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Helmet Detection using Machine Learning

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ABSTRACT: The continuous motorization of transportation has led to an increase in traffic accidents on a global scale. The government is making great efforts to enforce traffic laws in order to reduce incidents and fatalities, especially in India. The motorbike is the most common type of vehicle in our country. It is suggested that a technology for automatically detecting helmet use be required for the sake of traffic safety. when a significant number of people's deaths were caused by not wearing a helmet. The main objective of this study is to use CCTV footage to recognize bike riders who are not wearing helmets automatically. A machine learning-based strategy is used to produce a distinct object identification model that can recognize motorbike riders. Using the background subtraction technique, the bike is first identified. Finding out if the cyclist is wearing a helmet is the next step. If the motorbike rider without a helmet is discovered, the license plate is removed from the video frame. Closed-circuit television is therefore crucial for identifying helmets and preventing fatalities. A system that combines image processing techniques with machine learning algorithms, classifiers like SVM, and a few other techniques could be able to solve this issue. This project demonstrates how to recognize motorbike riders who are not wearing helmets using a dataset that has been provided. The detection of motorcycles with human observers who are not wearing helmets presents a challenging issue for them. For the purpose of detecting. We used traffic video data as a dataset. Here, the helmet was located using machine learning. By using this technique, motorbike riders can travel safely, which can reduce the likelihood of head injuries during collisions and the total accident rate. This research presented a system for motorcycle detection and categorization in order to find and identify motorcyclists who are not wearing helmets and to report them to the appropriate authorities.

KEYWORDS: Helmet Detection on Motor Cycle; Machine Learning; Road accidents; two-wheelers; MobileNet.SSD, CNN(Convolutional Neural Networks);Deep Learning.

I. INTRODUCTION

Road accidents damage thousands of people, according to research. The majority of two-wheeler accidents occur in that area. The majority of incidents involving two-wheelers occurred because the rider was not wearing a helmet. Many people have lost their lives in bike accidents. This project focuses on providing a great solution to address the aforementioned issues. The answer is based on ongoing real-time video processing of traffic-related video. Once the system is implemented, this technology is entirely cost-free. As open-source technologies were used to create the software. The project will cost close to nothing. Every vehicle on the road will be monitored, and a database for the offenders will be created. There won't be a drop in traffic accidents as long as the government doesn't punish the wrongdoers. Machine learning is the best field right now. Whichever model is taught can function independently. Throughout the training period, it operates using the user's inputs. Typically, in order to forecast an item or make any judgements involving a process, machine learning algorithms build a statistical model from data sets, which are referred to as training data. As a result, the implementation of the Helmet detection model can benefit from the machine being trained with a huge number of similar data sets. The bike riders who are not wearing helmets can be easily spotted using these trained models, and appropriate action can then be taken. The number plate of the bike is recognised or identified based on the classes that are taught by the system. After then, an image format is stored after it has been cropped out. An optical character recognition model can then receive the cropped or identified image. which afterwards decodes the words on the number plate and outputs the right number? The result will be a text that has been encoded. By using a camera, the aforementioned procedure can be carried out in real time. Therefore, the primary goal of this project is to put in place a system that can follow CCTV videos and identify whether or not people are wearing helmets. The deployed system seeks to alter the rider's typical behaviours and the frequent occurrence of traffic accidents.

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II. RELATED WORK

From many years, different algorithms are being presented to automatically detect the helmet. Researchers have proposed several methods [1], [2], [3], [4], [5]. In order to overcome this, we need to find a solution for this problem and few methods are taken into consideration and discussed in the section given below.

The latest suggested method for not wearing helmet in the detection of helmet is proposed by Chiverton [1]. Here following use the support vector machine which is taken through the picture data from the head portion area of motorbike riders. So whichever part or features is been extracted it captures the shape and reflective properties of helmet, and it even uses the detection technique (circular arc detection) supported through Hough transform. The disadvantage of this system is that it brings up in many misclassifications. One of the major drawbacks is that it will directly identify helmet in some cases without identifying motorcyclists within the captured frames.

To solve this, Waranusast et al, [5] got the better idea of it and came up with a more developed system that use (KNN) which is captured and been extracted from a picture. For the KNN for the motorbike classification, the features are been considered. For this, circular arc is been taken into consideration. The photographs which is been captured and extracted within the system is not been involved in any form because the picture is upright for cameras. Therefore, the term occlusion is not considered during this.

Chiu et. [3] recommended a method to unravel motorcyclist spotting from real time monitoring system. So, the following technique identifies target and then records or tracks motorbikes and head portion of it which will be employing an algorithm based on probability that will control the occlusioning problem and cannot control few changes because of illumination, and even in order to detect head it will be using canny edge detection.

In [4], Min-Yu, suggested a method for detecting helmet from real time surveillance data, then used support vector machine to analyze between motor rider and non-motor rider further other support vector machine to differentiate between helmet vs with no helmet. Here we implement histogram of the gradients and few other techniques is been implemented also the result of every classifier is been compared. They concluded that HOG helped them to attain greater accuracy.

In [5], C. Vishnu et al presented a method using (CNNs) in order to segregate them. So, thesystem uses its data and gathering data from the monitoring traffic from the university andattainedgreat performanceandaccuracy.

III. PROPOSED METHODOLOGY

Data Set:

Here we used traffic video as dataset for evaluating a performance of the application.

This dataset is collected from the traffic by ourselves. Because Public dataset was not available. so we took two minutes traffic video data. Later that data will be collected at 60 frames per second.

Fig.1. Video feed

Architecture:

Here we broken down the complex project into the following two phases to make it easier to implement and test it

- **Phase1:**

Data was collected and a literature survey was done. From the objectives gained from theliterature survey basic working of the system was designed. Prototype was designed to detectmotorbikeand basic implementation will be done to detect helmet on still images.

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• **Phase2:**

The Prototype was updated incorporating video feed. The trained model was tested for different videos and conditions. All the pending errors was be fixed and the model was be updated. In this phase, the 1st version is released. With the model released it will be monitored and new models will be added in the future for other safety rules violation.

The model receives the video feed as input. The algorithm is then taking the video in out frame by frame and working on each frame individually. Using mobilenet.ssd we are marking the motorbike in traffic and the and then predicting the biker with or without helmet.

A. Model back grounding and Object Detection:

Here, we put on adaptive back ground deduction to segregate the movable things like motorcycles, other transports like buses and all other objects from traffic surveillance videos using MobileNet.SSD model.

B. ConvNet (CNN) to classify objects:

ConvNet may be of feedforward network that uses the back-propagation algorithm. It gains knowledge from various images. Within this first layers CNN we get the information of the pictures sort of a number of the handcrafted algorithms but, within this ultimate layer, we start getting the solid info which in turn help in gaining precise matter that will be useful to classify objects.

C. Identification of Motor riders from Movable Objects:

To find this various thing, we use Mobile Net. SSD that uses a method to model each of the back ground and spotting the motor bike. After obtaining all of these objects of motorcyclists and non-motorcyclists, a CNN model is taken and then built using these images to differentiate the motor riders from the other movable objects.

D. Identification of Motor riders with no Helmet:

To identify the motor riders with no helmet, we crop upper 1/4th part of it from thepicture since it is the exact partwhere these motor ridersheadsare located almostevery time. Therefore, from here, we locate the head region and then with help of thisMobileNet. SSDand CNNwe predict theriderwith orwithout helmet.

we are using mobilenet.SSD to get the target area and then we are running the algorithmon the target area to detect helmet. Video feed is given as input then the video is further splitframe by frame then thealgorithm is working on the targeted area to analyze for the helmetpresence.

Fig.2. Background Modelling & Moving Object Detection

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IV. SEQUENCE DIAGRAM

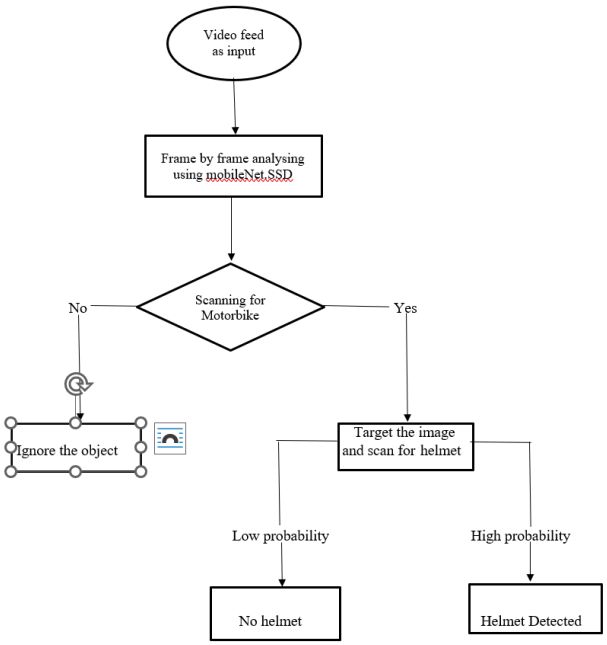

Fig. sequence diagram for helmet detection

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V. EXPERIMENTAL RESULTS

The main goal of this research is to create a machine learning-based method for determining whether a motorcyclist is wearing a helmet or not. Several video frames were used throughout the project to train the model to recognise the helmet worn on the rider's head. Applying this technique resulted in a noteworthy degree of accuracy. Additionally, it was able to count the number of people seated on the bike and determine whether or not they were wearing helmets. When the number of people on the bike exceeded a specific threshold, accuracy was jeopardised and the algorithm was difficult to segment. This appears to be less of an issue in nations where there is a two-rider maximum for motorcycles and stringent law enforcement. The created method can capture at a rate of 60 frames per second with the help of consumer hardware. Therefore, the technique can be used in any real-time applications where it is necessary to determine helmet usage. The accuracy of the algorithm improved over time through observation and repeated testing, outperforming a casual observer.

Fig.3. Rider on the motor bike without helmet

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Fig.4. Rideronthemotorbike withhelmet

VI. CONCLUSION AND FUTURE WORK

Future Scope: Further research to this project can be carried to detect rash driving, accident-related offense, overloading in vehicles, etc. In addition to this, it can also be extended for alcohol detection using an alcoholic sensor in the vehicle ignition system. Bikes can be automated to not start if the driver doesn't wear helmet on application of blue tooth, NFC or zigbee. Government must make sure bikes and helmets equipped with such systems. Implementation of such mechanism in two-wheeler might reduce deaths that occur due to carelessness of driver to great extent. Another limitation that the algorithm has been troubling with is that it is unable to distinguish between a cap and helmet in particular. This would be a point where more research can be carried out.

Conclusions: Motorcycle riders who are not wearing helmets will be detected by the system. The three key components of this system are those that detect motorcycles, helmets, and motorcycle riders who are not wearing helmets. We can make sure that everyone riding a motorbike is wearing a helmet the entire way by setting up several checkpoints. It is possible to construct a safe two-wheeler route that will protect bike users and lessen the severity of accidents. A cyclist must exercise vigilance to prevent accidents in addition to wearing a helmet.

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