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Image Processing For Driver's Safety

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Abstract: ***Driver in-alertness is an important cause for most accident related to the vehicles crashes. Driver fatigue resulting from sleep deprivation or sleep disorders is an important factor in the increasing number of the accidents on today's roads. Drowsy driver warning system can form the basis of the system to possibly reduce the accidents related to driver's drowsiness. The purpose of such a system is to perform detection of driver fatigue. By placing the camera inside the car, we can monitor the face of the driver and look for the eye-movements which indicate that the driver is no longer in condition to driver is no longer in condition to drive. This System describes how to find and track the eyes. We also describe a method that can determine if the eyes are open or closed. The main criterion of this system is that it must be highly non-intrusive Nor should the driver be responsible for providing any feedback to the system..***

Keywords: ***Preventive traffic safety, AHS, image processing sensor, Accident reduction***

I. INTRODUCTION

These are one of the foundational techniques of image analysis. The idea of analysing image structure separately at every scale and orientation originated from a number of sources: measurements of the physiology of mammalian visual systems, principled reasoning about the statistics and coding of visual information Gabor`s, DOGs, and jets), harmonic analysis (wavelets),and signal processing (multi rate filtering).Such representations have proven e effective for visual processing tasks such as de noising ,image enhancement, texture analysis ,stereoscopic correspondence ,motion ,attention , boundary detection and recognition[9]. It has become clear that such representations are best at extracting visual in-formation when they are over complete, i.e., when one over samples scale, orientation and other kernel properties. This was suggested by the architecture of the primate visual system,where striate cortical cells (roughly equivalent to a wavelet expansion of an image) outnumber retinal ganglion cells (a representation close to image pixels) by a factor ranging from 102 to 103. Empirical studies in computer vision provide increasing evidence in favor of over complete representations. Most likely the robustness of these representations with respect to changes in viewpoint, lighting, and image deformations is a contributing factor to their superior performance. Driver drowsiness detection is a car safety technology which prevents accidents when the driver is getting drowsy. Various studies have suggested that around 20 percent of all road accidents are fatigue-related. Driver fatigue is a significant factor in a large number of vehicle accidents. Recent statistics estimate that annually 1,200 deaths and 76,000 injuries can be attributed to fatigue related crashes. The development of technologies for detecting or preventing drowsiness at the wheel is a major challenge in the field of accident avoidance systems.

Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its causes. Driver inattention might be the result of a lack of alertness when driving due to driver drowsiness and distraction. Driver distraction occurs when an object or event draws a person`s attention away from the driving task.

Unlike driver distraction, driver drowsiness involves no triggering event but, in-stead, is characterized by a progressive withdrawal of attention from the road and traffic demands. Both driver drowsiness and distraction, however, might have the same effects, i.e., decreased driving performance, longer reaction time, and an increased risk of crash involvement [1].

II. LITERATURE REVIEW

Review of image processing based driver drowsiness detection General architecture for drowsiness detection using vision based image processing techniques. First of all in these techniques they captured video by putting camera in vehicle and get images from video frames.

From these video frames, one can use face detection algorithms to detect face of driver. After that eyes detection algorithms is used to detect eyes.

1] A Real Time Embedded System Application For Driver Drowsiness and Alcoholic Intoxication Detection
Author: Dwipjoy Sarkar and Atanu Choudhary

This paper outlines a novel approach for the real time detection of car driver drowsiness and alcoholic intoxication. There are large numbers of road accidents which takes place due to fatigue or alcohol drinking of driver. Computer vision and alcohol gas sensor application is combined to an embedded system to achieve this goal. The proposed system is realized with an open source 5 megapixel digital camera supported embedded system board Raspberry-pi loaded with Raspbian-OS, and Python-IDLE with Open-CV installed. The Raspberry-pi system board is serially interfaced with another open source embedded system board Arduino Uno with I2C protocol, which will perform some task like issuing the alarm notification and switching off the car power source to stop the car upon receiving the positive detection message from Raspberry-pi.

2] Hough Transform Method for Iris Recognition-A
Biometric Approach
Author: Prateek Verma, Maheedhar Dubey, Somak Basu, Praveen Verma

Iris recognition is most accurate and reliable biometric identification system available in the current scenario. Iris recognition system captures an image of an individual's eye, the iris in the image is then meant for segmentation and normalized for feature extraction process. The performance of iris recognition systems highly depends on the segmentation process. Segmentation is used for the localization of the correct iris region in an eye and it should be done accurately and correctly to remove the eyelids, eyelashes, reflection and pupil noises present in iris region. In our paper we are using Hough Transform segmentation method for Iris Recognition. Iris images are selected from the CASIA Database, then the iris and pupil boundary are detected from rest of the eye image, removing the noises. The segmented iris region was normalized to minimize the dimensional inconsistencies between iris regions by using Daugman's Rubber Sheet Model. Then for the features of the iris were encoded by convolving the normalized iris region with 1D Log-Gabor filters and phase quantizing the output in order to produce a bit-wise biometric template. The Hamming distance was chosen as a matching metric, which gave the measure of how many bits disagreed between the templates of the iris.

3] Detecting Pupil and Iris under Uncontrolled Illumination using Fixed-Hough Circle Transform
Author: Biswajit Sit , Md. Iqbal Quraishi

The Hough transform is a feature extraction method that can be used in image analysis and digital image processing. The aim of this technique is to produce a computer vision system that can detect arbitrary shapes within a sample image. The main purpose of this method is finding imperfect instances of objects within a certain class of shapes by a voting procedure. The classical Hough transform was mainly introduced for the identification of lines in images, but later the Hough transform has been modified and extended to identify the positions of arbitrary shapes within an image, most commonly the extended version indulged itself in finding circles or ellipses. In that case appropriate parametric representation is needed. Nowadays there are a wide range of areas where the Hough Transform can be implemented successfully such as in medical visualization or in order to achieve high accuracy in face recognition etc. The characteristics of Pupil and Iris under Uncontrolled illumination can also be obtained by Hough Circle Transform. In Objective Spinal Motion Imaging Assessment system(OSMIA), it is required to locate marker that can be used in determining the positions of the vertebral bodies.

4] Drowsy Driver Detection and Accident Prevention System using Bio-Medical Electronics
Author: Murugan Ezhumalai1, Venkat Subramanian2, Venkatraman Pitchaikannu

The traditional vehicle-based and vision based drowsy detection become apparent only after the driver starts to sleep, which is often too late to prevent an accident. In this proposed project a buzzer with low power consumption, is placed near the driver which would wake up the driver while he falls asleep while driving. The EEG-sensor senses the brain signals and also the eye blink of the driver using ADS1299, and the entire device is operated using an Op-amp TLV 2760. The EEG signal is converted to digital using ADS1299 Analog front end and the output is acquired using MSP430G2553. The speed of the car will be varied according to the EEG signals. If the car slows down the indication is displayed at the back of the car using a LED display. Thus a sensor able to detect the activities and components of brain is important for comprehensive care and analysis of body conditions. The Low cost embedded drowsy driver detection system determines the sensor result and if it is below or above the optimum value it will indicate by the buzzer and the LED indication at the back of the car will help others viewing the vehicle slowing down.

5] Driver Drowsiness Classification Using Fuzzy Wavelet-Packet-Based Feature-Extraction Algorithm
Author: Rami N. Khushaba, Sarath Kodagoda

Driver drowsiness and loss of vigilance are a major cause of road accidents. Monitoring physiological signals while driving provides the possibility of detecting and warning of drowsiness and fatigue. The aim of this paper is to maximize the amount of drowsiness-related information extracted from a set of electroencephalogram (EEG), electrooculogram (EOG), and electrocardiogram (ECG) signals during a simulation driving test. Specifically, we develop an efficient fuzzy mutual-information (MI)-based wavelet packet transform (FMIWPT) feature-extraction method for classifying the driver drowsiness state into one of predefined drowsiness levels. The proposed method estimates the required MI using a novel approach based on fuzzy memberships providing an accurate-information content-estimation measure. The quality of the extracted features was assessed on datasets collected from 31 drivers on a simulation test. The experimental results proved the significance of FMIWPT in extracting features that highly correlate with the different drowsiness levels achieving a classification accuracy of 95%-- 97% on an average across all subjects.

III. PROPOSED SYSTEM

The detailed block diagram of proposed system is shown in fig below, which consists of two tasks, first is driver's drowsiness detection and second is sign board detection. In driver`s drowsiness detection, the camera is mounted at car dash board. This camera is always

capturing the image of driver, subsequently image of face and then eyes. The eye blinking frequency is counted. If that frequency exceeds the threshold value(which is already set),then alarm is on. In object detection (sign board detection), the camera is mounted on external side of car where it can easily capture the images of sign board which are at the side of the roads. The images are saved in the system memory before so the system compare these data to the saved data and then with the help of sound signal it will give the information to the driver.

Modules

System uses following different Modules in the system:

1. Hardware Embedding
2. Face Detection
3. Eyes Detection
4. Iris Detection
5. Eye Blinking Detection.
6. Alert Generation

Face detection:

Face of the Driver is detected through front camera which is located at the front side of the drivers face by eliminating nearby noise. The human face poses even more problems than other objects since the human face is a dynamic object that comes in many forms and colors. However, facial detection and tracking provides many benefits. Facial recognition is not possible if the face is not isolated from the background.

The function of this module is to determine where in an image a face is located. The face detection module works by scanning up an image at different scales and looking for some simple patterns that denote the presence of a appears in the center and presented at a uniform size. Face detection determines where in an image a face is located. Fig.3.1 shows Haar like features are used for Face detection.

Eyes Detection

In Eyes Detection Determining one candidate pair from among the candidate pairs as nostrils, establishing the remained candidate pairs forming equi-lateral triangles in relation with the nostrils as eye candidate pairs; and determining a candidate pair forming the small equilateral triangle as the driver`s eyes.

Iris detection

The iris recognition system consists of an automatic segmentation system that is based on the Haar algorithm, and it is able to localize the circular iris and pupil region, occluding eyelids and eyelashes, and reflections. The extracted iris region was then normalized into a rectangular block with constant dimensions to account for imaging inconsistencies.

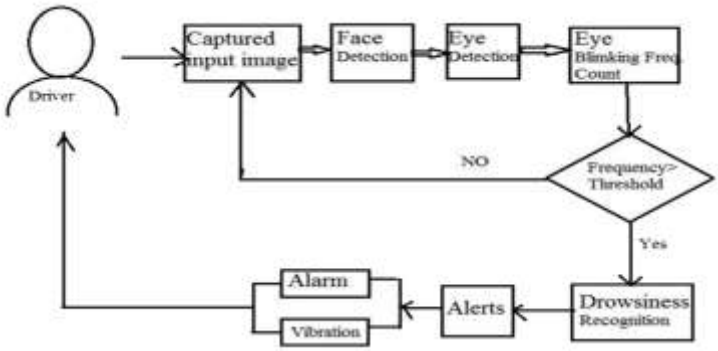

Figure-1 System Architecture

CONCLUSION

The aim of this dissertation is to detect the drowsiness for drivers using image processing. We are going to design a system using camera that points directly towards the driver's face and monitor the driver's eyes in order to detect fatigue or drowsiness by self-developed image processing algorithm which can give information regarding drowsiness of drivers. So the first step is the face detection.

For face detection viola-jones method is used. Viola-jones has been successfully applied on the facial detection system and based on the accuracy of human location detection. The second step is Feature Extraction like detect the eye portion which has been done by viola-jones algorithm.

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