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Detection of Bus Driver Fatigue

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Abstract- *In today's ever-changing life, an human ought to respond Per necessities of the scenario. Hence, it's vital to own an honest & the harmonious culture in the workplace, which may be terribly useful to reduce an conflict scenario. Choosing an incorrect decisions or rejecting the correct decisions may prove to be pricey mistakes for the individual. Our system is one amongst the system that reduces a number of accidents caused by the driver fatigue and therefore improves the road safety. This technique treats the automated detection of the driver sleepiness supported visual information and computing. We locate, track and analyze each driving force face and eyes to live PERCLOS (percentage of eye closure) with Softmax for a neural transfer perform. Driver's fatigue is one of the main causes of a traffic accidents, significantly for the drivers huge vehicles (such as buses and significant trucks) because of prolonged driving periods and tedium in occupied conditions. This study discusses a good assessments of the impact of a stress throughout operating & the importance of different connected factors which causes the road accidents.*

Keywords: *Bus drivers, visual information, PERCLOS, Softmax, fatigue, stress.*

I. INTRODUCTION

The main idea behind this project is to a develop the system which can detect an drowsiness of the driver and issue a timely warning. Driver Fatigue is the main reason for a large number of a road accidents. The detection can be done in the many different ways and by using the different parameters.

The parameters can be the drivers behavior while a driving, the physiological parameters and by checking a vehicle steering. Propose system uses the behavior of parameter. The behavior parameter include the eye blinking, the yawning, the eye openness, jaw position etc.

The live video is captured by a camera that is fit in the bus. The video is divided into the frames and then select the images from the frames. By taking individual image, noise from the image is cleared. Then the image is converted into an grayscale image. The respective calculation of the image selection is displayed on the screen. After converting of the image to grayscale the face detection is done on the converted image. Compare an sample image with the image present in the database of the sample images. Then the detection of jaw position, eye openness and the angle of iris.

Then, whether the driver is drowsy or not is checked by the calculation of before the mentioned parameters. If the driver is drowsy then the alarm is raised. By using this system the rate of the accidents can be reduced.

II. LITERATURE SURVEY

A Survey on Driver Fatigue-Drowsiness Detection System paper by Indu R. Nair, Nadiya Ebrahimkutty , Priyanka B.R , Sreeja M, Prof. Gopu Darsan ,this paper address to one of an major reasons for road accidents now a day is due to driver fatigue. Be it long distant travelling or drunk driving drowsy state leads to risky crashes which are hazardous to lives as well. To overcome such accidents some method has to be developed which is feasible to all the vehicle drivers. This paper is based on various methods for the preventing road accidents and designs on a drowsiness detection methods which were proposed and have advantages and disadvantages.

A Review on the Driver Face Monitoring Systems for Fatigue and the Distraction Detection driver face monitoring systems is one of the main approaches for the driver fatigue or distraction detection and accident prevention. Paper by Mohamad-Hoseyn Sigari, Muhammad-Reza Pourshahabi Mohsen Soryani and Mahmood Fathy. Driver face monitoring systems capture the images from an driver face and extract the symptoms of fatigue and distraction from eyes, mouth and head. These symptoms are usually percentage of eyelid closure over time (PERCLOS), eyelid distance, eye blink rate, blink speed, gaze direction, the eye saccadic movement, yawning, head nodding and head orientation. The system estimates driver alertness based on extracted the symptoms and the alarms if needed. In this paper, after an introduction to a driver face monitoring systems, the general structure of these systems is then discussed. Then a comprehensive review on the driver face monitoring systems for fatigue and distraction detection is presented.

Jennifer F. May , Carryl L. Baldwin present a paper on Driver fatigue: The importance of identifying causal factors of the fatigue when considering detection and the counter measure technologies this paper state that the technologies currently exist which enable detection of the driver fatigue and the interventions that have the potential to dramatically reduce the crash probability. The successful implementation of these technologies depends on the cause and a type of fatigue experienced. Sleep-related (SR) forms of a driver fatigue result from accumulated sleep debt, prolonged wakefulness or troughs in the circadian rhythms. SR fatigue is resistant to the most intervention strategies. Conversely, technologies for detecting and the countering task-related (TR) fatigue (caused by mental overload or under load) are proving to be effective tools for improving transportation safety. Methods of the detecting and counteracting the various forms of driver fatigue are discussed. Emphasis is placed on examining the effectiveness of the existing and the emerging technologies for combating TR forms of the driver fatigue.

Design and Implementation of the Driving Assistance System in the Car-like a Robot .When Fatigue in the User is Detected. In this paper, it is presented an driving assistance system when drowsiness is detected in a driver; the system is tested by a car like robot that is wirelessly controlled by the computational interface developed in Visual Studio 2010, which emulates an automobile panel. Through an artificial vision system the driver´s head orientation is monitored for determining that if he/she is in the drowsiness state; if so, the robot control turn into automatic and the robot pull over to the right side of the way (built track).

Automatic Detection of Driver Fatigue Using Driving Operation Information for Transportation Safety Paper by Zuojin Li , Liukui Chen, Jun Peng and Ying Wu. The method in this paper is based on the steering wheel angles (SWA) and the yaw angles (YA) information under real driving conditions to detect the drivers' fatigue levels. It analyzes an operation features of SWA and YA under different fatigue statuses, and then calculates the approximate entropy (ApEn) features of a short sliding window on the time series. Using the nonlinear feature construction theory of the dynamic time series, with the fatigue features as input, designs a "2-6-6-3" multi-level back propagation (BP) Neural Networks classifier to realize an fatigue detection. An approximately 15-h experiment is carried out on the real road, and the data retrieved are segmented and labeled with the three fatigue levels after an expert evaluation, namely "awake", "drowsy" and "very drowsy". The average accuracy of 88.02% in the fatigue identification was achieved in the experiment, endorsing the value of the proposed method for engineering applications.

A driver face monitoring systems can be divided into the two general categories. In one category, the driver fatigue and the distraction is detected only by an processing of the eye region. There are many researches based on this approach. The main reason of this large amount of researches is that the main symptoms of a fatigue and the distraction appear in the driver eyes. Moreover, a processing of the eye region instead of the processing of the face region has less computational complexity. In the other category, the symptoms of fatigue and the distraction are detected not only from the eyes, but also from the other regions of the face and head. In this approach, in addition to processing of the eye region, the other symptoms including yawning and the head nodding are also extracted.

Driver face monitoring system includes some of the main parts: (1) face detection, (2) eye detection, (3) face tracking, (4) symptom extraction, and (5) driver state estimation. These main parts are reviewed in a different systems in the current section.

In the most of the driver face monitoring systems, the face detection is the first part of the image processing operations. Face detection methods can be divided into the two general categories : (1) feature-based and (2) learning-based methods.
In the feature-based methods, the assumption is that the face in the image can be detected based on applying a heuristic rules on features. These methods are usually used for detecting one face in the image. Color-based face recognition is one of the fast and a common methods. In these methods, the face is detected based on the color of skin and the shape of a face. Color-based face detection may be applied on different color-space including RGB, YCbCr, or HIS. In the noisy images or in the images with low illuminations, these algorithms have a low accuracy.
Learning-based face detection uses statistical learning methods and the training samples to learn the discriminative features. These methods benefit from the statistical models and the machine learning algorithms. Generally, learning-based methods have less error rates for a face detection, but these methods usually have more computational complexity. Viola and Jones presented an algorithm for the object detection, which is very fast and robust. This algorithm was used in for an face detection.

Almost in all the driver face monitoring systems, because of the importance of a symptoms related to eye, the eye region is always processed for extracting the symptoms. Therefore, before the processing of a eye region, eye detection is required. Eye detection methods can be divided into the three general categories: (1) methods based on the imaging in an infrared spectrum, (2) feature-based methods, and (3) other methods.

One of the fast and the relatively accurate methods for the eye detection is the method based on the imaging in the infrared (IR) spectrum. In this method, physiological and optical properties of the eye in an IR spectrum are used. The eye pupil reflects a IR beams, and it seems as a bright spot when the angle of IR source and imaging device are suitable. According to this interesting property, pupil and the eye are detected. The systems proposed in used such method for eye detection.

Feature-based eye detection approach includes various methods. Image binarization and the projection are two feature-based eye detection methods which assume that the eye is darker than the face skin. Usually, more complicated processing is needed to detect an proper location of eyes, because these methods are simple and have a high error rate.
There are few methods for eye detection based on the other approaches which were used in the driver face monitoring systems. In, a geometrical face model with some feature-based methods was used to detect eyes. In addition, some systems such as used hybrid methods for eye detection. In, the elliptical gray-level template matching and IR imaging system were used for the eye detection in day and night, respectively.
Usually, the entire image is searched for detecting an face/eye. Searching an entire image increases the computational complexity of the system. Therefore, usually after the early detection of face/eyes, in the next frames, face/eye tracking is performed. In the most of driver face monitoring systems, Kalman filter or a extended versions of Kalman filter such as Unscented Kalman Filter (UKF) were used. However, in some researches, search window and particle filter (PF) were used for tracking.
In the driver face monitoring systems, useful symptoms for fatigue and distraction detection can be divided into the three general categories:(i)a symptoms related to the eye region;(ii)symptoms related to the mouth region;(iii)symptoms related to the head.
Eye is a most important area of the face where the symptoms of fatigue and distraction appear in it. Therefore, many of the driver face monitoring systems detect a driver fatigue and distraction only based on the symptoms extracted from the eyes. The symptoms related to eye region include PERCLOS , eyelid distance, eye blink speed , eye blink rate , and gaze direction .
Yawning is one of the hypo vigilance symptoms related to the mouth region. This symptom was extracted by detecting the open mouth in .These systems detect the mouth based on the color features of an lips in the image.
Some fatigue and the distraction symptoms are related to head. These symptoms include head nodding and the head orientation . Head nodding can be used for the fatigue detection, and a head orientation can be used for both the fatigue and distraction detection. Driver nodding and the lack of driver attention to the road can be detected by estimating an angle of head direction.
After the symptom extraction, the driver state has to be determined. The determination of a driver state is considered as a classification problem. The simplest method for detecting an driver fatigue or distraction is based on applying a threshold on the extracted symptom .
Another method for determining the driver state is an knowledge-based approaches. In a knowledge-based approach, decision making about the driver fatigue and distraction is based on the knowledge of an expert which the knowledge usually appears in the form of if-then rules. In, fuzzy expert systems were used as the knowledge-based approach for estimating the driver state.
More complicated approaches such as the Bayesian network and nave dynamic Bayesian network were used for driver state determination. These approaches are usually more accurate than the threshold-based and a knowledge-based approaches; however, they are more complicated.

III. EXISTING SYSTEM

A driver falls asleep, then the driver loses control over the vehicle, an action which often results in a crash with either another vehicle or any object. In order to prevent these devastating accidents, there was a previous approach developed, in this system the state of drowsiness of an driver was monitored. The following measures were used widely for monitoring drowsiness:
(1) Vehicle-based detection: An number of actions/metrics, including deviations from a lane position, movement of the steering wheel, pressure on the acceleration pedal, etc., are constantly monitored and any change in these that crosses the specified threshold indicates a significantly increased probability that the driver is drowsy .
(2) Behavioral measures: The behavior of the driver, including yawning, eye closure, eye blinking, head pose, etc., was monitored through an camera and the driver was alerted if any of these drowsiness symptoms are detected.
(3)Physiological measures: The correlation between physiological signals (electrocardiogram (ECG), electromyogram (EMG), electrooculogram (EOG) and electroencephalogram (EEG)) and driver drowsiness was studied.

3.1 Disadvantages of Existing System

1. The subjective self-assessment of drowsiness can be obtained only from the subjects in particular environments. In real conditions, it is unfeasible to obtain this information without distracting the driver from their primary task.
2. EEG signals require an number of electrodes to be placed on the scalp and the electrodes used for measuring the EOG signals which are expensive.

IV. PROPOSED SYSTEM

In recent days, driver drowsiness has been one of the major causes of road accidents and can lead to severe physical injuries, deaths. Statistics indicate the need of the reliable driver drowsiness detection system which could alert the driver before a incidents takes place. The proposed system is a driver eyes monitoring system that can specially works on a drivers eyes and the face region. Firstly the eyes and the face regions are monitored by camera. Secondly, Iris structuring, the jaw angle finding and the calculation is done using regression analysis, Haar (cascade classifier algorithms) which will examine the eyes are open or closed, then system will detect whether driver is sleeping or not sleeping. If driver is sleeping the alarm rings.

4.1 Advantages of Proposed System

1. System is able to distinguish the simulated drowsy and an sleepy states from the normal state of driving on the low resolution images of the faces and eyes observed from an oblique viewing angle.
2. Effectively monitors the bus driver's attention level without the extra requirement for a cameras.
3. The System approach could extend the capability and applicability of the existing vision-based techniques for the driver fatigue detection.

V. SYSTEM ARCHITECTURE

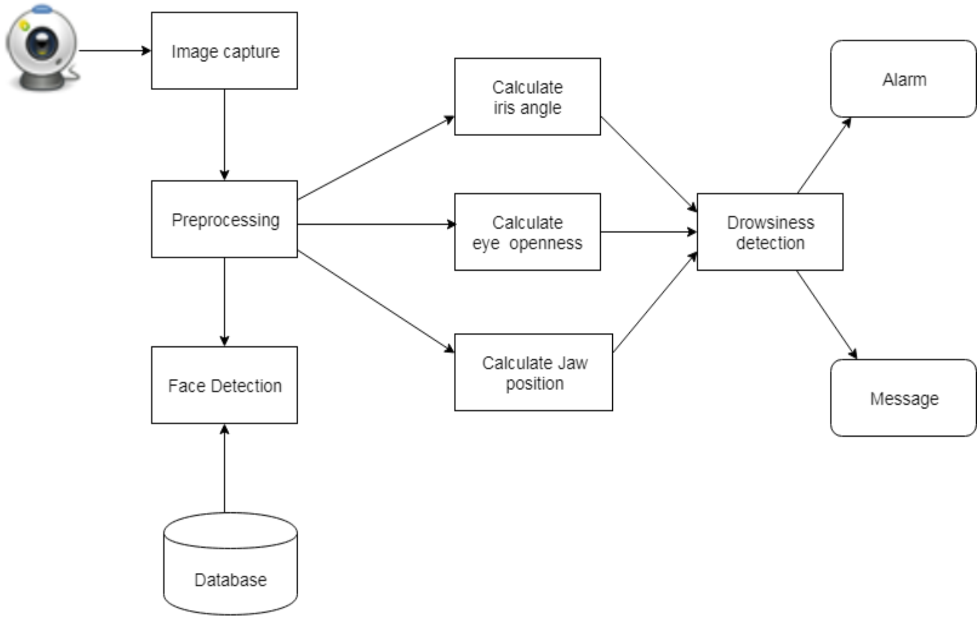

Figure 1. Proposed System Architecture

VI. CONCLUSION

A vision-based method and an system towards bus driver fatigue detection using existing dome cameras in the buses. Approach starts with the detection of head-shoulders of the figure in the image, followed by the face and the eye detections and eye openness estimation. Hence, system might be able to effectively monitor the bus driver's attention level without an extra requirement other than cameras.

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