A Review Paper on Monitoring Driver Distraction in Real Time using Computer Vision System

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***Abstract*—**Drivers with a fatigue condition have always become basic problem for many accidents. Driver supposes required to identify the object in front of the vehicle and need to understand the causes of accidents and trouble in vehicle control. Now a day with the increasing traffic conditions, possibility for accidents is increased in a large space because driver is unable to detect themselves the type of fatigue condition they are suffering while driving. So the reason we are going to develop the system which always monitors driver's to avoid accidents in real time. This paper describes dissimilar methods existing for detecting the crisis of driver vigilance and then with comparison of all also chooses best system out of those accessible. As of comparison with all existing methods we have implemented a device which always monitors driver vigilance in real-time using computer vision system which consist of main components as, Raspberry Pi which is specially designed for hardware platform, video camera, and the alarm system for alerting.

Keywords– Driver Monitoring classification; recognition; fatigue Condition; Raspberry pi; and image processing;

I. INTRODUCTION

According to the precious studies it is understood that driver's inattention is the major cause for many accidents. Reduction of accidents and improvements in public safety has become important goal of the research system. Considering safety instructions the analysis of driver responsiveness becomes current ground in investigation. In recent studies it is identified that driver's eyes has been most recently conducted as driver workload metrics. Because of the complexity and variations like intensity of light involved in it, the Gaze identification has been challenging from earlier times. Although gaze tracing process is applied in many risings chemes as well as in some final consumer yields, but yet gaze tracing technique didn't reach their target. In our existing system we use gaze wink device, here a person need to wear a goggles also provided motionless infrared sensor, though goggles used to detect tiredness. The gaze will get affected by transferring infrared sensor to the gaze, which is mostly MATLAB based eye monitoring. In order to investigate the bodily fluctuations like opening-closing of gaze distraction activity, this technique is used. Thus the computer vision system is well suited for real environment driving situation since it is non-intrusive technique to detect changesby using a video camera. Thus this method is effective because it continuously monitors the eyes of the driver anddetects the sleepy state of driver and gives a timely warning to alert the driver in case of insecure driving condition.

II. LITERATURE REVIEW

A. DriverGaze Zone Estimationusing BayesianFiltering and Gaussian Processes.

Malin Lundgren, Lars Hammarstrand, and Tomas McKelveay [1], this paper solves the gaze zone estimation problem based on three sets of information commonly provided by single-camera driver monitoring systems. These systems are both cheaper and easier to install, but cover a smaller range of head rotations, compared to multiple camera system.Here Bayesian approach provides a framework of the driver behavior as well as to describe the uncertainties in the produced estimates. To model the visual focus in absence of gaze observations, the proposed solutions incorporate probabilistic mappings describing the gaze direction based on the head rotation and the eye closure. Similar to, we find these mappings using Gaussian processes. For clarity, we emphasize that the aim of this paper is not to evaluate or to compare the two systems, but to evaluate the filtering methodology. The evaluation shows that the proposed methods provide significantly better gaze zone estimates compared to those found using unprocessed data [1].

B. Deep Head Pose: Gaze-DirectionEstimation in Multimodal Video.

Sankha S. Mukherje and Neil Martin Robertson [2], Here Author describes reason of road accidents. Distraction of driver on road represents an increasingly important contributor to accidents and crashes. Actual aim of this activity is to achieve unique signals from head positions called as, "Social Signal Processing". As human head position tracking always provides advantage where eye tracking becomes difficult.Due to difference of quality of input from two different systems like Visual surveillance and human computer tracking by

interference-applicable method can be used as per system requirement for head position tracking. Thisschemeis remains verystrongas well as has good speed of measure. Here facial expressions and closed gaze pose are considered to get exact output.But the problem of using human computer interface is sensor need to keep very close to the user rather than one or two meter away, hence problem of detecting face feature and head movement at a certain distance. Moreover, this case is not applicablefor inhousecommunicationsituations because theseissues are stationery.Therefore, purpose of the system is to work on moving things like bodily changes which are easy to detect the drowsiness but failed to get correct accuracy [2].

C. Driver Face Monitoring System for Fatigue and Distraction Detection

Here author highlight on detecting variation in human face expressions near eye and other face regions. It gives more importance to top half area of face thus giving hypo vigilance symptoms from face and eye, respectively. Any angular change for head position gives indication of distraction in system. It may use factors regarding eye like as how much % of eye closure,eyelid changes and eye closure. Eye closure and eyelid distance changes may indicate how much distraction for driver and warns prior to total distraction but eye closure detection symbolizes complete distraction. There are three main contributions in the introduced method: (1) Angular change in head position (2) Eye region monitoring (3) Analyzing extracted signals.

III. PROPOSED SYSTEM BLOCK DIAGRAM

The proposed system consists of following blocks explained here under.

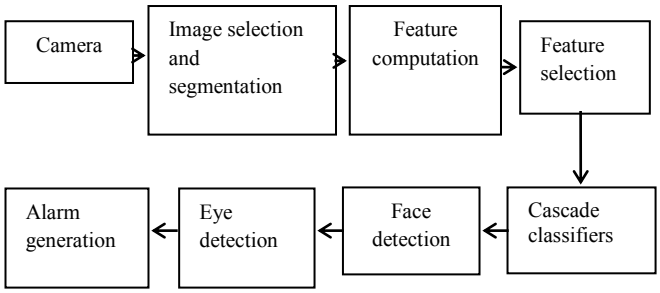
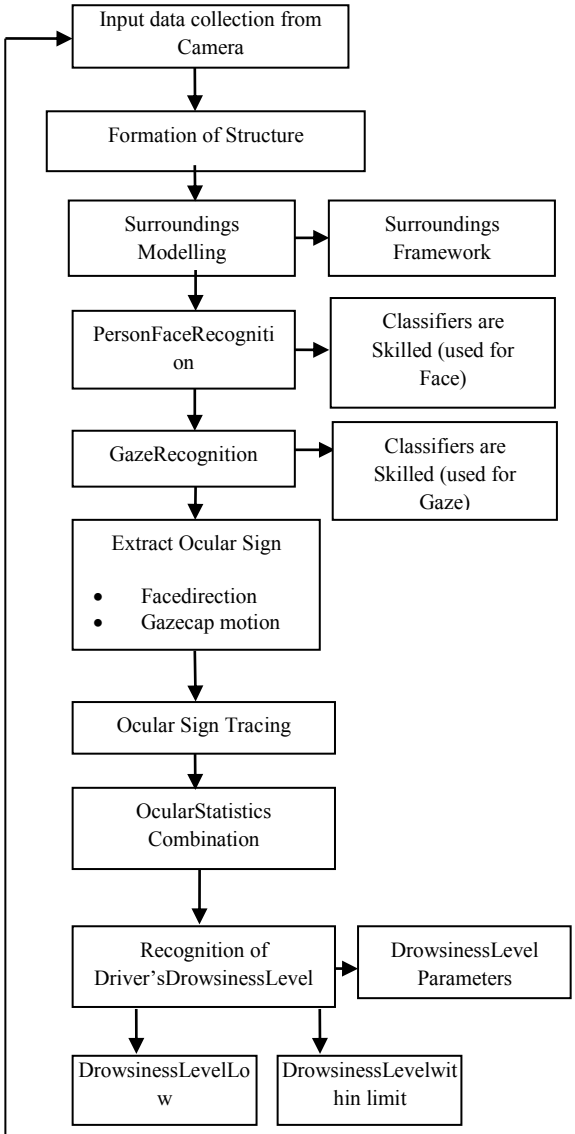


Fig.1.Block diagram of Proposed System Architecture

- **Image Acquisition**: Camera with arrays of infrared LED's is mounted in vehicle on dash board, which is used to capture continuous recording of the driver.
- **Recognition of Face:** Recognition of face is used to capture and display facade features. The proposed system uses Viola Jones algorithm for finding face feature.
- **Recognition of Gaze:** Primary intention is to recognize the eyes disturbance;thissystem usesHaar Classifier and based on eye detection system. Initially system matches these effects with regularform of eyes which is necessary for safe travelling.
- **Visual Indications Removal:** By usingfacadeandeyes coordinates some of theadditional visional signsare abstracted; for example closure of eyes, facadealignment as well as eye movement order.
- **Visual Indications tracing:**By detecting the state of driver, visional information can be detected, alsoactions, situations are extractedand tracked continuouslyfrom one frame toother frame.
- **Driver's Alertness Level Judgment:** Dependingon fatigue level of the driver, alarm is created alsoon the level of drowsiness scale; awareness of driver is resolved. For very low vigilance state of the driver Non-stopcheckingwill be ON.

IV. SOFTWAREFLOWCHARTILLUSTRATION



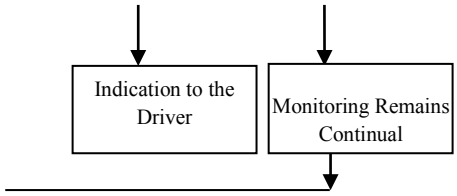


Fig.2.Proposed System Flow diagram

Fig.2 displaysproposed software flow mapof the system which is correlated to a driver'sbody changes like facadeand eye movement.In order to alert the driver in case of not secure environment an alarm is created in three waysthat is ocular, audible, and perception, so that driver can awake himself,by doing so many accidents be reduced. Many system uses, only alarm sound as an output but at this point providing ocular indication to alert the driver.

V. TYPES OF ALGORITHMS GENERALLY USED

- *Bayesian filtering, and Gaussian processer algorithm:* Bayesian filtering is acommonstructurefor identifying the drowsy state of the driver. The Kalman filters are moreregular Bayes filter. Mainmechanism of every Bayes filter is probabilistic calculation and investigation models.Gaussian processes are introducedfrom training data for learning models.
- *Convolution Neural Networks algorithm:* By using convolutionsystem, it is possible to calculate the system deepness and its correctness level which is applied in many image recognition systems. The keyinvolvement is to estimate the increasing depth of system withextremely small convolution filters i.e. (3x3) that indicateconsiderabledevelopment in the systems that supposed to be achieved by taking deepness ofweight layers.
- *Hyper spectral imaging algorithm:* This was more challenging due to background interference, it is used for both statistical and subspace models for the description of spectral variability.Finally, results which illustrate the performance of some detection algorithms using real hyperspectral imaging (HSI) data.

VI. ALGORITHM USED FOR SYSTEM IMPLEMENTATION

A. Viola Jones Face RecognitionApproach.

Paul Viola and Michael Jonesoffered a robust and dynamic system for recognition of face which is faster than othersystem and gives 95% accuracy. It hasthree key aspects:

a. "Haar-Like" characteristicdemonstration

b. "Integral image" for features calculation

c. AdaBoost learning algorithm for aggressive features selection.

a. "Haar-Like" feature representation:

Viola and Jones have used three kind of features are as follows

- The calculation of two-rectangle characteristic is the differentiationbetween the sums of the pixels within two rectangular regions. Theseareas have same dimension and character and have vertically or horizontallyclosest.
- A three-rectanglecharacteristic, computes sum of centre rectangle subtracted from the sum inside two outside rectangles.
- 3. A four-rectangle feature computes it finds the differentiationamongslanting pairsof rectangles.

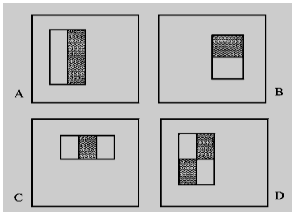


Fig.3.Example for Rectangle character: (A) and (B) illustrate 2-rectangle character, (C) illustrate 3-rectangle character, and (D) illustrate 4-rectangle character.

b. Integral Image:

An integral image is used to allowaproficientcalculation of rectangle character. The value of x and y is given with the sum of the pixels to the left and sum of the pixels from the above as shown in Fig 4.

$$P(x,y) = \sum_{x' \le x,\, y' \le y} p(x', y'). \quad \text{-------(1)}$$

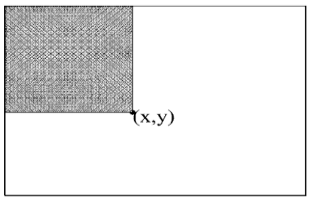


Fig.4.Integral Image

Cumulative count is given by row sum at each location of x and y.Eachfigure frame is divided in to 24x24 sub-windows, and scales is given for every sub window along with that features of windows are extracted at all feasible locations.

c. AdaBoost learning algorithm:

The complete set of features is quite large that is it has 160,000 characters in a solo sub-window. This method is used to improve results of classification of a learning algorithm. Here weak classifiers are combined with strong classifiers. The system starts with equal weights. In each round, the weight is updated so that the misclassified examples receive more weight. Difference among weak classifiers and character, Viola and Jones used AdaBoostfeature for destructivecollection of a littleamount of finecharacter, which for no reason have similarselection. It has advantage of speed of learning

VII. CONCLUSION

Viola John's algorithm is trending in technology due to its high accuracy as compare to other techniques, as it is used to detect drivers face motion, gaze movement and open/closure of eyes in order to detect drowsy condition and alert in case of insecure driving environment. In proposed system, continuously adaptive mean shift algorithm will be used for adjusting the size of face as person move away and closer to camera.

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