Grenze International Journal of Engineering and Technology, Jan Issue

Driver Drowsiness Detection by CNN Model

Gaja Lakshmi Banavath[1], Kalpana Kelavath[2], Imran Shaik[3] and Ramesh Mande[*4]
[1-4]Velagapudi Ramakrishna Siddhartha Engineering College, Vijayawada, India
Email: {gajalakshmi.b2001, kelavathkalpana, shaikimmu27}@gmail.com, ramesh.welcome@gmail.com

***Abstract*—Vehicles are used by millions of people all around the world. According to hedgescompany.com's blog, the global percentage of drivers is closer to 16percent to 17 percent. We also see that many traffic accidents occur as a result of driver inattention. When a driver becomes sleepy, detection is a safety mechanism that prevents accidents from occurring. As a result, our effort is primarily focused on resolving this issue. The state of consciousness of a person is deter- mined as the outcome, we employed a Convolutional Neural Networks [CNN] model to assess whether they are drowsy or not. CNN is a pattern recognition and image processing method that is frequently utilized. The concept has direct ap- plication in the automobile industry, making driving safer and reducing the number of people killed in crashes caused by drowsy driving. As a result, this aids inthe detection of tiredness while driving and the timely notification of the driver to avert road accidents.**

***Index Terms*— Face detection, driver drowsiness detection and alarm generation.**

I. INTRODUCTION

Drivers' attention levels deteriorate due to insufficient sleep, long hours of continuous driving, or other medical conditions such as brain illnesses. According to several studies on road accidents, driver weariness is responsible for roughly 30% of all collisions. Excessive exhaustion and tiredness are induced when a driver drives for longer than is typical for a human. This causes the driver to become sleepy or lose consciousness. Drowsiness is a complex process in which the driver's alertness and consciousness levels decline.

Unlike driver distraction, driver fatigue has no beginning and is distinguished by a progressive lack of concentration from the road and traffic. Driver fatigue and diversion, on the other side, can lead to poor ride quality, prolonged response times, and an increased risk of being involved in a crash.

Here, in the paper we have built a CNN model to verify the state of drowsiness in a person and to make him attentive while driving a vehicle if he is drowsy through the alarm set in model. The model is constructed with private dataset images related to nature of eyes being open and closed and training of model is performed. And later through the live capturing it identifies the tiredness in a person. The paper is structured as follows. In Section 1.1 we have related work and in the next section i.e., 2 we have shown the Proposed Work which gives us about the dataset information in Section 2.1used in our model and also regarding the model Design Methodology in the Section 2.2. Then in Section 3 we have presented the results we have obtained by implementing on a new person. In later Section 4 we gave our conclusions about how important it is for the safety of persons who are doing lengthy journeys. And followed by references which were helpful in understanding the recent works regarding the project.

Grenze ID: 01.GIJET.9.1.72

II. Review of Literature

In [1] They created a CV-based project. The image portion has been captured first, and the face is found using facial landmark detection, followed by the detection of facial features. They created HAAR cascades with OpenCV to detect faces. They found 68 (x, y)-coordinates on the face, and the dlib library was used to train the face detector. They employed EAR to detect yawns by comparing the top to lower lip distance with a threshold value. eSpeak, a text-to-speech conversion module, was also utilized to deliver alarm messages via voices.

In [2] They employ approaches to detect the facial region in a video, as well as Haar classifiers' Eye recognition algorithms for high accuracy in this work. They have created a brief table describing smart phone approaches for various systems, their accompanying accuracy values, and their detecting techniques. Then it was discussed about desktop-based approaches, which include a variety of techniques such as processing, imaging, eye detection, and so on. These strategies were enumerated along with their benefits and drawbacks.

In [3] The face and eye detection is done with OpenCV and 68- facelandmarks drowsiness detection, however they have limited the frames to be examined while identifying eyes in face, and if they are not identified for 20 consecutive frames, the system concludes that the driver is sleeping. The Euclidean eye aspect ratio can be used to identify the state of eyes. They concluded that their project was more accurate than detection done using MATLAB by using Anaconda Software, a Python package.

In [4] Here, we learned how to use OpenCV and Keras to develop a Deep Learning Model that takes an image from a camera frame by frame and creates a ROI that is fed to a classifier, which is then categorised and scored, as well as making an alarm sound when a person is asleep. The model was trained using Haar-cascade files, and the dataset was built for it. The model was created with Keras and CNN architecture, with multiple layers of Relu and Softmax activation. On drowsiness detection, a warning alarm sound is generated.

In [5] They used an image dataset with four class labels: closed, open, no yawn, and yawn and developed a CNN model with multiple layers and Data Augmentation to get a more accurate model, then showed the validation to training accuracies and losses. It is a multi-class classification based on horizontal and vertical distance ratios. They created a CNN model containing Convolutional and Maxpooling layers, as well as a Flatten and Dense layer. Adam was used as the optimizer, and the model was ran with 50 epochs. The classification report is created, which includes precision, recall, f1- score, and support data. And with new incoming image data, forecast the class labels.

III. Proposed Work

Drowsy driving is a major factor in thousands of traffic accidents around the world. To develop a system that can identify driver drowsiness by continuously monitoring the retina of the eye. The device responds under a variety of lighting conditions and even while the driver is wearing glasses. To use a buzzer or an alarm to inform the driver when drowsiness is detected. The vehicle's speed can be lowered. Accidents can be reduced to preserve traffic management. The project's goal is to develop a solution for detecting driver drowsiness using the CNN algorithm.

A. Dataset

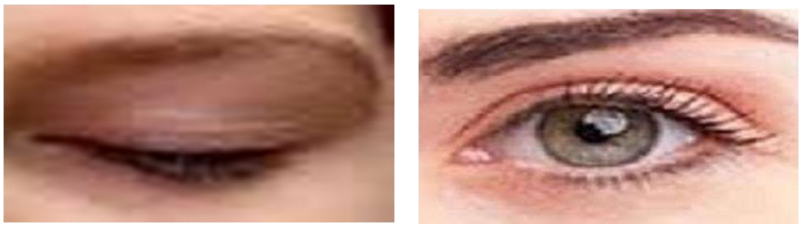
The dataset that was used in this study was a custom-built, private dataset. They wrote a script to capture the part of the eyeballs from the camera and save it to their local disc in order to construct this dataset. We labelled them respectively. A mechanical way was used to filter the data by deleting any photographs that were not required for the model's construction. The data consists of nearly 7k pictures of which they are individual eyes and were under various lighting conditions. We've uploaded the updated values of error calculated weights through the constructed model then model is being trained. This model may now be used to determine.

The project makes advantage of the Kaggle platform's sleepiness dataset. The original dataset has four categories for categorizing images. The goal of this project, however, is to classify drowsiness based on facial region identification of a person. Driver drowsiness is a security measure that can help drivers avoid accidents caused by falling asleep while driving.

B. Design Methodology

The Driver Drowsiness Detection System was created with OpenCV and trained with a CNN model. It is quite helpful in detecting tiredness in drivers. Drunk driving is responsible for roughly 21% of all accidents. As a result, our model focuses on preventing accidents by identifying the driver's tiredness using an OpenCV algorithm and a neural network model which is convolutionised that has been trained for certain inputs.

Yawn No_Yawn



Eyes_Closed Eyes_Open

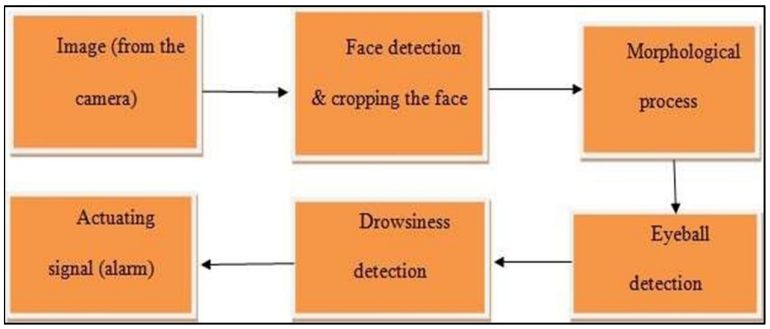


Figure 1. Architecture of the proposed method

Here, we mainly use web based camera which will take pictures and it is through a endless loop. we take each of the frame from the continuous video then through the built-in methods of the Opencv modules are used to get them. And we store the respective images into respective objects. Actually here we need to make all pictures into a single scale that is being grayscale images. As if only this type of scale is being accepted in algorithm present in the python pre-defined libraries. We make use of the classifier called Haar files for the searching of the face part. It then provides us with the dimensions of indentified part. Here we both find the same methods being applied on the Eyes as well as the face part of an individual picture. First we get both the eyes configured through the cascade files. By the dimensionality of the detected picture we get details of the frame. Later we make store of this data in their related classifiers of the convolutinized neural networks. To train the model we need to get the better measurements of the image being caught. Now we check the size of the pictures to give the model good inputs. We also make use of the standardization method to get the values into a certain range. In the further process we make loading of the constructed model then we make the prediction process for both the parts of the eyes and a value is being assigned for finding the state of eye.

Keras Convolutional Neural Networks were used to create the model. It is a type of neural network which gets deep analysis of model and excels at classifying images. Generally as we know that a cnn model is build up with different combination of layers added together. And the filtering of the layers is also being done for the constructed model. Conv2D layers have Kernal _size 3 and MaxPooling2D layers have Kernal_size 3. Dropout certain neurons to increase convergence, then use the Flatten () layer in addition to these. There are also 128 nodes present in one of the type of layer. And at the last we have a connection of nodes. And mostly the Relu being used as the function of activation at the last used the SoftMax function. And the optimizer 'Adam' is put into use for building the model, with 'categorical_crossentropy' as the loss and ['accuracy'] as the metrics. Finally, we save the model.

They developed the dataset utilized in this model. The dataset being formed is through capturing the required part of the face that is eye. The data being labelled to make them identified. The filtering of data being done by discarding any photographs that were not required for the model's construction. More than 6k photos are being collected under different types of lights which together made this data. The accuracy of the model constructed here is 96 percent for the picture datasets used in the CNN model. It was created by adding Convolutional layers to the base model, increasing the drop out value to 0.7, and increasing the number of epochs. This is how we arrived at the accuracy value.

IV. Results and Observations

Step.1: A webcam will be used to capture photos as input. We're also using OpenCV to gather pictures from the webcam and feed them into a model that can tell whether the person's eyes are 'Open' or 'Closed.'
Step.2: After accepting photos as input, we must first convert the image to grayscale in order to recognize the face in the image. To detect the objects, we don't need color information.
Step.3: Only the eyes data must be extracted from the entire image. The CNN classifier will determine whether or not the eyes are open.
Step.4: The score is a number that will be used to determine how long the person has been closed-eyed. So if both eyes are closed, the score will continue to rise, whereas if both eyes are open, the score will fall.

Figure 2. Identifying if a person is drowsy or not

The left picture indicates that the person is not drowsy. And the right picture we get the result that the person is drowsy and beep of alarm is sounded.

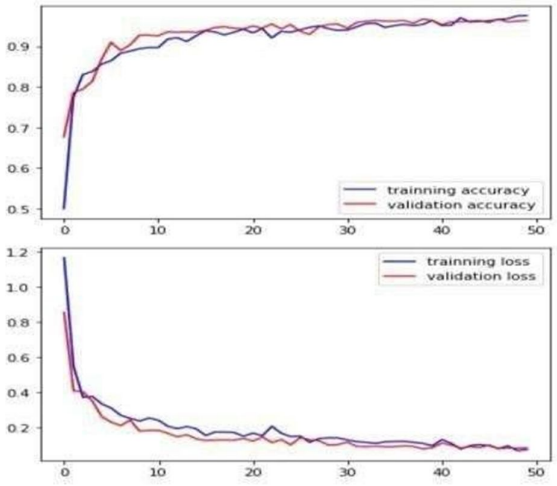


Figure 3. Graphical representation of accuracy for Base Model

These are the graphs for the base and standard models. Because the base model includes Convolutional layers, its accuracy is lower than the standard model. Both the training and validation accuracy are quite close to each other on the base model graph. However, there is a little difference between training and validation accuracy in the conventional model graph. We also increase the epochs value, which explains why the conventional model has such great accuracy.

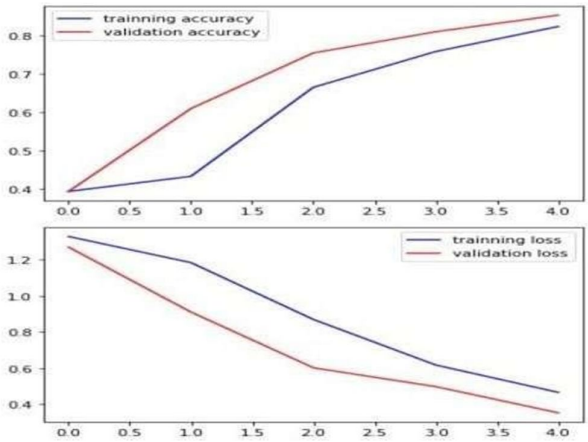


Figure 4. Graphical representation of accuracy for New Model

V. CONCLUSIONS

The Drowsiness causes severe traffic accidents, and as a result, drivers become less active when driving. This system can distinguish between normal eye blink and drowsiness, preventing the driver from falling asleep while driving. During the monitoring, the equipment can tell if the nature of eyes. When eyes are shut for roughly the thresh-old score, the alarm beeps, and the vehicle's speed is reduced. Many accidents will bereduced as a result of this, as well as the driver's and vehicle's safety. Only the most expensive vehicles have a system for driver safety and vehicle security. Driver safety can also be applied in standard vehicles using a sleepiness detecting system.

REFERENCES

[1] Tamanani, Reza & Muresan, Radu & Al-Dweik, Arafat. (2021). Estimation of Driver Vigilance Status Using Real-Time Facial Expression and Deep Learning. IEEE Sensors Letters. PP. 1-1. 10.1109/LSENS.2021.3070419.

[2] Soares, Sónia & Monteiro, Tiago & Lobo, António & Couto, António & Cunha, Liliana & Ferreira, Sara. (2020). Analyzing Driver Drowsiness: From Causes to Effects. Sustainability. 12. 10.3390/su12051971.

[3] Vinutha, K. & Ashwini, N. & Raj, Amrit & Sukruth, Jayam & Praneeth, M. & Anand, Shubham. (2021). Driver Drowsiness Detection and Alert System Using Computer Vi-sion. 10.9734/bpi/naer/v1/2206F.

[4] Li, Yingjie & Min, Chaobo & Zhang, Baohui & Sun, Bin. (2013). Intelligent Eye-In- formation Fusion Monitioring System. Proceedings of the IASTED International Conference on Computer Graphics and Imaging, CGIM 2013. 10.2316/P.2013.797-042.

[5] Lee, Kyong & Kim, Whui & Choi, Hyun & Jang, Byung. (2019). A Study on Feature Extraction Methods Used to Estimate a Driver's Level of Drowsiness. 710-713.10.23919/ICACT.2019.8701928.

[6] Tipprasert, Wisaroot & Charoenpong, Theekapun & Chianrabutra, Chamaporn & Sukjamsri, Chamaiporn. (2019). A Method of Driver's Eyes Closure and Yawning De-tection for Drowsiness Analysis by Infrared Camera. 61-64. 10.1109/ICA- SYMP.2019.8646001.

[7] Rajneesh, "Real Time Drivers Drowsiness Detection and alert System by Measuring EAR," International Journal of Computer Applications (0975 – 8887) Volume 181 – No. 25, November- 2018.

[8] Assari, M. A., & Rahmati, M. (2019). Driver drowsiness detection using face expression recognition. IEEE International Conference on Signal and Image Processing Ap- plications (ICSIPA).