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AUTOMATIC NUMBER PLATE DETECTION FOR MOTORCYCLISTS RIDING WITHOUT HELMET

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ABSTRACT: Currently, there are several issues with Indian traffic regulations that can be resolved with various proposals. Driving a motorcycle or moped without wearing a helmet is a traffic infraction that has increased the incidence of collisions and fatalities in India. The current method largely uses CCTV recordings to keep track of traffic offences. The traffic authorities must take into account the frame in which the infraction is occurring and zoom in on the licence plate in the event that the cyclist is not wearing headgear. However, due to frequent traffic violations and the growing number of bike users, this requires a significant amount of labour as well as time. In this research study project, a system is designed to detect non-helmeted riders in an effort to automate the detection of this traffic infraction as well as the extraction of the vehicle's licence plate number. The key idea is that Deep Learning at 3 degrees is used for Item Discovery. Person, motorcycle or scooter at first level using YOLOv2, helmet at second level using YOLOv3, and licence plate at third level using YOLOv2 is the objects recognised. After that, OCR is used to extract the licence plate registration number (Optical Character Recognition). In fact, we used more of the aforementioned methods to create a substitute system that can recognise helmets and remove licence plate numbers.

KEYWORDS: *helmet detection, number plate recognition, you only look once, Deep learning, optical character recognition, convolutional neural networks*

INTRODUCTION

Headgear reduces the likelihood that the skull will fracture, effectively reducing head activity to zero. The cushion inside the safety helmet absorbs the impact of an accident and also causes the head to stop moving over time. Additionally, it disperses the force of the hit over a wider region, shielding the skull from serious wounds. More importantly, it serves as a mechanical shield between the cyclist's head and whatever it was that came into touch with it. If a high-quality complete safety helmet is used, injuries can be reduced. Website traffic regulations exist to promote self-control, ensuring that the risk of fatalities and serious injuries can be greatly reduced. But in reality, there is no strict adherence to these rules. Therefore, effective and practical solutions must be devised to address these problems. One option is the manual security of traffic using CCTV. However, in this case, a great deal of human resource is needed to complete multiple iterations in order to achieve the goal. As a result, cities with large populations and plenty of lorries operating on the roads are unable to manage this ineffective manual method of helmet finding. So, utilising YOLOv2, YOLOv3, and OCR, we present a method for complete safety helmet identification and licence plate removal below. The basic phases in a helmet discovery system are dataset collecting, object localization, background subtraction, and item categorization using semantic networks.

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2. RESEARCH CONTEXT

Observation 1:
A technique for the automatic classification and tracking of bike motorcyclists wearing and without wearing headgear is provided in the research article titled "Headgear Visibility Category with Motorcycle Detection and Tracking" by the author J. Chiverton [1]. The method uses support vector machines that were trained on pie charts created from head region image data of motorcycle riders using both static images and individual photo structures from video clip data. Motorcycle riders are promptly segregated from video data using background reduction, and the qualified classifier is integrated right into a radar. The motorcyclists' heads are segregated before being classified by a skilled classifier. Each motorcycle rider creates a track, which is a collection of areas in close proximity to one another. The mean of the various classifier results is then used to identify these tracks in their whole. Studies reveal that the classifier can accurately identify whether or not bikers are wearing safety helmets on still photographs. Radar tests further demonstrate the validity and potency of the category technique.

Observation 2: A system that can automatically identify motorcycle riders and determine whether they are wearing helmets or not is described in the research paper "Machine Vision Strategies for Motorcycle Helmet Discovery" by Rattapoom Waranusast, Nannaphat Bundon, Vasan Timtong, and Chainarong Tangnoi. [2] Using the K-Nearest Neighbor (KNN) classifier, the system uses information taken from nearby buildings to identify migrating things as bikes or other relocating objects. On the basis of estimate profiling, the heads of the riders on the identified bike are next tallied and divided. Based on features derived from 4 sections of the segmented head region, the system categorises the head as wearing a safety helmet or not. Results of the experiment show that the average correct discovery price for the near lane, the distant lane, and both lanes is, respectively, 84 percent, 68 percent, and 74 percent.

Monitoring 3: The term paper "Motorcyclist's Headgear Using Discovery Using Image Handling" by authors Thepnimit Marayatr and Pinit Kumhom provided an automated method for vehicle detection, a classification of motorcycles on public roads, and also a system for automatically identifying riders without helmets. [5] For handling, we first identify vehicles that are moving in real-time by subtracting the background from the foreground using the back subtraction method, then enhancing it using the threshold and mathematical morphology method. The second step is distinguishing between bikes and different other autos. Location is given attribute removal, and semantic network categorization is also asked. Hough transform is obtained by spotting a hat in the final step. According to the experimental findings, the precision rates for the headgear discovery and motorcycle categorization were 98.22 percent and 77 percent, respectively.

Observation 4: The research paper "A Research of Low-resolution Safety Helmet Image Acknowledgment Incorporating Statistical Features with Artificial Neural Network" by the author Xinhua Jiang discussed the recognition method of the safety helmet of the low-resolution image captured from video clip and also deduced the relationship between various attributes and acknowledgment price appraising the low-resolution safety helmet acknowledgment issue at the cross-coordinate [8] It first identified the heads in the monitoring video clip, and then it used a neighbourhood binary pattern and a grey level co-occurrence matrix to extract the analytical features. Finally, a back-propagation artificial neural network was used to calculate the recognition rate of the test sample. The results of the experiment show that the helmet can be successfully identified using the GLCM statistical features in conjunction with the BP man-made semantic network.

Observation 5:

A method for automatically identifying bike riders without safety helmets using security video clips in real-time was suggested in the research paper "Automatic Discovery of Bike-Riders without Headgear Using Surveillance Videos in Real-time" by the authors Kunal Dahiya, Dinesh Singh, and C. Krishna Mohan [9]. The recommended method uses object division and history reduction to first identify motorcycle riders in security footage. The next step is to use binary classifier and aesthetic functions to detect whether the bike rider is wearing a hat or not. Additionally, they provide a combined strategy for covering infractions, which helps to increase the dependability of the advised technique. They have provided a performance comparison of three widely used feature representations, including regional binary patterns (LBP) for classification, scale-invariant attribute change (SIFT), and pie chart of oriented slopes (HOG), in order to assess the effectiveness of their approach. According to the experimental results, 93.80% of the real-world surveillance data may have been detected.

1. EXISTING REGIME

The current approach largely uses CCTV recordings to check for internet traffic violations. The traffic authorities must look at the frame where the violation is occurring and zoom in on the licence plate to check for helmetless motorcycles. However, this takes a lot of labour and time because more and more people are riding bikes and there are frequent traffic offences online. Current research has successfully completed this work using CNN, R-CNN, LBP, HoG, HaaR characteristics, etc. However, these tasks have limitations in terms of their effectiveness, accuracy, or the speed at which items and categories are discovered.

Problem Statement:

Machine learning (ML) is a branch of artificial intelligence where a trained version may solve problems on its own using the inputs provided during the training phase. Machine learning algorithms create a mathematical representation of sample data, referred to as "training material," in order to generate predictions or judgments. They are also used in applications for object detection. Consequently, a Headgear discovery version can be used after training with a particular dataset. This safety helmet discovery design makes it simple to identify motorcycle riders without helmets. The rider's licence plate is clipped out and saved as an image based on the observed courses. An optical character recognition (OCR) model is given this photo, and it recognises the text and returns the licence plate number as a consequence in the form of maker-encoded text. Additionally, it can be carried out using a camera in real time.

MODULES

Information gathered

The version was trained using 50,000 models and 11,000 tiny YOLOv3 images across 5 classes. The training was stopped after 50,000 iterations because all of the object courses' detections were made with high accuracy, and the mean average precision (mAP) attained a continuous maximum value of 75%. detection of safety helmets

The YOLOv3 model is given the annotated photos as input to train for the bespoke courses. The version is filled using the weights generated during exercise. After that, a photograph is supplied as input. All

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five of the trained classes are recognised by the model. This provides information on particular motorcycle riders. We can easily retrieve the other course details of the rider if they are not wearing a safety helmet. This can be used to extract the licence plate.

License Plate Recovery

The connected person course is recognised when the helmetless motorcyclist is located. This is accomplished by determining whether or not the no headgear course's works with are located inside the person course. Similar procedures are followed in order to locate the corresponding motorcycle and licence plate. The licence plate is cut and also saved as a new image when the uses of the plate are discovered.

License Plate Recognition: An optical character recognition (OCR) model is given the deleted certificate plate. In the machine-encoded message, the OCR outputs the acknowledged strings after identifying the text in the given image. The OCR module will undoubtedly generate a list of potential licence plate numbers and a confidence score. The level of self-assurance demonstrates how confident it still is in correctly identifying the provided licence plate. Then, for later use, the licence plate identified with the greatest confidence value is saved in a text file.

3. RECOMMENDED METHODS

In this work, we investigate if two-wheeled bikers are wearing helmets or not. If they are not, we take the number plate off the bike. We have a YOLO CNN version with some train and test shots to draw out the number plate.

To put the aforesaid strategy into practise, we are following or using the components indicated below.

1) The first image will be submitted to the programme, and we will use YOLOV2 to determine whether the picture has a human and an electric bike or not. If YOLO design detects both, we will move on to step 2.

2) In this module, we'll use the YOLOV3 design to determine whether or not somebody is wearing a safety helmet. If so, the programme will stop working. After that application, if the rider is not wearing a helmet, move on to step 3.

3) Using the Python Tesseract OCR API, we will delete the number plate information in this section. OCR will use the provided photo to retrieve the car number later.

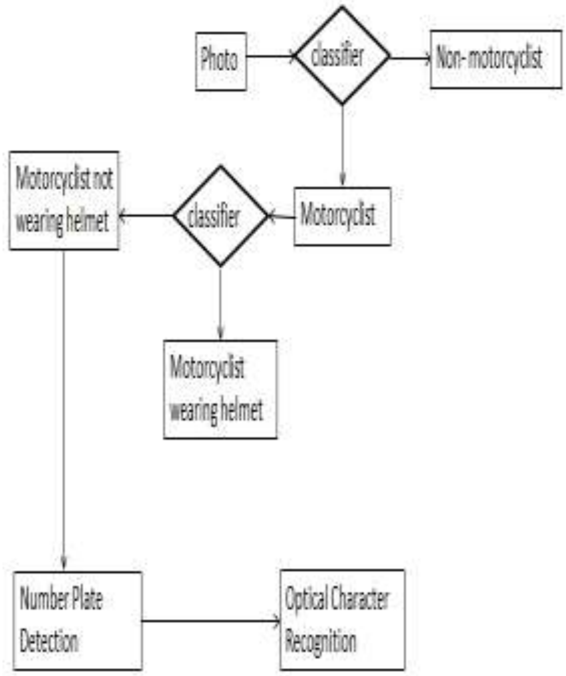

Figure 4.1 Flow chart for the proposed methodology

The nature of the method described below is explained by picture 4.1 above.

1. Classifier for Non-Motorcyclists and Motorcyclists:

The framework is given as input to the "Motorcycle" and "Person" classes in the "YOLOv2 Things Discovery Version." As a result, a picture with the necessary route detection, confidence of discovery within the bounding box, as well as chance value, is obtained.

Only the things that are detected are extracted, saved as distinct images, and called with class name and photo number in sequence using the features provided by Picture AI collection. For example, if the extracted item is a motorcycle, it will be conserved as motorcycle-1, motorcycle-2, etc., or if the image is of a person, it will be conserved as person-1, person-2, etc. A dictionary that can be used later for additional processing is where the details of these deleted photographs are kept.

2. Classifiers for motorcycles wearing safety helmets and those not wearing them: Once a person and a motorcycle have been identified, the person's photo is used to feed the helmet detection model. During the headgear discovery model check, some false positives were found. So, only the top quarter of the original shot remained after being cut. By doing this, it is ensured that false detection scenarios are avoided, as well as circumstances when a cyclist's safety helmet is being held in their hand or left on their motorcycle while they are riding rather than being worn, leading to incorrect results.

3. Optical character recognition: The Transportation Office can use Google's Tesseract Optical Character Recognition to identify the characters on the number plate and obtain the results in order to penalise the concerned motorcycle riders.

Recall, Precision, and Precision both display the effectiveness measures for each classifier on the test data. In our experiment, accuracy is used to calculate each classifier's efficiency. The following formula is used to calculate the precision.

$$Accuracy = \frac{No.\ of\ samples\ correctly\ classified}{Total\ number\ of\ samples}$$

2. RESULT ANALYSIS

Figure 5.1 Detection of motorcycle and person (not wearing helmet)

Figure 5.2 Detection of helmet

C:/Users/latha/Desktop/nameplate detection/HelmetDetection/bikes/13.png

Number plate detected as AP13Q 1121

Figure 5.3 License plate registration number is obtained using optical character recognition

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Figure 5.4 Detection of motorcycle and person (wearing helmet)

Fig.5.Detection of helmet with probability value

Motorcycle vs. non-motorcycle classifier in our experiment had a 99.78 percent accuracy rate, while safety helmet vs. non-helmet classifier had a 99.64 percent accuracy rate. As a result, the overall accuracy for finding motorcycle riders without safety helmets was 99.78% * 99.64% = 99.42%.

4. FINAL CONCLUSION.

A system for non-helmet rider discovery is created, and the input is photo data. The motorcycle's licence plate number is retrieved and displayed if the rider in the photograph is not wearing headgear while operating the machine. For the detection of bikes, people, helmets, and licence plates, an object discovery idea in the YOLO manner is applied. If the motorcyclist is not wearing a protective helmet, OCR is utilised to extract the number from the licence plate. Not only are the personalities removed, but also the framework from whence they were taken in order to make it useful for other purposes. The job's objectives are all satisfactorily met.

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