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Detection of Motorcyclists without Helmet with Their Number Plate Using Convolutional Neural Network

[1]Prof. Jyotsna Gabhane, [2]Roshni Singh, [2]Nikhil Patre, [2]Sanket Moon, [2]Rajat Mohapatra, [2]Pinak Misar

[1]Assistant Professor, Department of Computer Technology, Priyadarshini College of Engineering, Nagpur, Maharashtra, India

[2]BE Scholar, Department of Computer Technology, Priyadarshini College of Engineering, Nagpur, Maharashtra, India

ABSTRACT

These days, street accidents are one of the significant makes that drives human passing. Among them, engine bicycle accidents are normal and causes basic wounds. Helmet is one of the principle assurance unit for an engine bicyclist. Be that as it may, many neglect to adjust to the law of wearing helmet. Here, to recognize the motorcyclists who are damaging the helmet laws, a framework utilizing picture preparing and convolutional neural network is actualized. The framework comprise of motorbike location, helmet versus no helmet grouping and motorbike license plate acknowledgment. The motorbikes are recognized utilizing the element vector HOG. When the motorbike is identified, by methods for convolutional neural network, it is resolved whether the motorcyclist is wearing a helmet or not. On the off chance that the motorcyclist is distinguished without a helmet, at that point the license plate of the motorcycle is recognized utilizing tesseract OCR.

Keywords : Helmet Detection, Convolutional Neural Network, Tesseract OCR, License Plate Extraction

I. INTRODUCTION

Street accidents are one among the significant makes that leads reason for human passing. There is a rapid increment in motorbike accidents attributable to the way that lion's share of the engine bicyclist neglect to wear helmet that makes it an ever-present threat. Inside the most recent couple of years, a large portion of the accidents are caused in view of the head injury. Because of this, wearing helmet is made vital by methods for traffic rules. Be that as it may, the vast majority of the engine bicyclists never comply with the standard. Numerous urban areas utilize a reconnaissance network to screen the motorcyclists disregarding the helmet laws. Be that as it may, such a framework will require human mediation. The present reviews state that human intercessions demonstrate inadequate, because of the expansion in the hour of observing and furthermore because of the blunders made by human during checking. Various strategies are there for recognizing the engine bicyclist who doesn't wear helmet. Recognizing the genuine pace of engine bicyclists without helmets is trying because of block, illuminance, low quality of recordings and so forth. The framework that initially proposes for the programmed location of motorcyclist for not wearing the helmet which was finished by Chiverton [1]. Right now head bit of the motorcyclist is taken and includes are gotten from this picture, those highlights are

prepared on a SVM classifier. The highlights taken here is the shape and intelligent property of the helmets on the grounds that the top segment of the outside of the helmet is seen as progressively splendid. It likewise takes the round bend state of the helmet as well.

In any case, this strategy prompts parcel of miss classifications that is the articles appearing to be like helmets likewise get named helmet. Additionally it doesn't distinguish the motorcycle initially is likewise a constraint of this work. Silva et al [2], [3] acquaints a strategy with expel the issue of miss classification. For that, the framework distinguishes the motorcycle from the edge. The highlights from the edges are removed by neighborhood Binary example descriptor and utilizing SVM classifier these highlights are prepared. At that point helmet classification is performed on SVM utilizing the highlights made by the mix of roundabout hough change, histogram of angles and neighborhood parallel examples. In [4], Doungmala et al presents a framework for the recognition of half helmet and full helmet. It is finished by utilizing a choice tree classifier with Ada Boost. For this technique, it first uses the highlights of haar for location of face and groups it as without helmet and full helmet. Likewise it utilizes roundabout hough change for the classification it as without helmet and full helmet. However, the framework shows its own restricted degree as it gets the video from the inadequate traffic. Additionally this technique doesn't show any drive on recognizing the motorcyclist.

Rather than that it straightforwardly goes into the helmet discovery. In [5], K. Dahiya presents a technique that helmet discovery should be possible from observation recordings. Here it utilizes a SVM classifier for the classification of motorcyclist and non-motorcyclist. Additionally it utilizes another SVM classifier for the classification of helmet and non-helmet. Both these classifiers executed the framework utilizing the highlights like HOG, SIFT and LBP. Also, every one presentation were contrasted and the other two highlights which prompts the end that, HOG descriptor accomplishes its best execution than the other two. In [6], C. Vishnu, utilizes convolutional neural network for classification. Here they make their dataset from the reconnaissance network of recordings.

II. METHODOLOGY

The different units included are as per the following:

1. Motorcycle Detection utilizing HOG.
2. Helmet Classification utilizing CNN.
3. Location of License Plate.
4. Character Classification utilizing tesseract OCR.

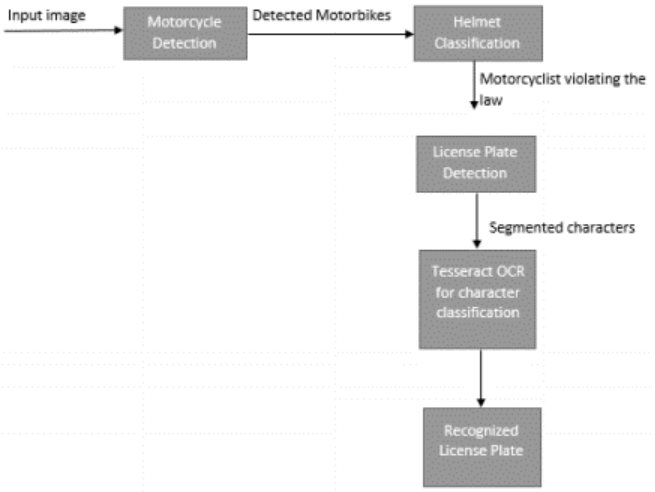

Figure 1 : Block diagram of the system

A square outline of the helmet infringement location framework is appeared on figure 1. It comprise of identification of motorbike, classification of helmet versus no-helmet, and motorbike distinguishing proof of plate. When the picture gets caught on to the camera, the initial step is to identify whether there is a motorcycle is available in the caught picture. For that the procedure typically utilized is to compute the histogram of angles from the picture [8]. It is a

component descriptor typically utilized for object recognition which depicts the shape and presence of the picture. When the picture with a motorcycle is distinguished, regardless of whether the individual is having helmet or not is recognized.

For distinguish that one needs to decide the district of enthusiasm of the person [9]. District of intrigue is chosen since it lessens the zone and just a specific locale is concentrated, which diminishes less preparing time. The head segment of the motorcyclist is chosen totally inside the district of intrigue. The dim scale picture of the head divide is resolved and determined. After that they got pictures of head and helmet is taken care of to a convolutional neural network (CNN) in this way grouping helmet and non-helmet motorcyclist.

So as to decide if the caught picture is having a motorcycle or not, histogram of inclinations of a picture is determined. It isolates the source picture into squares and figuring the greatness and bearing. It very well may be accomplished by utilizing a 1D focused cover that passes vertically and evenly. The size and heading added to a 8 x 8 pixel speaking to in 9 container histogram. The picture which is isolated into squares is linked with histograms to frame a component vector. These vectors are connected to shape a mammoth vector that is 3780 element vectors. After the element vectors are acquired, these component vectors are benefited from to a SVM classifier then it is delegated "motorcycle" or "non-motorcycle".

After the bicycle riders are recognized the subsequent stage is to decide whether the rider is wearing a helmet or not. To find the leader of the motorcyclist utilizing the way that the suitable area of helmet will likely be in the upper regions of bicycle rider. For that the upper one-fifth piece of the picture is edited which is where the motorcyclists' head is generally found. Utilization of this procedure will lessen the territory where the inquiry will be performed. At that point there by building a CNN model to isolate with helmet and without helmet pictures. When the helmet classification predicts as no helmet, the picture of the motorcyclist is passed for number plate discovery. Tesseract is an open-source optical character acknowledgment framework utilized for number plate identification. The pictures of the number plate is of high difference which makes it simpler for the individuals to peruse. In this way, it very well may be isolated as foundation and forefront. When the picture of the motorcyclist is given as an info picture it will be first changing over its picture into its parallel picture which is called versatile thresholding. On the off chance that the pixel esteems are said to be over the limit, at that point it is said to be the forefront part of the picture. Furthermore, on the off chance that the pixel esteems are said to be beneath the limit level, at that point it is said to be the foundation part of the picture. Associated segment investigation of the number plate plays out the assignment of extricating the frameworks of the characters that is, the character to be perceived is given in white content and rest of the part of the picture is of dark. When the blueprints of the characters are removed, at that point the specific picture is changed over into masses. Masses are little locales of checked picture that contrasts in property like splendor or shading contrasted with environmental factors area.

III. PERFORMANCE EVALUATION

The system uses Python-2.7.12 along the libraries such as OpenCV-3.3.0 for computer vision and image processing, Tensorflow-1.4.1 backend for building CNN, scikit-learn-0.19.1 for machine learning and numpy-1.14.0 for multi-dimensional arrays, mathematical functions and linear algebra. The experiments are performed on a 64 bit Windows 10 Operating System. The specifications

of the system are 4 GB RAM, 4 Intel PENTIUM Quad core processors and no GPU.

The dataset comprise of 311 pictures utilized for preparing reason. Among this dataset 239 pictures is utilized for preparing motorcycle pictures and 72 pictures is utilized for preparing non motorcycles pictures. A sum of 131 pictures is utilized for the testing reason. Among them 90 pictures are with motorcycles and 41 pictures are without motorcycles. Out of the 90 pictures, 31 pictures are with helmet and 59 pictures are without helmet. As appeared in the table 1, out of 90 motorcycle pictures utilized for testing, 82 pictures were accurately identified as motorcycles.

In this way, for motorcycle versus motorcycle classification, out of the all out 131 pictures utilized, 123 pictures were accurately distinguished which gives an exactness of 93%. Out of the 31 pictures with helmet , 21 pictures are accurately recognized as "helmet identified", Out of the 59 pictures without helmet, 56 pictures are effectively distinguished as " no helmet identified" that makes the helmet versus non-helmet classification as 77 out of 90 which gives an exactness of 85%. Out of the 56 pictures accurately distinguished as without helmet, 29 license plates are perceived effectively. This gives a precision of 51%. A portion of the pictures show low lucidity and subsequently brings about poor identification.

Table 1: Testing of images

CLASSIFICATIONS	NO: OF IMAGES CONSIDERED FOR TESTING	TRUE POSITIVE	ACCURACY (%)
MOTORCYCLE VS NO MOTORCYCLES MOTORCYCLES → 90 NO MOTORCYCLES → 41	131	123	93
HELMET VS NO HELMET	90	77	85

IV. CONCLUSION

In this work, framework is produced for distinguishing the motorcyclists who are damaging the laws of wearing the helmet. The framework primarily comprises three sections – the discovery of motorcycle, location of helmet and acknowledgment of license plate of motorcyclists riding without a helmet. The preeminent criteria are to decide if the caught picture is having a motorcycle or not utilizing HOG, and checking whether the motorcyclist is wearing a helmet or not by utilizing CNN. On the off chance that the motorcyclist is distinguished without a helmet, at that point the license plate of the motorcyclist is perceived utilizing tesseract OCR. The precision acquired for motorcycle/non-motorcycle classification is 93%, helmet/no-helmet classification is 85% and license plate acknowledgment is 51% bringing about a normal exactness of around 76%. The exactness can be improved by expanding the preparation informational collection and picture quality.

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