Two Wheelers Traffic Violation Finder And Warning System

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Abstract- *In recent years, riding a motorcycle has become one of the most convenient ways for consumers to go to their destination. In recent years, the real-time video monitoring of helmet wearing based on deep learning has attracted extensive attention. This project presents an automatic surveillance system for detecting two-wheeler drivers without helmets and recognizes their License plate numbers in the system. The proposed system is to solve this problem by automating the process of detecting the riders who are riding without helmets. The automated system for Helmet and Number Plate Detection and Recognition were to first detect if someone is wearing a helmet or not, if he is wearing it, no problem, but if not, detect his number plate and send an e-challan to him. The license plate is provided as the output in case the rider is not wearing a helmet. The extracted registration numbers are then stored in a database for further identification of the bikers without helmets.*

This project can help local authorities to quantify the compliance levels of motorcyclists and prevent irreversible damage to them. To achieve an efficient helmet detection model, machine learning classifier is applied to the moving object to identify if the moving object is a two-wheeler. And then the system used the Faster Region Convolution Neural Network object detection model using transfer learning.

For number plate recognition the system uses Easy OCR. As a result, the model with the best training received a MAP (Mean Average Precision) of 97%. The proposed system outperforms other related real-time helmet detection systems and license plate recognition models.

Keywords: MAP, Helmet Detection and Number Plate Detection.

I. INTRODUCTION

In developing countries, most of the population uses Motorcycles for daily commuting. Motorcycles, by definition, are significantly less crashworthy than closed automobiles. In addition, they are less visible to other cars and pedestrians and less stable than four-wheel vehicles. Motorcycle riders and passengers are more sensitive to weather and road conditions than drivers in enclosed cars.

In the population-based observational study [1] in India, helmet observations were recorded for 68,229 motorcyclists and 21,777 pillion riders. About 22.6% of motorcycle drivers and only 1.1% of pillion riders were found to be wearing helmets. Motorcycle riders lack the safety of an enclosed vehicle when they crash, making them more likely to be injured or killed. Helmets are approximately 37% effective in avoiding motorcycle deaths and around 67% effective in preventing brain injuries.

Helmets are required because severe head injuries are typical among fatally wounded motorcycle riders. Currently, the Traffic Police capture photographs of the Riders not wearing helmets using their Handy smartphones and then manually input the Vehicle License Plate into the system to take strict action against these violators. This procedure is inefficient owing to a lack of police officers and excessive manual work. Also, now almost all the cities have CCTVsurveillance cameras on the majority of the Road Junctions. These, however, require human participation and are not computerized.

The technique presented in this study automates the surveillance of non-helmeted motorcyclists. It identifies bikers who are not wearing helmets and recognizes license plates from CCTV footage in real time. The You Only Look Once [2] (YOLO) architecture is used that is built using Convolutional Neural Networks.

II. RELATED STUDIES

In this research work, a Non-Helmet Rider detection system is built which attempts to satisfy the automation of detecting the traffic violation of not wearing helmet and extracting the vehicles' license plate number. The main principle involved is Object Detection using Deep Learning at three levels. More importantly it acts as a mechanical barrier between head and object to which the rider came into contact.

Injuries can be minimized if a good quality full helmet is used. Traffic rules are there to bring a sense of discipline, so that the risk of deaths and injuries can be minimized significantly.

However strict adherence to these laws is absent in reality. Hence efficient and feasible techniques have to be created to overcome these problems. Manual surveillance of traffic using CCTV is an existing methodology [8].

Colour feature recognition is another option deployed colour space transformation and colour feature discrimination for detecting the helmet. GLCM statistical features and Back-Propagation artificial neural network is used to detect helmet more effectively [3, 7, 10].

Helmet detection system involves following steps such as collection of data set, moving object detection, background subtraction, object classification using neural networks and extraction of licence plate number if the rider is not wearing helmet. Rattapoom Waranusastetal. The used CNN classifier for moving object extraction and classification [5, 6].

III. METHODOLOGY

1. Deep Learning-Based Automatic Safety Helmet Detection System for Construction Safety

This work proposes a deep learning-based framework architecture to detect worker's helmets at construction sites using a publicly available benchmark dataset. Power-law transformation was initially performed for image enhancement, followed by image rescaling. Finally, a computer vision system was developed using the YOLOv5 object detection algorithm to classify workers with or without a helmet [4].

YOLO architecture is high-speed and can process 45 frames per second, making YOLO-based architectures feasible to use in real-time safety helmet detection.

Fig.1: Helmet Detection

2. Detection of Non-Helmet Riders and Extraction of Licence Plate Number using Yolo v2

In this section we explain the frame chosen is given as input to YOLOv2 object detection model, where the classes to be detected are 'Motorbike', 'Person'. At the output, image with required class detection along with confidence of detection through bounding box and probability value

Fig.2: License plate extraction and rotation

3. An Intelligent Traffic Monitoring System for Non-Helmet Wearing Motorcyclists Detection

The proposed system is an end-to-end intelligent traffic monitoring solution to detect non- helmet wearing motorcyclists. The solution uses a convolutional object detector to detect violators from the input video streams in real-time. They replaced manual feature extraction with a Convolutional Neural Network (CNN), leading to significantly higher accuracy [8, 11].

Fig.3: Non-Helmet Wearing Motorcyclists Detection

4. Helmet Detection and Number Plate Recognition Using Machine Learning

This proposed system, first we apply adaptive background subtraction to detect the moving objects. These moving objects are then given to a CNN classifier as input which then classifies them into two classes, namely, motorcyclists and non-motorcyclists. After this, objects other than motorcyclists are discarded and passed only objects predicted as motorcyclist for next step where we determine weather the motorcyclist is wearing a helmet or not again using another CNN classifier.

By using machine learning, the device identifies motorists not wearing helmets and automatically provides their motorcyclist's licence plate number on demand, without the need for operators to look it up on driver licence photos at camera posts.

The helmet protects the motorcyclist against accidents. Although the helmet use is mandatory in many countries, there are motorcyclists that do not use it or use it incorrectly. Over the past years many works have been carried out in traffic analysis, including Vehicle Detection, Classification Helmet Detection.

IV. EXPERIMENTAL RESULT

A Non-Helmet Rider Detection system is developed where a video file is taken as input. If the motorcycle rider in the video footage is not wearing helmet while riding the motorcycle, and then here we are uploading image to identify license plate number of that motorcycle is extracted from image and displayed. Object detection principle with YOLO architecture is used for motorcycle, person, helmet and license plate detection. OCR is used for license plate number extraction if rider is not wearing helmet. Not only the characters are extracted, but also the frame from which it is also extracted so that it can be used for other purposes. All the objectives of the project is achieved satisfactorily.

V. CONCLUSION

Motorcycle accidents are the most common road accidents leading to many deaths. One of the most significant reasons for deaths during motorcycle accidents is the rider not wearing a helmet. Many laws are passed making it mandatory for two-wheeler drivers to wear helmets, but still, many motorcyclists do not obey them. The current systems are very inefficient. In this research, we have proposed a practical framework for detecting non-helmeted motorcyclists from CCTV footage using YOLO; it is very fast and effective in real-time. After the non-helmeted motorcyclists are detected, the number plate characters are extracted using optical character recognition and stored in a database so that the concerned individuals can be penalized.

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