Functional Specifications Document

<Project Title>

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Submission Date:

_____

Project Manager's Signature

Definition of Terms, Acronyms and Abbreviations

This section should provide the definitions of all terms, acronyms, and abbreviations required to interpret the terms used in the document properly.

Term	Description
FC	Face detection
EMD	Eye mouth detection
SOI	State of eye
SoM	State of mouth
fb	Feedback

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1. Introduction

1.1 Purpose of Document

This document provides detailed descriptions of what are the problem driver facing in context of Driver Drowsiness and procedure, algorithm to overcome the accident while driving. It provides detail what kind of Mobile application will develop to overcome the drowsiness issue. Car drivers, truck drivers, taxi drivers, etc. are the mostly user of this application

1.2 Project Overview

It is very dangerous for a driver to fall into a momentary drowsiness Road accident all over the world have been a major problem for a very long time. Long hours of driving cause the driver Drowsiness and, consequently, reduces her/him response time. Therefore, there is a need to develop a system that will detect and notify a driver of her/him Drowsiness condition, which could significantly reduce the number of Drowsiness-related car accidents. One of the technical possibilities to implement such a system is to use vision-based application. With the rapid development of image processing techniques and methods. Car drivers, truck drivers, taxi drivers, etc. should be allowed to use this solution to increase the safety of the passengers, other road users and the goods they carry.

1.3 Scope

Functionality system provide

- To be able to accurately detect a face from a video.
- To be able to detect the region of interest in this case the eyes
- To be able to detect the region of interest in this case the mouth
- To accurately classify drivers, expect state of the eye and mouth either closed or open
- To provide a warning to the driver if drowsiness is detected.
- To provide notification to driver, he/she need rest
- To provide Feedback functionality to user

Functionality system not provide

- To be not able to detect face if angle is not accurate to mobile camera
- To be not able to detect eyes movement of use black Glass
- To be not able to detect movement if it's too much dark inside car

2. Functional Requirements

Registration:

User must be register him or herself in the mobile application with the valid license number to use the application

Login:

after the registration user can easily login with username and password in mobile application

Face detection:

System can detect the face of the driver in the mobile camera of the application

Eye detection:

System can detect the eye of the driver inside the square of face mark

Mouth detection:

System can detect the mouth of the driver inside the square of the face mark

Classify SOE:

system can classify the state of the eye weather it is open or closed and from how long it is closed

Classify SOM:

System can classify the state of the the mouth whether it is open or closed and from how long it is closed

Predict Drowsiness:

system predict the drowsiness with the help of classify the state of iron classify the state of mouth with the help of algorithm

Show rest notification:

System show the rest notification to the user

Warning alert:

If user ignore the rest notification then won the driver with the alarm and showing the warning again and again

Feedback:

at the end of the drive used can give the feedback of the mobile application

3. Non-functional Requirements

3.1 Performance Requirements

The system performance required to operate under:

- Limited memory
- Constrained power supply
- Low processing power
- Meet real time capabilities

3.2 Security Requirements

- Security requirement include privacy issue like don't allow any unauthorized user to open your camera
- User can only sign up on app just with valid driving license

3.3 Accessibility Requirement:

- System is easily assessable with just login in app and with the valid driving license number.

3.4 User Documentation:

- We will provide user guide for driver to use the application and also write help question and add tutorial video in start of app for guide

4. Assumptions and Dependencies

Assumptions:

Mobile phone position:
We assume that mobile phone is on the proper angle so that application can detect the face from the angle of camera
Internet connectivity:
We assume that Mobile app is connected to internet so login, register, Feedback function easily perform.

Mobile camera:
We assume that user mobile has camera with better quality so system can easily detect face and eyes

Dependencies

Dependence on ambient light:
The model developed for this purpose strongly depends on the ambient light condition. As our algorithm considers the eye sight as a dark region when it is closed and brighter region when it is open so if the ambient condition affects such that there may be possibility of brighter and darker condition depending on light source then it causes error in the result. Also this model depends on certain minimum level of light condition otherwise it becomes very difficult to detect.
Distance of camera from driver face:
For best result we have assumed and designed the code according to the fact that the distance between camera and face should be nearly 100 cm. Hence the designed set up output may vary from vehicle to vehicle as different vehicle have different types of seat lengths.

Multiple face problem: If multiple face arises in the window then the camera may detect more number of faces undesired output may appear. Because of different condition of different faces. So we need to make sure that only the driver face come within the range of the camera. Also the speed of detection reduces because of operation on multiple faces

5. Summaries of 5 Research Paper:

USE OF IMAGE PROCESSING IN DROWSINESS DETECTION AMONG DRIVERS TO REDUCE ROAD TRAFFIC ACCIDENTS IN KENYA

Summary:

The proposed system used self-designed wristband consisted of photoplethysmogram sensor and galvanic skin response sensor.[7] The sensors data are sent to the mobile device which served as a main analyzing processing unit. Those data are analyzed along with the motion sensors, which are the mobile device built-in accelerometer and gyroscope sensors. The testing results indicated that the accuracy of the system with SVM model reached up to 98.3%.This

method enables the detection of drowsiness level without installing any other component in their vehicle. With 5input features using SVM models as classifiers to detect driver drowsiness level, analysis results reached accuracy of 98.3%. Future studies include the aim to increase the number of features without affecting the accuracy rate to improve the tradeoff between the processing power of smartwatch and the accuracy and reliability of the system.

Q1) What was the main theme of the paper?
To develop an embedded system that detects driver drowsiness level and warns him or her of his or her state.
Q2) Was the discussed problem significant of addressing?
Driverdrowsiness detection system had been developed as mobile device application such as Percentage of Eye Closure (PERCLOS) measured by using mobile device camera. Nevertheless, the mobile device has the potential risk of distracting the driver's attention, causing accidents.
Q3) How problem was solved?
The processing video images obtained through a sensing technology. The outcome of the video will be used to determine the drowsiness levels and then provide a warning to the driver if he or she is drowsy.
Q4) What are the strengths of the approach?
The system performed well registering an average drowsiness detection of 65% , however this might need to be improved in order enhance reliability.
Q5) What are the lackness of the approach?
Lack of well detailed test databases inhibit extensive testing of the system. Challenge of addressing the illumination as it impacts on the system, the pixel intensity of the eye region varies with illumination changes.
Q6) Finally any improvement possible in the approach and how?
To advance this technology further environmental illumination can be addressed through introduction of a module that can estimate the illumination levels and the threshold value for blink detection adjusted accordingly.
Q7)Anything important auther have not discussed or ignore?
Limited processing resources, image processing is both computation power and memory intensive hence use of a raspberry power with only 512mb Ram and 700mhz was a challenging task.

Driver Drowsiness Detection based on Multimodal using Fusion of Visual-feature and Bio-signal

Summary:

Research say that there is insufficient information to judge the driver's condition by using only single data (physiological data, visual data)[5]. In this study, we propose a system based on Multimodal Deep Learning that recognizes both visual and physiological changes in drowsiness. Because using different kind of data, heterogeneity problem arises. To discriminate(distinguish) the driver's condition used deep learning, Experimental results show that the accuracy is higher

than when using a single modality, because used more the features. We will recruit additional data now, and if we learn more and more data, we will be able to show high accuracy. In addition, we will be designed additional layers on current system

Q1) What was the main theme of the paper?
we propose a system to detect driver's drowsiness by using physiological data as well as visual data.
Using all of the driver's physiological changes along with visual changes can be a clear basis for drowsiness decisions

Q2) Was the discussed problem significant of addressing?
The problem was that drowsiness was detecting by three methods. The first is to use physiological data. This can determine correct drowsiness. The second is to grasp the driving pattern and identify the case of lane invasion. The third is to utilize the driver's visual data It is a method widely used in the limited situation of driving by detecting the drowsiness of the driver by observing changes that occur when drowsiness occur when drowsiness. However, visual data determines the driver's condition through the designed algorithm, which makes it difficult to say that it is an accurate drowsiness.

Q3) How problem was solved?
We used the features of the driver's eyes and mouth. Keeping eye closure duration after continuous yawning it is more accurate drowsiness rather than simply keeping eye closure. In addition, we used the bio-signals (heart rate, EEG etc.) collected from wearable devices and a total of three modalities.

Q4) What are the strengths of the approach?
It is not safe and ethical to make a drowsy driver drive on road. Hence, researchers have used simulated environments to carry out their experiments. Experimental control, efficiency, low cost, safety, and ease of data collection are the main advantages of using simulators

MOBILE APPLICATION TO DETECT DROWSINESS AND ALERT DRIVER

Summary:

- In this research paper Life saving ideas are considered to be the crucial arena in today's growing trends. But these ideas despite being accurate, is not easily accessible unless we present it as an application in mobile. As per the RTI 60% of the accidents today occur due to driver fatigue (drowsiness). In this paper we provide an application that alerts the driver if his eyes are closed for more than 3 seconds. Not necessarily sleep, eyes closed for more than 3 seconds for any reason can turn fatal, especially in monotonous highways. If the eyes are not detected to be open for more than 7 seconds, a loud alarm is played by the mobile application. If the eyes do not open even after 10 seconds then the current GPS location is sent to the pre-stored contacts from the database of the application.

Q1) What was the main theme of the paper?
In this we propose a concept of GPS is an innovative idea to detect the location of the victim in case of accidents.
Q2) Was the discussed problem significant of addressing?
One of the major problems in dealing with the road safety is the difficulty in detecting when drivers are experiencing fatigue.Fatigue is likely to increase the incidence of crashes.
Q3) How problem was solved?

If the eyes are not detected to be open for more than 7 seconds, a loud alarm is played by the mobile application. If the eyes do not open even after 10 seconds then the current GPS location is sent to the pre-stored contacts from the database of the application.
Q4) What are the strengths of the approach?
This advanced GPS technology that not only detects sleep but also driver carelessness. This idea is feasible and applicable. Proposed application will prove a great help in avoiding accidents when implemente.

Q5) What are the lackness of the approach?
One of the major drawbacks encountered in developing this idea was what should be done if the driver does not wake up even after the last buzzer.
Q6) Finally any improvement possible in the approach and how?
But the best solution found was to inform contacts the current GPS location, as they could spot the driver even in case of misha
Q7)Anything important auther have not discussed or ignore?
Talk about was what should be done if the driver does not wake up even after the last buzze?

Wearable Driver Drowsiness Detection System Based on Biomedical and Motion Sensors

Summary:

The proposed system used self-designed wristband consisted of photoplethysmogram sensor and galvanic skin response sensor.[7] The sensors data are sent to the mobile device which served as a main analyzing processing unit. Those data are analyzed along with the motion sensors, which are the mobile device built-in accelerometer and gyroscope sensors. The testing results indicated that the accuracy of the system with SVM model reached up to 98.3%.This method enables the detection of drowsiness level without installing any other component in their vehicle. With 5input features using SVM models as classifiers to detect driver drowsiness level, analysis results reached accuracy of 98.3%. Future studies include the aim to increase the number of features without affecting the accuracy rate to improve the tradeoff between the processing power of smartwatch and the accuracy and reliability of the system.

Q1) What was the main theme of the paper?
The main theme was to wear a wearable device which will predict the drowsiness of driver while driving. The system will concentrate on both driver behavior and bio-signal into calculation to make the detection system more accurate.

Q2) Was the discussed problem significant of addressing?
Driver drowsiness detection system had been developed as mobile device application such as Percentage of Eye Closure (PERCLOS) measured by using mobile device camera. Nevertheless, the mobile device has the potential risk of distracting the driver's attention, causing accidents.

Q3) How problem was solved?

The problem was solved by using a wearable device like wrist band . PPG and GSR signal were received using self-made wrist band from which biological data is received. Motion data were extracted using Smart watch built-in motion sensors which were accelerometer and gyroscope. Combining both motion data and biological data received through BLE, features extraction and classification were done to detect driver drowsiness.

Q4) What are the strengths of the approach?
It is not safe and ethical to make a drowsy driver drive on road. Hence, researchers have used simulated environments to carry out their experiments. Experimental control, efficiency, low cost, safety, and ease of data collection are the main advantages of using simulator

Real-time Driver Drowsiness Detection for Android Application Using Deep Neural Networks Techniques

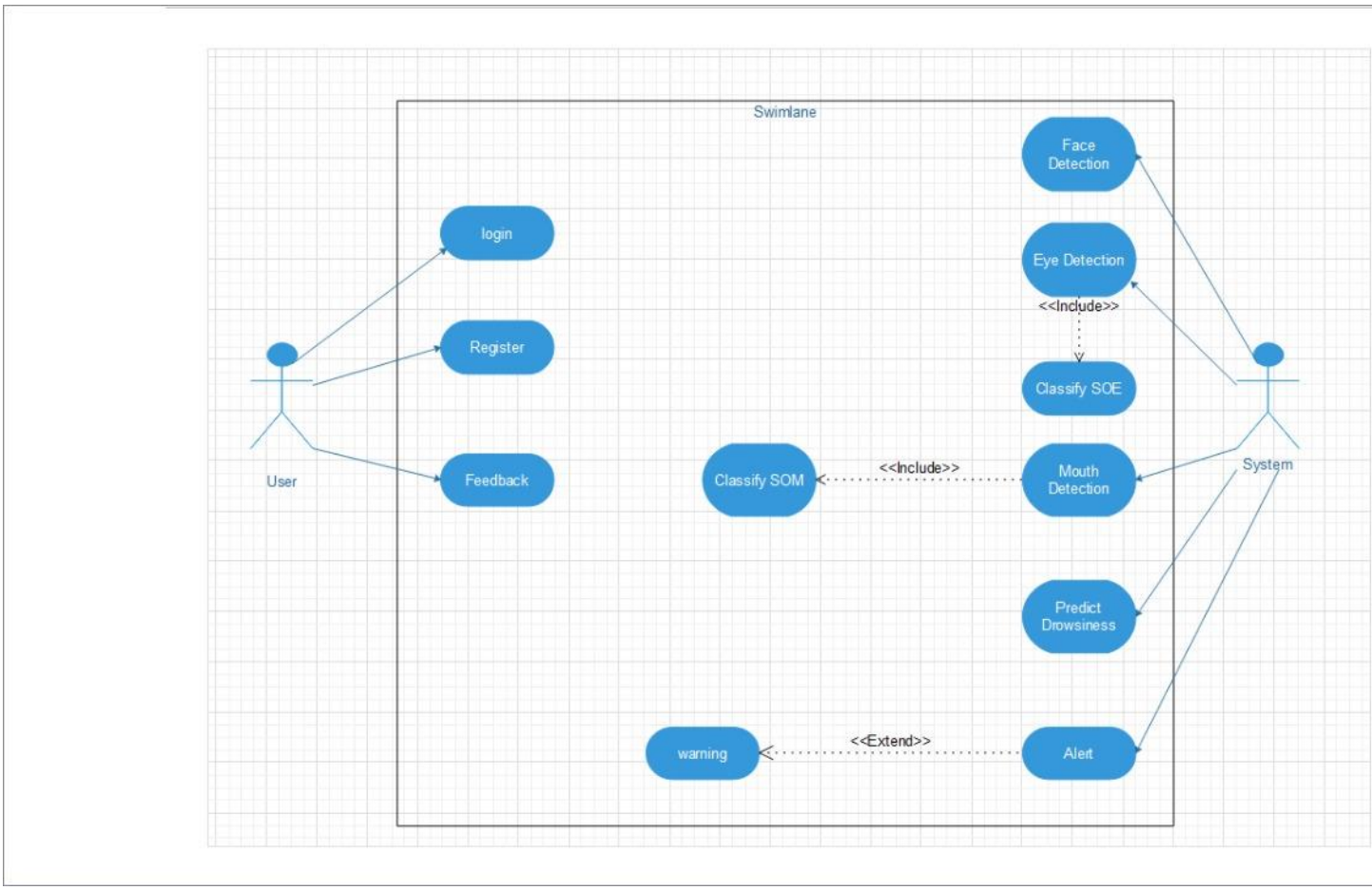
Summary:

Road crashes and related forms of accidents are a common cause of injury and death among the human population. According to 2015 data from the World Health Organization, road traffic injuries resulted in approximately 1.25 million deaths worldwide, i.e. approximately every 25 seconds an individual will experience a fatal crash. While the cost of traffic accidents in Europe is estimated at around 160 billion Euros, driver drowsiness accounts for approximately 100,000 accidents per year in the United States alone as reported by The American National Highway Traffic Safety Administration (NHTSA). In this paper, a novel approach towards real-time drowsiness detection is proposed. This approach is based on a deep learning method that can be implemented on Android applications with high accuracy. The main contribution of this work is the compression of heavy baseline model to a lightweight model. Moreover, minimal network structure is designed based on facial landmark key point detection to recognize whether the driver is drowsy. The proposed model is able to achieve an accuracy of more than 80%.
Q1) What was the main theme of the paper?
The purpose of the method is to reduce the model's size considering that current applications cannot be used in embedded systems due to their limited calculation and storage capacity.
Q2) Was the discussed problem significant of addressing?
. According to the experimental results, the size of the used model is small while having the accuracy rate of 81%. it can be integrated into advanced driver-assistance systems, the Driver drowsiness detection system, and mobile applications.
Q3) How problem was solved?
The neural network model was developed and fitted by using facial landmark coordination, it was evaluated by a computer with the following properties: Intel Core i7-7500U, 8 GB RAM, Intel GMA HD 2 GB. The results show an accuracy of 81%.
Q4) What are the strengths of the approach?
Regarding accuracy, its value when physiological sensors are used ranges from 73%15 to 86%4 . The purpose of this work is to develop an algorithm fitting embedded systems by reducing the neural network model's size
Q5) What are the lackness of the approach?

there is still space for the performance improvement. The further work will focus on detecting the distraction and yawning of the driver.
Lack of well detailed test databases inhibit extensive testing of the system. Challenge of addressing the illumination as it impacts on the system, the pixel intensity of the eye region varies with illumination changes.
Q6) Finally any improvement possible in the approach and how?
This publication was made possible by an NPRP award [NPRP8-910-2-387] from the Qatar National Research Fund (a member of Qatar Foundation). The statements made herein are solely the responsibility of the authors.
Q7)Anything important auther have not discussed or ignore?
There should work would focus on detecting the distraction and yawning of the driver.

6. Use Cases

6.1 Use Case diagram :



6.2 Use case Description

<Use case 1: Register>		
Actors: *User, System*		
Feature:	*For the Registration of user/driver in database*	
Use case Id:	*1*	
Pre-condition:	*User must be having internet connection and database connectivity must be enable*	
Scenarios		
Step#	***Actor***	***Reaction***
1.	*System*	*Load all the field in form*
2.	*User*	*Fill all form data*
	System	*Sava all field data in database*
Alternate Scenarios:		
1a: If there is no internet Connection: ***I****f there is not internet connectivity then system show that "check your internet connection".*		
Post Conditions		
Step#	**Description**	
	Register is successful	
	Sava all field data in the database	
Use Case Cross referenced	-	
User Interface reference	*Sign up Interface*	
Concurrency and Response *Give an estimate of the following* ♦ *Number of concurrent users :1* ♦ *Expected response time of the use case: 1 Minute*		

<Use case 2: Login>		
Actors: *User, System*		
Feature:	*For allow user/driver to use App*	
Use case Id:	*1*	
Pre-condition:	*User must be login page data connectivity must be enable*	
Scenarios		
Step#	***Actor***	***Reaction***
1.	*System*	*System display the login page*
2.	*User*	*User must be enter the data*
3.	*System*	*System redirect to home page validate the user name and password*

Alternate Scenarios:
1a:If there is no internet Connection: ***I****f there is not internet connectivity then system show that "check your internet connection".* ***3a:If Enter password is invalid:*** *If enter password is not correct then re-enter your correct password and go to the sign-up page.*

Post Conditions

Step#	Description
	Validate all Fields
	Login is successful
	User is redirected to home page

Use Case Cross referenced	*Sign up use case*
User Interface reference	*Login Interface*

Concurrency and Response
Give an estimate of the following
- *Number of concurrent users :1*
- *Expected response time of the use case: 1 minute*

<Use case 3: Face Detection>

Actors:	System
Feature:	*For the detection of face in camera of app*
Use case Id:	*3*
Pre-condition:	• User must be login • Mobile camera must be ON and angel must be toward the face of Driver

Scenarios

Step#	Action	Software Reaction
1.	*System*	*System detect the face using the algorithm*
2.	System	Show the round/circle shape around face on mobile camera screen

Alternate Scenarios:

1a:If there is not Detection:
If mobile can't detect the face of driver change the angel of mobile to detect the face correctly.

Post Conditions

Step#	Description
	The face has been successful detected
	The square circle box should be shown on the face of the user mobile camera

Use Case Cross referenced	*Login page*

User Interface reference	*Mobile camera interface*

Concurrency and Response
Give an estimate of the following
- *Number of concurrent users : 1*
- *Expected response time of the use case : 10 second*

<Use case 4: Eye Detection>

Actors:	*System*
Feature:	*For the detect the eyes in the face*
Use case Id:	*4*
Pre-condition:	*The face must be detected.*

Scenarios

Step#	Action	Software Reaction
1.	*System*	*System detect the eye inside the face area*
2.	*System*	*System show the dots on Eye*

Alternate Scenarios:

1a:If System not detect the Eye:
System has not detected the Eye so show the notification and driver should be re-arrange the angel of the face to detect the dots on the face.

Post Conditions

Step#	Description
	System show the dots on Eye area on mobile live screen

Use Case Cross referenced	*Face detection*
User Interface reference	*App Mobile Camera*

Concurrency and Response
Give an estimate of the following
- *Number of concurrent users: 1*
- *Expected response time of the use case: 5 second*

<Use case 5: Mouth Detection>

Actors:	*System*
Feature:	*For the detect the mouth in the face*
Use case Id:	*5*
Pre-condition:	*The face must be detected.*

Scenarios

Step#	Action	Software Reaction
1.	*System*	*System detect the mouth inside the face area*
2.	*System*	*System show the dots on mouth*

Alternate Scenarios:

1a: If System not detect the mouth: System has not detected the mouth so show the notification and driver should be re-arrange the angel of the face to detect the dots on the mouth.

Post Conditions	
Step#	
	System show the dots on Eye area on mobile live screen
Use Case Cross referenced	*Face detection*
User Interface reference	*App Mobile Camera*

Concurrency and Response
Give an estimate of the following
- *Number of concurrent users: 1*
- *Expected response time of the use case: 5 second*

<Use case 6: Classify the state of Eye>		
Actors: *System*		
Feature: *check states of Eye*		
Use case Id:	*6*	
Pre-condition:	*Eye and face is already detected on the system*	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	*System*	*Classify the state of Eye*
2.	System	Save the state of the eye if the drowsiness is detected on the face

Alternate Scenarios:

1a:*If the system is failed to classify the state of eye then try again with restart the camera or any other option.*

Post Conditions	
Step#	**Description**
	Save the state of the eye
Use Case Cross referenced	*Eye detection*
User Interface reference	*Mobile camera*

Concurrency and Response
Give an estimate of the following
- *Number of concurrent users: 1*
- *Expected response time of the use case: 5 second*

<Use case 7: Classify the state of mouth>

Actors: *system*		
Feature: *check states of Mouth*		
Use case Id:	*7*	
Pre-condition:	*Mouth and face is already detected on the camera*	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	*System*	*Classify the state of mouth*
2.	System	Save the state of the mouth if the drowsiness is detected on the face
Alternate Scenarios:		
1a:If the system is failed to classify the state of the mouth then try again with the restart the camera or by any other option.		
Post Conditions		
Step#	**Description**	
	Save the state of the mouth	
Use Case Cross referenced	*Mouth detection*	
User Interface reference	*Mobile camera*	
Concurrency and Response *Give an estimate of the following* ♦ *Number of concurrent users : 1* ♦ *Expected response time of the use case*		

<*Use case 8:* Predict Drowsiness:>		
Actors: system		
Feature: predict the drowsiness using algorithm		
Use case Id:	*8*	
Pre-condition:	SOE and SOM is detected and use Algorithm to find drowsiness	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	*System*	*System find drowsiness of driver using SOE and SOM*
Alternate Scenarios:		
1a: if system don't detect drowsiness then do noting carry on running algorithm		
Post Conditions		
Step#	**Description**	
	Detect the drowsiness using SEO and SEM	
Use Case Cross referenced	*SEO, SOM*	
User Interface reference	*App mobile camera*	

Concurrency and Response
Give an estimate of the following
- *Number of concurrent users: 1*
- *Expected response time of the use case: 5 second*

<Use case 9: *Show rest notification* >		
Actors: system		
Feature:	*show the notification if drowsiness detected*	
Use case Id:	*9*	
Pre-condition:	System detect the drowsiness	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	*System*	*Show the notification to user that you feel sleepy take a rest*
2.	User	User acknowledgment to system that receive the notification
Alternate Scenarios:		
2a: Wait for acknowledgment from user otherwise resend him/her		
Post Conditions		
Step#	**Description**	
	Show a notification to user take rest	
Use Case Cross referenced	*Drowsiness detection*	
User Interface reference	*Notification interface*	
Concurrency and Response *Give an estimate of the following* ♦ *Number of concurrent users:1* ♦ *Expected response time of the use case: 10 second*		

<Use case 10: Warning>		
Actors: *System*		
Feature:	*Show alert and alarm to driver*	
Use case Id:	*10*	
Pre-condition:	*Drowsiness has been detected and system show the pop up to the user but the user ignores the pop up.*	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	*System*	*System show the warning message alarm to the user*
Alternate Scenarios:		
1a: If the user ignore the message the system send the warning notification to the user again and again.		

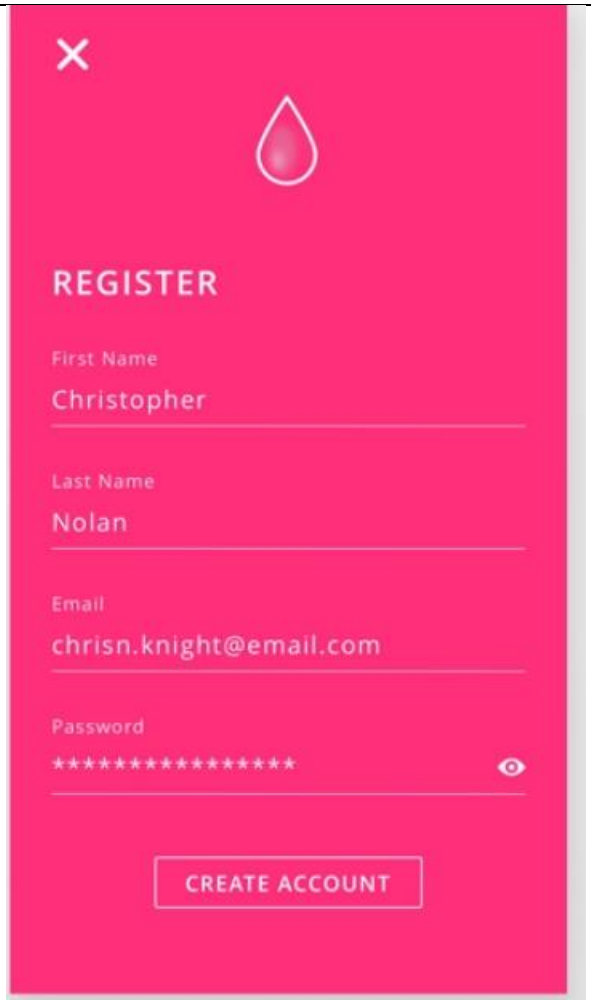
Post Conditions	
Step#	**Description**
	Ring the alarm to the user so that user can listen it and wake up
Use Case Cross referenced	*Notification to user*
User Interface reference	*Alarm warning*
Concurrency and Response *Give an estimate of the following* ♦ *Number of concurrent users:1* ♦ *Expected response time of the use case:20 Second*	

<Use case 11: Feedback >		
Actors: *user, system*		
Feature: *Too get feedback from diver after Complete ride*		
Use case Id:	*11*	
Pre-condition:	*Drive is complete user want to end it*	
Scenarios		
Step#	**Action**	**Software Reaction**
1.	*system*	*Show feedback form*
2.	user	User fill it
3.	system	System save feedback
Alternate Scenarios:		
3a: database connectivity error happen		
Post Conditions		
Step#	**Description**	
	Show feedback form	
	Save form in database	
Use Case Cross referenced	-	
User Interface reference	*Feedback interface*	
Concurrency and Response *Give an estimate of the following* ♦ *Number of concurrent users: 1* ♦ *Expected response time of the use case: 1 minute*		

7. Graphical User Interfaces

Give a detailed account of user interfaces included in this project.

<User Interface 1: register>	
Interface Id.	*1*
Use case Reference	*1*
Snapshot	



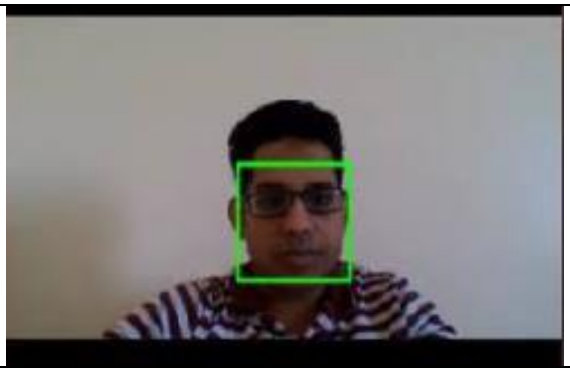
Data dictionary reference

Label	Data dictionary identifier
	User-id
	User_name
	User_password
	User-email

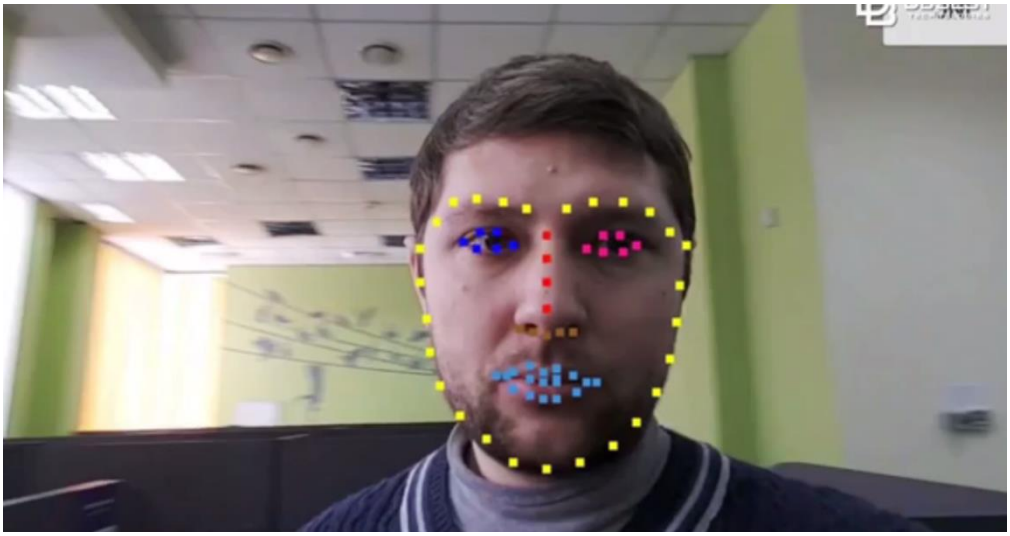
<User Interface 2: login>	
Interface Id.	*2*
Use case Reference	*2*
Snapshot	

Data dictionary reference
Data dictionary identifier
User_email
User_password

<User Interface 3: face detection >	
Interface Id.	*3*
Use case Reference	*3*
Snapshot	

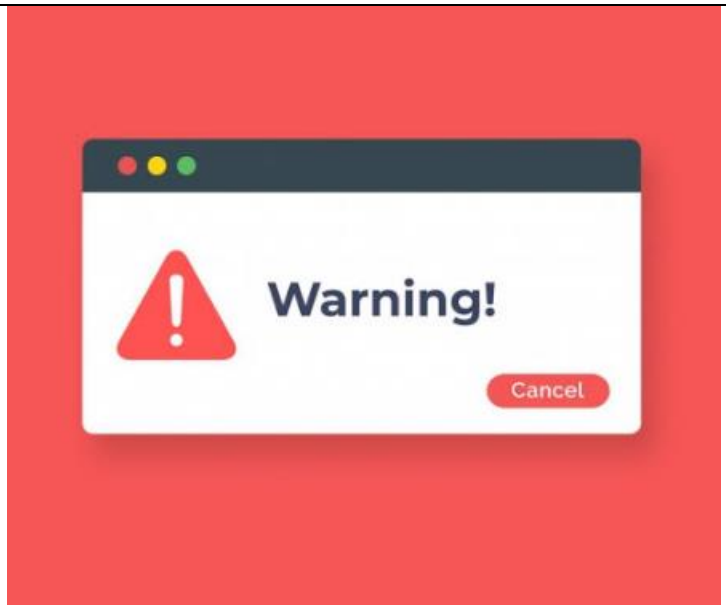


<User Interface 4: facemarks>	
Interface Id.	*4*
Use case Reference	*3,4,5,6,7*
Snapshot	

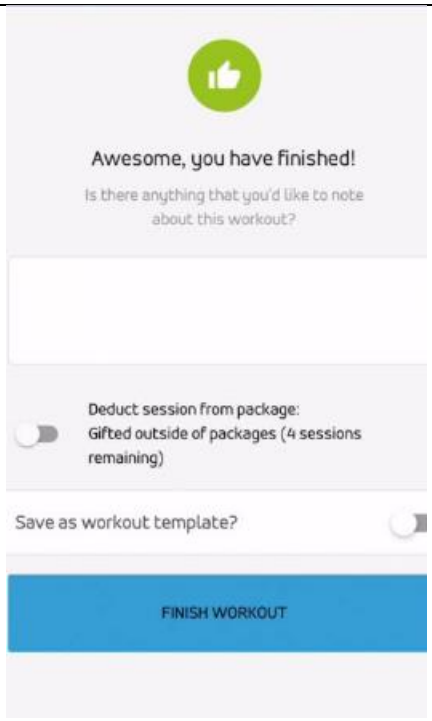


<User Interface 5: alert>	
Interface Id.	*5*
Use case Reference	*9*
Snapshot	

<User Interface 6: warning >	
Interface Id.	*6*
Use case Reference	*10*
Snapshot	



<User Interface 7: feedback>	
Interface Id.	*7*
Use case Reference	*11*
Snapshot	



Data dictionary reference
Data dictionary identifier
Fb_id
Fb_type
Fb_desc

8. High Level Design

8.1 ER Diagram

8.2 Data Dictionary

8.2.1 Data 1

< Data 1>	
Name	*User_id*
Alias	*User_identity*
Where-used/how-used	*Used in entity name user* *User as store user identity*
Content description	=

Supplementary information	*Data type: number* *PK - A unique, sequence-generated number used as the record identifier.*

8.2.2 Data 2

< Data 2>	
Name	*User_name*
Alias	*Username*
Where-used/how-used	*Used in entity name user* *Use for store user name*
Content description	*=*
Supplementary information	*Data type: VARCHAR* *The name of the user .*

.

8.2.3 Data 3

.

< Data 3>	
Name	*User_mobile*
Alias	*User_mobileNumber*
Where-used/how-used	*Used in entity name user* *User as store user phone number*
Content description	*User_mobile={0-9}^{11}*
Supplementary information	*Data type: integer* *Phone number of user*

8.2.4

< Data 4>	
Name	*User_email*
Alias	*User_email*
Where-used/how-used	*Used in entity name user* *User as store user email*
Content description	*User_email={0-9|a-z|@}*
Supplementary information	*Data type: text* *Email of the user*

8.2.5

< Data 5>	
Name	*User_password*
Alias	*User_password*
Where-used/how-used	*Used in entity name user* *Use as store password of user*
Content description	*User_email={0-9|a-z|}*
Supplementary information	*Data type: text* *Password of user*

8.2.6

< Data 4>	
Name	*License_number*
Alias	*License_number*
Where-used/how-used	*Used in entity name Register* *Use as store license number*
Content description	*License_number={0-9}**
Supplementary information	*Data type: integer* *Register license number of user*

8.2.7

< Data 4>	
Name	*Fb_id*
Alias	*Feedback_id*
Where-used/how-used	*Used in entity name feedback* *Use as store id of feedback*
Content description	*Fb_id={0-9}**
Supplementary information	*Data type: integer* *Feedback id store*

8.2.8

< Data 4>	
Name	*Fb_type*
Alias	*Fb_type*
Where-used/how-used	*Used in entity name feedback* *Use as store feedback type*

Content description	*Fb_type=[positive|negative]*
Supplementary information	*Data type: text* *Feedback type of feedback*

8.2.9

< Data 4>	
Name	*Fb_desc*
Alias	*Fb_description*
Where-used/how-used	*Used in entity name feedback* *Use as store feedback description*
Content description	*=*
Supplementary information	*Data type: text* *Feedback description store*

9. Requirements Traceability Matrix

Sr. #	Feature	Use case ID	UI ID	Priority	Build Number	Use Case Cross reference (Related Use Cases)
1	register	1	1	4/5	1	-
2	Login	2	2	4/5	2	1
3	Face detection	3	3	5/5	3	2
4	Eye detection	4	4	3.5/5	4	3
5	Mouth detection	5	4	3.5/5	5	3
6	Classify SOE	6	4	4/5	6	4
7	Classify SOM	7	4	4/5	7	5
8	Predict drowsiness	8	4	4.5/5	8	4,5
9	Rest alert	9	5	2/5	9	8
10	Warning	10	6	4.6/5	10	9
11	feedback	11	7	1/5	11	-

The columns carry the following meaning:

- *Feature: Lists system features based on which use cases are built.*

- *Use Case ID:* *Write the ID of the use case for easy lookup*
- *UI ID:* *Write the user interface ID for this use case.*
- *Priority:* *Give an appropriate rating to each use case according to its priority*
- *Build Number:* *Write the reference number to which this feature belongs.*
- *Use Case Cross Ref:* *Write the related use cases separated with commas.*

10. Risk Analysis

(Consult your Project Manager for this section)

Risk Identification

- Dependence on ambient light:
- Distance of camera from driver face:
- Multiple face problem:

Risk Drivers

In risk drivers, we talk about driver video input. Driver video will be input to system and this image may be uncontrolled background, faces in this image are variant pose also may be this input image of user has in illumination condition So due to this we can feel or describe this is risk & maybe occur.

Percentage Impact of Risk Drivers

After more study & understanding about our purposed system, we conclude that 10 – 20% risk will be occur.

Risk Mitigation Plan

To minimize the risk we will plan for minimize it that are:

- Use an efficient algorithm for detect faces
- Ask driver to maintain distance from camera
- Detect one face at a time

11. Cost Estimation Sheet

(Consult your Project Manager for this section)

1.	**Software development cost**	250$
2.	**Packaged software**	
3.	**Hardware**	Mobile for testing350$
4.	**Network**	10$
5.	**Client**	
6.	**Misc.**	

		Total cost =610$

12. References

This section should provide a complete list of all documents referenced at specific point in time. Each document should be identified by title, report number (if applicable), date, and publishing organization. Specify the sources from which the references can be obtained (This section is like the bibliography in a published book).

Ref. No.	Document Title	Date of Release/ Publication	Document Source
1	Project Proposal	Oct 20, 2003	https://www.researchgate.net/publication/319464008_Driver_Drowsiness_Detection_Systems
2	Project Schedule		https://infograph.venngage.com/templates/recommended
3	ERD,use case	-	Edraw Max
4	Flow diagram	-	Edraw Max

13. Appendices

Include supporting details that would be too distracting to include in the main body of the document.

PROJECT SCHEDULE: