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Helmet Detection using Machine Learning and Automatic License Plate Recognition

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Abstract: With the increasing population, the number of two-wheeler riders has increased rapidly. This causes an increase in accidents rates. Riders, being careless by not wearing helmets might lead to more health damage. Human involvement in monitoring the vehicles may be less effective and hard to catch every rider with no helmet, thus monitoring all these manually may be difficult if we consider the huge number of riders. Observers may not be able to capture everyone with no helmet. Thus to ensure that every single rider is monitored properly a Computerized Automatic Helmet Detection System is implemented. The system is trained with a dataset for better accuracy and prediction of results. The system will detect the rider with no helmet and will extract the number plate of the two-wheeler. The system uses GUI and various Python libraries such as sklearn, NumPy, TensorFlow, Keras, etc, also algorithms such as Yolo V3(You Look Only Once) and SSD (Single Shot Detector) has been used for object detection.

Keywords: Helmet, Number plate, Detection, Python Libraries, Machine Learning, Yolo V3, SSD.

I. INTRODUCTION

Two-wheeler vehicle has been playing a crucial role in the transportation field being affordable and compact. Since the availability of two-wheelers is in abundance their usage has increased tremendously which leads to reckless driving and results in more accidents. According to a recent survey, people who travel on two-wheelers, among that 37% of people come across road accidents and a good majority of them are aged between 15 – 29 years. Despite knowing the casualties, 80% of people are careless and avoid wearing helmets while riding a bike.

The Indian government has passed laws for wearing helmets while riding two-wheelers and it is mandatory. Now, motorcyclists are monitored by the traffic police manually, thus there might be the possibility of human errors as well as it is time-consuming. Also, many motorcyclists run away to avoid penalties, thus it gets quite difficult for traffic police to catch them, thus to ensure that every motorcyclist is wearing a helmet, we are implementing an automatic helmet detection system which will help to monitor every single rider as well as to obliged them to wear a helmet.

The implemented system monitors the riders and detects the presence of helmets. Weight has been trained to get more accuracy while detecting an object. YOLO V3 and SSD algorithms have been used for object detection. The system continuously monitors the motorcyclist and saves the data in a particular folder. Using the same stored data, the number plates of non-helmet riders can be extracted.

II. LITERATURE SURVEY

In [1] The machine systems used for detection and classification from images and video require features. Feature extraction manually is an invincible work. CNN learns the whole image by extracting features using feature map and has proven to obtain better detection and classification. Large data with a good machine hardware is required by CNN to train from beginning. Although with these sources it also needs a proper configuration. Also small amount of data, may over-fit or under fit the data based on the given type of learning. So, transfer learning, was used on CNN model, Yolov3-tiny Darknet trained in advance on the COCO dataset. These information has encouraged in acquiring high precision in order.

In [2] deep learning algorithm and CNN has been used by previous authors. Techniques like transfer learning and fine tuning made it easier to build a model across video captured from camera to check if the helmet is present or missing. Further use of real time object detection model is done those frames are said classifier and differentiated in two class of helmet and non-helmet. then only missing helmet class will be taken for further process. Using neural network prediction is made to generate bounding box around the images near the region of interest.

In [3] The Authors have proposed a deep learning based method to automatically perform three elements of human observer motorcycle helmet use registration, i.e. detection and tracking of active motorcycles, as well as identification of rider number per motorcycle, rider position, and rider specific helmet use. In addition, they have applied an approach to

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video data from diverse road environments, which included adverse factors such as occlusion, differences in camera angle, an imbalanced number of coded classes, as well as differing rider numbers per motorcycle and varying traffic densities. For the element of frame-based detection of motorcycles, we achieve an average precision of 95.3%.

In [4] an effective safety helmet wearing detecting system, which based on SSD and a novel safety helmet precision detecting module. An image dataset was built especially for safety helmet wearing detection under power station scenario. In addition, the system can achieve real-time speed, i.e., 21fps. These advantages demonstrate that our safety helmet wearing detecting system is more suitable for the application of power station surveillance.

III. PROPOSED SYSTEM

The system proposed by us includes two modules, the first one is vehicle and helmet detection, and the second module is number plate extraction. It begins with camera which records the vehicle moving on the road, then this recorded video file is given as an input to our module/system to detect the vehicle, person and helmet. As soon as it detects the helmet missing it takes a screenshot and saves it in the system directory. Then these particular image can be used in other module (number plate extraction). After uploading the image, it can be processed. OCR (Optical Character Recognition) is used to identify the text from the number plate. As it recognizes the text from the images then it creates a border around it and then that part is processed to extract the text part. The obtained text is then displayed in the GUI. The below figure 1 describes the working of our approach. With our idea of approach, the accuracy gained is of 80%.

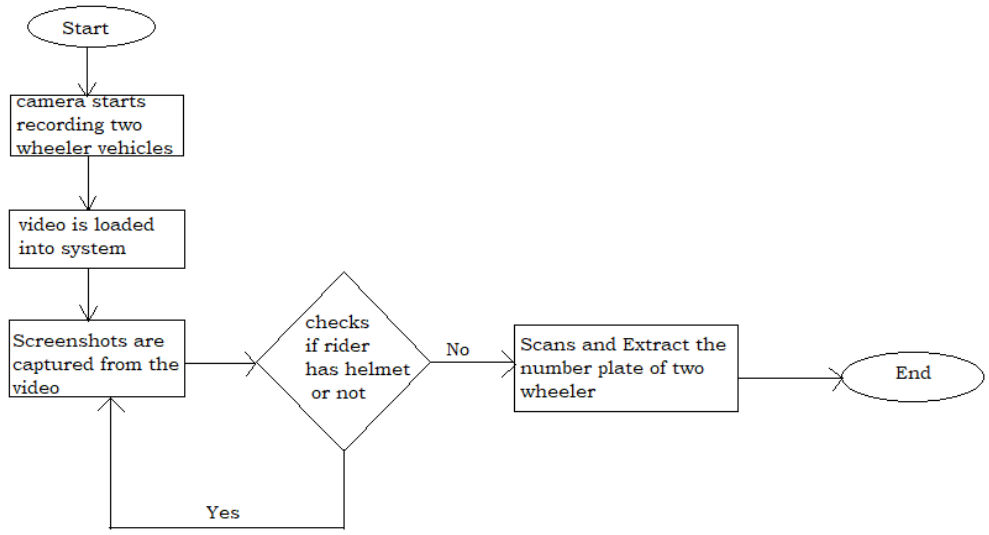

Figure 1. Working of the proposed system

IV. IMPLEMENTATION RESULT

First an image is generated from a video file as shown in the below figure 2. The image is fed to the system to carry out the further process of detection of helmet. The images that has been obtained from a video file is stored into a system directory.

Figure 2. Image file generated

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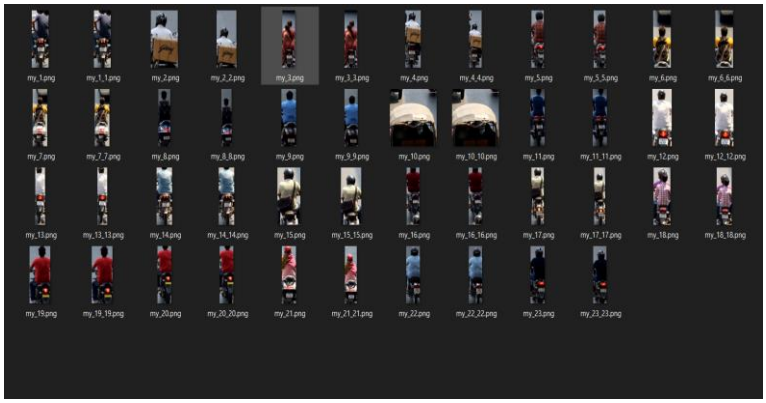

Figure 3. Stored images in directory

Figure 4. Sample image loaded into the system for detection

Object detection algorithms such as YOLO V3 and SSD is used to detect the targeted objects. As it detects an object it creates a border around those objects. A GUI is designed to detect and extract the number plate text.

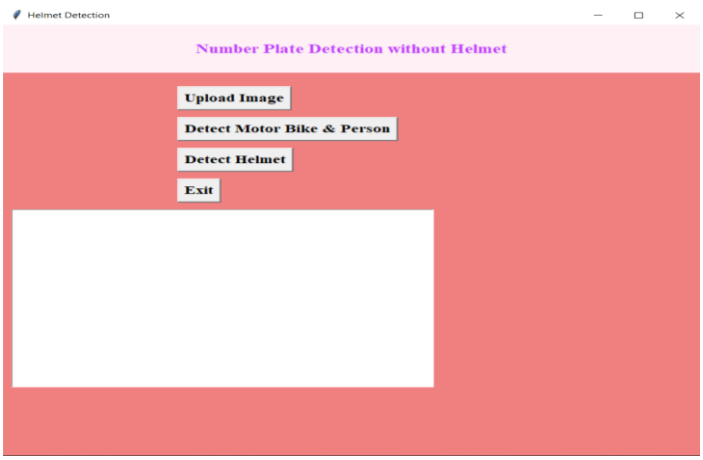

Figure 5. User Interface to upload the image

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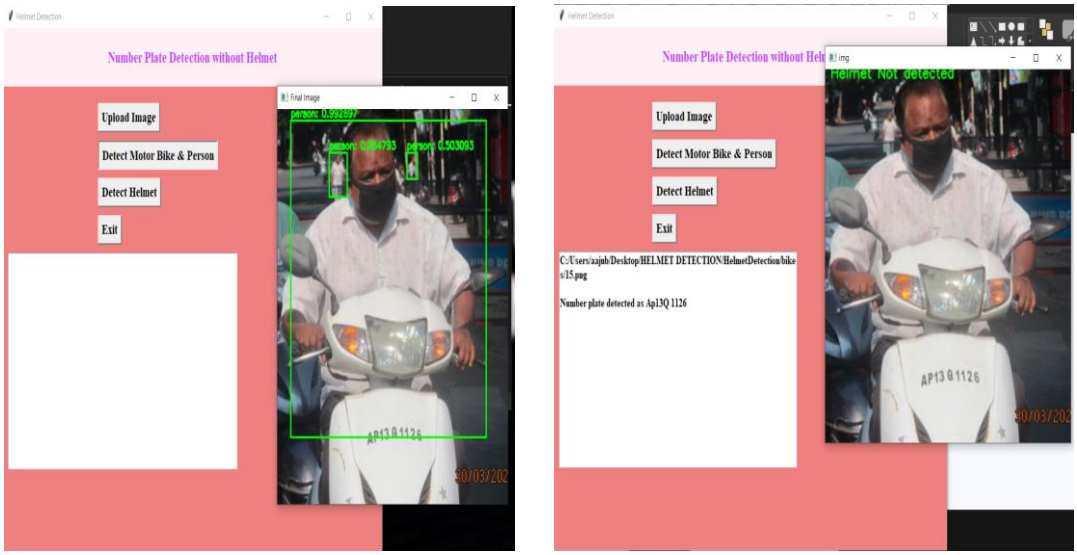

Figure 6. After Detecting no Helmet

V. CONCLUSION

In this paper, we have proposed a machine Learning based method to perform detection of riders with no helmet. Our implemented system is designed to detect the presence of helmet while riding a bike/ two wheeler vehicle. The system is initially trained with a dataset which helps to increase the accuracy. GUI is used to interact for carrying out all the steps. The image is loaded into the system on which the detection has to be done. After the images is successfully loaded, it detects the helmet of the user. A number plate is captured and extracted in case there is no helmet found near the head region. The GUI creates bounding box around the part that has to be detected known as ROI (Region of Interest) with the help of OCR (Optical Character Recognition). The Extracted details of number plate is displayed once the system fails to detect the helmet.

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