REAL-TIME DRIVER BEHAVIOUR MONITORINGSYSTEM IN CARS USING IMAGE PROCESSING

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Abstract*— Driver fatigue and using mobile phones is the major cause of traffic crashes and financial losses. Webcam based system is available which is not efficient. When there is quick head-movement there will be some false detection. At that time face detection fails. Steering wheel based drowsiness detection system; the false detection rate is more due to the odd angle of the steering wheel which makes the system inefficient. These limitations can be corrected by smartphone based drowsiness detection system. To improve driving safety, the related research in the literature can be roughly categorized image processing techniques to detect drivers fatigue and to detect the distraction to enhance driving safety. Using image processing detects facial expression i.e. Anger, sad or happy which improve diving safety. *Index Terms*— *Driver fatigue, Drowsiness, Face detection, and Driving safety, Image processing, etc

I. INTRODUCTION

Accidents occur all over the world cause of being not able to concentrate on the road while driving. The concentration is missed due to tiredness, distraction while driving or driving the car without resting which makes the person drowsy. Every year the amount of deaths and injuries are increasing in traffic accidents due to human errors. 20% of all traffic accidents are due to the diminished level of attention caused by fatigue or using mobile phones and it can lead to serious physical injuries, loss of human life, damage to property and loss of money. This paper focuses on the study of effectiveness of Image Processing and Computer Vision techniques for monitoring driver's fatigueness, distraction, drowsiness, facial recognition and mobile handling.

II. OVERVIEW

The Image processing can be used to accurately monitor the open and closed state of driver's eye. It also will be used Image processing domain to process the input image and accordingly alert the driver by buzzing the alarm. Webcam is used for capturing the image. Admin user will be able to configure the system. Here admin will add the drive information and set the threshold value in server. And also add the contact number of driver running the car. Whenever driver will start the car, camera will capture the image continually. This image proceeds for image processing. Then system will search and detect the face. After face detection find eyes position from face and monitor the open and close state of eye. System will calculate the area of eyeball. System will judge that, either the eyes are close or open. If the eyes of driver will remain close for five consecutive image frame then system will warn the driver. System send will send the command for switching the alarm setting on.

Many special body and face gestures are used as sign of driver fatigue, including yawning, eye tiredness and eye movement, which indicate that the driver is no longer in a proper driving condition. Here, we propose a method of yawning detection based on the changes in the mouth geometric features.

A. A Real-Time Wireless Brain–Computer Interface System for Drowsiness Detection

A real-time wireless electroencephalogram (EEG)-based brain-computer interface (BCI) system for drowsiness detection has been proposed. Drowsy driving has been implicated as a causal factor in many accidents. Therefore, real-time drowsiness monitoring can prevent traffic accidents effectively. However, current BCI systems are usually large and have to transmit an EEG signal to a back- end personal computer to process the EEG signal. In this study, a novel BCI system was developed to monitor the human cognitive state and provide biofeedback to the driver when drowsy state occurs. The proposed system consists of a wireless physiological signal-acquisition module and an embedded signal-processing module. Here, the physiological signal-acquisition module and embedded signal-processing module were designed for long-term EEG monitoring and real-time drowsiness detection, respectively. The advantages of low owner consumption and small volume of the proposed system are suitable for car applications. Moreover, a real-time drowsiness detection algorithm was also developed and implemented in this system. The experiment results demonstrated the feasibility of our proposed BCI system in a practical driving application.

B. A Wearable-glasses-based drowsiness-fatigue-detection system for improving road safety

A drowsiness-fatigue-detection (DFD) system for improving road safety, which consists of wearable smart glasses, an in-vehicle infotainment system (a vehicular telematics device), an automotive diagnostic bridge, and a cloud-based platform, etc. The proposed DFD system can
real-time detect driver's state for drowsiness or fatigue. When detecting drowsiness or fatigue situation occurrence,
thus the rear lights of the vehicle will automatically be flickered and message will be sent to the cloud-based platform, concurrently. Hence, the proposed system can effectively achieve the purpose of road safety improvement.

C. Measuring Non Gaussianity

Many traffic injuries and deaths are caused by the drowsiness of drivers during driving. Existing drowsiness detection schemes are not accurate due to various reasons. To resolve this problem, an accurate driver drowsiness classifier (DDC) has been developed using an electrocardiogram genetic algorithm-based support vector machine (ECG GA-SVM). In existing studies, a cross correlation kernel and a convolution kernel have both been applied for performing the classification. The DDC is designed by a Mercer kernel KDDC formed by commuting the cross correlation kernel $K_{xcorr,ij}$ and the convolution kernel $K_{conv,ij}$. $K_{xcorr,ij}$, and captures the symmetric information among ECG signals from different classes, while Kconv,ij captures the antisymmetric information among ECG signals from the same class. The final KDDC (a precomputed kernel) is obtained by a genetic mutation using a multi-objective genetic algorithm. This renders an optimal KDDC that confidently serves as the full descriptor of the drowsiness. The performance of KDDC is compared with the most prevailing kernels. The obtained DDC yields an overall accuracy of 97.01%, sensitivity of 97.16%, and specificity of 96.86%. The analysis reveals that the accuracy of KDDC is better than those of both $K_{xcorr,ij}$ and $K_{conv,ij}$ by more than 11%, and typical kernels including linear, quadratic, third order polynomial, and Gaussian radial basis function by 17-63%, respectively. Comparing with related works using the image-based method and the biometric signal-based method, KDDC improves the accuracy by 48.4-87.2%. Testing results showed that KDDC has a less than 1% deviation from simulated results. Also, the average delay of DDC was bounded by 0.55 ms. This renders the real time implementation. Thus, the developed ECG GA-SVM provides an accurate and instantaneous warning to the drivers before they fall into sleep. As a result this ensures the public transport safety.

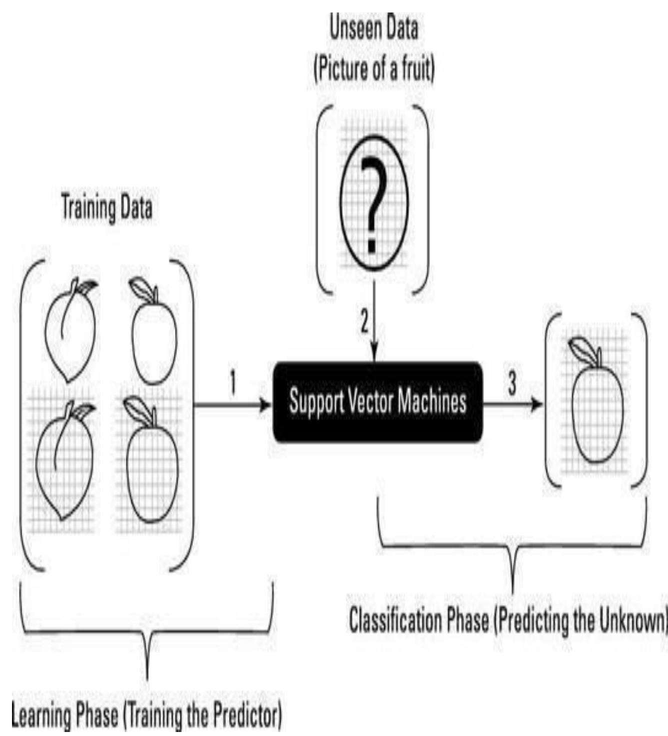
III. Proposed Method

Support Vector Machine

Algorithm:

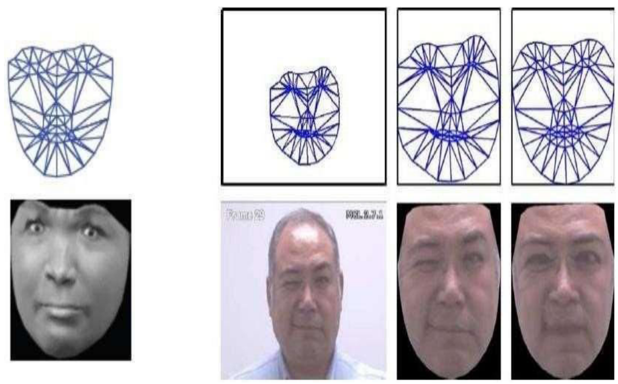
A support vector machine (SVM) is a supervised machine learning model that uses classification algorithms for two- group classification problems. SVM classifies between two classes by constructing a hyperplane in high-dimensional feature space which can be used for classification. Hyperplane can be represented by equation : - w.x+b=0

Where W is weight vector and normal to hyperplane. b is bias. It uses a technique called the kernel trick to transform your data and then based on these transformations it finds an optimal boundary between the possible outputs. It does some extremely complex data transformations, then figures out how to separate your data based on the labels or outputs you've defined. SVM to be used as classifier on a dataset that contains more than one class (grouping or category). SVM has been successfully used in many applications such as image recognition, medical diagnosis, and text analytics.



Feature Extraction

- AMM 2D points (68 vertex points)
- Canonical normalized Appearance (APP)



Support Vector Machine

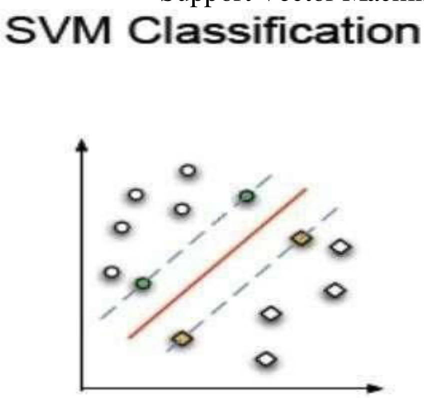


Fig. 1.
ICA

Haar Cascade Algorithm:

The Haar Cascade Algorithm is a classifier used to detect objects which is trained and to train the classifier the OpenCV (Open Source Computer Vision) is used. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. First step is to collect the Haar features which is considers adjacent rectangular regions at specific location in a detection window.

IV. CONCLUSION

Therefore, the research discussed here is used to monitor driver to detect drowsiness, fatigueness, distraction, drowsiness, facial recognition, mobile handling and helps the driver to be alert while driving using an alarm system. The system is capable of differentiating a normal blink verses the drowsiness. Support Vector Machine is a binary classifier based on supervised learning which has very good efficiency, produces the accurate results and gives better performance than other classifiers.

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