DROWSINESS DETECTION AND ALERTING SYSTEM

IBM NAAN MUDHALVAN

PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled **"DROWSINESS DETECTION AND ALERTING SYSTEM"** is the bonafide work of **"KIRUTHIKAA B D(611220106309), BARATH KUMAR K (611220106008), KOWSHIKA M(611220106037), SRIKANTH R(611220106074),DHANALAKSHMI S(611220106302)"** who carried out the project work under my supervision.

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At the outset, we express our heartfelt gratitude to **GOD,** who has been our strength to bring this project to light.

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INTRODUCTION

1.1 PROJECT OVERVIEW

Nowadays, accidents occur during drowsy road trips and increase day by day. It is a known fact that many accidents occur due to driver fatigue and sometimes inattention, this research is primarily devoted to maximizing efforts to identify drowsiness. State of the driver under real driving conditions. The aim of driver drowsiness detection systems is to try to reduce these traffic accidents. The secondary data collected focuses on previous research on systems for detecting drowsiness and several methods have been used to detect drowsiness or inattentive driving. Our goal is to provide an interface where the program can automatically detect the driver's drowsiness and detect it in the event of an accident by using the image of a person captured by the webcam and examining how this information can be used to improve driving safety can be used. A vehicle safety project that helps prevent accidents caused by the driver's sleep. Basically, you're collecting a human image from the webcam and exploring how that information could be used to improve driving safety. Collect images from the live webcam stream and apply machine learning algorithm to the image and recognize the drowsy driver or not. When the driver is sleepy, it plays the buzzer alarm and increases the buzzer sound. If the driver doesn't wake up, they'll send a text message and email to their family members about their situation. Hence, this utility goes beyond the problem of detecting drowsiness while driving.

1.2 PURPOSE

The purpose of a drowsiness detection and alerting system is to enhance road safety by monitoring driver drowsiness, detecting early signs of fatigue, and providing timely alerts to mitigate the risks of accidents caused by drowsy driving.

The alerting mechanisms employed by drowsiness detection systems can vary. They may include auditory alarms, vibration of the steering wheel or seat, visual cues like flashing lights or messages on the dashboard, or even haptic feedback. These alerts aim to arouse the driver, draw their attention, and prompt them to regain focus or pull over for rest.

The goal of this system is to prevent accidents caused by drowsy driving. Fatigue-related accidents can have severe consequences, resulting in injuries, fatalities, and property damage. By providing early warnings and reminders to the driver, drowsiness detection systems contribute to reducing the likelihood of accidents and promoting safer driving practices.

these systems can be particularly beneficial for long-haul truck drivers, shift workers, or individuals with sleep disorders who are more susceptible to drowsiness and its associated risks. By addressing the issue proactively, drowsiness detection systems help safeguard the well-being of both drivers and other road users.

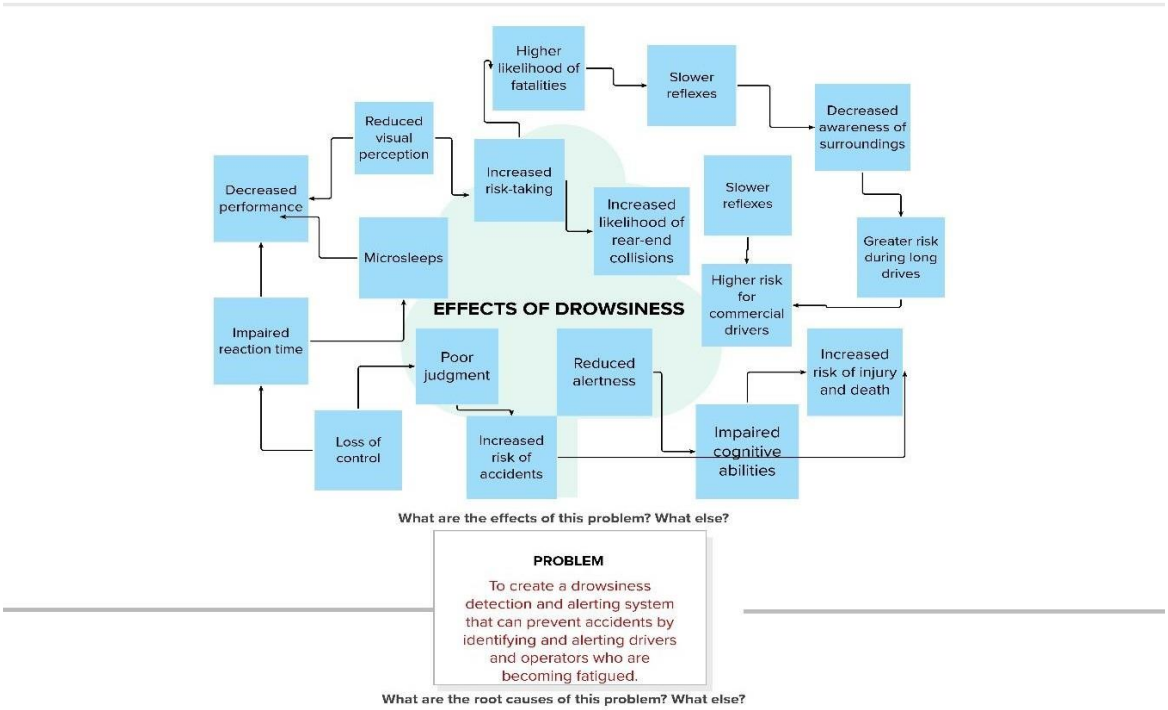
CHAPTER – 2

IDEATION AND PROPOSED SOLUTION

2.1 PROBLEM STATEMENT DEFINITION

Creating a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

Our main aim is to make a drowsiness detection and alerting system that helps in the enhancement of safety by identifying signs of drowsiness or fatigue in individuals and providing timely alerts.



2.2 EMPATHY MAP CANVAS

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

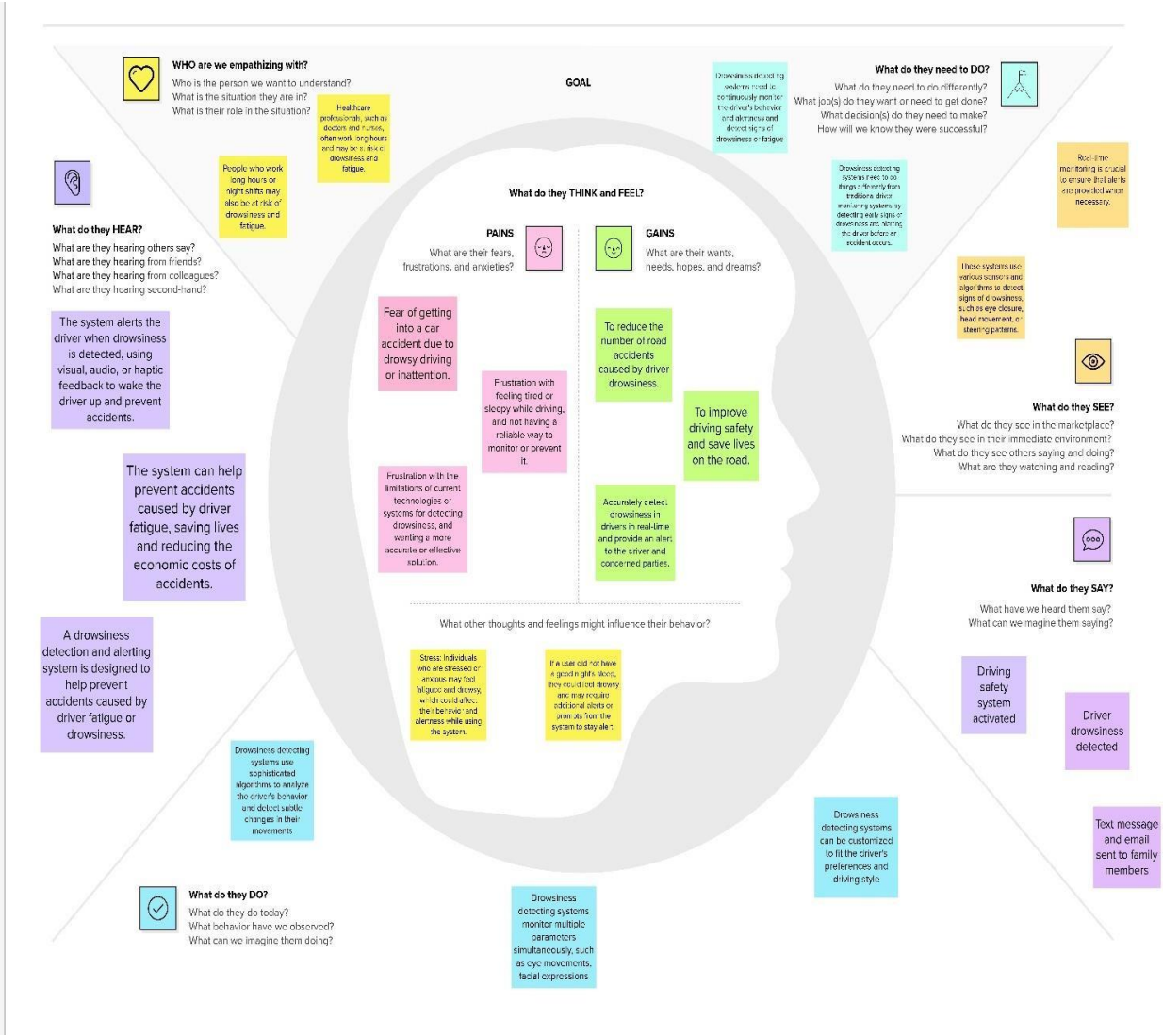


Figure 2.1. Empathy Map

2.3 IDEATION & BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem-solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich number of creative solutions.

STEP-1 TEAM GATHERING, COLLABORATION AND SELECTING THE PROBLEM STATEMENT

This step includes the formation of a team, collaborating with the team by collecting the problems of the domain we have taken and consolidating the collected information into a single problem statement.

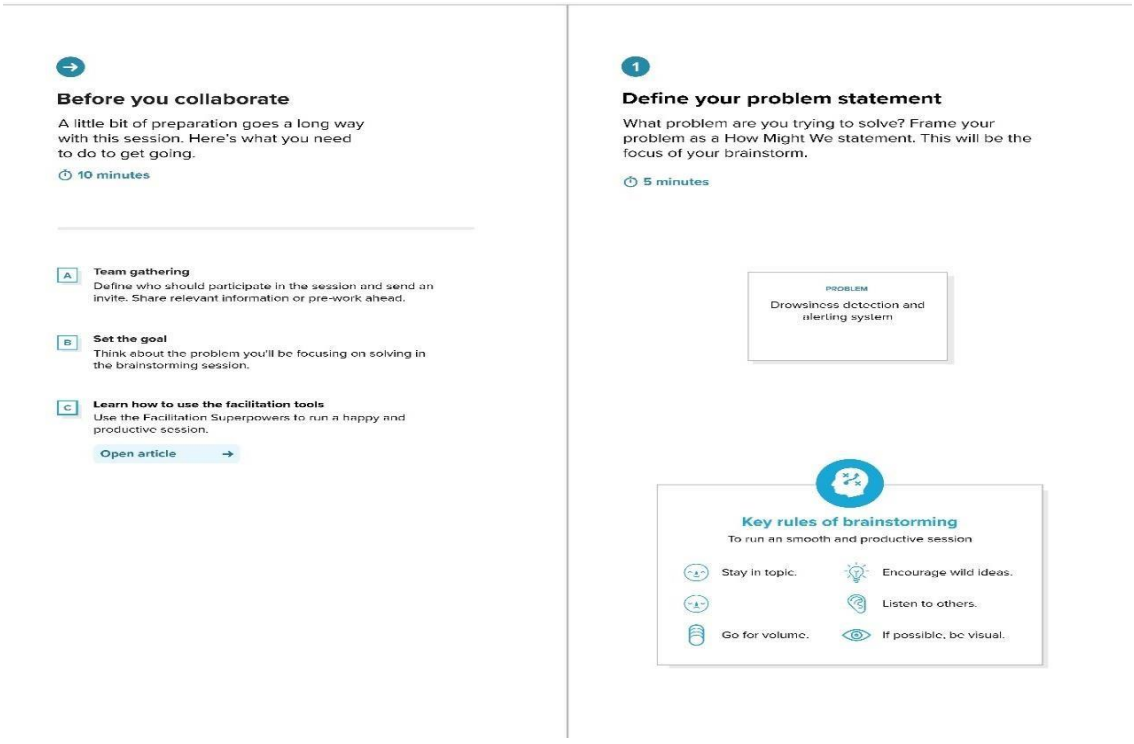


Figure 2.3.1. Ideation and Brainstorming

STEP 2 BRAINSTORM, IDEA LISTING AND GROUPING

This step of ideation includes the listing of individual ideas by teammates to help with the problem statement framed. All the individual ideas have been valued and made individual clusters.

Then discussed as a team and finally made an ideation Cluster A and concluded with the most voted ideas from all the clusters together and Cluster with the least needed ideas.

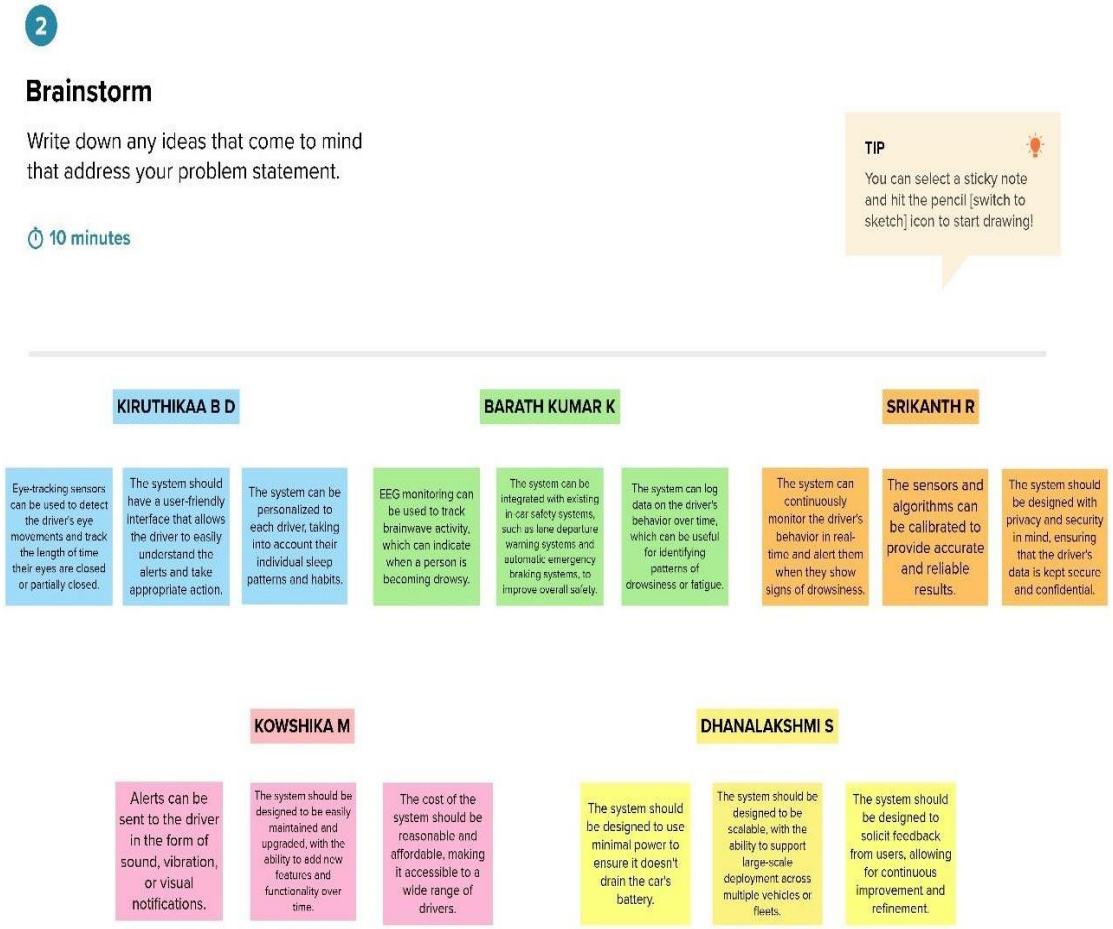


Figure 2.3.2. Idea Listing

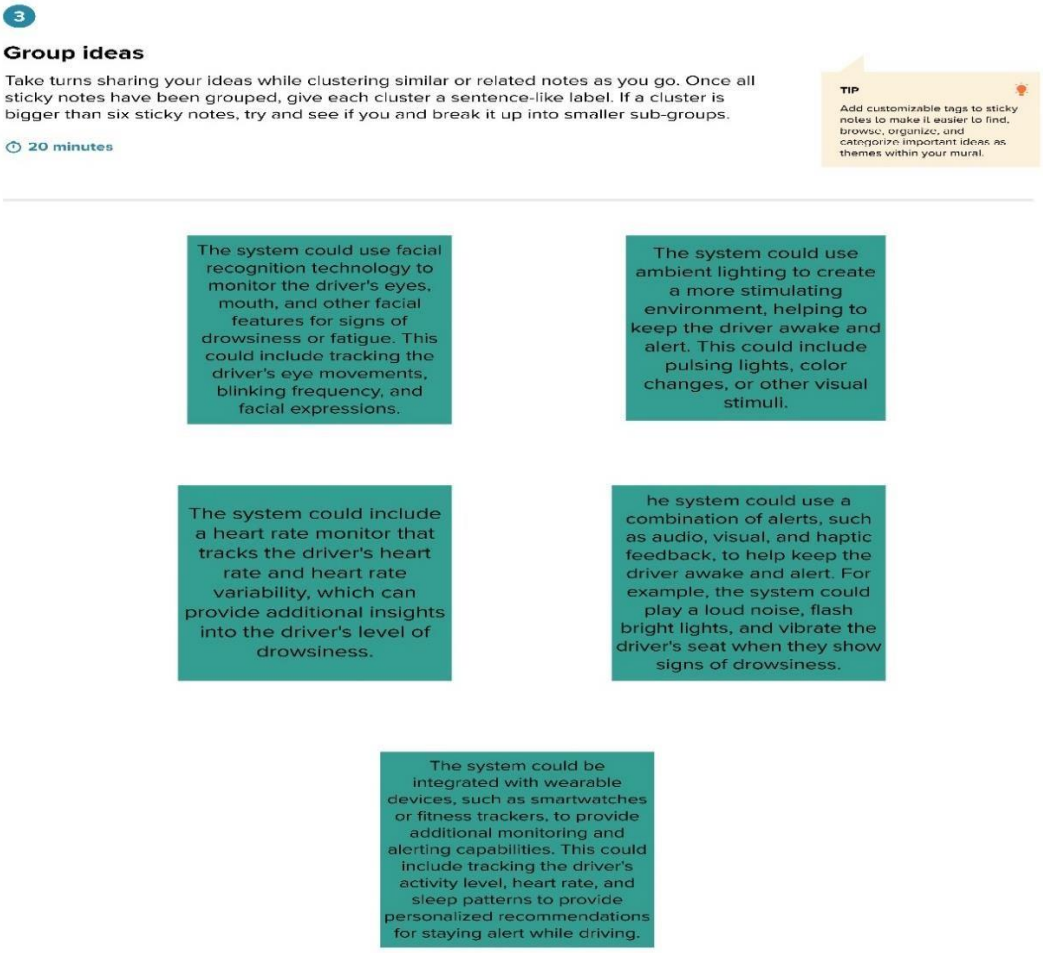


Figure 2.3.3. Grouping

STEP 3 IDEA PRIORITIZATION

This step includes the process of listing necessary components to come upwith the working solution and making a hierarchy chart by prioritizing the components based on importance, say from the higher being backend and lowerbeing the user interfacing components.

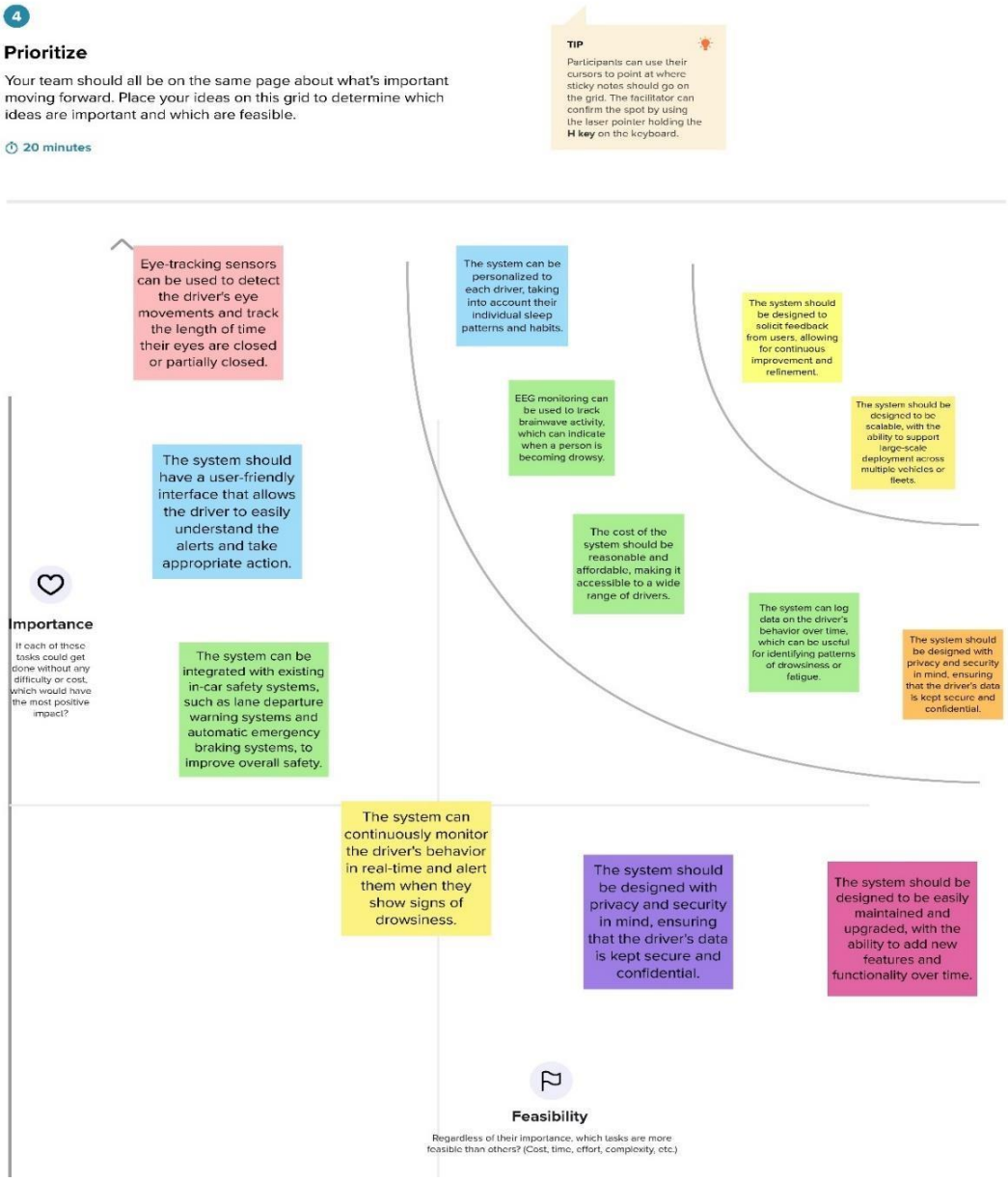


Figure 2.3.4. Idea Prioritization

2.4 PROPOSED SOLUTION

Problem statement (problem to be solved) :

Driver fatigue and drowsiness are major contributors to road accidents, leading to loss of lives and property. It is crucial to develop an effective drowsiness detection and alerting system that can monitor driver behavior and provide timely warnings when signs of drowsiness are detected.

Idea / Solution description :

The proposed solution aims to provide an accurate, reliable, and user-friendly drowsiness detection and alerting system that can significantly reduce the risks associated with driver drowsiness. By leveraging advanced technologies and real-time monitoring, the system will help prevent accidents caused by drowsy driving and enhance overall road safety.

Novelty/Uniqueness:

The combination of multi-modal sensing, real-time monitoring, individualized adaptation, context-awareness, robustness, and integrated alerting mechanisms makes the proposed drowsiness detection and alerting system novel and unique, offering an advanced and comprehensive solution to address the critical issue of drowsy driving.

Social Impact / Customer Satisfaction :

The system's effectiveness in detecting drowsiness and providing timely alerts contributes to a safer and more satisfying driving environment.

Business Model (Revenue Model) :

It is important to note that the specific revenue model can vary depending on the target market, customer segments, and competitive landscape. Market research and feedback from potential customers will play a crucial role in shaping the most effective revenue model for the drowsiness detection and alerting system.

Scalability of the Solution :

It has the ability to handle increasing demands, accommodate a larger user base, and maintain performance as the system expands.

2.5 PROBLEM-SOLUTION FIT

The Problem-Solution Fit simply means that you have found a problem withyour customer and that the solution you have realized for it solves the customer's problem.

Figure 2.2. Solution Fit

CHAPTER - 3

REQUIREMENT ANALYSIS

3.1 Functional Requirements

- User Requirement - Set up the device in necessary place
- User Registration - Manual Registration
- User Confirmation - Confirmation of receiving the calls & message
- User Alert - Gets alert as an SMS message
  Gets alert alarm in working area

3.2 Non-Functional Requirements

Usability

The Device must be usable by customer anywhere.h

Smart

Data from the sensor are stored securely and away from other data.

Reliability

Data can be retrieved anytime and no data is discarded without customer knowledge.

Performance

No performance delay in case of large number of data or parameters.

Availability

It works for 24/7 without rest it can be monitor with durability.

Scalability

Device must be capable of measuring conditions even in large industry.

CHAPTER – 4

PROJECT DESIGN

4.1 DATA FLOW DIAGRAMS

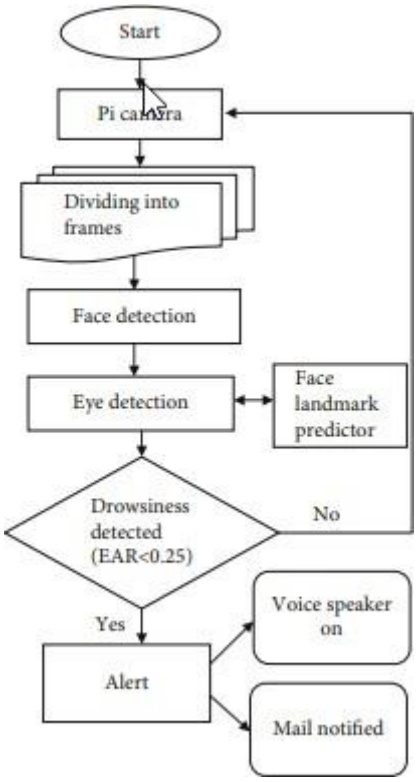


Figure4.1. Data flow Diagram

4.2 SOLUTION AND TECHNICAL ARCHITECTURE

The solution architecture includes the components and the flow we have designed to deliver the solution.

Here, the application is planned to be designed, where the software monitors the gas leakages in industry sends the alerting message through SMS or Mail

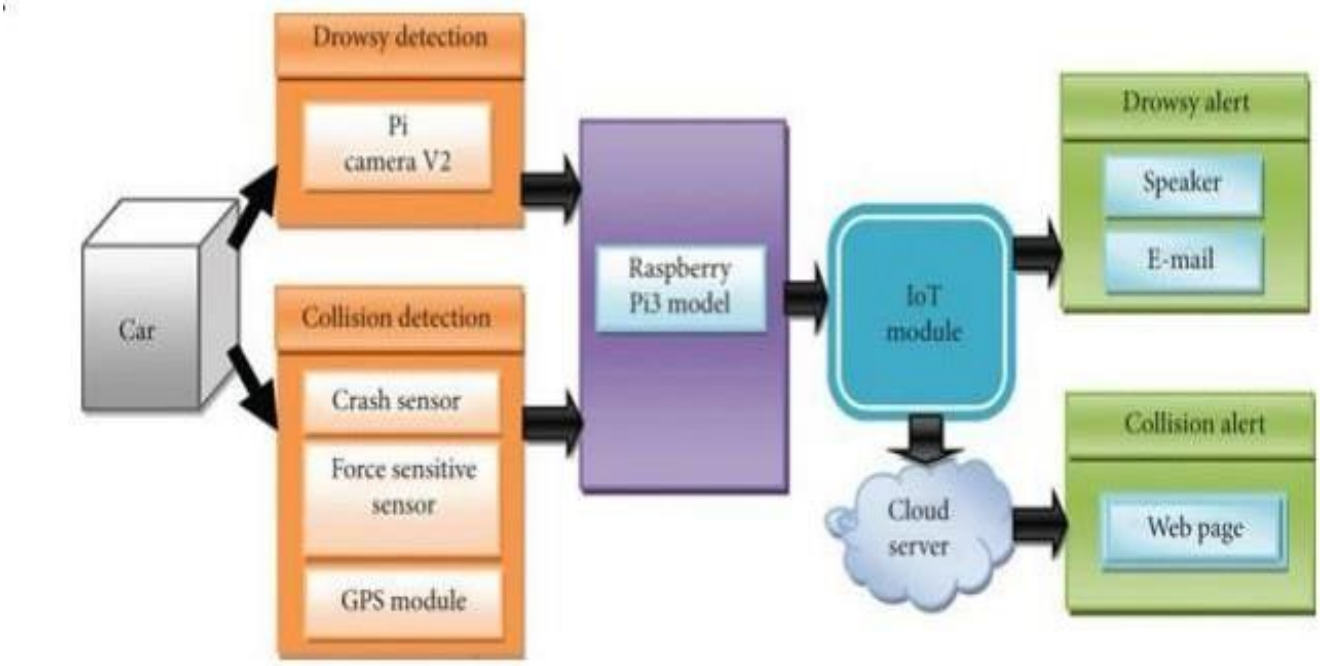


Figure4.2. Technology Architecture

4.3 USER STORIES

User Type	Functional Requirement(Epic)	User Story Number	User Story /Task	Acceptance criteria	Priority
Driver	DrowsinessDetection	US-01	As a driver, Iwant the system to detect my drowsiness and alert me.	System monitors driver's eyes and facial expressions using computer vision. Triggers alert if eyes closed for >2s or head tilts forward consistently for >10s.	High
Administrator	System Configuration	US-02	As an administrator, I want to configure thesystem parameters for drowsiness detection	The system enables the administrator to set the thresholds for both eye closure duration and head tilt duration.	Medium
Driver	Notification references	US-03	As a driver, Iwant to customize the notification preferences for drowsiness alerts.	The system provides the driver with the option to choose between visual alerts, auditory alerts, or both, and allows them to adjust the volume of auditory alerts.	Medium
Driver	Data Logging	US-04	As a driver, Iwant the system to log drowsiness events for future analysis.	The system should log the timestamp and duration of each drowsiness event. - The logged data should be exportable in a CSV format.	Low

Table4.1. User Stories

CHAPTER - 5

CODING AND SOLUTIONS

FEATURE 1

By combining the capabilities of Node-RED and Python, the Drowsiness Detection and Alerting System can benefit from the visual programming environment provided by Node-RED, while leveraging the computational power and extensive libraries of Python. This integration enables efficient development, integration, and deployment of the system, facilitating real-time drowsiness detection and timely alerting to ensure driver safety.

Features of Node-RED & Python

Visual Programming and Easy Integration

Simple user interface creation

FEATURE 2

IoT cloud Watson plays a crucial role in supporting the Drowsiness Detection and Alerting System by providing a scalable, secure, and analytically robust platform. It enables real-time data analysis, personalized detection, remote monitoring, and integration with other IoT devices, ultimately enhancing the system's performance and effectiveness in preventing drowsy driving accidents.

CHAPTER – 6

RESULTS

Performance Metrics

NFT -Detailed Test Plan

S.No	Project Overview	NFT Test approach	Approvals
1.	Drowsiness detection and alerting system	open CV	Approved

Table 9.1. NFT - Detailed Test Plan

End of Test Report

Project Overview	NFT Test approach	NFR - Met	GO/NO-GO decision	Identified Defects	Approvals/ Sign Off
Drowsiness detector web UI	load	Performance	GO	Closed	Approved

Table9.2. End of Test Report

CHAPTER – 7
ADVANTAGES

ADVANTAGES

Enhanced Road Safety:

The drowsiness detection and alerting system improves road safety by timely identifying driver drowsiness and alerting them, preventing potential accidents caused by fatigue.

Real-time Monitoring:

The system continuously monitors driver behavior in real-time, ensuring prompt detection of drowsiness and enabling immediate alerts.

Customized Approach:

By considering multiple indicators of drowsiness, the system can adapt to individual variations and provide personalized alerts based on each driver's unique patterns.

Accurate Detection:

Leveraging advanced machine learning and computer vision techniques, the system accurately detects signs of drowsiness, minimizing false alarms and ensuring reliable performance.

Contextual Awareness:

The system takes into account driving conditions, environmental factors, and vehicle types to provide contextually relevant alerts, improving its effectiveness and adaptability.

Proactive Prevention:

By alerting drivers before they become too drowsy, the system helps prevent accidents rather than simply reacting to dangerous situations, reducing the overall risk on the road.

User-Friendly Design:

The system can be integrated into existing vehicle technologies with user-friendly interfaces, ensuring ease of use and acceptance among drivers.

Continuous Monitoring:

The system provides continuous monitoring throughout the entire duration of a driving session, offering a reliable safety net against fatigue-related accidents.

Potential Cost Savings:

By preventing accidents and reducing the associated costs of injuries, property damage, and insurance claims, the system offers potential long-term cost savings for individuals and society.

Improved Driver Well-being:

The system promotes driver well-being by encouraging regularbreaks, rest, and self-awareness, ultimately leading to healthier driving habits and reduced fatigue-related risks.

CHAPTER – 8

CONCLUSION

In conclusion, the drowsiness detection and alerting system represents a significant advancement in road safety technology. By leveraging machine learning and computer vision techniques, the system accurately monitors driver behavior in real-time, identifying signs of drowsiness and providing timely alerts. With its ability to consider multiple indicators of drowsiness and adapt to individual variations, the system offers personalized and contextually relevant alerts. By preventing accidents caused by driver fatigue, the system enhances road safety and potentially saves lives. Moreover, its continuous monitoring capabilities, user-friendly design, and potentialcost savings make it a valuable tool in promoting driver well-being andreducing the risks associated with drowsy driving

CHAPTER – 9

FUTURE SCOPE

In the future, drowsiness detection and alerting systems will employadvanced technologies to enhance road safety by effectively monitoring and detecting driver fatigue. These systems will utilize artificial intelligence, machine learning, and computer vision algorithms to analyzemultiple indicators such as eye movement, facial expressions, body posture, and driving behavior. By accurately assessing driver alertness in real-time, they will provide timely alerts and interventions to prevent accidents caused by drowsy driving. With their ability to personalize alerts and consider contextual factors, these systems will significantly reduce the number of fatigue-related accidents, ultimately saving lives and improving road safety in the future.

CHAPTER – 10

APPENDIX

SOURCE CODE:

CLIENT:

```
# Face Recognition
# Importing the librariesimport cv2
import ibmiotf.applicationimport ibmiotf.device

# Loading the cascadesface_cascade =

cv2.CascadeClassifier('haarcascade_frontalface_default.xml')

    eye_cascade = cv2.CascadeClassifier('haarcascade_eye.xml')



    # Provide your IBM Watson DeviceCredentials
  organization = "yccm9d"deviceType = "3ASSGN" deviceId = "121"



  authMethod = "token" authToken = "0123456789" def ibm_start(status):

def myCommandCallback(cmd): print("Command received: %s"%

  cmd.data['command'])

  print(cmd)

  try:

deviceOptions = { "org": organization,"type": deviceType,"id": deviceId,
```

```
    "auth-method": authMethod,"auth-token": authToken
    }
ibmiotf.device.Client(deviceOptions)except Exception as e:
                    print("Caught exception
          connecting device: %s" % str(e))
                    sys.exit()

                deviceCli.connect()
                data = {'Status': status}

                def myOnPublishCallback():
                  print("Published Status = %s"
% status, "to IBM Watson")
        success = deviceCli.publishEvent("DD",
"json",data, qos=0,
on_publish=myOnPublishCallback)
if not success:
print("Not connected to IoTF")

        deviceCli.commandCallback =
myCommandCallback
deviceCli.disconnect()
```

```
        # Defining a function that will dothe
    detections

    def detect(gray, frame):

            faces = face_cascade.detectMultiScale(gray, 1.3,
    5)

  for (x, y, w, h) in faces: cv2.rectangle(frame, (x,

    y),
    (x+w, y+h), (255, 0, 0), 2)

    roi_gray = gray[y:y+h, x:x+w] roi_color =

    frame[y:y+h, x:x+w]

                eyes = eye_cascade.detectMultiScale(roi_gray,1.5, 3)


      if len(eyes) == 0: cv2.putText(frame,
      "DROWSY", (x, y), cv2.FONT_HERSHEY_SIMPLEX, 1, (255,
      255, 0), 2)

      ibm_start("DROWSY")
            else:

                cv2.putText(frame, "AWAKE", (x, y), cv2.FONT_HERSHEY_SIMPLEX,
      1, (100,
      255, 0), 2)

      ibm_start("AWAKE")
```

```
for (ex, ey, ew, eh) in eyes: cv2.rectangle(roi_color, (ex,
  ey), (ex+ew, ey+eh), (0, 255, 0), 2)return frame

      # Doing some Face Recognitionwith the webcam

      video_capture =cv2.VideoCapture(0)

            while True:

              _, frame = video_capture.read()

              gray = cv2.cvtColor(frame,
        cv2.COLOR_BGR2GRAY)

              canvas = detect(gray, frame)

              cv2.imshow('Video', canvas)

              if cv2.waitKey(1) & 0xFF ==break
  video_capture.release()

    cv2.destroyAllWindows()
  client.disconnect()
```

OUTPUT 1 :

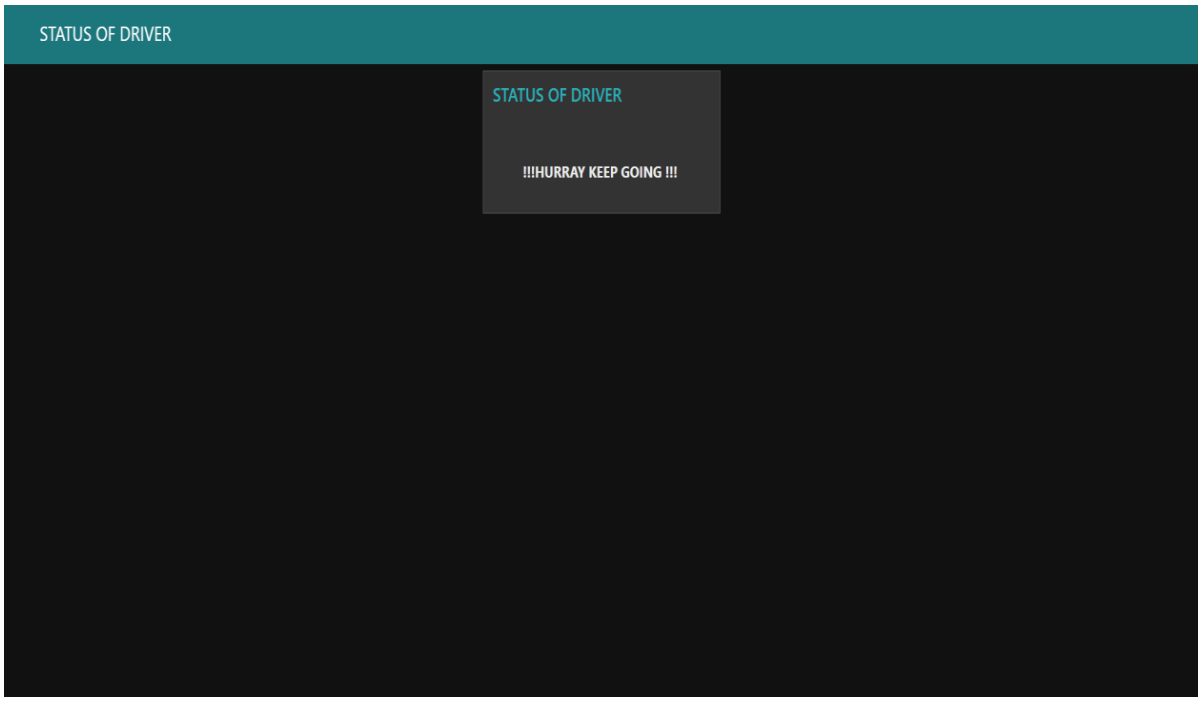


Figure.13.2.1. Dashboard UI

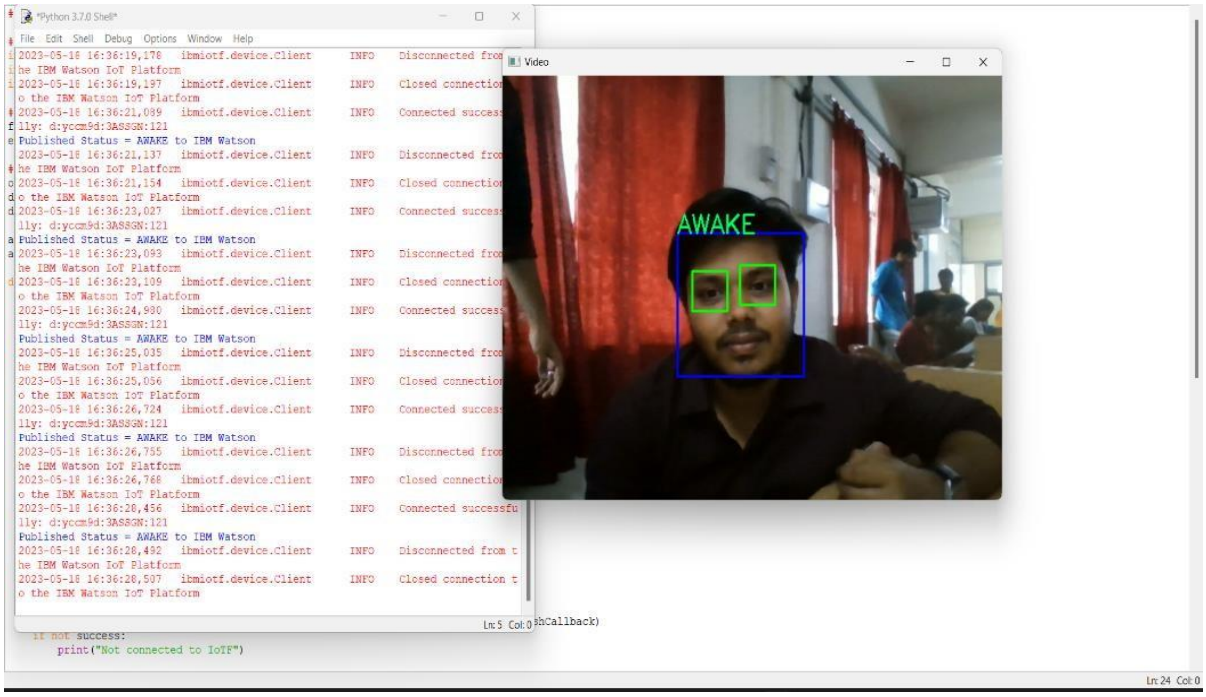


Figure.13.2.2.Output

CHAPTER - 11

GITHUB & PROJECT DEMO LINK:

Content	Link
Github	https://github.com/naanmudhalvan-SI/PBL-NT-GP--2966-1680668579
Project Demonstrationvideo	https://bit.ly/3MJd6Ap

CHAPTER - 12

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