is poor, and they have restrictions on helmet colour and the number of riders on a single motorcycle. Accuracy and speed are required for in-flight helmet detection. A DNN-based model is therefore necessary. In order to do this, we use a YOLOv3 descriptor to extract features.

Advantages

- It aims to change unsafe behaviours and, as a result, reduce the number of accidents and their severity.
- The system reduces the need for human resources.

System Design Architecture

Each image is classified using the necessary classes' ground truth. We utilise a deep learning, convolutional neural network-based classifier for extracting the characteristics and storing them in order to recognise those features in additional photos. The detection of the pretrained class is required when an image is provided to this trained model. The detecting capacity of the custom trained model is demonstrated using a few photographs as examples. To train the YOLOv3 model for the custom classes, the annotated images are provided as input. In order to load the model, weights are generated after training. An image is then provided as input after this is completed. All five trained classes are recognised by the model. Through this, we learn more about the motorcycle-riding person. If the rider is not wearing a helmet, we can quickly determine their other class characteristics. You can use this to get the licence plate out.

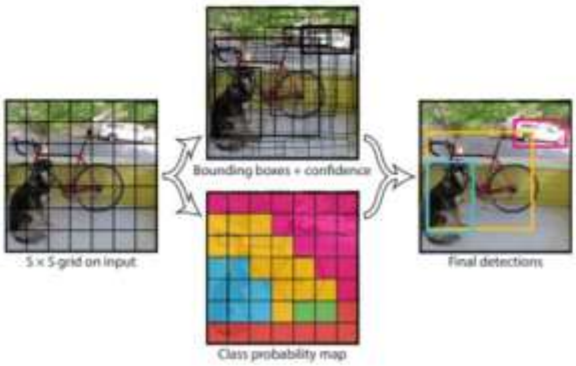

Figure.no:2

ALGORITHM

Our attention was drawn to YOLO throughout our web inquiry since it was the most widely used technique for real-time object detection. YOLO only applies a single model to a target, as opposed to earlier detection systems, which do so at many locations and scales.

Applying a neural network to the entire target image. The image is separated into areas with various weighted bounding boxes, according to the official YOLO website. Every area has a unique likelihood. You simply look at the entire image once, as opposed to earlier work for object detection like CNN, which takes multiple loops and requires a lot of time and memory.

As a result, it can process more global context from the image, which speeds up processing.

Character Recognition

In this way, character recognition in pictures is known as acknowledgement. OCR is a programme that follows optically generated machine-readable codes and specifies the procedures for number plate recognition.

Modules

There are four modules they are:

• Motorcycles Detection
• Head Detection
• Helmet Detection
• Number plate Detection

Modules Description

Motorcycles Detection

In the field of image processing, it has been challenging to identify bikes and helmets from pictures. The challenges included the condition of the bike in the photo, the identification of people travelling on a cruiser or an empty vehicle without a rider.

Head Detection

From the images above, we could make out a cruizer . If the model is able to determine the bike's proximity, a limit box is created. A trained model could tell apart people from objects like chairs, horses, and people. It creates the appearance of human heads when viewed through the position of the camera due to its depression angle. The Gabor-Wavelets filter is utilised to detect the highlights that represent the face segments because of its robustness and stability against changes in scale, direction, and dazzle. It consistently recognises the human head in a variety of ecological settings.

Helmet Detection

We start our research with a straightforward model and gradually add more input channels of RGB colour to make the model more sophisticated in order to obtain a reliable and accurate model for determining if a person is wearing a helmet or not.

The detection of a helmet at the rider's head location and the determination of whether there are people riding motorcycles or if the vehicle is empty and unoccupied. Before it can determine where the motorcycle is in the video frames, a number of image processing steps must be applied.

Number Plate Detection

We now move these images to the next stage of processing. By removing this module, the remainder of the categories, such as bike detection and recognition of a motorcyclist with or without a helmet, have been actualized, and the entire system has been tested. As a result, the region associated (false positive) with the motorcycle, motorcyclist, head, and helmet has been found in both the background and foreground. So, it demonstrates the value of the first foreground segmentation, motorcycle detection, motorcyclist detection both with and without a helmet, and License Plate detection.

2. Result and Discussion

YoloV3 Algorithm used to isolate motorcycles in security footage. In its third iteration, YOLOv3, the widely used object identification algorithm "You

Only Look Once" has been updated. The released model is quick and almost as accurate as Single Shot Multi Box at recognizing distinct item types in both still photos and moving films (SSD). However, YOLO takes an alternative tack on the object detection issue. As a result, the picture is sent via the network only once in its entirety. While SSD, another object identification system, also uses a deep learning network to process images once, YOLOv3 is much quicker while maintaining extremely high accuracy. YOLOv3 returns results in less time than a real-time algorithm. Matching the available weights in yolov3, we focused only on motorcycles for this analysis.

In the first stage, we publish pictures once the system has recognized motorcycles, determined whether or not helmets were worn, and decided whether or not to penalize riders for taking bikes at once. Just we uploaded one picture is uploaded here. When an image is uploaded and analyzed, we may use the identify motor cycle and detect human buttons to locate the subjects in the picture.

Figure.no: 3

As a final stage, we may choose to have the figure indicate whether or not the rider is protected by a helmet by pressing a button.

Figure.no:4

3. Conclusion

It is clear from the data above that YOLO object detection is ideally suited for real-time processing and was capable of accurately classifying and localising all the object classes. The proposed end-to-end model has all the necessary components to be automated and deployed for monitoring, and it was successfully constructed. Many strategies are used to extract the licence plates while taking into account various scenarios, such as numerous motorcyclists riding without helmets, and are created to handle the majority of cases. Since all the software's and libraries we utilised was open source, it was both versatile and affordable. The primary goal of the project was to address the issue of ineffective traffic management. Hence, we can conclude that if implemented by any traffic management departments, it would make their job easier and more efficient.

Future Scope

After attaining a successful helmet detection result. We would like to take it one step further and figure out how to make the system accessible to the public in a way that will make it simpler to use it for additional study. By using cutting-edge security After getting positive results for the Helmet Detection methods, such as checking collision detection, taking pictures of cars that violate the law by driving too fast, and taking pictures of drivers who are on the phone while driving. The technology can now tell if someone is wearing a helmet or not. Yet, we may add characteristics like the ability to identify turbans, which many people wear. We can therefore expand it to include turbans, which would undoubtedly boost its usefulness and lot more security.

4. References

"Helmet presence categorization with motorcycle recognition and tracking," by J. Chiverton, published in Intelligent Transport Systems (IET), vol. Volume 6, Issue 3 (September 2012), pages 259-269.

Chen, Ellis, and Chen (S. Vehicle Detection, Tracking, and Classification in Urban Traffic, Velastin, in Procs. affiliated with the IEEE International. Conf. in Anchorage, Alaska, September 2012, on Intelligent Transportation Systems (ITS), pages 951..956.

X. Wen, and H. Duan; Y. Liu; C. Yang; X. Wen; and B. Duan Yuan, "Real-time On-road Vehicle and Motorcycle Detection Using a Single Camera," in Procs. affiliated with the IEEE International. Conf. on Manufacturing Technology, ICIT 2009, pp. 1–6.

All of us here at R. Silva, K. Aires, T. Santos, K. Abdala, R. Veras, and A. Soares, "Automatic identification of motorcyclists without helmet," in ACM Computing Conference Proceedings, 2017. See: (CLEI), XXXIX Latin American, October 2013, pages 1-7. ISSN 2515-8260 Volume9, Issue03, 2022 10787 European Journal of Molecular and Clinical Medicine