Design hybrid approach for real time eye gazing with hardware interface

Singh Binita Sumant[1], Ravi Krishna Pandey[2]

[1] Student, Dept. of Computer Engineering, Gujarat Technological University PG School, Gujarat, India
[2] Asst. Prof, Dept. of Computer Science, Laxmi Institute of Technology, Gujarat, India

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Abstract - *Many accidents in the industry and on the road occur because of the drowsiness of machine operators or drivers and it results into loss of lives and economy. These factors can be reduced if the drowsy operators and eye gazing or drivers can be identified. This research is conducted for the identification of driver's drowsiness and fatigue using image processing base real time observe and monitor drivers eye gazing drowsiness and fatigues using camera with matlab algorithm with work on real time environment. And also add alert and sms facilities for car owner and person who sitting in car. Using hardware board (ARDUINO MEGA2560) with matlab and if drivers gazing or drowsiness detect than sms send to car owner and alert generated for person who is sitting in car.*

Key Words: Drowsy detection, eye gazing, Arduino board, Hardware, GSM Modem, alert system

1. INTRODUCTION

Image processing is the process in which image is analyzed and manipulation is done to get the improved quality of image. Input for image processing can be image or video. Mathematical operations are performed on this input and processing is done to get the result. A result of an image processing may be either an image or it can also be a parameter of the input. This parameter may be used for analysis purpose, which will be used for analyzing [3].

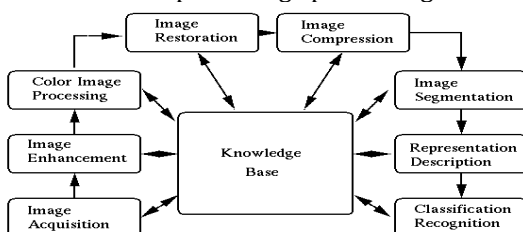There are the few steps in image processing.

Fig 1- Basic steps in digital image processing

1.1 MOTIVATION

Nowadays many of the road and site accidents taking place. According to national highway data administrator's database, around 100,000 accidents occurring every year on road due to drowsy condition of driver. When the driver is in fatigue condition, driving ability of driver, behavior and decision are affected. At this stage, risk of accident increases such as car crash that may cause injury, car damage or even death. Sleepy driver fails to take decision prior to collision. Accident takes place especially during night because street lights are reflecting into driver's eyes and sometimes are also OFF. During this situation if the driver fails to change the brightness level of the light when another car comes from the opposite side, accidents take place. It is caused due to the opposite driver to miss the judgments and gives rise to accident. Accidents are also caused due to the invaders coming suddenly in either side of the vehicle due to which the driver miss the judgments and meets with an accident. Major cause of car accident is drowsy driver. Drowsiness of driver may be because of night shift, alone travelling for long distance or can be because of some medical impairment. Inadequate driver may also cause accident. Inadequate condition of driver will include alcoholic condition. In order to prevent this accident, high technology should be used to build the system.

Some recent work proposed different techniques but most of them have some or the other limitation. So proposed technique try to increase capacity of the system by reducing rate of accident taking place because of drowsy condition and also developing alert system.

1.2 PAPER ORGANIZATION

This paper laid out 5 topics. It is followed by the references. Topic1 introduces the concept of image processing. The motivations for the research project identify gaps and the need for research in the chosen area. Topic 2 presents various methods used for drowsy detection. It also provides an extensive review and discussion of current literature within the topic area in order to build theoretical knowledge for the dissertation. Comparative studies of various techniques that are previously used for drowsy detection along with their limitation are discussed. Also extensive review of existing system is also presented. Topic 3 presents problem statement and design of proposed work. Also algorithm for same is also presented. Topic 4 provides overview about the tool used for implementation of proposed method and also specifies the language used for it.

Topic 5 is the conclusion section that summarizes the entire research project.

2. LITERATURE REVIEW

From the survey, we have come to the conclusion that drowsy detection can be done on the basis of three technology, they are as follows
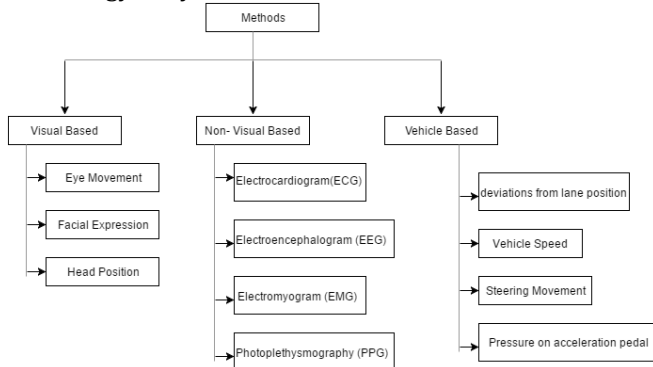

Fig 2- Technique used in drowsy detection

Technology used for visual based detection is image processing. Visual Drowsy detection is done on basis of the eye detection, head position, yawning and facial expression. There are many methods for eye detection.

a. Eye detection: It can be done in the basis of texture, shape, combination of texture and shape, blinking rate of eye, color based, EOG signals, Infrared oculography, Image Based, Haar like features, etc.

b. Facial Expression: There are basically three methods for face detection. They are feature based, template based and appearance based.

c. Non-Visual Based Drowsy Detection:

In physiological method, heart rate, pulse rate, brain rate, etc are calculated. Non-visual detection can detect in a very initial state of the drowsy condition.

d. Vehicle Based Detection:

Driver behavior will include vehicle speed, lane observation, steering, pressure on acceleration pedal, car seat, acceleration, brake and gear change. Different types of sensors are placed on a vehicle.

e. Research Gap:

For Non-visual based technology, these methods show good detection accuracy, they also depend on peripheral measuring equipment that must be attached to the driver's body.

For vehicle based technology, accuracy depends on the individual characteristics of the vehicle and its driver.

Methods based on visual features detect drowsiness using information obtained from a camera, and thus neither depend upon vehicle or driver characteristics nor require intrusive measuring equipment. As such, visual feature-based methods have emerged as the preferred avenue for research.

3. PROPOSED SOLUTING
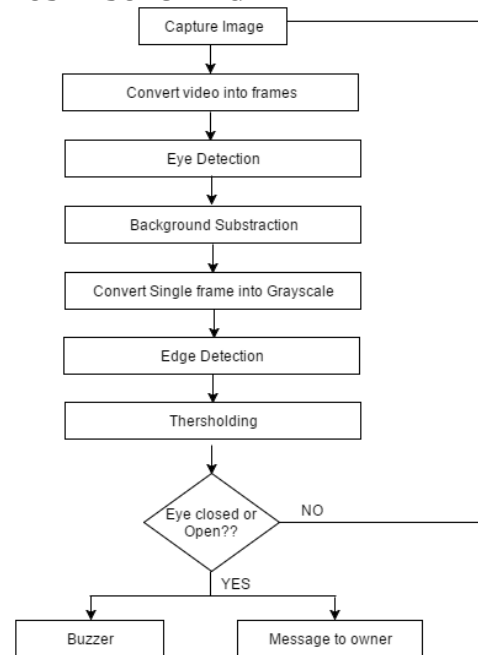
Step 1: Real time picture of the driver or workers will be captured using camera, which will be converted into frames of video

Step 2: Human eyes will be detected using Viola Johns algorithm and features point will be detected using Principle Component Analysis.

Step 3: Feature level fusion of left and right eye is done.

Step 4: Image captured from camera may also include noise, which is supposed to be removed. Background subtraction is done using Morphological Operation

Step 5: Single frame will be converted into gray scale.

Step 6: Threshold value of image will be captured using mathematical approach OTSU.

Step 7: On the basis of ECD and PERCLOS parameters, Support Vector Machine classifier will find whether the eye of driver is closed or not.

Step 8: If eyes are closed then alarm will be generated in car and alert message will be sent to the owner of the car or machine. If the eyes are found open then driver is attentive and so the image processing will be continued.
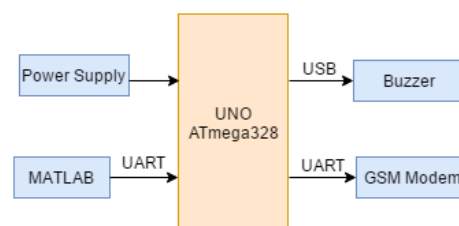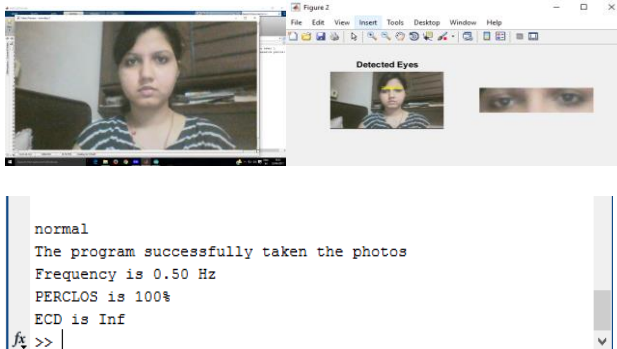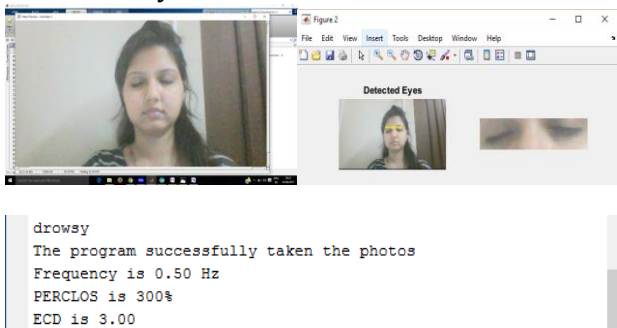

Fig 3- Block Diagram of Proposed method

4. IMPLEMENTATION

a. For Normal state detection

b. For drowsy state detection

c. Hardware Interfacing

If system will find driver's eye drowsy than hardware board will be called

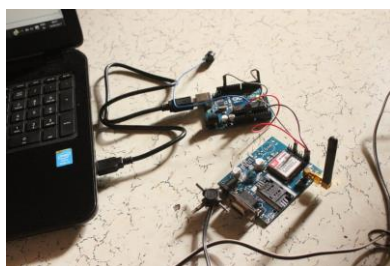GSM will send alert SMS to owner and Buzzer will generate alarm in car

Fig 4- hardware interface

5. EXPERIMENTAL RESULT

we had collected data from 10 different drivers and had got result according to the state of driver. From the result, we have analyzed that our system gives 93% result accurate and 8% is false alarm.

TABLE 2- result analysis

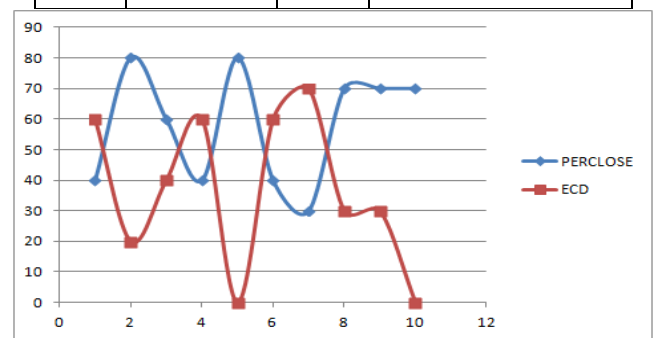| No.	PERCLOSE	ECD	DROWSY/NORMAL
1	40	60	Normal
2	80	20	Drowsy
3	60	40	Drowsy
4	40	60	Normal
5	80	0	Error
6	40	60	Normal
7	30	70	Normal
8	70	30	Drowsy
9	70	30	Drowsy
10	70	0	Error

Fig 5- ECD and PERCLOSE result

6. CONCLUSION

- Integrating different technique in a single system will give efficient result than all proposed system

- Security of car accident and machine accident will be increased

- Owners of the car and machine will get alert message, which will help them to make decision

- This proposed system will help to reduce the road accident during day as well as night.

7. FUTURE WORK

- Will add more feature for detecting drowsy condition, other than image processing

- Will use Raspberry pi Hardware for interfacing

- Implement in real world

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