International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Driver Safety Prediction System

Kalyan Raja K[1], Sahiti Adepu[2]

[1]CSE, Keshav Memorial Institute of Technology, Narayanguda, Hyderabad, India
kalyanraja012[at]gmail.com

[2]CSE, Keshav Memorial Institute of Technology, Narayanguda, Hyderabad, India
sahitiadepu10[at]gmail.com

Abstract: ***Safety is one of the most essential factors that one should look at while driving, that includes Driver's state of mind and ensuring that the Driver follows speed limits or ant further possible Dangers. Most of the accidents on the road can be avoided if early alerts can be given to warn the Driver about his exhaustion level. In this paper, a real - time driver safety prediction system is presented Which aims to detect driver's mental state to drive and to detect and recognize traffic signs and vehicles on the roads. In the proposed system, Detection, classification and recognition are performed using Convolutional Neural Networks (CNN) and OpenCV to identify the content of the traffic signs found and to detect the vehicles. And the driver's drowsiness is detected by extracting an eye feature called the eye aspect ratio. The applications of this real time system include tracking objects, video surveillance, pedestrian detection, people counting, self - driving cars, face detection and traffic sign recognition.***

Keywords: OpenCV, Convolutional Neural Network, Eye Aspect Ratio

1. Introduction

Recently the number of automobiles has increased tremendously thanks to the technological advancements in the motor industry and very precisely the availability of low rates. With this exceptional growth, the number of accidents is as well in an infinite raise year after year, due to different causes, in which the ignorance of traffic signs and driver's drowsiness are considered as a major cause of these lasts. Traffic signs are recognized by image segmentation, by which the color enhancement technique is used to extract red colored regions in a particular image which is detected. This technique accurately determines the color of particular sign. Processing the mental state of the driver and detection of certain exhaustion level, the vehicle can regulate its speed and can be driven with respect to the exhaustion level. Advanced models and mapping of data used in this system ensures to further improve the output. This system can be used as Advance driver assistance systems (ADAS).

The Evaluation of prediction in tracking the vehicles based on fatigue in the latest eye tracking technique. These measures are statistically assessed and using large dataset of 66 hours of non - virtual road driving classification. Using the method Hidden Markov Model based on dynamic modeling to detect the state of a person mentally. This algorithm can be implemented using a simulated driving setup.

2. Literature Review

The early traffic sign detection and processing was attempted by Akatsuki in 1987. A system capable of automatic recognition of signs by the different roads for assistance for drivers and alerting them for a specific sign and explaining the significance of the sign was the main aim of the detection and then the attempt was made to classify the datasets have been made.

In 2008, Sú et. 'Multiple eyelid movement features based on fusion technique to predict the trend in the change'. Partial least squares regression, with which to cope with the problem of movement and thus, to predict the tendency correctly. In 2010, Bin et. Al. ' Camera based reference for driver state classification under for driving in real time conditions. They can be the measures of the driver's eyes that are capable of detecting the conditions which fall under the simulations.

In 2011 Flores et. Al. described' Driver state detection system under the infrared illumination for an intelligent state of the vehicle. They are to reduce the amount fatalities, and the amount of distraction which is present in the system. In June, 2012, Cheng et. al. described ' The computer vision technology is used to detect the state. They presented a nonintrusive state of mentally recognition method using eye tracking and image processing technique.

A study on several techniques for object tracking in many video devices have been made use of this technique for mainly tracking the footage of the person in the 1950s and reinforces the point stated in the section about how the illustrations have been made for automating the procedure to that by introducing a sophisticated surveillance system. From spotting the moving objects in backdrop removal to show how the moving objects may have the pixels to move them differently compared to that of impacted if the background is not non - static and has the changes of the result with specific weather conditions. There are other algorithms for subtraction of the background as well. A study by Flitton compares the 3D interest in the airport images from the CT images of the Baggage. Finding interesting stuff during baggage x - ray inspections of concept is the core here. The article covers fewer papers than our Systematic Literature Review does because of their narrower scopes.

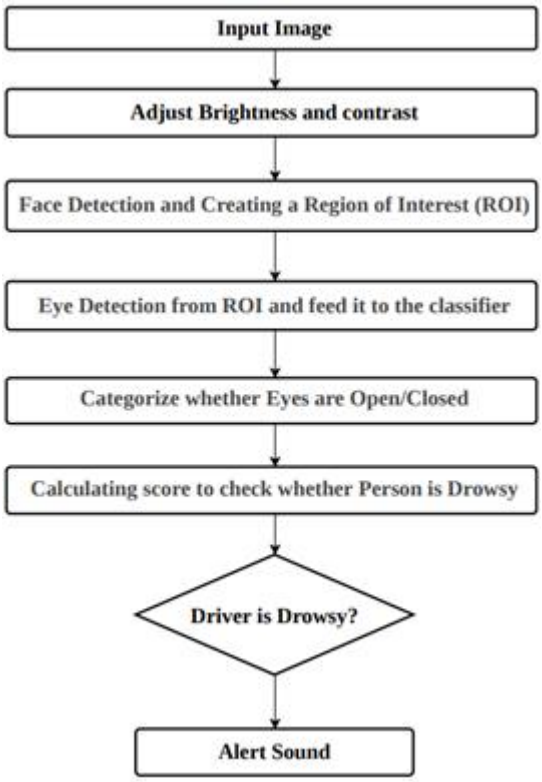
Jung, H., suggested that deep learning techniques should be used to recognize face expressions instead of using manually produced characteristics. Convolutional neural networks (CNN) and deep neural networks (DNN) are two types of deep networks that are used to tackle recognizing

difficulties. In June, 2014, Eyosiyas et. al. described 'Driver State through HMM based Dynamic Modeling'. The facial expression of the driver through Hidden Markov Model to detect the state of the respective person.

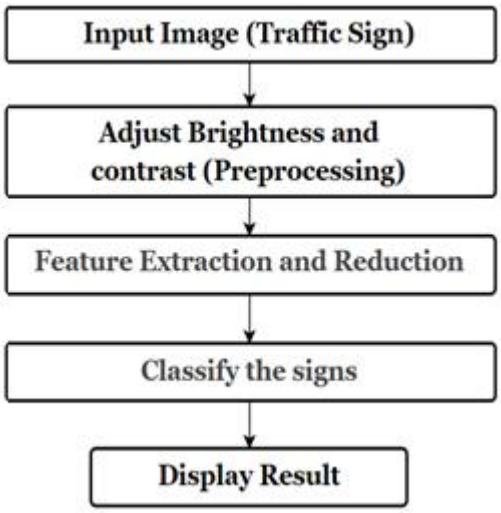
3. Methodology

After surveying different number of papers, the following tools and methodologies are identified:

1) OpenCV: Open - Source Computer Vision (OpenCV) is a huge open - source library which is used for computer vision, machine learning, and image processing. OpenCV supports various programming languages like Python, C++, Java, etc. It can process images and videos to identify objects, faces, traffic signs, eyes and many more. When it is integrated with other libraries, such as 'NumPy' which is an optimized library for various numerical operations, then the number of weapons increases in your Arsenal i. e., whatever operations that can be done by NumPy, can be combined with OpenCV.
2) TensorFlow: TensorFlow is also an open - source software library which was originally developed by researchers and engineers working on the Google Brain Team within Google's Machine Intelligence research organization for the purposes of conducting machine learning and deep neural networks research, but the system is general enough to be applicable in a variety of other domains too. TensorFlow is nothing but a software library for numerical computation using data flow graphs where nodes in the graph represent mathematical operations, edges in the graph represent the multidimensional data arrays (known as tensors) communicated between them. (Note: Tensor is the central unit of data in TensorFlow).
3) Keras - Open - source Library which runs on TensorFlow and is user friendly. It is also most extensible which also supports the combination of Convolutional Networking platforms as well as Recurrent Networking platforms so it supports multi - platform backend. It is also used for prototyping rapidly and runs seamlessly on both CPU and GPU.
4) Py Game: This library is generally used to create video games and this includes several modules for playing sound (in our system it is used to play alarm sound), drawing graphics, handling mouse inputs etc. Py Game can be used to create client - side applications that can be wrapped in standalone executables.
5) EAR (Eye Aspect Ratio): The Eye Aspect Ratio is calculated as the ratio between the distance between the vertical landmarks of the eye and the distance between the horizontal eye reference points. The aspect ratio of the eye is a constant when the eye is open, but it drops to zero when eyes are blinking.



With the help of a webcam, we give pictures as input. To access the webcam continuously, we created an infinite loop that captures each frame. We will use the methods which are provided by OpenCV to access the camera and configure the captured object, we will read each frame and store the image in a frame variable. In order to recognize the face in the image, firstly image is converted to the grayscale, as the OpenCV algorithm for object recognition uses only Gray images as it's input. We don't need any colour information to identify the objects. Then we will be using a hair cascade classifier to identify the faces (i. e., face recognition), which returns an array of detections with x, y coordinates and the height and width of the bounding box of the object. Now we can iterate over the faces. and draw contour boxes for each face.



Automatic recognition of traffic sign could be used as assistance for drivers, alerting them about the presence of some specific sign (e. g. pedestrian crossing) or some risky

situation (such as driving at a speed higher than the maximum speed allowed). The road sign recognition system is to be divided into two parts, the first part is the detection stage which is used to detect the traffic signs from the given input image, and the second part is that classification stage where the detected sign in the first part is classified into one of the reference signs which are present in the dataset provided.

4. Conclusion

In this project, we have proposed an unique approach to detect the drivers' drowsiness, vehicles and traffic signs using computer vision (OpenCV) and machine learning techniques (CNN). Currently, the proposed system can detect whether the driver is drowsy or not and identifies the vehicles and traffic signs ahead of him with the help of OpenCV and CNN classifier. Further, we have noticed that as every person have different face proportions, the Eye Aspect Ratio (EAR) differs. So normalization process for every person was necessary which resulted in lot of time consumption. And the results of vehicles and traffic sign detection was moderate and we aim to improve the system accuracy and robustness by testing it against different set of classifiers and other neural network techniques.

5. Future Scope

In real - time scenario, the persons will be dynamic on the screen and any sudden movements from the person/driver may signal drowsiness or waking up from sleep. This may result in false alert for the driver. So updating the parameters with more complex neural network models helps in achieving better results. And implementation of new methods of data augmentation can be done to improve the robustness of the classifier. Moving forward it would be better if we collect our own training data from a larger sample of people in real - time and also include other signs of drowsiness like sudden or unexpected head and hand movements, or improve tracking of eye movements. For future enhancement, implementing the project on system having GPU may result in better accuracy and reduces time consumption.

References

[1] "Early driver drowsiness detection using electroencephalography signals"; Sazali Yaacob, Nur Iman Zahra Muhamad'Arif, Pranesh Krishnan, Amir Rasyadan, Muhyi Yaakop and Firdaus Mohamed.
[2] "A Comparative Study of Facial Landmark Localization Methods for Face Recognition Using HOG descriptors";
[3] David Monzo, Alberto Albiol, Antonio Albiol and Jose M. Mossi.
[4] "Real time eye detection using edge detection and Euclidean distance"; Alireza Rahmani Azar and Farhad Khalilzadeh.
[5] "Real Time Eye Monitoring System Using CNN for Drowsiness and Attentiveness System"; Rahul Pai, Avinash Dubey and Nikhita Mangaonkar.
[6] "Histograms of oriented gradients for human detection"; N. Dalal and B. Triggs.
[7] "Novel approach to automatic traffic sign inventory based on mobile mapping system data and deep learning";
[8] Balado, J., González, E., Arias, P., & Castro, D. (2020).
[9] "Evaluation of deep neural networks for traffic sign detection systems"; Alvaro Arcos - Garcia, Juan A Alvarez - Garcia and Luis M Soria - Morillo.
[10] "The mapillary traffic sign dataset for detection and classification on a global scale"; Christian Ertler, Jerneja Mislej, Tobias Ollmann, Lorenzo Porzi, Gerhard Neuhold and Yubin Kuang.
[11] "Traffic signs detection and recognition system using deep learning";
[12] Pavly Salah Zaki, Marco Magdy William, Bolis Karam Soliman, Kerolos Gamal Alexsan, Keroles Khalil and Magdy El - Moursy.
[13] "A unified system for object detection texture recognition and context analysis based on the standard model feature set"; S. Bileschi and L. Wolf.
[14] "Efficient high - quality image contour detection"; B. Catanzaro, B. - Y. Su, N. Sundaram, Y. Lee, M. Murphy and K. Keutzer.
[15] "Mean shift: A robust approach toward feature space analysis"; D. Comaniciu and P. Meer.

Author Profile

Kalyan Raja Kadari received bachelor's degree in Computer Science and Engineering from Keshav Memorial Institute of Technology in 2022.

Sahiti Adepu received bachelor's degree in Computer Science and Engineering from Keshav Memorial Institute of Technology in 2022.