# A Review of Fatigue Monitoring System

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*Abstract:* This system is based on fatigue detection using smartphone. Drowsiness of the driver will be detected by this system when the driver is driving the vehicle. Alert will be generated when a reverie is detected by the system. To detect the reverie some parameter are consider such as yawning, eyes blinking and head shaking. The Harr-like technique is used for detecting face expression and eye's blinking. And for detecting yawning the Canny Active Contour method is used.

*Keywords*: Fatigue monitoring, Eye blinking, Yawning, Face tracking, Head Noding

## I. INTRODUCTION

Now-a-days a huge number of accident are happen and it result in deaths, injuries, etc. So the reason behind it is the reverie and fatigue of the driver. By monitoring the vigilance level and the fatigue the chances of the occurrence of accident can be prevented. We can monitor the drowsiness of the driver, fatigue of the driver and monitoring the traffic on the road by using various and different kind of the active safety system. And by using this active safety system we can give the alert to the driver or owner of the vehicle. The important facial point can be detected automatically by a statistically anthropometric face model which was introduce in year 2007. Many different techniques where used by many researches i.e physiological detection and detection using visual based who focuses on the behavioral measures of driver.

Accordingly to Optic nurve fatigue when the eye blinking is detected it state that the driver goes to the state of reverie. In year 2016 Adaboost algorithm was used for face detection.Fatigue is detected using the head shaking. But by observing head orientation system can detect fatigue and the distraction.Using the Gravity Center Template method a face can be detected. And by using Gabor Wavelets technique and Gray Protection technique the corner of the mouth is detected. Yawning can be detected using a technique known as LDA. S-FCM technique i.e Spatial Fuzzy C-means clustering is used for the detection of lip motion. One more algorithm is used for face detection known as Tracking algorithm. And Kalman Filter Motion Tracking algorithm can be used along with this algorithm for face detection. By using this algorithm color and the texture of the face skin can be detected. RGB, YCbCR , HSV and other values are used for the identifying color.

Table1: Summary of the face detection techniques

| Algorithm Or Method/Technique | Description |
|---|---|
| Fisherface Method | The difference between the ratio of variance of two person is considered. . |
| Geometric Base Face Detection Method | It is effective approach and easy to implement. |
| Neural network based face detection | In this technique of neural network based system small windows/piece of an image is examine and check whether each window contains a face. |
| Haar-like technique | In this focuse is on the RGB value of pixel of image. |
| Feature Base Face Detection | It uses low execution time and give accurate result. |
| Adaboost boosting algorithm | It uses two set i.e. training dataset and set of features these are the two inputs for algorithm. |
| Hidden Markov Models Method | In this facial expression and orientation in images and deals with it. |
| Eigenface Method | In this method difference between face images.. |

## II. RELATED WORK

### A. *A POINT OF ATTENTION AND DROWSINESS MONITORING SYSTEM FOR DRIVER VIGILANCE*

A system which represents a framework by combining the face having elliptical shape and features of face location to measure the fatigue and the drowsiness of driver which was introduced by Jorge Batista [1] in year 2007. Attention of head point and eyelid movements where two computational parameters used to get the solution from the system.Facial point can be detected automatically by the model statistically anthropometric face model. Statistically anthropometric model deals with the biological area. Anthropometric model calculate the measures of the face. And it's the advantage of this paper. In this system the parameter of yawning is not considered, so the parameter used by this system does not have enough to detect the drowsiness of the driver or to detect the vigilance level of the driver. So this can be result in the disadvantage of this system.

### B. *DRIVER DROWSINESS MONITORING BASED ON YAWNING DETECTION*

In year 2011 ShervinShirmohammadi, ShabnamAbtahi and Behnoosh Hariri proposed a system [2] for detection of drowsiness of driver by monitoring it. The system uses many parameter such as face tracking yawning, eye movement, eye tiredness for detecting the drowsiness and fatigue id the driver. To prevent from road accident it is important to monitor the vigilance level of the driver. This can be done by using the existing system. Yawning, heavy eyes, feeling reacting slowly, blinking of eyes, motion of lips, daydreaming while driving over centre line, feeling impatient, sleepy face are some of the symptoms used for the detection of driver fatigue.Difference between two images of face region is purposed of detection. Gravity-Center template is used to measure the distance between the midpoint of chin and nostrils to detect

the yawning of the driver Grey projection and Gabor wavelets detect mouth corners. LDA can be used and applied to classify feature vectors to detect yawning. The mouth window can be extracted from the face region by spatial fuzzy c-means clustering in which the lips are tracked.The advance features in this system is that it can detect yawning which was the disadvantage of the previous system but the advantage of this system. So this system has overcome the disadvantage of the previous system.

## C. A METHOD OF DETECTING DRIVER DROWSINESS STATE BASED ON MULTI-FEATURES OF FACE

A system was proposed for face region detection by Lin Shen and Ping Wang [3] . The system gives high correct rate and because of this the Ada Boost algorithm used it in year 2012. Depending upon the geometric features the exact position of mouth and eyes of the driver this solution was found.For finding the driver is drowsy or not techniques like Percentage And Time that Mouth Is Open (PATMIO) and Percentage And Time that Eyelids Cover the Pupils (PATECP) along with these two techniques different new judging techniques and rule was also used. In this system the detection of driver's reverie state or drowsiness is more accurate because it based on the features of mouth as well as eyes.In this paper work's with state tracking, formatting region location, facial reverie state. It uses the AdaBoost algorithm.The advantage of this system is it high accuracy and the system works without the influence of light.

## D. AN EFFICIENT SYSTEM TO IDENTIFY USER ATTENTIVENESS BASED ON FATIGUE DETECTION

In year 2014 Sameer Jain, Syed Imran Ali, Dr.Prashant Singh proposed a system [4] which was known as user alertness identification system. System uses a web camera for monitoring and continuously capturing images of the driver. To monitor and focus on the behaviour of the eyes and lip an efficient image processing techniques are used. The first thing is to do is that capture a image which called as RGB image and convert RGB image into gray image. The gray image is converted into blur image by dilation and erosion techniques. The edge of the blur image can be found out by the Sobel edge detection filter algorithm. The image is separated into two section i.e the first section is image of eyes and the second section is of mouth. The first section i.e the eye image is again divided into two parts right eye part and left eye part. The alert is generated by the system only if the drowsiness or capture or detected in this image.The advanrage of this system is that it works efficiently, also it is light weight and it requires less CPU execution time. A system was proposed by Ismail Shaykha, Ahmad Menkara, Michel Nahas, MiladGhantous [5]. Non-Intrusive Facial Expression and Emotional Recognition are consider for monitoring Driver's vigilance. System uses an integrated camera with on-board processor. The system uses face features such as mouth and eyes for detection of driver vigilance and it quickly analyzed.

Adaboost boosting algorithm is used for the facial detectionand after this the various features are extracted such as eye analysis and mouth analysis is done. Based on the analysis result the decision is taken. The system can distinguish between normal eye blinking and beginning of sleepiness and complete sleep thisis the main advantage of this system. It requires an integrated camera this is the disadvantage of this system.
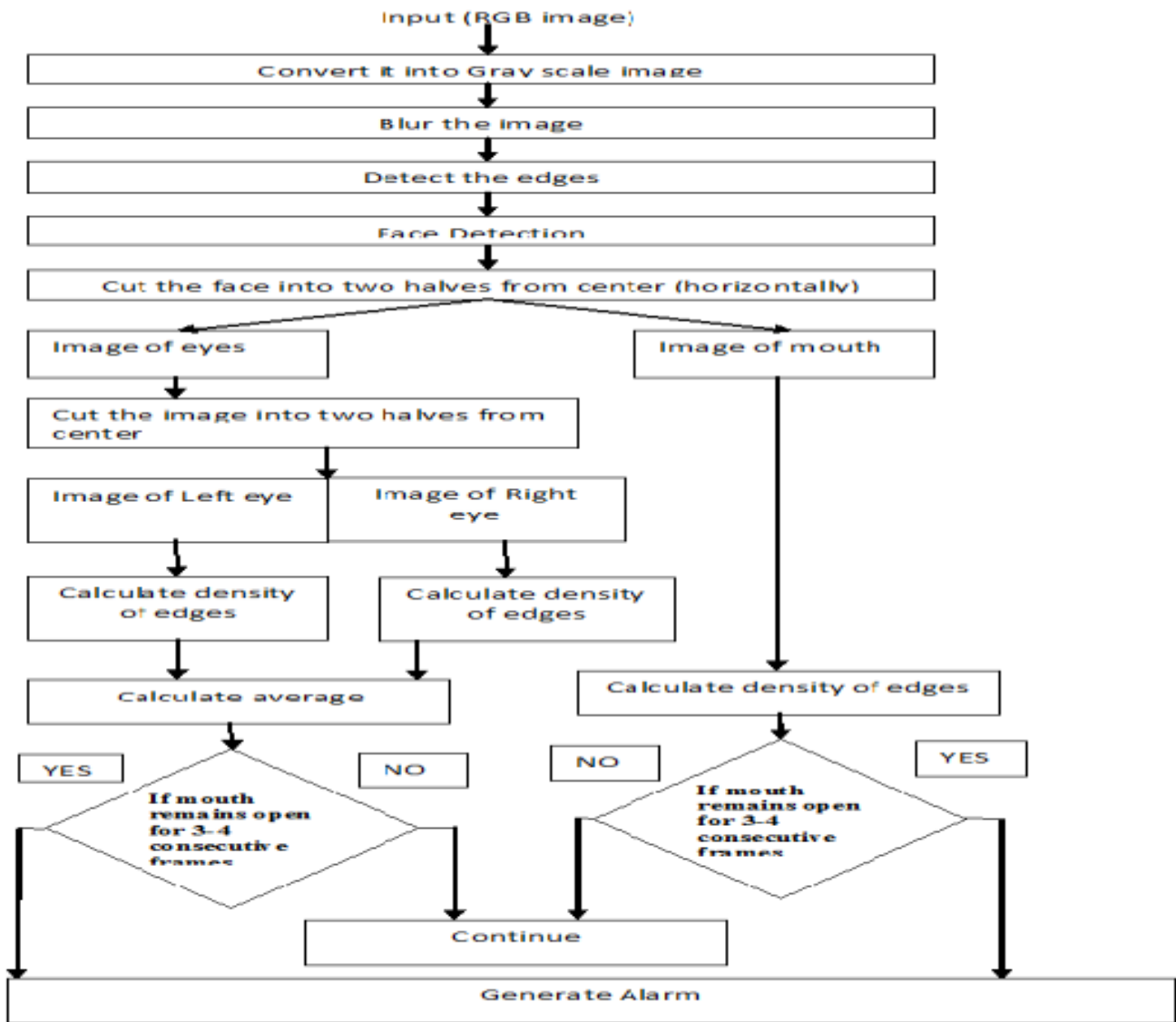
Fig 1. Flowchart of the system

### E.FEER – Driver's vigilance monitoring

A system was proposed by Ismail Shaykha, Ahmad Menkara, Michel Nahas, MiladGhantous [5]. Non-Intrusive Facial Expression and Emotional Recognition  are consider for monitoring Driver's vigilance. System uses an integrated camera with on-board processor. The system uses face features such as mouth and eyes for detection of driver vigilance and it quickly analyzed. Adaboost boosting algorithm is used for the facial detectionand after this  the various features are extracted such as eye analysis and mouth analysis is done. Based on the analysis result the decision is taken. The system can distinguish between normal eye blinking and beginning of sleepiness and complete sleep thisis the main advantage of this system. It requires an integrated camera this is the  disadvantage of this system.

### E. A SMARTPHONE-BASED DRIVER FATIGUE DETECTION USING FUSION OF MULTIPLE REAL-TIME FACIAL FEATURES

A fatigue monitoring system was proposed by Xiaoyu Yin, Kai Zeng, LinaXu and YantaoQiao. System is implemented and designed in smartphone which focuses on fusion of information. The parameter

used to indicate drowsiness of the driver are yawning, eye blinking and head shaking. Harr-like technique is used for eyes blinks and face detection.

The system uses a smartphone for detection of drowsiness of driver and it does not require any other equipment's such as camera so this is the main advantage of this system.

### III.COMPARISON :

There are many methods for detection of drowsiness. But each method is different from each other because each method uses different tools and techniques. Table1: Summary of the face detection techniques shows various algorithm and technique used for drowsiness detection.

The face and eye blinking is detected using Harr-like technique. Canny Active Contour method is used for mouth yawning detection. To detect the reverie of driver various facial features is considered and captured using this techniques.The system does not require any other equipment's such as camera this is main advantage of this system.

### IV.CONCLUSION :

For driver fatigue detectionwe have surveyed few techniques. To detect the fatigue of driver and prevent from accidents some algorithm uses single facial feature is used. From above mentioned approaches the last approach is having addition features to detect fatigue of driver. In these approach we use various facial festure such as yawning, eye blinking, head shaking and face detection to detect the fatigue of driver. This approach is advantageous because it uses the feature of head shaking to detect the drowsiness. It is based on the smart phone so there is no need of using any other equipment such as camera.

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