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DRIVER DROWSINESS DETECTION AND ALARMING SYSTEM

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ABSTRACT

The number of casualties from road accidents keeps arising each year. During long distance journeys , drivers usually are sleep deprived as they do not take enough breaks and there is a high risk of becoming drowsy and causing accidents. Drowsy Driver Detection System is developed, using a machine learning and image processing concepts. Proposed system is ready to use for car because of compact hardware which consumes less power and provides much faster processing speed and also can be operated in low light conditions. This system detects the eye landmarks from camera frames for monitoring the drowsiness of driver. Inspite of having several methods for measuring the drowsiness, this approach is completely non-intrusive and does not affect the driver in any way, thus giving the exact condition of the driver. For detection of drowsiness the method of per closure value of eye is considered. When the closure of eye exceeds a certain amount then the driver is identified to be sleepy. For implementing the system several OpenCv libraries are used including Haar-cascade. The entire system is implemented using Raspberry-Pi.

Keywords: Drowsy, machine learning, face detection, eye detection, image processing, Adaboost (adaptive boost), open computer vision(OpenCV).

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I. INTRODUCTION

The increasing numbers of traffic accidents are attributed to human errors, especially drowsiness. The state of drowsiness causes people to lose their vigilance, hence becoming a danger not only to themselves, but also their surroundings.

Drowsiness is a complicated phenomenon which states that there is a decrease in alert level and consciousness levels of the driver. There is also an increase in fatigue level. Though there are no direct measures to detect the drowsiness but several indirect methods can be used for this purpose.

According to the Ministry of Road Transport and Highways, 1,50,785 people were killed and another 4,94,624 were injured in 4,80,652 road crashes in India in 2016-2017.This translates into 1317 crashes and 413 deaths every day or 55 crashes and 17 deaths every hour. The number of road crash deaths has increased by 31% from 2007 to 2017 and that of fatal road crashes have increased by 25.6% in the same period.Responsibility of drivers is the top contributor to road crash deaths, accounting for 80.3% deaths out of the total road crash fatalities in 2017.

Detecting drowsiness of driver can play major role in avoiding road accidents in future, and thus may help to save thousands of lives. In this project we are going to implement a system which will detect drowsiness of driver and will take actions accordingly.

System uses image recognition, various AI algorithms, Machine Learning and few other technologies to develop this system.

II. LITERATURE SURVEY

In 2017, AldilaRiztiane, David HabsaraHareva, Dina Stefani, Samuel Lukas described 'Driver Drowsiness Detection Using Visual Information on Android Device'.They proposed a technique for drowsiness detection using three ways for better accuracy. The eyelid dilection period is

checked. They proposed the basic requirement scale for checking drowsiness based on pupil detection using template matching.

They used Haar cascade approach to do the face and eye detection and template matching in OpenCV. The predictive precision and robustness of the model thus established are validated, which shows that it provides a novel way of fusing multi-features together for enhancing our capability of detecting and predicting the state of drowsiness.

Nur FatinIzzati Y., M. M. Ibrahim, N.A. Manap ,Nur Shazwani A. proposed the system in which the height of iris is used to classify the eye state and to analyze the eye closure duration.

Face and eye detection is the first step and Viola-Jones algorithm is implemented in the procedure.

Next, face and eye tracking is done by utilizing the Kanade Lucas Tomasi (KLT) algorithm which tracked the feature points. The extracted eye region is further used to localize the iris through image enhancement process.

The most crucial step in eye closure duration is the eye state classification process. The eye state is classified based on the height of the iris that has been localized. The height of the iris is acquired from the bounding box drawn surrounding the area of the localized iris.

Finally, after the state of an eye is classified successfully, the eye closure duration is analyzed through the plotted graph between the heights of the iris against a period of time. Furthermore, by evaluating the iris' height, the size of an eye for each subject is classified.

III. PROPOSED WORK

This System will be mostly focusing on amount of eye closure also called (PERCLOS). Percentage Of Closure as it provides the most accurate information on drowsiness.

It is non-intrusive in nature, hence does not affect the state of the driver and also the driver feels totally comfortable with this system.

The development of this system includes face identification and tracking, detection and location of the human eye, human eye tracking, eye state detection, and driver fatigue testing.

The key parts of the detection framework fused the detection and location of human eyes and driver fatigue testing.

The technique for measuring the PERCLOS estimation of the driver is to compute the proportion of the eyes being open and shut with the aggregate number of frames for a given period.

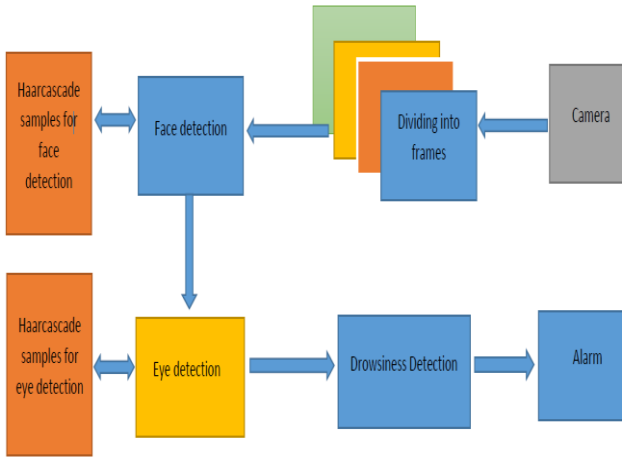

Fig 1. Propsoed system

Proposed Algorithm

1. Image Capture
2. Dividing into Frames
3. Face Detection
4. Eye Detection
5. State of eye

A. Object Detection

Object detection is commonly defined as method for discovering and identifying the existence of objects of a certain class. Also it can be considered as a method in image processing to find out an object from images. There are several ways to classify and find objects in a frame. Out of that one way can be based on color identification. But it is not an efficient method to detect the object as several different size object of same color may be present. Hence a more efficient way is Haar-like features, developed by Viola and Jones on the basis of the proposal by Papageorgiou et. al in 1998. Haar-like features are digital image features used in object detection. Or we can say that these are rectangle shaped dark and light areas having similar kind of features like our face. The cascade classifier comprises of a number of stages, where each stage consists of many weak features. The system detects objects by moving a window over the entire image and by forming a strong classifier. The output of each stage is labelled as either positive or negative–positive meaning that an object was found and negative means that the specified object was not found in the image.

B. Face Detection

We know that face is also a type of object. So we can consider detection of face as a particular case of object detection. In this type of object type of class detection, we try to know where the objects in the interest image are located and what is their size which may belongs to a particular class. The work of algorithm that is made for face detection is mostly concentrated on finding the front side of the face. But the algorithm that are developed recently focus on more general cases. For our case it may be face in the

tilted position or any other portion of the faces and also it finds the possibility of multiple faces. Which means the rotation axis with respect to the present observer from the reference of face in a particular. Or even if there is vertical rotation plane then also it is able to solve the purpose. In new type of algorithm it is considered that the picture or video is a variable which means that different condition in them like hue contrast may change its variance. The amount of light may also affect. Also the position of the input may vary the output. Many calculations actualize the face-detection assignment as a two way pattern-differentiation task. It means the contextual features present in the interest image is repeatedly change into features and this results in preparing the the respective classifier on the reference faces which decides if the specified area is a face or any other objects. If we obtain a positive response for the detecting a face then the process goes for next stage continuation otherwise the algorithm is designed in such manner to go for capturing of image till any hint of face is found. The main algorithm used for this process is Viola Jones algorithm. For getting particular output the utilization of cascade part of open cv is made. Cascade file of OpenCv contains 24 stages and has got 2913 weak classifiers. Its window starts with size of 24 x 24 pixels. Set up for the starting scale has to be made 1.0 and the step size of each scale was set to 1.1 and the position step size Δ was set to 1.0. The total number of scales used is 32 resulting in a total of more than 1.8 million possible detection window which is huge. Training of cascade was done by OpenCv hence it is easy to use.

C. Eye Detection

Poor contrast of eyes generally creates a lots of problems in its detection. After successful detection of face eye needs to be detected for further processing. In our method eye is the decision parameter for finding the state of driver. Though detection of eye does not look complex but the actual process is quite hectic. In this case it performs the detection of eye in the specified region with the use of feature detection. Generally Eigen approach is used for this process. It is a time taking process. When eye detection is done then the result is matched with the reference or threshold value for deciding the state of the driver. Eye detection is divided into two categories: eye contour detection and eye position detection. Basically eyes are detected based on the assumption that they are darker than other part of the face. Hence Haar Features of similar type can be moved throughout the upper part of the face to match with the feature of eye leading to location of eye. We consider as potential eye areas, the non-skin locales inside face district. Clearly, eyes ought to be inside a face area and eyes are not distinguished as skin by the skin identifier. In this way, we need to discover eye-simple sets among a decreased number of potential eye regions. In recent years several eye detection methods have been developed. Deformable template is one of the popular method in identifying the human eye. In this method, a model of eye is designed first and then eye position is obtained by recursive method. But this method strongly depends on initial position of the eye which should be near the actual position of eye. In the template matching aspect, the proposed algorithm is based on eigenfeatures and neural networks for the extraction of eyes using rectangular fitting from gray-level face images. This method does not need a large set of training images in its advantage and does by eigenfeatures and sliding window. But this algorithm fails if the user uses glasses or having beard. We know that using Haar features in AdaBoost results in increasing computational efficiency and accuracy than other methods for face detection. But Haar feature has a limitation i.e. discriminant capability. Although the Haar features vary with different patterns, sizes and positions, they can only represent the regular rectangular shapes. But for our case of eye detection eye and iris is of round shape. Hence eyes can be represented by learning discriminate features to characterize eye patterns. So an approach towards probabilistic classifier to separate eyes and non-eyes are much better option for better accuracy and for robustness.

D. Principal Component Analysis (PCA)

Principal component analysis (PCA) was invented in 1901 by Karl Pearson. If the resulted data is repeated again and again or has redundancy the PCA helps in reducing this redundancy. PCA basically removes the variables to reduce redundancy. So after reduction of variables we will get less variables named as Principal Components. Principal components will generally represent all the variables present in the obtained variable. But it only reduction of variables does not solve the purpose. Main Problem appears when we try to achieve face recognition in a more and high dimensional space. The main objective of PCA is to decrease the no of dimension as well as retain more and more possible variation in the given data set. But we know that reduction in dimension results in information loss as information are directly linked with dimension. Hence we can overcome the problem of data loss by choosing the best principal components as main principal components determines the low dimension. Though use of PCA has many advantages but mostly it is used for eigen face approach. In eigen face approach the reduction of size of the data base is achieved for recognizing the test images. The obtained images are stored in the data base in vector form which are also called feature vectors. And these are found out from set of Eigen face obtained by projecting it over trained image. So basically PCA is used for Eigen face approach for the reduction of dimensionality with our causing the loss of data.

E. Alarming System

After ensuring that the driver is not alert from the results of previous module the alarming system will be set off. The alarm will be beeped every time it is found that the driver is not attentive . The system will reboot itself after the specified time period.

IV. APPLICATIONS

1. System can be used in any type of vehicles to detect drowsiness of driver and to alert them.
2. This system will help to prevent accidents and it will save many lives.

3. Students can also use this system, while studying.
4. Various organizations can use this system to keep watch on employees.

V. LIMITATIONS

1. For more accuracy, processer with higher processing power is required, which is costly, hence cost will be increase as accuracy increases.

2. If multiple faces are detected by system, undesirable outputs are generated by system due to problem in detection of eyes.

VI. CONCLUSION AD FUTURE SCOPE

This system is developed to detect drowsiness of driver and alert them to prevent accidents and other casualties. Using face detection, the system predicts whether the driver is feeling drowsy or not. If system finds that driver is drowsy, it alerts the driver by sounding alarm and take actions accordingly.
Implemented system continuously monitors the driver's face using camera. The system can be developed in future to be more accurate and more fast, with the advancements of technology. Chat bots can be also introduces to have interaction with driver. Same system can be developed using mobile system, having higher processing power and higher RAM. A separate motor can be fitted in vehicle to control the speed of vehicle if driver is not responding to alerts given by system.

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