Project : Driver Drowsiness

Project Report

Driver Drowsiness and Emotion detection

Self-Declaration

I, Jenish Vaghela, The students of Information Technology Engineering Branch enrolled at Saffrony Institute of Technology, Mehsana here by certify and declare the following:

1. We have defined my/our project based on inputs at Saffrony Institute of Technology (users name/industry/any other user like faculty or any other organizations) and each of us will make significant efforts to make attempt to solve the challenges. We will attempt the project work at my college or at any location under the direct and consistent monitoring of Prof. Param Ahir (guides name/industry/user). We will adopt all ethical practices to share credit amongst all the contributors based on their contributions during the project work.

2. We have not purchased the solutions developed by any 3rd party directly and the efforts are made by we under the guidance of guides.

3. The project work is not copied from any previously done projects directly. (Same project can be done in different ways but if it has been done in same manner before then it may not be accepted)

4. We understand and accept that he above declaration if found to be untrue, it can result in punishment/cancellation of project definition to we including failure in the subject of project work.

Place: India Date: March, 2021

Acknowledgement

We would like to express our special thanks of gratitude to our teacher or guide Prof. Param Ahir Ma'am as well as our college S.P.B. Engg. Institute gave us the golden opportunity to do this wonderful project on the topic "Driver Drowsiness and Emotion Detection", which also helped us in doing a lot of Research and we came to know about so many new things we are really thankful to them.

Secondly we would also like to thank our parents and friends who helped us a lot in finalizing this project within the limited time frame.

Abstract

A system which installed a car on a phone which has access to a camera which detects the face of the driver and predicts the drowsiness of the driver via an algorithm we designed. This prediction results will be connected to a buzzer which plays whenever drowsiness State detects. We also plan to make an algorithm which detects the mood of the driver and plays songs accordingly. This system will reduce the number of accidents and make riding.

Key words: Real Time Face Detection, Machine Learning, Drowsiness Detction, Music Alert System

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Chapter- 1

Background Study

1.1 Definition:

Create a real-time driver drowsiness system to alert the driver about his/her drowsiness before an accident occurs. We came up with a system that can detect drowsiness more accurately using facial feature detection and emotion detection of drivers using neural networks and will create an emotion-based system to alert the driver.

1.2 History & Current Scenario:

Driver Drowsiness is a car safety Technology which helps prevent accidents caused by the driver getting drowsy.According to data , 1.3 billion people die each year on the road by injuries due to road accidents. Main reason of the accidents was the Driver Drowsiness.In 2009, US National Sleep Foundation (NSF) reported that 54 % drivers have driven car feeling drowsy and 28 % of them fell asleep.

In previous years the work done by some companies on this problem is given below.

- Volvo: Volvo Cars launched the world's first Driver Drowsiness Detection system, Driver Alert Control. With the help of car's movements and assesses system predict the behavior of the car whether the vehicle is under control or not. If the system detects a high risk of the driver being drowsy, the driver is alerted via an audible signal. Also, a text message or coffee cup symbol appears in the display.
- Audi: Audi invented a system for detecting driver drowsiness called Rest recommendation system
- BMW: BMW also invented a system that analyses behaviour of the driver and if necessary it advises the driver to take rest.
- Bosch: "Driver drowsiness detection" is invented for solving the problem of driver drowsiness which takes input from the steering angle sensor.
- Citroën: AFIL/LDWS system detects the position of your vehicle on the road, if you drift out of lane, it gives audible reminders and also Driver Attention Monitor

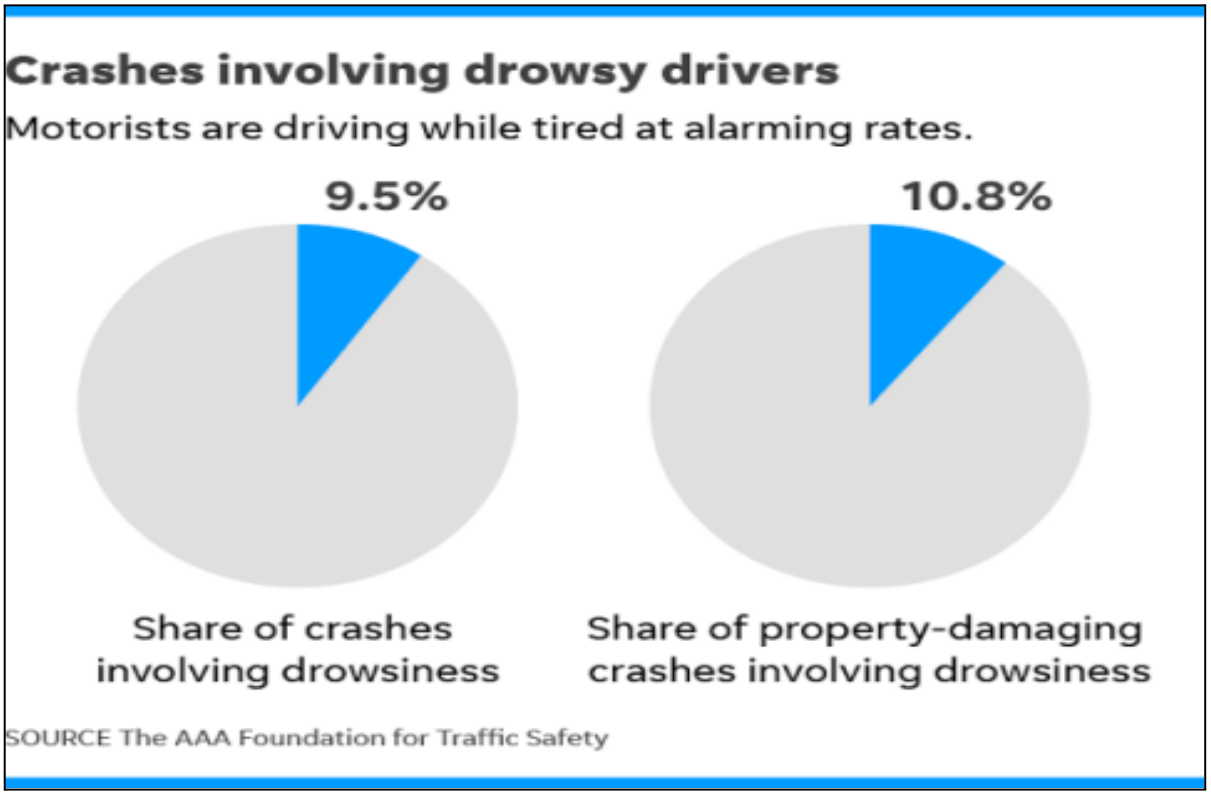
monitors the eyes for signs of drowsiness/tiredness, movements of face and head continuously.

- Jaguar Land Rover: Driver Condition Monitor and Driver Fatigue Alert, both determine the driver's movements and if the driver is fatigued, the message displays the warning take a break for a minute and if drivers continues the driving for next 15 minutes, it gives another warning.
- Mercedes-Benz: Attention Assist which monitors driver's drowsiness level. It warns drivers by audible alarm when it detects driver's drowsiness. It linked with the navigation system which is used to tell the driver where coffee or fuel is available.

3)Graphical and Statistical Data:-

- Indian National Highway Traffic Safety Administration estimates that in the india alone approximately 1.3 billion crashes each year are caused primarily by driver drowsiness and death rate is 25%

Figure (1)



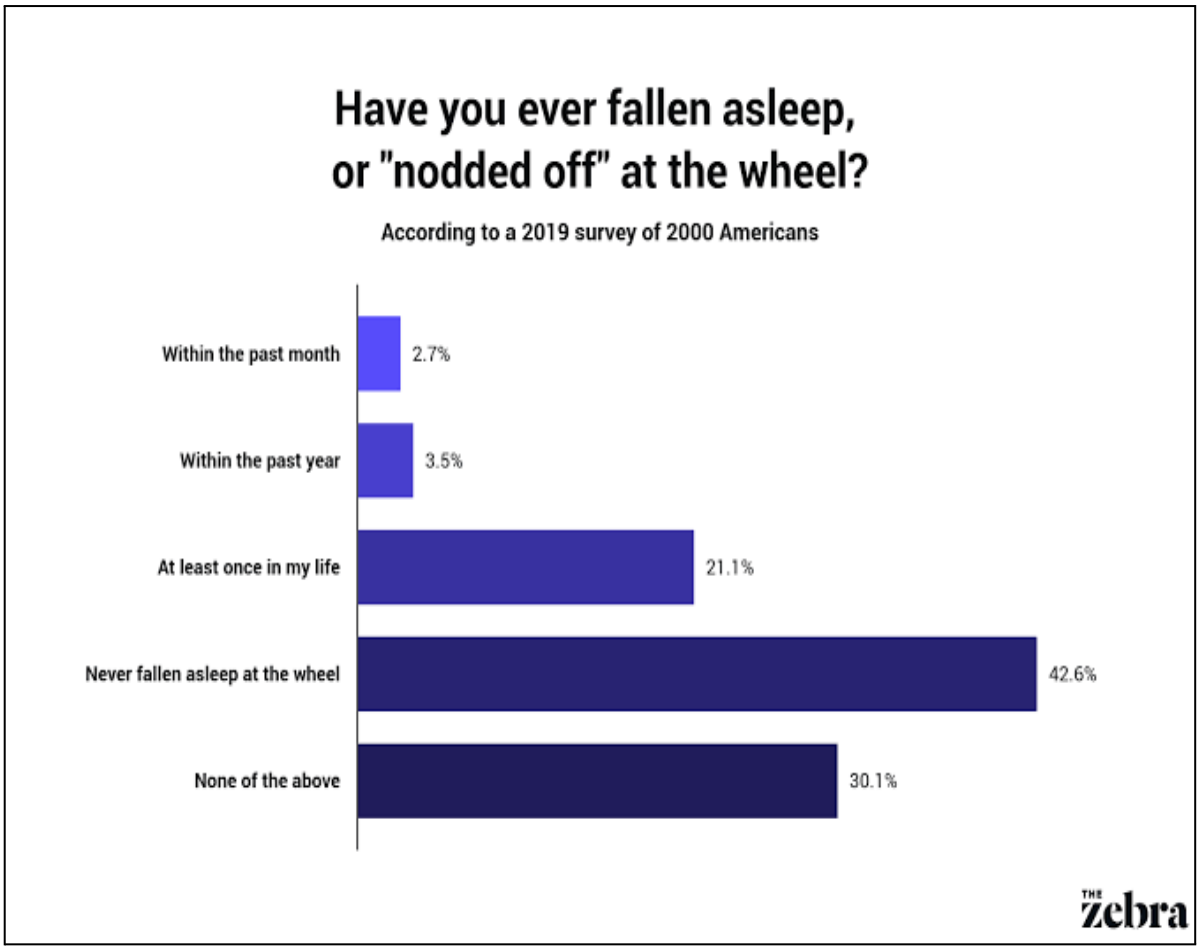
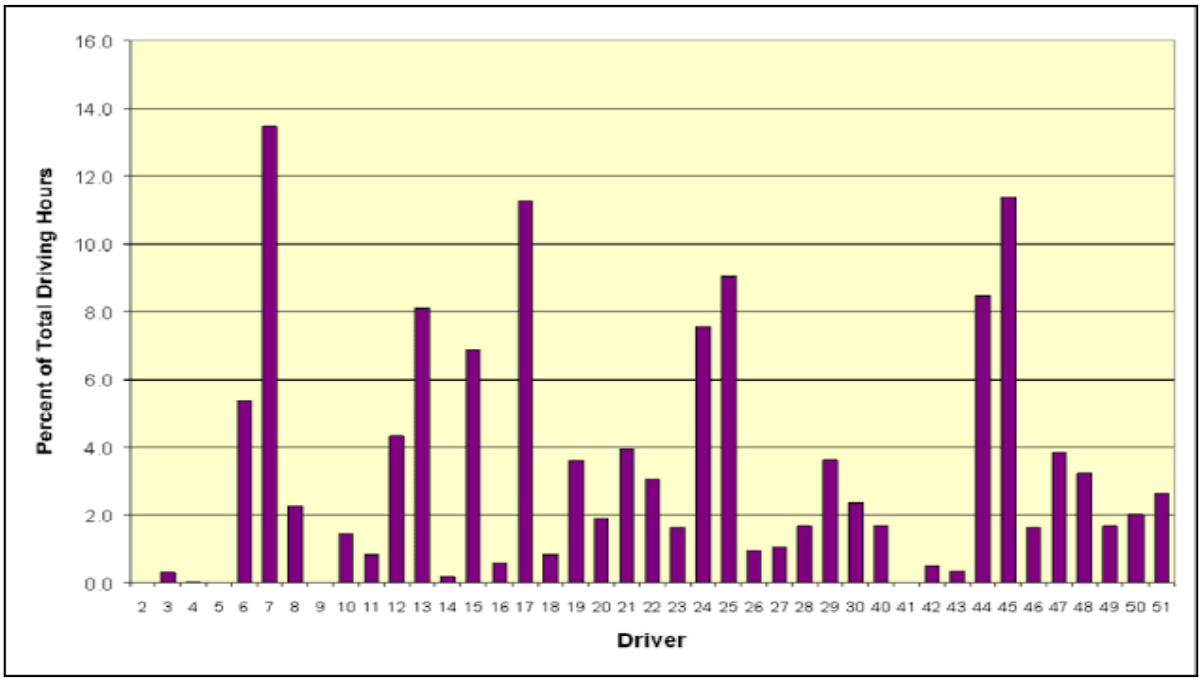


Figure (2)



Figure(3)

1.4 Problem Definition:

Create a real-time driver drowsiness system to alert the driver about his/her drowsiness before an accident occurs. We came up with a system that can detect drowsiness more accurately using facial feature detection and emotion detection of drivers using neural networks and will create an emotion-based system to alert the driver.

Chapter- 2

Face Data Capture

2.1 Objective:

To create an active face monitoring system that captures a face in real time using camera.

2.2 Methodology:

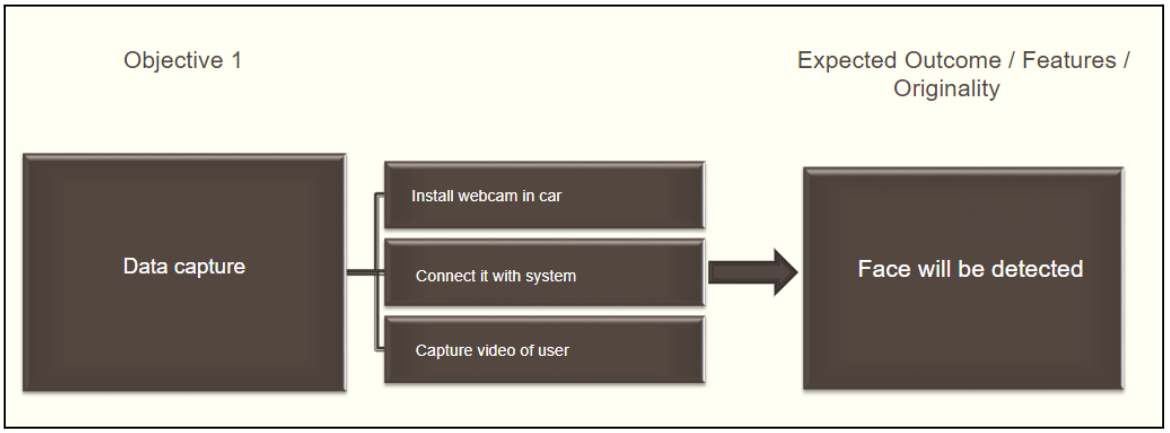


Fig.2.1 Objective-1_Methodology

Here the subject plays a video game on an open source platform and uses a steering wheel. To have a realistic feel in the Windows version of the game some effects were also put on, physical situations were created which used to drag cars left or right, artificial wind was created so the yang subject can feel fatigued and the chance of drowsiness increases. This type of manipulation had been found in the past to increase fatigue. Driving speed was held constant. Facial expressions were recorded during that time, so that the relation between sleep and mood can me derive. Six subjects performed the experimental task of driving over three hours during midnight. It is found that subjects, many a time fall asleep during this experiment resulting in their car meeting a crash. Episodes in which the car left the road (crash) were recorded.Video of the subject's face was recorded using a DV camera for the entire 3 hour session.

2.3 Tools and Technology:

- Affectiva

2.4 Verification & Validation:

Verification :- To set a diod beside the camera which change it's colour to red when camera is on and changed it's colour to green when a face is detected.

Validation:- User monitor the colour of diod whenever they drive the car and on the camera

2.5 System Modelling:

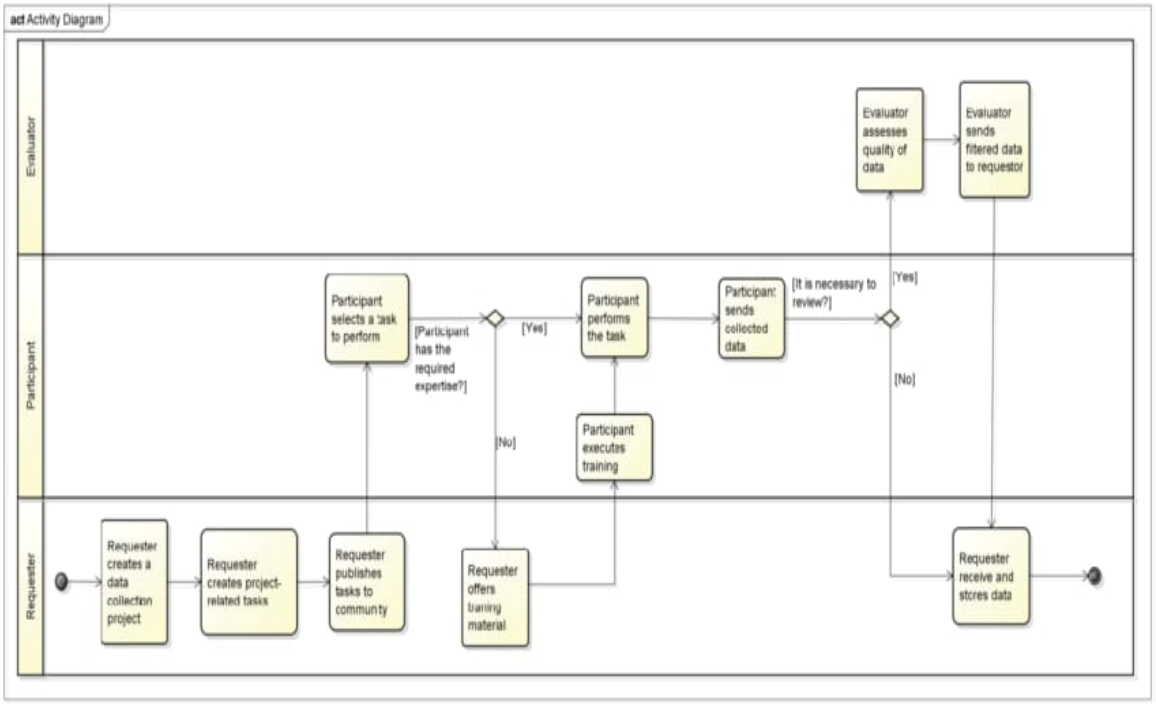


Fig. 2.2 Objective-1_Activity Diagram

Chapter 3

Feature Extraction

3.1 Objective:

To generate facial features from the real time data for driver drowsiness using Facial Action Coding System for face and eye movement detection.

3.2 Methodology:

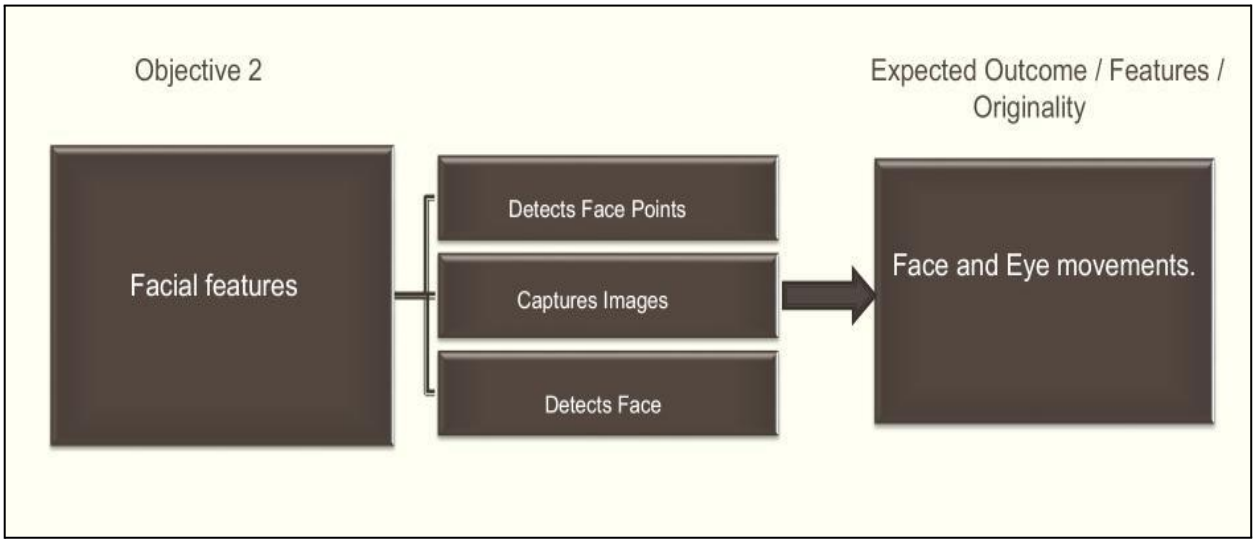


fig. 3.1 Objective – 2_ Methodology

3.3 Tools and Technology:

- Facial Action Coding System

3.4 Verification

Whatever data is detect via camera is stored in a particular folder so we can confirm that data is actively captured.

3.5 System Modelling:

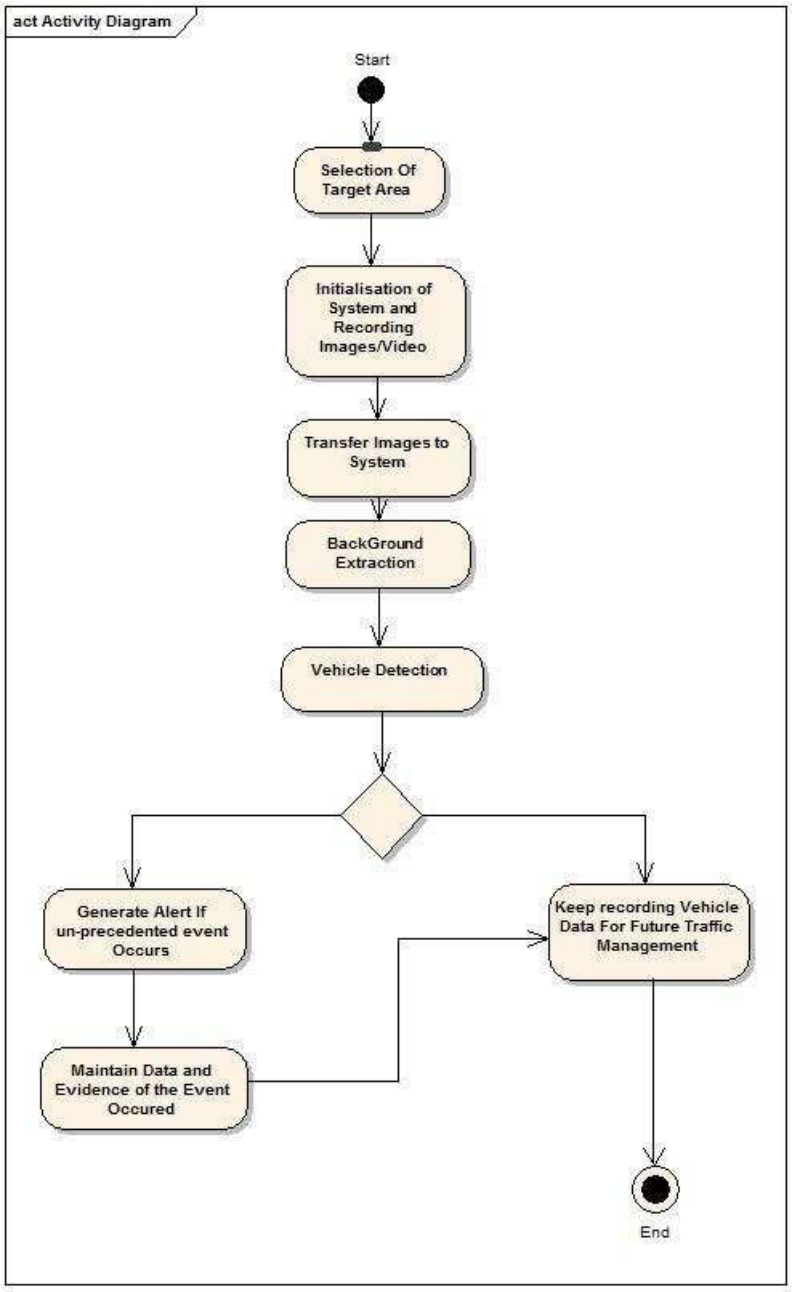


Fig. 3.2 Objective – 2_ Activity Diagram

Chapter 4

Model Training

4.1 Objective

To train a model for facial emotion recognition using facial action coding system for Emotion classifiaction on training data(hapiness, sadness, surprise, fear, anger, disgust and contempt).

4.2 Methodology

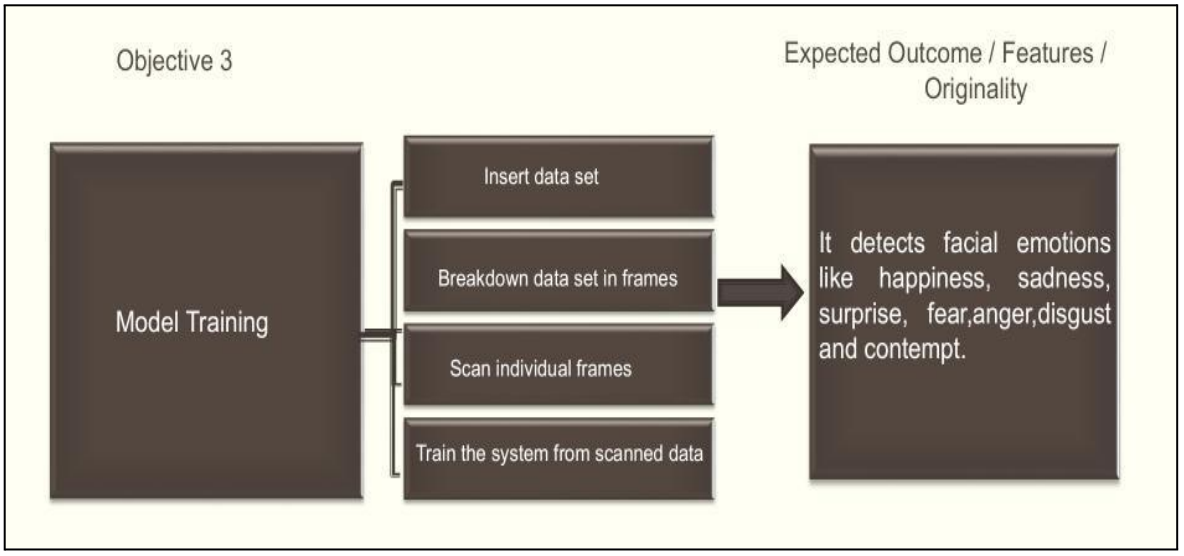


Fig. 4.1 Objective - 3_Methodology

The training data for the facial action classifiers came from two posed datasets and one dataset of spontaneous expressions. The facial expressions in each dataset were FACS coded by certified FACS coders. The first posed datasets was the Cohn-Kanade DFAT504 dataset. This dataset consists of 100 university students who were instructed by an experimenter to perform a series of 23 facial displays, including expressions of seven basic emotions.

AU Name

1	Inner Brow Raise

2	Outer Brow Raise
3	Brow Lowerer
4	Upper Lid Raise
5	Cheek Raise
6	Lids Tight
7	Lip Toward
8	Nose Wrinkle
9	Upper Lip Raiser
10	Nasolabial Furrow Deepener
11	Lip Corner Puller
12	Sharp Lip Puller
13	Dimpler
14	Lip Corner Depressor
15	Lower Lip Depress
16	Chin Raise
17	Lip Pucker
18	Tongue show
19	Lip Stretch
20	Lip Funneller
21	Lip Tightener
22	Lip Presser
23	Lips Part
24	Jaw Drop

25	Mouth Stretch
26	Lips Suck
27	Jaw Sideways
28	Bite
29	Nostril Dilate
30	Nostril Compress

The second posed dataset consisted of direct facial actions from 24 subjects collected by Ekman and Hager. Subjects were instructed by a FACS expert on the display of individual facial actions and action combinations, and they practiced with a mirror. The resulting video was verified for AU content by two certified FACS coders. The spontaneous expression dataset consisted of a set of 33 subjects collected by Mark Frank at Rutgers University.These subjects underwent an interview about political opinions on which they felt strongly. Two minutes of each subject were FACS coded. The total training set consisted of 6000 examples, 2000 from posed databases and 4000 from the spontaneous set.

4.3 Tools & Technology:

- Deep vision (for facial recognition software)
- Emotient

4.4 Verification

We'll used many tool and techniques for model train and even test is on google cloud ai for verification.

4.5 System Modelling:

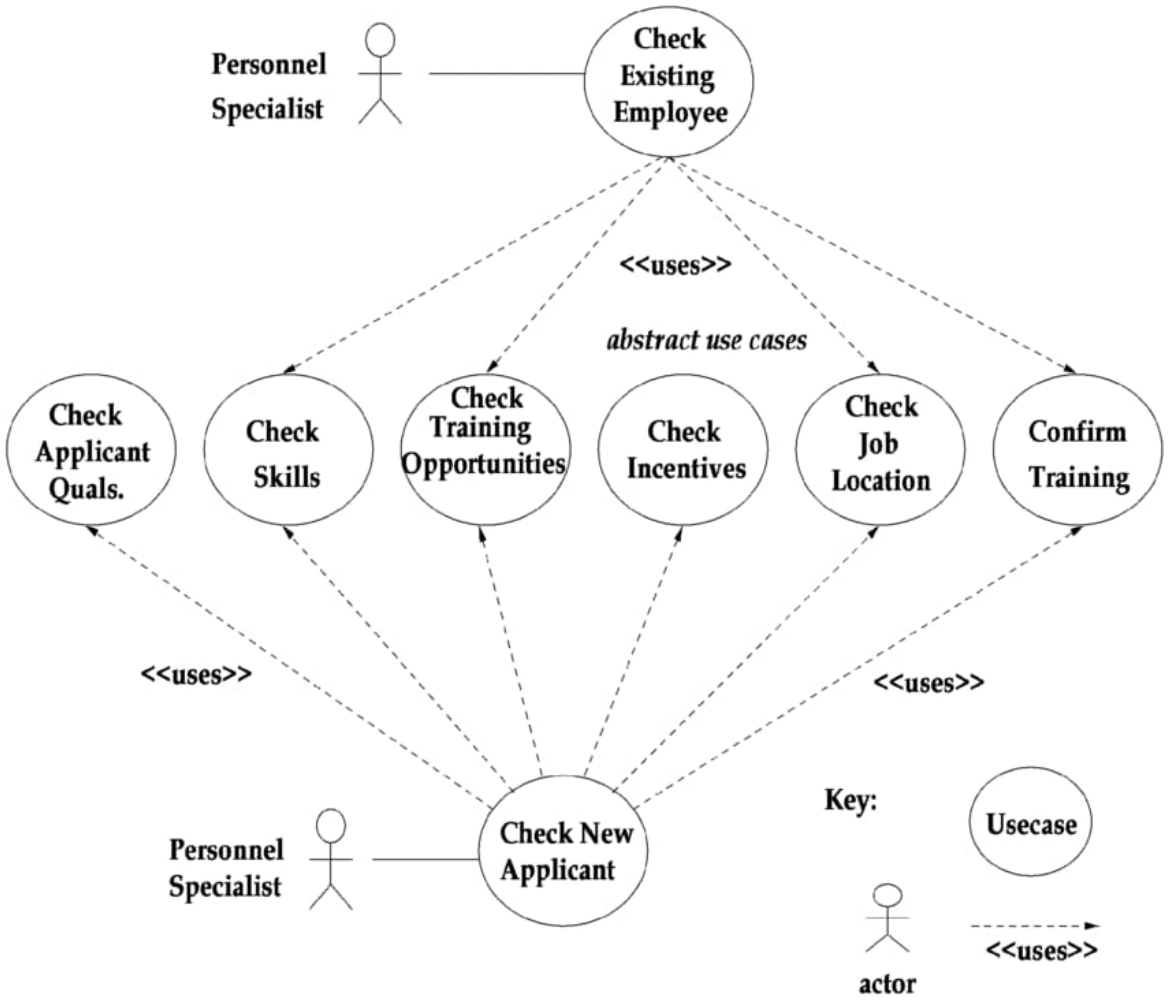


Fig. 4.2 Objective-3_Usecase Diagram

Chapter 5

Increase Efiiciency

5.1 Objective:

To Design hybrid algorithm by placing 42 points on face to increase the efficiency emotion detection that increases the accuracy of drowsiness classification system to around 70-72%.

5.2 Methodology:

At the end of the algorithm training final system will be able to detect the various emotions like sad, happy, surprise, angry, disgusted etc. And the system will detect (classify) drowsiness in the driver.It will also use cross entropy function for classifing emotion of a personIt generates answers in probability so multiple emotions will be classified using our model with different probabilities and out of that it will take answer with highest probability as correct emotion of person. And by combining results of both of these classification we will predict the drowse state of a person

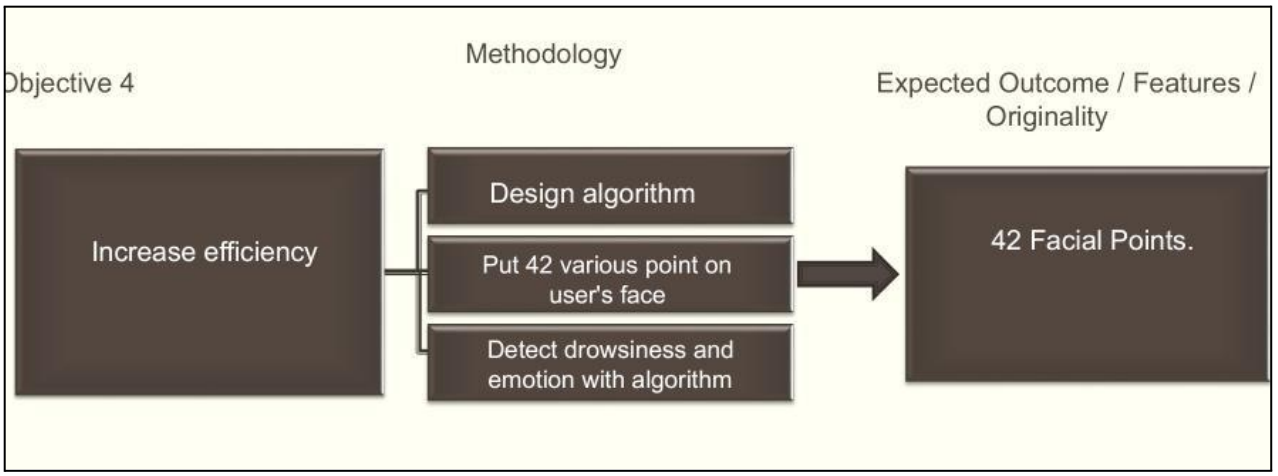


Fig. 5.1 Objctive-4_Methodology

5.3 Tools & Technology

- OpenCV
- Dlib
- Anaconda

- Tensorflow

5.4 Verification& Validation

Verification :- We'll try the various different algorithm and check against accuracy matrices for the verification of efficiency.

Validation :- User will observe the overall efficiency of product on the basis of how may time it accurately detect drowsiness.

5.5 System Modelling:

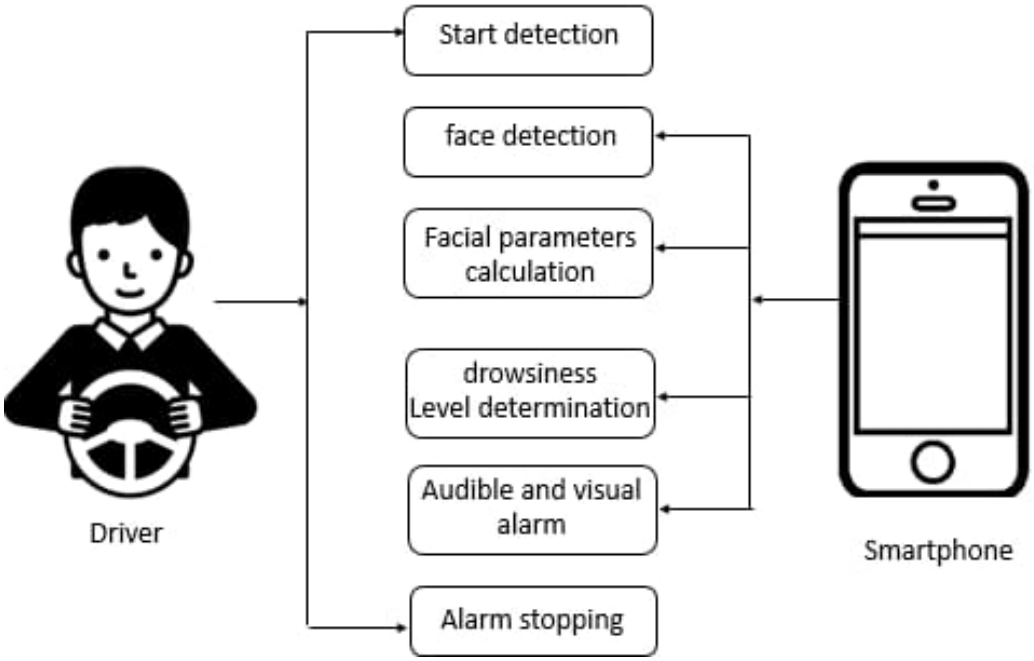


Fig. 5.2 Objctive-4_Usecase Diagram

Chapter- 6

Driver Alert System

6.1 Objective:

To create a user alert system to alert users about their drowsiness by sending the electric signal to the buzzer or by turning on the music system that plays music according to their state of mind.

6.2 Methodology:

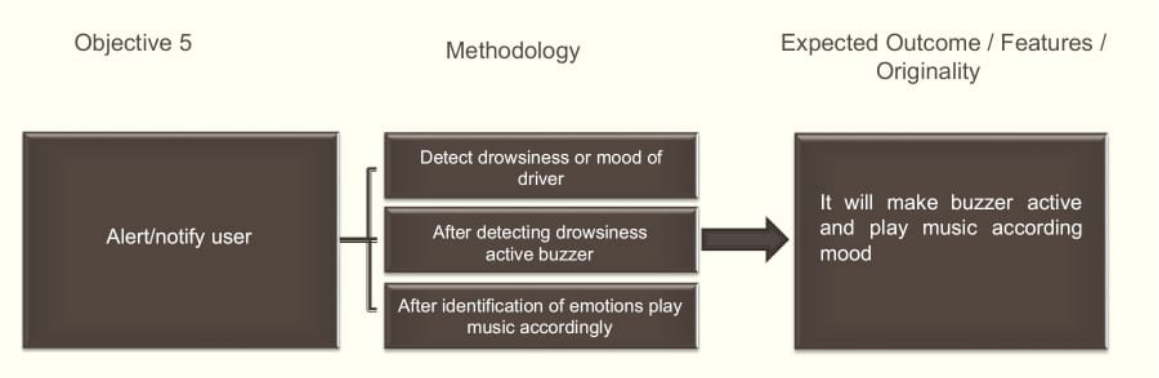


Fig.6.1 Objective-5_Methodology

At the end after detecting drowsiness the system will inform the driver via buzzer and it will also play songs according to what emotions it detects in the driver.

6.3 Tools and Technology:

- Buzzer
- Music System
- Song Reccomendation

6.4 Verification & Validation:

Verification :- To set a diod beside the camera which change it's colour to red when camera is on and changed it's colour to green when a face is detected.

Validation:- User monitor the colour of diod whenever they drive the car and on the camera

Chapter 7

Outcomes and Future Scop

7.1 Outcome:

The final product will detect the drowsiness in the driver and play a alarm or buzzer for the same and also detect the emotions of driver and play the songs according to his/her mood(emotions).

7.2 Future Scop:

In this project, supervised learning has been used. Unsupervised Learning can be used instead of supervised learning.

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Appendix-B (AEIOU Canvas)

AEIOU Canvas

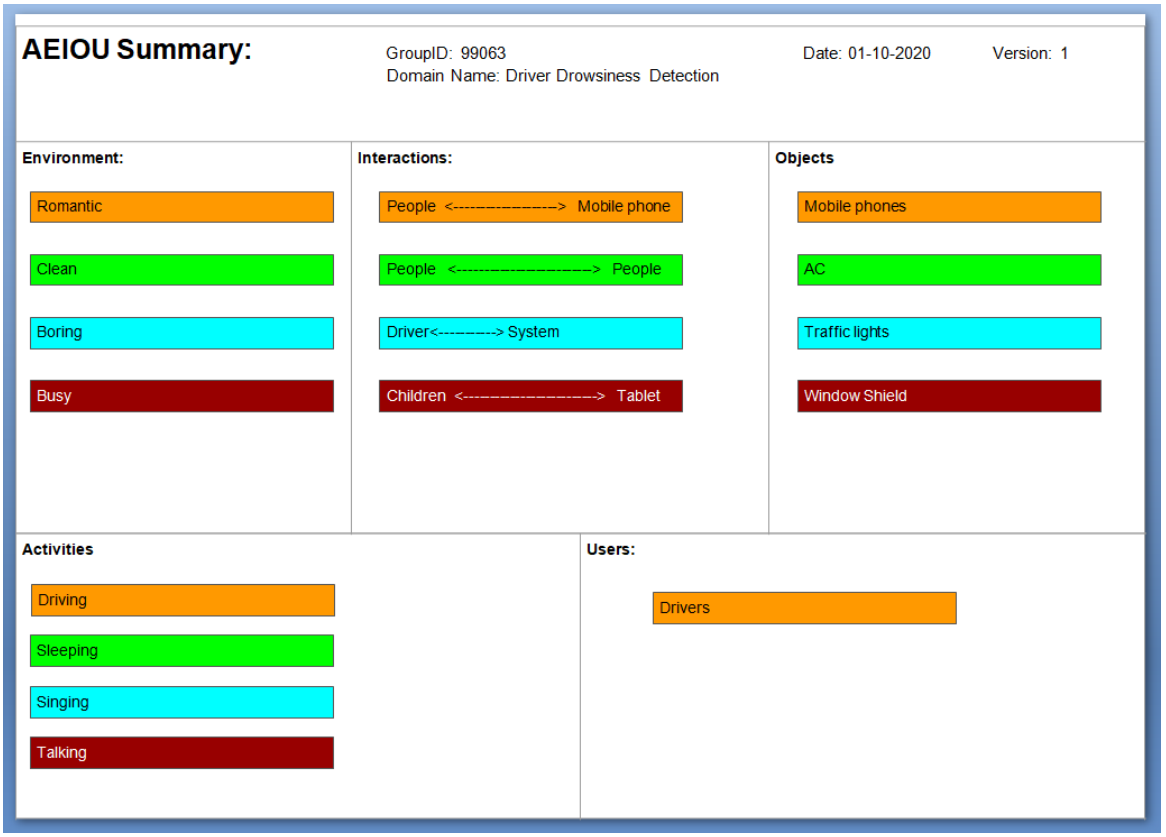

Fig. Appendix-B_AEIOU Canvas