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Helmet Detection using Deep Learning: A Review

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ABSTRACT: A smart traffic system must have an automated system for detecting traffic rule violators. One of the primary modes of transportation in a country like India, where there is such a high concentration of people in the major cities, is the motorcycle. Motorcyclists in the city and even on highways are frequently seen not wearing helmets. In most motorcycle accident cases, the use of a helmet can reduce the risk of head and severe brain injury for the motorcyclists. Today, most traffic and safety violations can be spotted by analysing surveillance camera footage. For the detection of single or multiple motorcycle riders without helmets, this paper presents a framework. An incremental version of deep learning is used to identify motorcycle riders in the proposed approach, a state of the art method for object detection. For the detection of motorcycle riders wearing helmets, a Convolutional Neural Network (CNN)-based architecture was proposed in the second stage. On traffic videos, the results of the proposed model are promising compared to other CNN-based approaches.

KEYWORDS: Helmate Detection, Image Processing, Deep learning.

I. INTRODUCTION

There has been an increase in motorcycle-related fatalities over the past few years in major metropolitan areas and on major highways. Non-helmet use is a major factor in these deaths. Detection of helmetless motorcyclists is critical to reducing the number of accidents and ensuring road safety. In road safety measures, automated detection of such riders by analysing traffic surveillance video is critical.

High-speed vehicles appear blurry in surveillance camera footage of traffic. So it is extremely difficult to detect high-speed motorcycles in real-time surveillance video. The identification of motorcycles is further complicated by the fact that they come in a wide variety of shapes, colours, and sizes. Thus, a robust and reliable system is needed to identify the rulebreakers (motorcyclists without helmets) in real-time surveillance videos.

Traditional image processing methods have previously been used to extract features from images in order to identify objects. For object detection in computer vision, Convolutional Neural Networks (CNNs) are the most advanced method. CNN's automatic feature extraction with greater accuracy makes it the best choice for use in this situation. The purpose of this paper is to identify whether or not A MOTORCYCLE RIDER IS WEARING A HELMET.

II. RELATED WORK

Helmet use among motorcycle drivers and passengers in Thika and Naivasha was assessed through systematic observations at randomly selected locations in the two districts between August 2010 and December 2014. Roadside KAP surveys were administered in both sites to motorcyclists in areas where they stopped, including motorcycle bays, petrol stations and rest areas near the helmet observation sites. Secondary analysis of trauma registries was also used. Negative binomial regressions were used to assess trends of helmet wearing among motorcyclists over time, and logistic regressions were used to analyze associated risk factors as well as association with health outcomes among those admitted to the four hospitals[1].

We trained a large, deep convolutional neural network to classify the 1.2 million high-resolution images in the ImageNet LSVRC-2010 contest into the 1000 different classes. On the test data, we achieved top-1 and top-5 error rates of 37.5% and 17.0%, respectively, which is considerably better than the previous state-of-the-art. The neural network, which has 60 million parameters and 650,000 neurons, consists of five convolutional layers, some of which are followed by max-pooling layers, and three fully connected layers with a final 1000-way softmax. To make training



faster, we used nonsaturating neurons and a very efficient GPU implementation of the convolution operation. To reduce overfitting in the fully connected layers we employed a recently developed regularization method called "dropout" that proved to be very effective[2].

In this paper, we proposed an improved YOLOv3-based neural network for De-identification technology. The existing YOLOv3 is a network with fast speed and performance recently. Most surveillance system using CCD cameras simultaneously store images from cameras installed in multiple locations. In such an environment, the use of deep learning requires a method of detecting objects through a single inference engine in a plurality of image. If the inference engine hardware is used for each camera channel, the cost of building a surveillance system increases significantly. Therefore, in the field of surveillance systems, a network structure with a high detection speed is required even if the detection performance is slightly degraded[3].

Helmet detection has a wide area of applications in image processing. A new helmet detection technique is proposed in this paper. The technique combines two methods for helmet detection to achieve better detection rates. The two methods are face detection using haar like feature for detection between without helmet and full helmet and circle hough transform for detection between without helmet and half helmet. In the first module of the technique, we proposed a fast algorithm for detecting helmet in color images. The algorithm uses haar like feature to detect helmet regions. that, face / nose / mouth / left eye / right eye detection method can not detection between full and half helmet. So, the second module of the technique, the circle hough transform is applied for detection it [4].

Safety helmet wearing detection is very essential in power substation. This paper proposed a innovative and practical safety helmet wearing detection method based on image processing and machine learning. At first, the ViBe background modelling algorithm is exploited to detect motion object under a view of fix surveillant camera in power substation. After obtaining the motion region of interest, the Histogram of Oriented Gradient (HOG) feature is extracted to describe inner human. And then, based on the result of HOG feature extraction, the Support Vector Machine (SVM) is trained to classify pedestrians. Finally, the safety helmet detection will be implemented by color feature recognition. Compelling experimental results demonstrated the correctness and effectiveness of our proposed method[5].

III. OPEN ISSUES

- In existing traditional methods which are used 1D input to neural networks.
- Static Dataset used.
- Low Detection Accuracy.

IV. CONCLUSION

The proposed approach is to detect single or multiple riders basically all riders of a motorcycle without wearing helmet from traffic surveillance videos. First deep learning model has been used for motorcyclist detection. Then, the proposed lightweight convolutional neural network detects wearing of helmet or no helmet for all motorcycle riders.

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