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Drowsiness detection using feature extraction

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ABSTRACT

Drowsiness detection system is a visual based system which will detect the eyes of the driver and classify it as awake or asleep in real time. The targeted customers predominately consist of commercial land transport companies, and is also available to general public. Since long distance transportations exhausts a lot of drivers which can lead to driver unexpectedly falling asleep can cause fatal accidents. In order to prevent this the Drowsiness detection system will immediately detect the state of the driver, if the driver falls asleep the system will immediately raise an alarm to alert the driver. The system's interface will be through a web app which will display the camera feed and the status of the driver in real time. The system uses HOG [Histogram Oriented Gradient] for feature extraction of facial points recognition. Though there will some delay between the real time feed and the processed feed Our project aims in making it as fast as possible with minimum compute resources. This project is done using OpenCV, python, Dlib, boot.python.

Keywords— *Drowsiness Detection, feature extraction, Histogram Oriented Gradient, Dlib*

1. INTRODUCTION

Statistics prove that daily sleepy drivers involved nearly 100,000 crashes a year. Our project aims in preventing such accidents using image processing techniques. Histogram Oriented Gradients is used in this project as it is accurate when compared with other HAAR cascades algorithms. This HOG is a feature descriptor used in Computer vision and image processing. This technique is for counting occurrences of gradient orientation in localized portions of image.

The essential idea behind the histogram of oriented gradients descriptor is natural interior appearance and shape within an image by the edge directions. The main advantages of the HOG descriptors over other HAAR cascades are it operates in local cells. It is not in correspondence to geometric transformations, except for object orientation. The normalization allows the body movement of pedestrians not to be considered as long as a n upright position is maintained. So, Feature extraction starts from a set of measured data and derives features which are used to solve a particular problem. In short terms, feature extraction can also be referred to dimensionality reduction. In the area of Image processing, these are used to detect and isolate various desired portions or shapes of a Video Stream. Dlib is a toolkit or a library in C++ which helps for making real world machine learning problems and data analysis applications. It has good and easy to use python bindings. In our view we strongly believe that Using the detector system for drowsiness will reduce the number of accidents in large numbers.

2. LITERATURE SURVEY

Normally Drowsiness Detection is can be measured in various types. Mainly Vehicle based Detection, Behavioral based detection, Physical motion-based Detections. Vehicle based detection is done by planting sensors on various vehicle components, which includes speedometers, steering of the vehicle etc. By analyzing the speed and based on various factors we can determine whether the driver is feeling drowsy or not. Physiological measures-based detection is another kind of drowsiness detection method which are based on the changes that occur in our body. They can be easily measured and utilized to predict fatigue levels and they can help in alerting the drivers who are feeling drowsy. This can be applied by various electronic instruments such as Electrocardiogram [ECG], [EOG] etc. Here the electrocardiogram electrodes are used to collect ECG signals from the human body which provides the key parameters corresponding to Heart Rate, respiration frequency etc. All these parameters are used for measuring drowsiness. Another algorithm is also used for measuring the drowsiness condition. It is done by converting the image to gray scale predicting the white percentage of both the eyes. If it is less than some threshold then the drowsiness alert can be made. These devices

are being easily variable. So, our paper aims in reducing such imbalances and variations. Our system also aims in producing better accuracy.

This paper also helps in the prevention of accidents with less cost and less maintenance.

3. CONCLUSION

Drowsiness Detection using feature extraction is a system that is built raise alerts when the user is in a state of feeling drowsy. This paper was mainly concerned with drowsy drivers. The drivers Fatigue system calculates the EAR values and based on certain threshold, it predicts whether the driver is feeling drowsy or not. By using our algorithm, when tested, it produces an accuracy of 89% which is pretty high when compared with other algorithms which are used in Drowsiness Detection. This system is pretty fact by calculating all frames and updating the EAR values for each frame. This paper can be further extended by analyzing how the cost is reduced and can also Used to make this algorithm work when more faces are involved in detection. This can also be extended by using the concepts of Machine Learning etc.

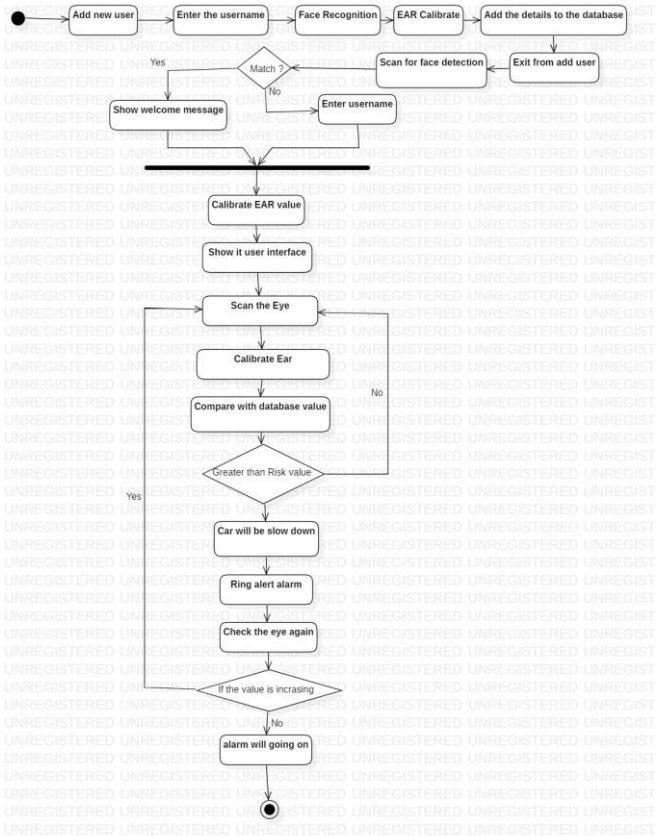

Fig. 1: Flow Diagram of the System

4. IMPLEMENTATION

These are the sequence of steps followed in our system development. Apply the facial landmark detection to localize the important features of a face. Only extract the vector representing the eyes. That is a set of two vectors containing (x, y) coordinates from p1 to p6. Using Dlib the facial points are extracted. Whenever the AEAR falls below the threshold, the counter gets incremented and after reaching maximum, the counter raises the alert using Play sound library till AEAR value becomes normal. The EAR value for each eye is calculated as follows:

$$EAR = ||p2-p6|| + |p3-p5|| / 2||p1-p4||$$

Here the pixels p1,p2,p3,p4,p5,p6 are the outer boundaries of the each eye. The average of LEAR and REAR gives AEAR [Average Eye Aspect Ratio]

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