Recognition of Preoccupied Drivers on the Road Using Deep Learning Approach

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Abstract

There are several reasons behind road accidents like violating road rules and regulations, over speed driving, etc. but one among those is drowsiness in driver. A sleepy/drowsy driver causes 40% of road accidents says the Central Road Research Institute (CRRI). Every year we lose nearly 1.5 lakh people in accidents caused due to the drivers dozing off on the wheels. This issue can be solved by detecting the drowsy drivers and alerting them whenever they seemed to be dozing off using Convolutional Neural Network (CNN) algorithms. We capture the images of the person on the wheels and classify it as open or close using the CNN algorithm implemented on TensorFlow andKeras framework. When comparing the existing algorithm with the CNN algorithm the current one works fine with the binary classification process so that the accuracy of this system is higher than that of existing system.

Keywords— AlexNet, CNN, Drowsiness, Keras, OpenCV

Introduction

Driving a automobile is a complicated task, and it calls for entire interest. Distracted riding is any hobby that takes away the driver's interest from the street. Several researches have recognized 3 most important varieties of distraction: visible distractions (driver's eyes off the street), guide distractions (driver's palms off the wheel) and cognitive distractions (driver's thoughts off the riding task). The National Highway Traffic Safety Administration (NHTSA) pronounced that 36,750 humans died in motor car crashes in 2018, and 12% of it turned into because of distracted riding. Texting is the maximum alarming distraction. Sending or analysing a textual content takes your eyes off the street for five seconds. At fifty-five mph, that's like riding the period of a whole soccer subject together along with your eyes closed. Many states now have legal guidelines in opposition to texting, speaking on a mobileular phone, and different distractions at the same time as riding. We agree with that pc imaginative and prescient can increase the efforts of the governments to save you injuries because of distracted riding. Our set of rules routinely detects the distracted hobby of the drivers and indicators them. We envision this kind of product being embedded in motors to save you injuries because of distracted riding.

Related Work

In [1] it is mentioned that machine objectives to alert the Driver whilst in drowsy country and additionally the Traffic department, to manipulate and stay away from any doable accident. this system aims to alert the Driver when in drowsy condition and also the Traffic department, to prevent any possible accidents. This is a non-intrusive system. It is divided into 3 subsystems. The first system that detects drowsiness which is called as a drowsiness detection unit.It sends the message via Controller Area Network (CAN) to the second subsystem that is called as the Dashboard unit once the drowsiness is detected. This system cautions and alerts the driver. An intelligent drowsiness alert system has been developed. The drowsiness detection generally limits the only detection, the after-effect is never implemented. This system attempts to overcome this limitation. An alert system is also developed to wake up the driver if drowsiness is detected

The authors of [2] states that it consists of the sensing schemes, detection algorithms, and their corresponding accuracy and limitations. Challenges and feasible

answers consisting of integration of the phone conduct class gadget with the idea of context-aware, cellular crowdsensing, and energetic guidance manipulate are analysed. Data gathered from the phone are a wealthy supply of statistics for studying motive force conduct. Numerous methodologies proposed through special authors to locate special forms of strange using had been reviewed. While phone answers gadget has numerous benefits in comparison to the telematics boxes, there exist numerous demanding situations that ought to be considered for an correct motive force conduct class.

[3] states that Neuromorphic imaginative and prescient sensors which include the Dynamic and Active-pixel Vision Sensor (DAVIS) the use of silicon retina are stimulated with the aid of using organic imaginative and prescient, they generate streams of asynchronous activities to suggest neighbourhood log-depth brightness changes. Their homes of excessive temporal resolution, low-bandwidth, light-weight computation, and coffee latency cause them to a terrific in shape for plenty programs of movement belief withinside the sensible car. However, as a more youthful and smaller studies area in comparison to classical laptop imaginative and prescient, neuromorphic imaginative and prescient is hardly ever linked with the sensible car. For this purpose, we gift 3 novel datasets recorded with DAVIS sensors and intensity sensor for the distracted using studies and attention on driving force drowsiness detection, driving force gaze-area recognition, and driving force hand-gesture recognition. To facilitate the assessment with classical laptop imaginative and prescient, we document the RGB, intensity and infrared statistics with a intensity sensor simultaneously. that sensible motors want to deal with complicated situations and, greater importantly nook instances wherein sensible car will manoeuvre. Exploring opportunity tactics of neuromorphic imaginative and prescient sensor as opposed to growing algorithms of traditional cameras is of exceptional price that can't handily offer a complementary sensor to deal with nook instances however additionally enhance the robustness and accuracy of the overall performance in complicated situations. In this work, we construct the first-ever database, NeuroIV, and offers a few baseline reviews that bridges the distance among neuromorphic engineering and sensible car studies. The NeuroIV introduces new methods to feel and understand the surroundings that brings new revolution of imaginative and prescient-primarily based totally belief gadget in sensible car.

[4] proposes that Driver tracking systems (DMSs) had been proposed to lessen the hazard of human-induced accidents. Traditional DMSs recognition on detecting unique predefined strange riding behaviors, including drowsiness or distracted riding, the use of frequent fashions educated with the information accrued for the duration of strange riding. However, it's far hard to acquire enough consultant schooling information to assemble frequent detection fashions, that are relevant to all drivers. Consequently, this paper proposes a brand new private-primarily based totally hierarchical DMS (HDMS). During riding, the primary layer of the proposed HDMS detects ordinary and strange riding conduct primarily based totally on ordinary private riding fashions represented with the aid of using sparse representations. When strange riding conduct is detected, the second one layer of the HDMS similarly determines whether or not the conduct is drowsy riding conduct or distracted riding conduct. The experimental effects received for 3 datasets display that the proposed HDMS outperforms present latest DMS techniques in detecting ordinary riding conduct, drowsy riding conduct, and distracted riding conduct. They proposed a unique hierarchical DMS (HDMS) for tracking drivers' riding conduct. In the proposed system, the arrival modifications of the driver's face for the duration of riding had been efficiently represented the use of part-primarily based totally temporal face descriptors. Furthermore, the strange detection performance of the proposed HDMS has been progressed with the aid of using filtering out ordinary riding conduct at once within side the first layer of the HDMS shape with the aid of using evaluating the face descriptors received for the duration of checking out with predefined ordinary private riding fashions (PDMs). Notably, the computational complexity of the assessment method is decreased with the aid of using the use of a sparse illustration to assemble the ordinary PDMs. In the occasion that an strange riding conduct is detected with the aid of using the primary layer of the HDMS, drowsy PDMs and distracted PDMs are used to similarly classify the riding conduct as both drowsy riding conduct, distracted riding conduct, or a few other (unspecified) shape of strange riding conduct

[5] appreciates that this work proposes a brand-new drowsy driving detection system that has those features. The proposed system, known as a wakefulness-retaining help machine (WKSS), includes a drowsiness detection method (DDS), which corresponds to the primary feature, and an lively sport machine (AGS), which corresponds to the second one and 0.33 features. The AGS is a easy sport, which inspires drivers to undertake unique lively conduct to play the sport.

Drivers can preserve their wakefulness with the aid of using gambling the AGS, whilst taking part in it, despite the fact that fake drowsiness alarms might also additionally occur. They proposed a wakefulness-retaining help system (WKSS) which includes a drowsiness detection system (DDS) and an lively sport system (AGS). The AGS calls for a driving force to undertake lively conduct; a head gesture while the usage of the AGS-Body or speech whiles the usage of the AGS Voice. The riding simulator experiments showed that lively conduct became extra powerful in keeping a driving force's wakefulness as compared to a traditional alarm machine, along with presenting beep sounds. The AGS-Body became extra powerful than the AGS-Voice in wakefulness-retaining. The members have been now no longer aggravated with the aid of using both AGS, despite the fact that they understood that the DDS furnished fake alarm.

[6] says that it is a method and uses cellular software for motive force monitoring, analysis, and suggestions primarily based totally on detected risky using conduct for twist of fate prevention the usage of a non-public phone. For the motive force conduct monitoring, the phone's cameras and integrated sensors (accelerometer, gyroscope, GPS, and microphone) are used. A advanced method consists of risky country classification, risky country detection, and a reference model. The method helps the subsequent motive force's on-line risky states: distraction and drowsiness in addition to an offline risky country associated with a excessive pulse charge. We carried out the gadget for Android smartphones and evaluated it with ten volunteers. A method to decide risky using conduct via way of means of the usage of a front-going through digital digicam and sensors of a non-public motive force's phone. Distraction and drowsiness are on line kinds of risky using conduct inflicting injuries on public roads which can be identified within side the paper. High pulse charge is the offline risky country this is decided via way of means of a phone. Based at the facts approximately excessive pulse charge, the subsequent risky states may be identified in consistent with the proposed scheme of phone usage for risky states identification: inebriated using, competitive using, and pressure condition. Authors plan to apprehend those risky states within side the future. We carried out the gadget for Android OS cellular gadgets and posted it to the Google Play Store. Five Drivers can use our gadget to decorate their using protection and reduce twist of fate probability.

[7] shows that This observation is accomplished via way of means of studying an electroencephalogram (EEG) dataset captured for the duration of a simulated persistence riding take a look at. Driving protection studies the usage of EEG information represents an critical brain-pc interface (BCI) paradigm from an software perspective. To formulate the drowsiness estimation hassle as an optimization of a Q-getting to know task, we adapt the terminologies in the riding take a look at to suit the reinforcement getting to know framework. Based on that, a deep Q-community (DQN) is customized via way of means of regarding the ultra-modern DQN technologies. The designed community deserves the traits of the EEG information and might generate moves to circuitously estimate drowsiness. The outcomes display that the trained version can hint the versions of thoughts state in a nice manner in opposition to the testing EEG information, which confirms the feasibility and practicability of this new computation paradigm. Deep reinforcement studying specifically deep Q-getting to know for fatigue estimation to target driving protection. They built variants of the deep Q-community and used them to perform the test for comparing our methodology. The effects manifested the practicality through excessive correlation coefficients among the measured RT and expected RT in each the single-concern case and cross-concern case. Due to reinforcement learning's low dependency at the exceptional of the label facts and the excessive performance of information utilization, our paintings requires ability destiny studies to systematically do not forget reinforcement getting to know in BCI for special applications.

Proposed Work

The proposed method is to classify the eye images captured from a OpenCV (computer vision) camera based on labels Open or Closed. Then classification CNN models in deep learning on TensorFlow and Keras Framework. Comparing the existing and current algorithms reveals that the accuracy of distractive drivers for binary classification based on classification CNNs is higher than other algorithms. The classification was performed using a input distractive driver images, we used whole images, so it was necessary to perform pre-processing of images, Samples of more number of images are collected that comprised of different classes such as eyes open, eyes closed this Different number of images is collected for each classes that was classified into input We proposed a Deep Learning (DL) based distractive driver's prediction method to prevent drowsiness by drivers. The DL method used in the study is the Convolutional Neural Network (CNN). It is predicted that the success of the obtained outcomes will increase if the CNN

method is supported by adding extra feature extraction methods and classify successfully distractive drivers.

3.1 Import images from dataset

We need to import our data set the use of keras preprocessing image data generator feature additionally we create size, rescale, range, zoom range, horizontal flip. Then we import our image dataset from folder via the data generator function. Here we set train, test, and validation additionally we set target size, batch size and class-mode from this feature we need to train the usage of our own created network with the aid of using adding layers of CNN.

3.2 To train the dataset by using AlexNet.

To train our dataset the usage of classifier and fit generator function additionally we make training steps according to epoch's then total quantity of epochs, validation data and validation steps using this data we are able to train our dataset. Their network includes 4 layers with 1,024 input units, 256 units in the first hidden layer, 8 units within side the 2d hidden layer, and output units.

3.3 To train the model using LeNet:

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm that could soak up an input image, assign importance (learnable weights and biases) to diverse aspects/objects in the picture and have the ability to differentiate one from the other. A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. It is the input layer, convo layer, pooling layer , fully extracted layer, logistic layer.

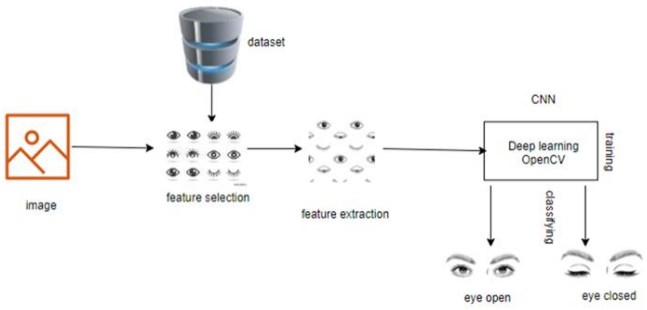

Fig.3.1 Architecture Diagram

3.4 Implementation of drowsiness by haar cascade classifier by using the deep learning model

This part detects whether the eye is closed or open using the haar cascade classifier alfgorithm.Each degree of the classifier labels the particular location described via way of means of the present day area of the window as both advantageous or poor – advantageous which means that eye turned into observed or poor method that the desired item turned into now no longer observed within the of the image.

Algorithm

Convolutional neural network is one of the most popular types of deep neural networks which is abbreviated as CNN or ConvNet. A CNN involves learning of features with input data, and uses 2D convolutional layers to make this architecture well suited to process 2D data, such as images.

CNNs eliminate the need for manual feature extraction, thus removing the procedure of identifying features used to classify images. The CNN works by extracting features directly from real time images. The features that are relevant are not retrained; these learned images while the network gets trained on a collection of images. This automated feature extraction makes highly accurate deep learning models for computer vision tasks such as object classification, image recognition.

CNNs learn to detect different features of an image using tens or hundreds or thousands of hidden layers. Every hidden layer increases the complexity of the learned and trained image features. For example, the first hidden layer could learn how to detect edges using image recognition, and the last learns how to detect more complex shapes specifically categorized to the shape of the object we are trying to detect.

Results

This system is designed that can be able to detect the drowsy drivers while driving using the deep learning approach. This method captures the images of the

driver using a camera and detects the facial features from which the eye region is distinguished, then using the haar cascade values the drowsiness is detected. The following images shows the outcomes of the system.

Fig.5.1 Closed eye

Fig.5.1 Opened eye

Discussion

This system uses the deep learning approach where the accuracy is greater than the existing systems. Although it seems to have some future enhancements like to deploy real time process by showing the prediction result in web application or desktop application and to optimize the work for implementing in the field of Artificial Intelligence environment.

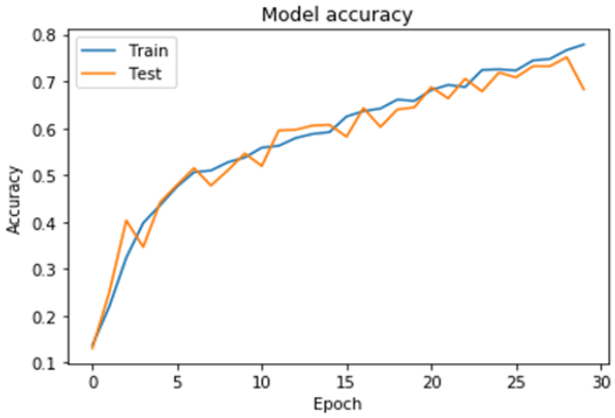

Fig.6.1 Accuracy

Conclusion

The dataset that is closed eye and opened eye images are trained using convolutional neural network which is a deep learning algorithm. The CNN are compared using the accuracy we had used three types manual CNN, AlexNet and LeNet where the AlexNet performed better and the .h5 file hierarchical Data format is taken from Alexnet model and it is used in OpenCv to detect the drowsiness in real time.

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