DRIVER DROWSINESS DETECTION SYSTEM

Harini priya K[1], Nisha M[2], Maheswari M[3], Roselin Mary S[4]

1. Student, Computer science and engineering, Anand Institute of Higher Technology, Chennai, India.
2. Student, Computer Science and Engineering, Anand Institute of Higher Technology, Chennai, India.
3. Assistant Professor, Computer Science and Engineering, Anand Institute of Higher Technology, Chennai, India.
4. Professor, Computer Science and Engineering, Anand Institute of Higher Technology, Chennai, India.

ABSTRACT

Now a days driving accidents are a major cause of injuries and deaths on the road. A substantial portion of these are because of fatigue and drowsiness. Here we are using Artificial Intelligence for the detection of drowsiness. Artificial intelligence helps enhance our information of complex connections and describe them the usage of easy equations. Facial features recognition has many potential applications which have attracted the attention of researchers in the closing decade. Facial expressions are maximum commonly used for interpretation of human emotion. There are 4 forms of typically the usage of machine: Face detection,extraction, type and recognition. In existing system a Pi camera is used to capture the images of the driver's eye and the entire system is incorporated using Raspberry-Pi. Even though Raspberry Pi can perform different tasks, there are some limitations due to its hardware, Emotion recognition system got affected because of rotation of facial images. In this proposed taking the large scale image, hybrid extraction feature and Haarcascade algorithm to classification of frame based expression recognition try to detect facial expression detection and emotion detection for authentication of website application.

Keywords: *Driver Drowsiness, Fatigue, Haar Cascade, CNN, Emotions, Face detection, Artificial Intelligence (AI).*

1.INTRODUCTION

Human emotions are natural expressions that people tend to make naturally, instead of any conscious effort that is accompanied by the reflexing of facial muscles. Some of the common emotions are happy, sad, surprised, anger and stable (normal) which a human face can make according to the different situations one may find itself in. We present the software which detects and recognizes faces as well as tells a lot more about that person which could be used to get feedback from customers or to know if a person needs motivation. Artificial Intelligence & Digital image processing technology used to make the system in python. These expressions can be derived from the live feed via system's camera or any pre-existing image available in the memory. Emotions possessed by humans can be recognized and has a vast scope of study in the computer vision industry upon which several researches have already been done.

The work has been implemented using Python, Open Source Computer Vision Library (OpenCV) and NumPy. The scanned image (testing dataset) is being compared to training dataset and thus emotion is predicted. The objective of this paper is to develop a system which can analyze the image and predict the expression of the person. The study proves that this procedure is workable and produces valid results. The main reason for designing a real time system which monitors the state of the driver's eyes is related to a decrease in car crashes that will benefit millions of people around the world. This work proposes a method to detect and to monitor the eyes of the driver, more precisely it analyses the eyes and check if they are closed or open. The number of frames in which eyes are closed is determined. When this number of frames is above a certain threshold, the driver will get a alert.

One of the critical problems prevailing in India is the deaths caused by road accidents. Almost 80% of the accidents are caused by the inattentiveness of the driver. Usage of mobile phones, turning the head while driving are some of the reasons due to which driver may lose attention. Distractions are of numerous types, out of which we focus on the manual distraction which is based on the posture of the driver. In this paper, we propose a system where we make use of Haar cacsde algorithm techniques. We have used the first publicly available dataset as input for our model. Our aim is to categorize a test image into one of the nine distinct distracted states of the driver that we have considered. Conclusively, the experimental analysis has shown that applying Haar cascade techniques, the proposed model gives better results.

2. RELATED WORKS

System continuously scans the eyelid movements of the driver and once drowsiness is detected the device automatically alerts him using a random-typed alarm. It automatically forwards the report to the vehicle owner from the web application through internet access[1]. The estimation of driver's vigilance is successfully made by combining facial and eye symptoms using fuzzy logic controller. Experimental result using fuzzy-logic simulation in Matlab show the performance of the developed approach in term of robustness and reliability[2]. The steering behavior under the fatigue state is analyzed, followed by the determination of the temporal detection window, and then, the data series of the steering wheel angular velocity in the temporal detection window is selected as the detection feature[3]. The first idea is creating the dataset of drowsiness facial expression because it can predict drowsiness and fatigue. Second idea is to combine visual, non-visual, and vehicular features into one for better detection. And last one is developing wearable hardwares such as smartwatch for drowsiness detection which are easy to use and user friendly[4]. Detects the driver's face in the image and estimates the landmarks in the face region. In order to detect the face, the proposed algorithm uses an AdaBoost classifier based on the Modified Census Transform features. And the proposed algorithm uses regressing Local Binary Features for face landmark detection. Eye states (closed, open) is determined by the value of Eye Aspect Ratio which is easily calculated by the landmarks in eye region[5]. The respiratory signal, which has been obtained using an inductive plethysmography belt, has been processed in real time in order to classify the driver's state of alertness as drowsy or awake. The proposed algorithm is based on the analysis of the respiratory rate variability (RRV) in order to detect the fight against to fall asleep[6]. The system uses Histogram Oriented Gradient (HOG) feature descriptor for face detection and facial points recognition. Then SVM is used to check whether detected object is face or non-face. It further monitors the Eye Aspect Ratio (EAR) and Mouth Aspect Ratio (MAR) of the driver up to a fixed number of frames to check the sleepiness and yawning[7]. It will take the processing of images through a camera which will focus on the driver. In that, it is going to analyze the changes that happen in the face and then will be processed through a program in order to detect drowsiness to send an alert to the driver[8]. The application, called “Driver Drowsiness Detection”, runs on an Android hand held and wearable. The purpose of this application is to alert drivers so that they can be cautioned to pull over and stop driving in a drowsy state[9]. The drowsiness detection is done based on the conditions like Black to White pixels ratio, number of pixels in the column greater than the threshold value and eye's shape. Light and position of the driver plays an important role. System can be set to self-learn at startup to setup threshold values[10].

3.EXISTING SYSTEM

Existing system used the eye closure ratio as input parameter to detect the drowsiness of the driver.Then Noise and rotation invariant facial expression recognition which is based of Statistical movement that is Zernike moments. Extracted feature form Zernike moments are given as input to Navie Bayesian classifier for emotion recognition. If the eye closure ratio deteriorates from the standard ratio, the driver is alerted with the help of a buzzer. For our system, a Pi camera is used to capture the images of the driver’s eye and the entire system is incorporated using Raspberry-Pi.

4. PROPOSED SYSTEM

This uses machine learning techniques to get a high degree of accuracy from what is called “training data”. Haar Cascades use the Adaboost learning algorithm which selects a small number of important features from a large set to give an efficient result of classifiers.

5. IMPLEMENTATION

The system is divided into four sections. Pre-processing is the first module, and it is the technique that is used to convert the raw data into a clean data set. The second module is Feature Extraction, which is the name for methods that select and /or combine variables into features, effectively reducing the amount of data that must be

processed, while still accurately and completely describing the original data set. The third module is Face Detection, this module is used to identify and locate the presence of human faces in digital photos and videos. The fourth module is Facial Emotion Recognition which is the technology that deals with methods and techniques to identify the emotions from the facial expression.

A. MODULE DESCRIPTION

Artificial intelligence helps to enhance our information of complex connections and describe them the usage of easy equations. Artificial intelligence can create software or devices which can solve real-world problems very easily and with accuracy. Their modules and its description below.

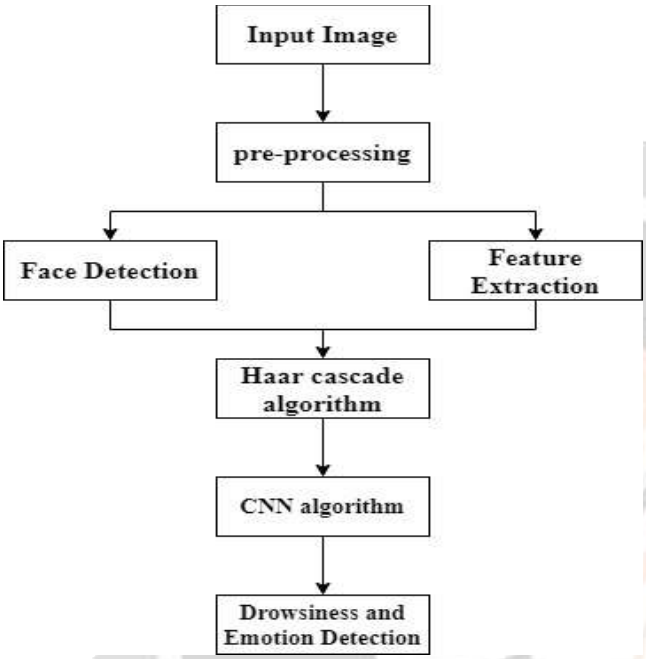

Fig 1 Architecture for driver drowsiness detection

B. PRE-PROCESSING

Preprocessing is a technique that is used to convert the raw data into a clean data set. In other words, whenever the data is gathered from different sources it is collected in raw format which is not feasible for the analysis. Preprocessing is a common name for operations with images at the lowest level of abstraction both input and output are intensity images. It is a very important step in the facial expression recognition task. The objective of the preprocessing phase is to take images which have normalized intensity, uniform size and shape, and represent only a face expressing certain emotion. The preprocessing procedure should also reduce the effects of illumination and lighting. Expression representation can be delicate to translation, scaling, and rotation of the head in a picture. To battle the effect of these pointless changes, the facial image may be geometrically institutionalized before classification.

Fig 2 Image Analyser

C. FEATURE EXTRACTION

Feature extraction is a process of dimensionality reduction by which an initial set of raw data is reduced to more manageable groups for processing. A characteristic of these large data sets is a large number of variables that require a lot of computing resources to process. Feature extraction is the name for methods that select and /or combine variables into features, effectively reducing the amount of data that must be processed, while still accurately and completely describing the original data set. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

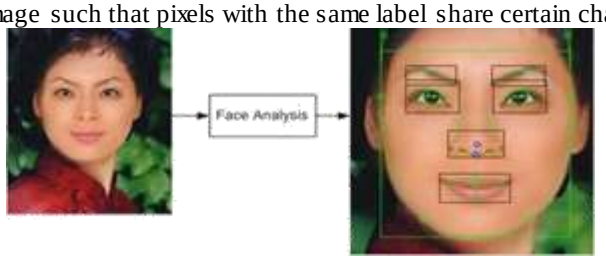

Fig 3 Feature Extraction

D. FACE DETECTION

Face Detection is a computer technology being used in a variety of applications that identifies human faces in digital images. In this face registration step, faces are first located in the image using some set of landmark points called "face localization" or "face Registration". These detected faces are then geometrically normalized to match some template image in a process called "face Detection". It is used to identify and locate the presence of human faces in digital photos and videos.

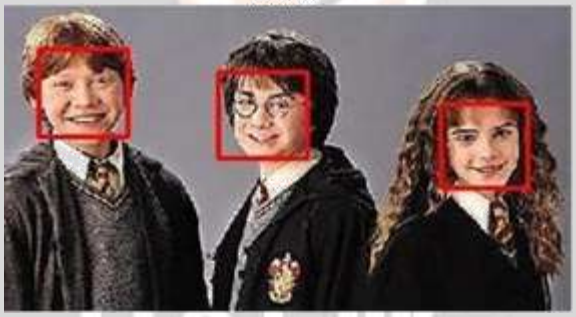

Fig 4 Face Detection

E. FACIAL EMOTION DETECTION

Facial Recognition is the technology that deals with methods and techniques to identify the emotions from the facial expression. It is a is research area which tries to identify the emotion from the human facial expression. The algorithm attempts to classify the given faces portraying one of the seven basic emotions.

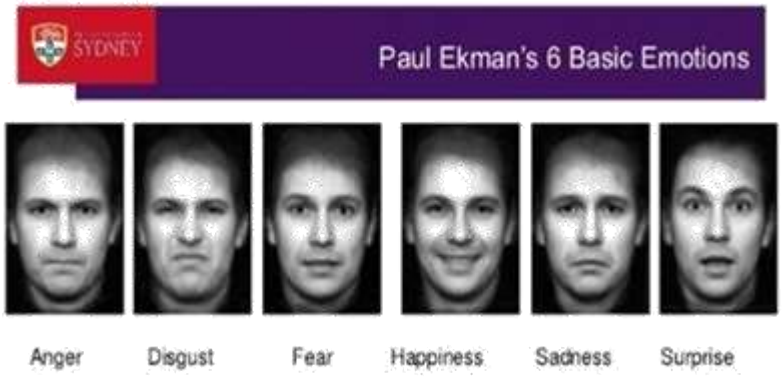

Fig 5 Emotion classification

6.RESULT AND DISCUSSION

The main purpose is to detect various emotions in a given sample image. The most challenging part in this task was to determine the exact emotion when two emotions look quite similar, for e.g. “Disgust” being classified as “Sadness”, “Surprise” like “Happy” and so on. Now for eight different categories, the result was approximately 70% accurate which is quite well actually as our classifier learned quite a bit. So, we must see how can we increase its efficiency and accuracy. If we look at our emotions list we can find out that we have only limited number of examples for “sad”, “fear” and “contempt”. By increasing the number of images for these emotions we can certainly increase optimization, or if we no longer consider these emotions in the list then optimization can be increased more than 85%.

A. RESULTS

The output presents itself as a probability for each emotion class.Therefore, the model is able to show the detail probability composition of the emotions in the face. As later on, you will see that it is not efficient to classify human facial expression as only a single emotion. Our expressions are usually much complex and contain a mix of emotions that could be used to accurately describe a particular expression. The resulting is a 5-class, balanced dataset, that contains angry, happy, sad, surprise, and neutral shown in the figures below.

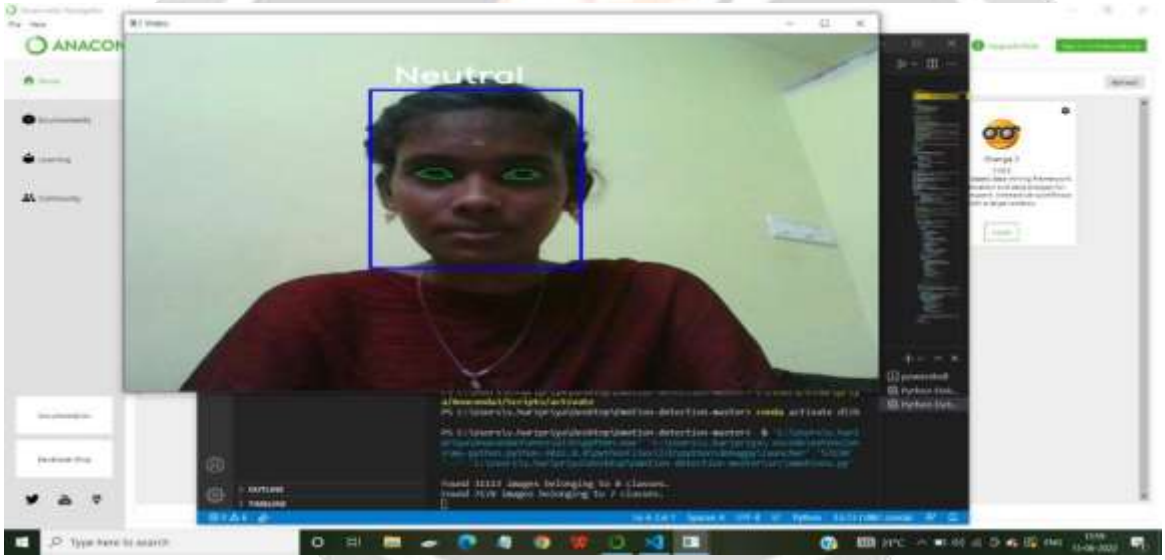

Fig 6 Neutral Facial Emotion Detection

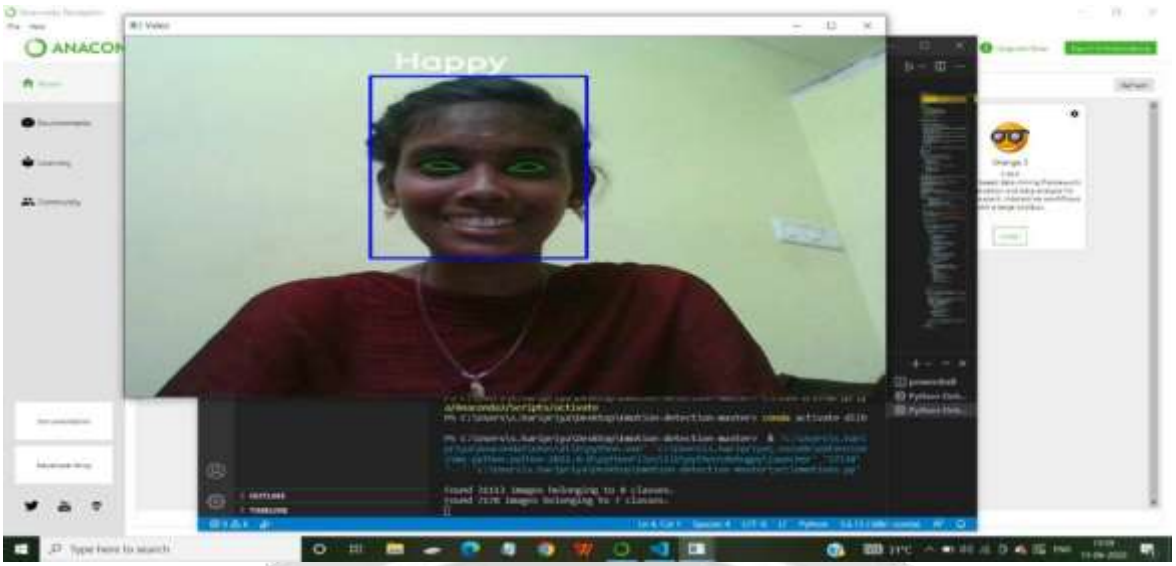

Fig 7 Happy Facial Emotion Detection

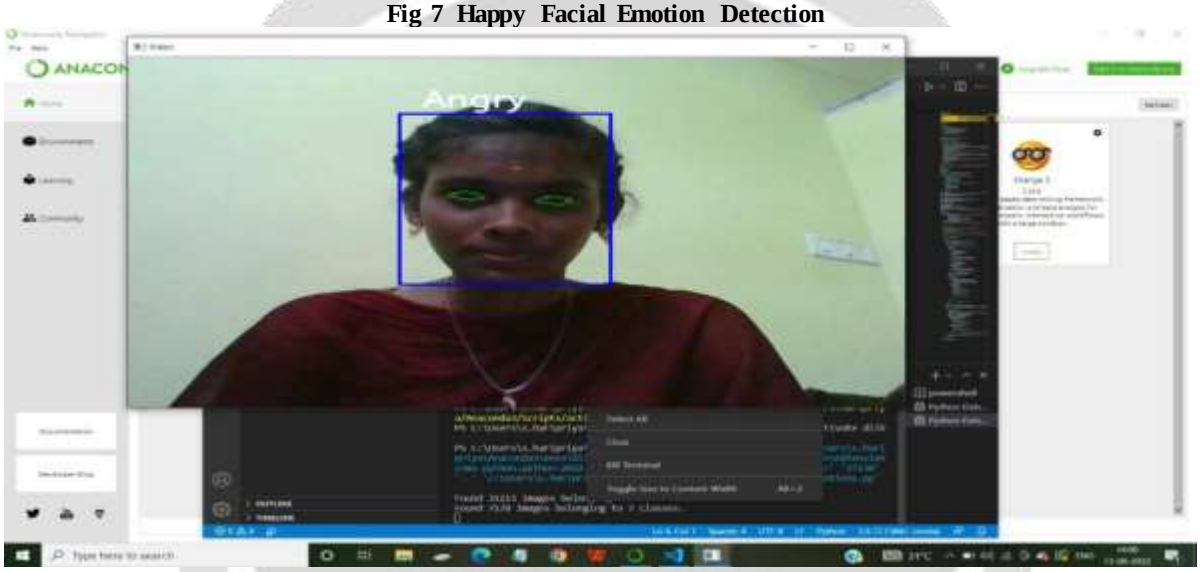

Fig 8 Angry Facial Emotion Detection

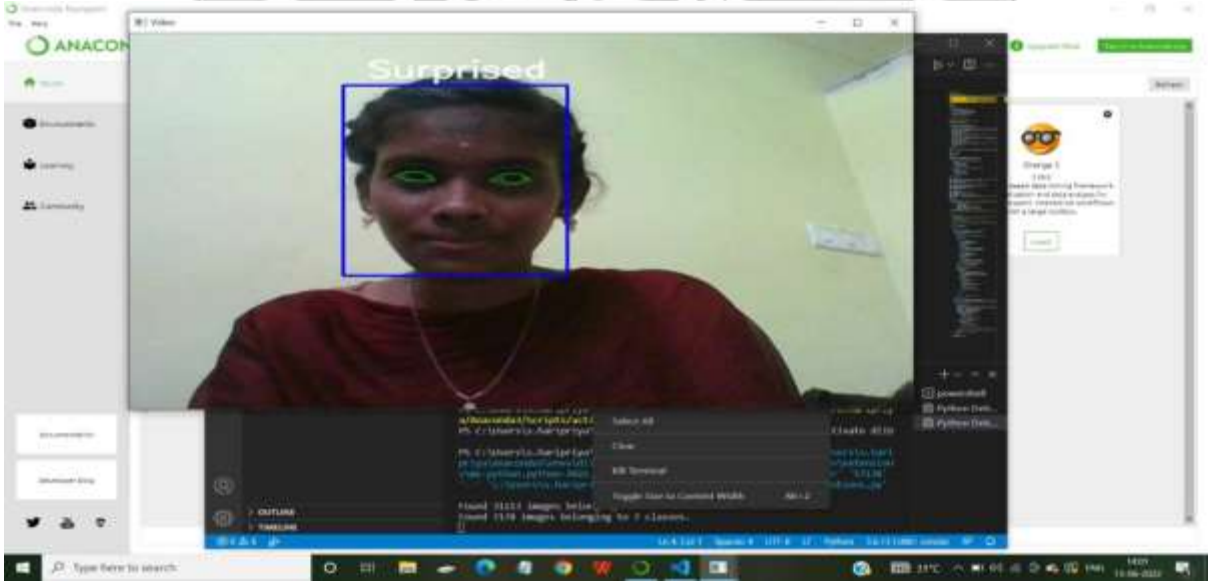

Fig 9 Surprised Facial Emotion Detection

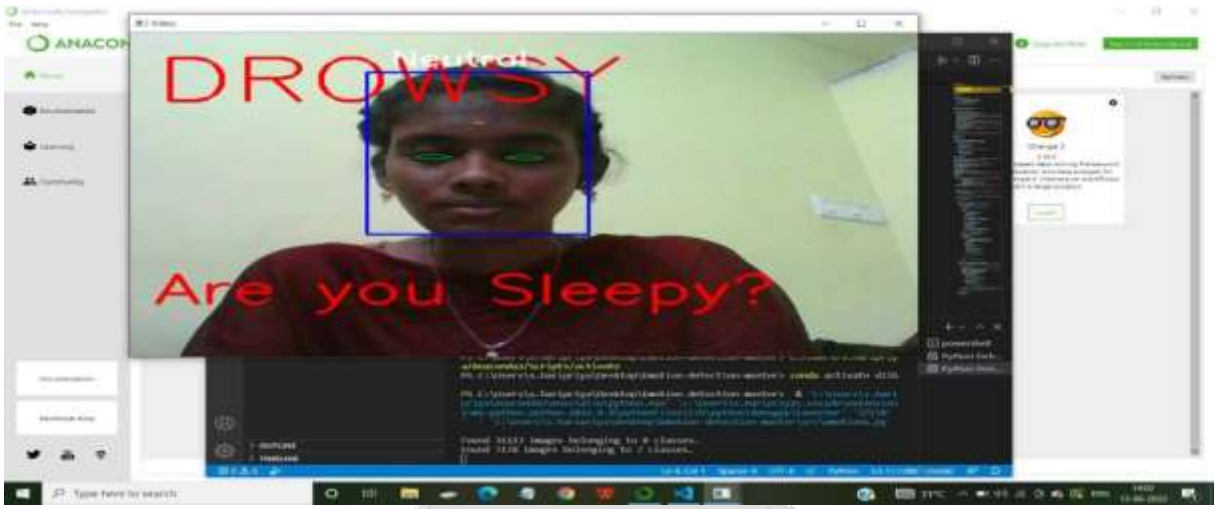

Fig 10 Drowsy Alert

7. CONCLUSION

The facial expression recognition system presented in this research work contributes a resilient face recognition model based on the mapping of behavioral characteristics with the physiological biometric characteristics. The physiological characteristics of the human face with relevance to various expressions such as happiness, sadness, fear, anger, surprise and disgust are associated with geometrical structures which restored as base matching template for the recognition system. The behavioral aspect of this system relates the attitude behind different expressions as property base.To detect the face expression, we have used Haar Casacaded Classifier technique which is based on Haar-like features.

8. REFERENCES

[1] Menchie Miranda , Alonica Villanueva , Mark Jomar Buo , Reynald Merabite , Sergio Paulo Perez , John Michael Rodriguez, "Portable Prevention and Monitoring of Driver's Drowsiness Focuses to Eyelid Movement Using Internet of Things", 2018 IEEE 10th International Conference on Humanoid, Nanotechnology, Information Technology,Communication and Control, Environment and Management (HNICEM)

[2] Karim Abbes , Chokri Abdelmoula , Mohamed Masmoudi,"A Fuzzy Based Method for Driver Drowsiness DetectionAuthors: Omar Rigane ", 2017 IEEE/ACS 14th International Conference on Computer Systems and Applications (AICCSA)

[3] Gao Zhenhai , Le DinhDat , Hu Hongyu , Yu Ziwen , Wu Xinyu, "Driver Drowsiness Detection Based on Time Series Analysis of Steering Wheel Angular Velocity" 2017 9th International Conference on Measuring Technology and Mechatronics Automation (ICMTMA)

[4] Bagus G. Pratama , Igi Ardiyanto , Teguh B. Adji, "A review on driver drowsiness based on image, bio-signal, and driver behavior", 2017 3rd International Conference on Science and Technology - Computer (ICST)

[5] Jang Woon Baek , Byung-Gil Han , Kwang-Ju Kim , Yun-Su Chung , Soo-In Lee, "Real-Time Drowsiness Detection Algorithm for Driver State Monitoring Systems" , 2018 Tenth International Conference on Ubiquitous and Future Networks (ICUFN)

[6] Federico Guede-Fernández , Mireya Fernández-Chimeno , Juan Ramos-Castro , Miguel A. García-González, "Driver Drowsiness Detection Based on Respiratory Signal Analysis" 2019 IEEE Access

[7] Isha Gupta , Novesh Garg , Apoorva Aggarwal , Nitin Nepalia , Bindu Verma, "Real-Time Driver's Drowsiness Monitoring Based on Dynamically Varying Threshold" 2018 Eleventh International Conference on Contemporary Computing (IC3)

[8] Melissa Yauri-Machaca , Brian Meneses-Claudio , Natalia Vargas-Cuentas , Avid Roman-Gonzalez, "Design of a Vehicle Driver Drowsiness Detection System Through Image Processing using Matlab", 2018 IEEE 38th Central America and Panama Convention (CONCAPAN XXXVIII)

[9] Aldila Riztiane ; David Habsara Hareva ; Dina Stefani ; Samuel Lukas, "Driver Drowsiness Detection Using Visual Information On Androi Device", 2017 International Conference on Soft Computing, Intelligent System and Information Technology (ICSIIT)

[10] Maninder Kahlon , Subramaniam Ganesan, "Driver Drowsiness Detection System Based on Binary Eyes Image Data", 2018 IEEE International Conference on Electro/Information Technology (EIT)