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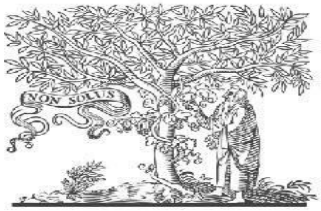

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Title **A NOVEL APPROACH FOR RECOGNIZING HELMETLESS MOTORCYCLE RIDERS WITH REGISTRATION NUMBER**

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A Novel Approach for Recognizing Helmetless Motorcycle Riders with Registration Number

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Abstract:
Recognition of helmetless motorcycles is essential for everyone's safety. Riding a motorcycle without a safety helmet is a criminal offense as well as one of the leading causes of accidents. To address this, a unique method of identifying riders without helmets has been developed. This method uses deep learning technology to identify riders wearing helmets and displays the rider's registration number. where the YOLO method is used in the model design to detect objects. The primary item in our model is the helmet, which is identified, and then the optical character recognition technique is used to display the registration plate of the rider without a helmet. We create a website that allows users to log in using their credentials. The webpage will then appear with an image upload button. In order to recognize a helmet, the model first determines whether a rider and a vehicle are present. The status of helmet detection is then shown. The vehicle's registration number is extracted if there is no helmet using OCR.

Keywords: Deep learning, YOLO, OCR, COCO, Flask, SQLite

Introduction:

In practically every country, two-wheelers are a very common form of transportation. The absence of protection, however, poses a significant risk, implying a high possibility of accidental deaths. In 2021, two-wheelers accounted for the majority of fatal road accidents (69,240 deaths), making up 44.5 percent of all road unintentional deaths, according to the World Health Organization (WHO), which estimates that 1.3 million people die each year globally as a consequence of traffic accidents, including those involving motorcycles The riders don't care about their lives, despite the numerous limitations and sanctions the government has placed. Other drivers who are riding on the road are also impacted by this recklessness. This has to be altered, and instances of this nature need to be properly observed. The danger of head deceleration can be decreased by wearing a helmet since it slows down head motion. The padding inside a helmet is intended to deflect the force of a collision, lessening the impact on the head. The head thereafter gradually slows down and eventually stops over time as a result. Because of this, the government mandates that all motor vehicle operators wear helmets. The majority of individuals believe that wearing a helmet detracts from their appearance. They won't attach to their heads, merely carrying with their bike. This results in an annual increase in traffic accidents. While manual CCTV traffic surveillance is an

established technique, it might take a while. A traffic monitor cannot inspect every rider to see if they are wearing a helmet. This is a physically difficult and time-wasting activity.

To solve this issue, we seek to design a system that can identify when a biker is not wearing a helmet and retrieve the license plate number of their bike. This project's detection of the person, bike, and helmet objects is being done using the YOLO deep learning algorithm. If a person and motor vehicle have been detected, a helmet detection check is performed. The system retrieves the vehicle's registration number and presents it to the user if it determines that the rider is not wearing a helmet. This method makes it simple for traffic monitors to identify drivers who are not wearing helmets, which encourages more drivers to do so and ultimately saves many lives. For web development, the flask framework is utilized, together with HTML, CSS, and SQLite as a database to hold the user registration information. YOLO v2 and v3 versions are used in the first level of the project, which detects the motorcycle and person, and the higher version at the helmet detection level.

Literature survey

Amir Mukhtar and Tong Boon Tang have presented a Vision-Based Motorbike Detection using the HOG features a model in which circular objects are first recognized and then vertical strips are identified around the circle. The size of ROI will be established by the fusion of the image gradient scheme and utilizing HOG features to discover the candidate regions of the rider. This model allows us to recognize multiple motorbikes and also false positive images.

Yuxiang Yang, GuoqingJin, Fan Wu, Mingyu Gao, and Zhiwei HE proposed a model for helmet detection based on the yolo algorithm full-regression deep neural network architecture and it uses the Densenet in model parameters and focuses on the detection of safety helmets and gives better accurate results and uses the GAN network for the better results.

Using computer vision and machine learning techniques, Abu H. M. Rubaiyat, Tanjin T. Toma, and Masoumeh Kalantari-Khandani presented an "automated identification of helmet use in a construction site". It primarily employs two components: one uses CHT and the other HOG for human detection. With this model, it is possible to identify several kinds of colored helmets including yellow, blue, white, and red which provides a new method of identifying different types of helmets.

The idea of "Half and Full Helmet Wearing Detection employing Haar Similar Feature and Circle Hough Transform" was presented by Pathasu Doungmala and Katanyoo Klubsuwan. Utilizing the haar feature, it can identify the nose, left eye, right eye, nose, and face but not the half or full helmet, therefore the circle Hough transform provides excellent detection rates. Both CHT and Haar feature techniques are used for the image processing in this model for the detection of half and full helmet

An "Automatic license plate recognition" utilizing OCR was proposed by Bhavin V. Kakani, Divyang Gandhi, and Sagar Jani. It consists of three primary components: license plate localization, plate character segmentation, and plate character recognition. We can reliably retrieve the license number using those three attributes. The findings from the ANN-trained photos are better and more accurate.

Proposed system

For the purpose of detecting motorcycles, people, helmets, and license plates, a web-based solution based on the object detection principle and YOLO architecture is employed in this project. Using the YOLOv2 and COCO datasets to find various kinds of objects and categorize them accordingly. The registration number from the license plate is obtained using the OCR technique. Finally, it displays with a

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message whether the helmet is detected or not.

a) Creation of website:

The first step is creating a website that requires users to sign up and log in using unique credentials. The flask framework with HTML and CSS is used to develop the website, and SQLite is used to store user credentials. The registration page provides a username, password, email and mobile number. It is displayed in Fig-1.

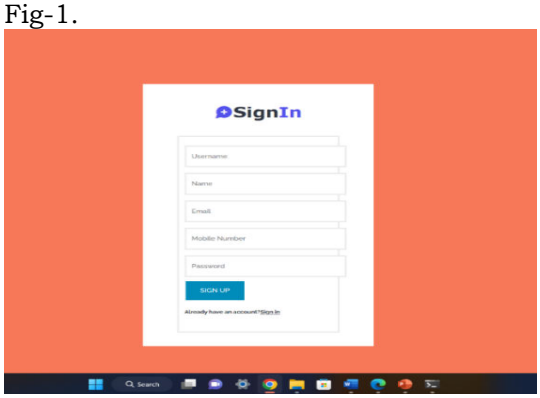

Fig-1: Registration page of the user

Once the login information has been properly input, the homepage, which contains the upload image option to check whether the rider is wearing a helmet, is presented If the rider is wearing a helmet, it will show that it has been detected, and if not, it will show that it has not been detected. It also obtains a specific vehicle's registration number.

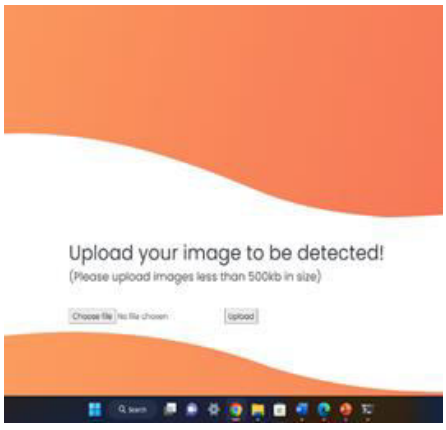

Fig-2: Homepage where user must upload images for Helmet detection

b) Detection of Motorcycle and Person:

The dataset that is linked to the yolov2 algorithm in this module is used to recognize the items. The YOLOv2 algorithm is used to recognize photos of riders with the vehicle since the coco dataset has trained photographs of humans and bikes. Finally, cropped pictures of people riding bikes are sent for the helmet module's detection.

Fig-3: Frame of vehicle and Motorcycle class detected

c)Detection of Helmet:

The YOLO v3 method, which determines whether the helmet was present in the image or not, should be used to identify a helmet, which is the actual object that should be identified. The previous model's cropped photos will be used as input, and the presence of the helmet in the image will be verified. After that, the image is compared to the dataset to determine if

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the motorcyclist is wearing a helmet or not.

Methodology:

YOLOv2: **You only look once** is a computer vision algorithm for object detection in images and videos. In this project, the person, the bike, and the helmet will all be detected using this method. In order to identify helmets more quickly and accurately, YOLO upgrades to YOLOV2, which has 23 convolutional layers and 5 max-pooling layers. After gathering the images, label them by delineating bounding boxes around the helmets and license plates. This will help the YOLO model understand how to identify these objects.

OCR: **Optical Character Recognition** converts any kind of image containing text into a machine-readable text format. Initially, we require some pictures of helmets and non-helmets in the database together with the license plate number. The images must then be pre-processed for ocr application and trained using machine learning. When the model is finished, it is utilised to extract the licence plate number from motorcycle without helmets. It extracts the registration number into a machine-readable format to make it simpler to identify motorcyclist licence plate numbers.

COCO dataset: Common Objects in Context dataset is the image dataset created with the goal of advancing image recognition. It is mostly utilized for object and image detection datasets. In Our dataset, it contains images of riders with and without helmets. So that the model can recognize and use the features on it more easily.

Result:

An image of a motorbike rider with and without wearing a helmet is given to the system. In the first stage, the system is trained to recognize bikes and people using the yolov3 algorithm and the coco dataset. When an image is uploaded, it goes through this stage and, if successful, becomes the input for the stage after that. The system then determines whether or not a helmet is present in the provided image. If the rider is wearing a helmet, it will display that "Helmet is detected" otherwise, it will indicate that "Helmet is not detected "and will extract the vehicle's registration number. The rider with helmet output is shown in Fig-4.

Fig-4: Helmet Detected for given input image

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The image for which the rider is not protected by a helmet and for which the bike's registration number is displayed in Fig-5.

Fig-5: Helmet not detected and Registration number extracted for the given image

Conclusion and Future Enhancement:

A novel approach for recognizing helmetless motorcycle riders and their registration numbers is developed, in which the user gives the image as input to verify whether the motorcyclist is wearing a helmet or not. Following that, the system looks at the input image to identify if a rider and a vehicle are there. Finally, the helmet is found using both the Yolo v3 algorithm and the Coco dataset. If the rider is wearing a helmet it displays as helmet detected and if the rider is not wearing a helmet it will retrieve and display the registration number. This strategy may be improved in the future by creating software and installing it in CC cameras with connected speakers so that the rider is alerted via speakers if they are not wearing helmets

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