MOTORCYCLE SAFETY HELMET DETECTION FOR THE TWO WHEELER MOTORCYCLIST

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Abstract—*Driving without a helmet is like risking one's life.In the event of an accident, a motorcycle lacks the structural support that a car does to keep drivers safe and protected. Even when a rider takes all possible precautions, accidents resulting in injury still occur .The primary objective of a helmet is to protect the driver's head in case of an accident or fall from a bike. Now a days use of helmets is low. The proposed project helps to identify whether motorcyclists wear safety harnesses that is helmets while driving or not. This proposed strategy uses Mobilenet-SSD which is to automatically detect bike riders without helmets using surveillance videos in real time.*

KeyWords**:** M**otorCycle, Helmet, CNN, YOLO, MobileNet**

I. INTRODUCTION

In India more than 35 million people are using motorcycles. Since their usage is high , the accident percentage of two wheelers is also high compared to four wheelers. The impacts of these accidents are more dangerous when the driver is involved in a high speed accident without wearing a helmet. We can't prevent accidents using 2-wheelers but can prevent Head - Injury. Bike accidents result in brain injuries , spinal cord injuries, broken bones, and more. These injuries can be life-changing and they may require a lifetime of medical treatment that can cost a huge amount of money. A helmet gives face protection, protects eyes from air and dust, Can protect from head injuries. The automatic monitoring system can help to keep an eye on motorcyclists and confirm that they are wearing their safety helmets. In the event of an accident, a motorcycle lacks the structural support that a car does to keep drivers safe and protected. Driving without a helmet is like risking one's life. This project helps to identify whether motorcyclists wear safety harnesses that are helmets while driving or not. The Proposed project uses Mobilenet SSD and detects the motorbike riders with and without a helmet with the help of machine learning. The limitations that are discussed in the literature surveys could be overcomed in this proposed project. This project will work by taking input from the video provided (or) from the live video, The working starts with the identification of the two wheelers on the frame of the video and ignores remaining vehicles. The two wheelers will be made into a frame and check the head section for helmet if the biker is wearing Helmet it will label it as Helmet with the help of a bounding box, if helmet is not present it will mark it as no Helmet.

II. LITERATURE REVIEW

[1] M.Swapna,Tahniyath Wajeeh,Shaziya Jabeen proposed A Hybrid Approach for Helmet Detection for Riders Safety.A list of all bike riders driving without wearing a helmet along a snapshot for proof. Limitations like capturing bike with high speed is difficult is found here.

[2] Romuere R.V.eSilva,Kelson R.T.Aires,Rodrigo de M.S.Veras proposed Helmet Detection on Motorcyclists Using Image Descriptors and Classifiers.This study addresses the detection of motorcyclists without helmets on public roads.Techniques used are crossline CL,Wavelet transform WT,MPL algorithm. Results obtained are vehicle segmentation and classification and helmet use. Limitations low quality images can not be able to generate promising results.

[3] Kunal Dahiya, Dinesh Singh, C.Krishna Mohan proposed Automatic Detection of Bike Riders Without Helmet using Surveillance Videos in Real-time(2016). HOG, SIFT, LBP, RBF are the techniques used in this paper. Limitations seen here is It tries to locate a helmet in full frame which is computationally expensive, so it is confused for other similar objects as helmet.

[4] Ramesh Babu, Amandeep, Krishnangini Kalita,Mahima Singh proposed Helmet Detection on Two Wheeler Riders Using Machine Learning(2018).The Techniques used are Machine Learning, Supervised Learning,Feature Extraction.Limitations seen are This does not work when there are multiple vehicles in the scene and accuracy is very low.

[5] Rattapoom Waranusast,Nannaphat Bundon,Vasan Timtong Chainarong Tangnoi proposed Machine Vision Techniques for Motorcycle Safety detection(2013). Techniques used are Support Vector Machine, K-Nearest Neighbour algorithm and Limitation seen is Most error occurs in the recognition of the far lane. when a moving object touches the detection line while it also overlaps with other objects, the system would treat them as one object and result in wrong classifications.

[6] J.Chiverton proposed Helmet Presence Classification with Motorcycle Detection And tracking(2012).Techniques used here are Support Vector Machine is used as a classifier. Limitations seen is Results of the tests were unsatisfactory ,they produced too many false positives and false negatives.

III. OBJECTIVES

The primary objective of a helmet is to protect the driver's head in case of an accident or fall from a bike. It should try to identify whether the motorcyclist is wearing a helmet or not in real-time.

IV. METHODOLOGIES

The models used for object detection are listed below.

A. *Convolutional Neural Network*

Convolutional Neural Network is a deep learning algorithm especially used for image classification problems. CNN model takes the images/videos as the input, process and classify them based on the classes. The video inputs are divided into frames and each frame is processed in the same way an image is processed. The training and testing images/frames are passed through many convolutional layers with filters. A Filter is used to extract the required features from the image. Pooling layer is used to minimize the input image's spatial size by sustaining common features. Padding preserves the original dimensionality of the image. An activation function is present at the end of each layer. The activation function is decided by the developer according to his needs.

B. *You Only Look Once (YOLO)*

YOLO is a clever convolutional neural network (CNN) for doing object detection in real-time. The algorithm applies a single neural network to the full image, and then divides the image into regions. Here our target is to detect both bike riders and their helmets. YOLO includes 19 convolutional layers and 5 max-pooling layers, followed by softmax activation functions to classify the object. The input image is divided into SxS grid cells. The grid cell, which contains the center of the object, is responsible for predicting the 5-bounding box (BB) coordinates (bx, by, bw, bh, c). The coordinates (bx, by) represent the center of the object relative to the grid cell location and (bw, bh) represents the width and height of the object relative to image dimensions. The presence of an object in a grid cell is given by confidence score c. For the target detection we used YOLO, which uses only one CNN network to directly predict the category and location of different targets. YOLO is incredibly fast and accurate. Finally, IoU and Non-Max Suppression to avoid selecting overlapping boxes. YOLO is a popular algorithm because it achieves high accuracy while also being able to run in real-time.

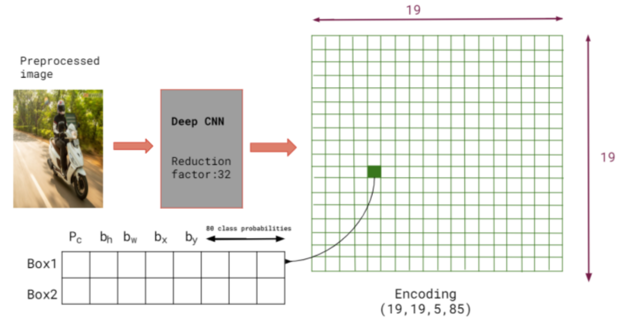
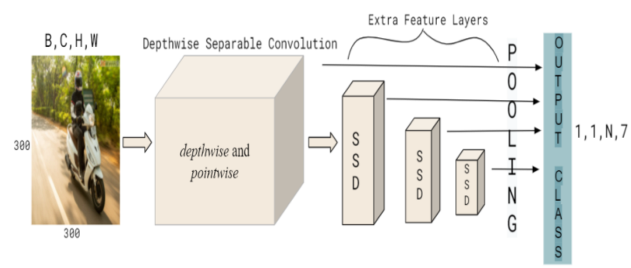


Fig:YOLO

A. *Mobilenet-SSD*

Mobilenet-SSD is a light-weight deep neural network architecture designed for mobiles and embedded vision applications. The core layers of MobileNet are built on depth-wise separable filters.



The SSD approach is based on a feed-forward convolutional network that produces a fixed-size collection of bounding boxes and scores for the presence of object class instances in those boxes. Image, name - prob, shape - 1, 3, 300,300 format is B,C,H,W, where in B stands for batch size, C - channel, H - height,W - width. Channel order here is BGR in the format 1, 1, N, 7, where N is the number of detected bounding boxes.For each detection, the description has [image_id, label, conf, x_min, y_min, x_max, y_max], Caffe stores and communicates data using blobs.

The SSD-MobileNet algorithm that is based on convolutional neural networks is used to train the model, which is verified in our study as an alternative solution to detect the unsafe operation of failure of wearing a helmet. The architecture has a depthwise convolution followed by a pointwise convolution. After each convolution, Batch Normalization and ReLU are applied.

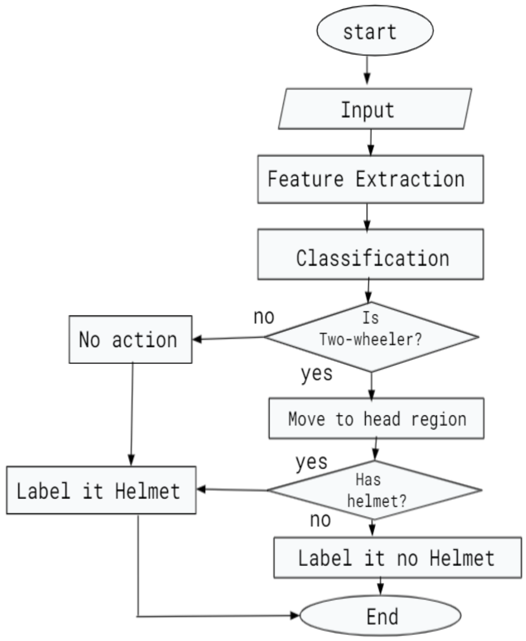


fig:FLOWCHART

fig:Output for Helmet Detection

V. Conclusion

The proposed method is for detecting the wearing of safety helmets of two wheelers motorcyclists based on convolutional neural networks. The model uses the SSD-MobileNet and YOLO algorithm to detect safety helmets of the bike riders. Then, an image dataset containing various helmets is built and divided into three parts to train and test the model. The TensorFlow framework is chosen to train the model. After the training and testing process, the mean average precision (mAP) of the detection model is stable and the helmet detection model is built. The experiment results demonstrate that the method can be used to detect the safety helmets worn by the two wheeler riders on the road at different weather conditions and lights(low, dim lights). The presented method offers an alternative solution to detect the safety helmets and improve the safety management of the bike riders. The objective of the project is to identify and detect whether the motorcyclists have helmets or not.

VI. Future Enhancements

The project can be linked with the traffic cameras and with some modifications and Deep Learning algorithms can be used for better results and accuracy. It can be used to detect helmets in the real time system. Furthermore we can merge the algorithm of automated license plate detection and make a system which generates challans for those who don't wear helmets.

VII. References

[1] M.Swapna,Tahniyath Wajeeh,Shaziya Jabeen " A Hybrid Approach for Helmet Detection for Riders Safety".

[2] Romuere R.V.eSilva,Kelson R.T.Aires,Rodrigo de M.S.Veras . "Helmet Detection on Motorcyclists Using Image Descriptors and Classifiers "

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[4] Ramesh Babu, Amandeep, Krishnangini Kalita,Mahima Singh . "Helmet Detection on Two Wheeler Riders Using Machine Learning(2018)"

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[6]J.Chiverton."Helmet Presence Classification with Motorcycle Detection And tracking(2012)"