India

LivSOS System

Introducing a comprehensive fatigue safety ecosystem, combining a drowsiness detection system with full auto parking for enhanced road safety.

Explore More →

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TEAM ISOURSE

S

SHRESTA BANERJEE

- Third Year in B-Tech CSE Core

R

RAJESHWARI DHAR

- Third Year in B-Tech
  CSE w/s Computer Networking

S

SARANYA GHOSH

- Third Year in B-Tech
  CSE w/s CyberSecurity

S

SRISHTI CHATTERJEE

- Third Year in B-Tech CSE Core

India

Overview

A Brief About The Project

The drowsiness detection system with full auto parking seamlessly integrates safety and convenience. It prioritizes safety by monitoring driver alertness and preventing fatigue-related accidents. Upon detecting drowsiness, it transitions to autonomous parking, ensuring safety while allowing the driver to rest or recover alertness. The system also extends vigilance to other vehicles, enhancing road safety. This intelligent combination enhances road safety and addresses driver fatigue, marking a pivotal advancement in automotive safety and comfort.

Problem

A Brief Story About The Problems

Fatigue-related road accidents, caused by drowsy or sleeping drivers, pose a grave threat to public safety, leading to injuries, fatalities, and vehicle damage. Multiple factors contribute to these accidents, demanding a comprehensive approach involving awareness, regulations, technology, and behavioral changes. Mitigation strategies include identifying at-risk drivers, implementing fatigue detection systems, promoting healthy sleep habits, regulating driving hours, fostering responsible driving culture, and utilizing vehicle technology. This issue necessitates collaborative efforts from government, industries, and individuals to enhance road safety and reduce the human and economic toll.

The Society

Driver fatigue and drowsiness are significant contributors to road accidents, resulting in injuries and fatalities.

Product Objective

Objective of the Idea

The objective of this system is to enhance road safety by continuously monitoring driver alertness, detecting drowsiness in real-time, and seamlessly transitioning control to an autonomous parking mode when necessary to prevent accidents caused by driver fatigue.

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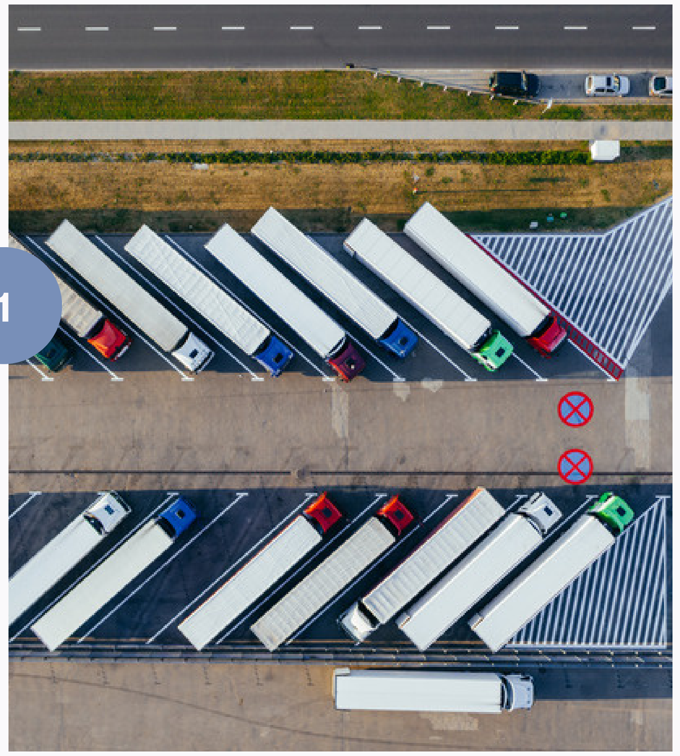

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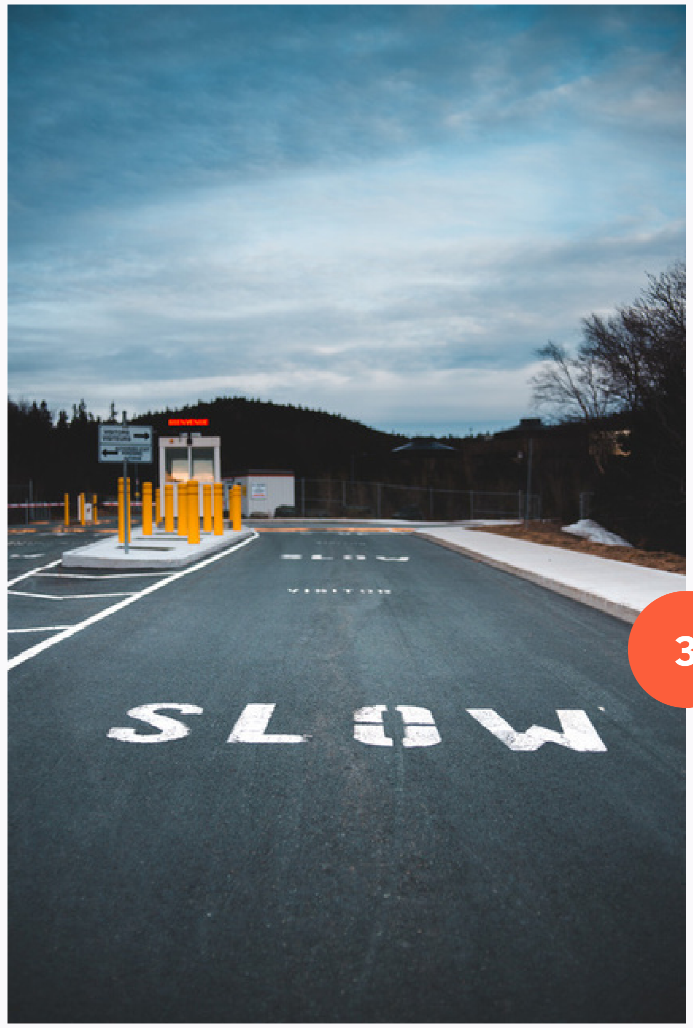

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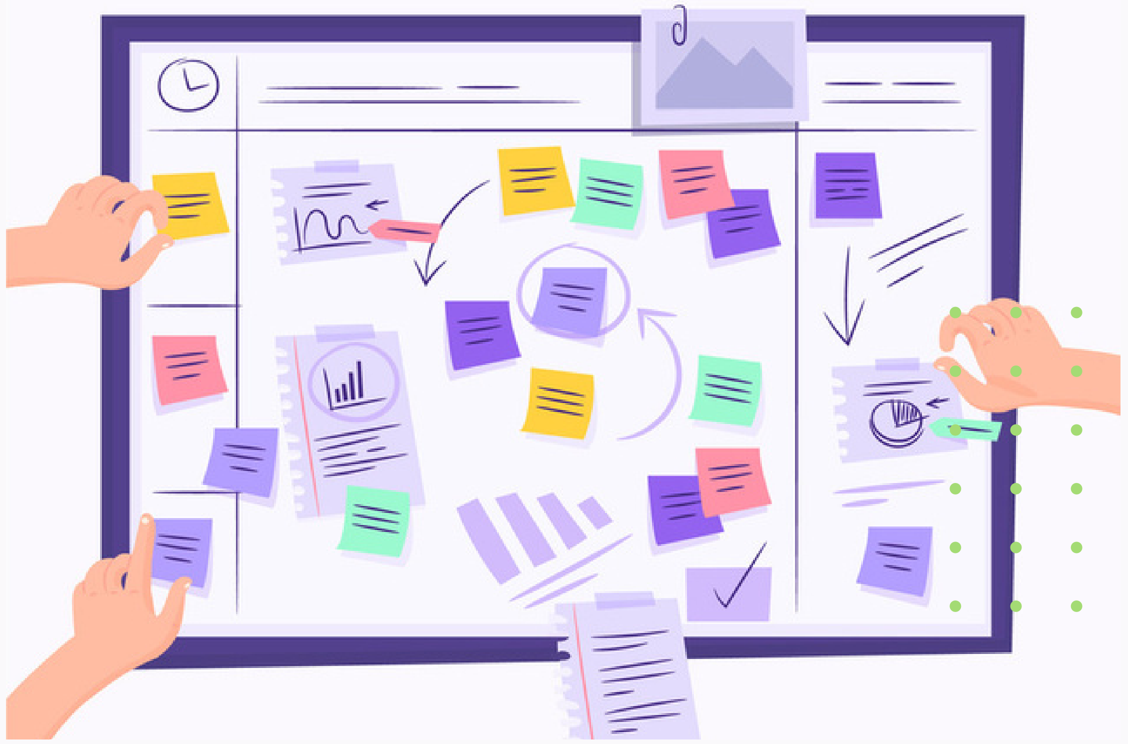
Approach

A Brief About The Solutions

In response to this critical issue, we present an innovative solution: LivSOS an integrated Drowsiness Detection System (DDS) coupled with a Full Auto Parking Mechanism (FAPM). This holistic system also extends its vigilance to other vehicles providind internal as well as external alert system

Market Driven Basic Implementation

The market-driven implementation prioritizes accessibility and affordability while delivering essential safety features. It targets a broad consumer base and offers the potential for future upgrades, aligning with market demands for enhanced road safety solutions.



Solution Overview

A Brief Story About The Product

Our revolutionary solution fuses a Drowsiness Detection System (DDS) with a cutting-edge Full Auto Parking Mechanism (FAPM). This holistic system also extends its vigilance to other vehicles, preventing collateral damages through strategic brake light blinking and honking patterns working as an alert system.

Drowsiness Detection System (DDS):

The Drowsiness Detection System utilizes a combination of advanced sensors, computer vision, and machine learning algorithms to assess the driver's state of alertness in real-time.

Key features include:

- **Facial recognition.**
- **Eye tracking.**
- **Steering behavior analysis.**

These components work together to detect signs of drowsiness, such as drooping eyelids, excessive blinking, and erratic driving patterns.

Upon detection of drowsy behaviour, the system triggers a series of escalating alerts to the driver, including visual, auditory, and haptic feedback

Surrounding Detection: V2V Communication (SDS)

A surrounding detection system in a vehicle employs Vehicle-to-Vehicle (V2V) communication is a crucial component of advanced driver assistance systems and autonomous vehicles.

key components :

- Include onboard transceivers, which enable vehicles to broadcast and receive data such as speed, position, and acceleration.

This technology relies on wireless communication between vehicles to enhance situational awareness and safety.

Surrounding Detection: V2V Communication (SDS)

Dedicated short-range communication (DSRC) or cellular networks facilitate data exchange. Advanced algorithms process this information to calculate relative distances, speeds, and potential collision risks, enabling vehicles to make informed decisions and take preventive actions

Our system also incorporates a comprehensive sensor suite comprising cameras and ultrasonic sensors. These sensors play a pivotal role in detecting a wide array of obstacles, including barriers and other objects in the vehicle's vicinity.

Lane Detection System (LDS) :

When the drowsiness detection system identifies signs of driver fatigue, it may use data from the lane detection system to assess lane-keeping behavior. If the driver shows signs of drifting across lanes due to drowsiness, it can trigger additional warnings or interventions.

During the auto parking process, the lane detection system assists in accurately identifying and tracking lanes within the parking area. This information helps the vehicle navigate safely into the parking spot

Lane Detection System (LDS) :

If the drowsiness score surpasses a specified threshold, activate a series of alerts:

- Auditory warnings, including beeping sounds or Loud horn
- Strategic brake light blinking

Key Components :

- **Camera(s):** Cameras capture images of the road ahead, serving as the primary sensor for lane detection.
- **Lane Marking Detection:** Algorithms process these images to identify and detect lane markings on the road.

Automated Alert System (AAS):

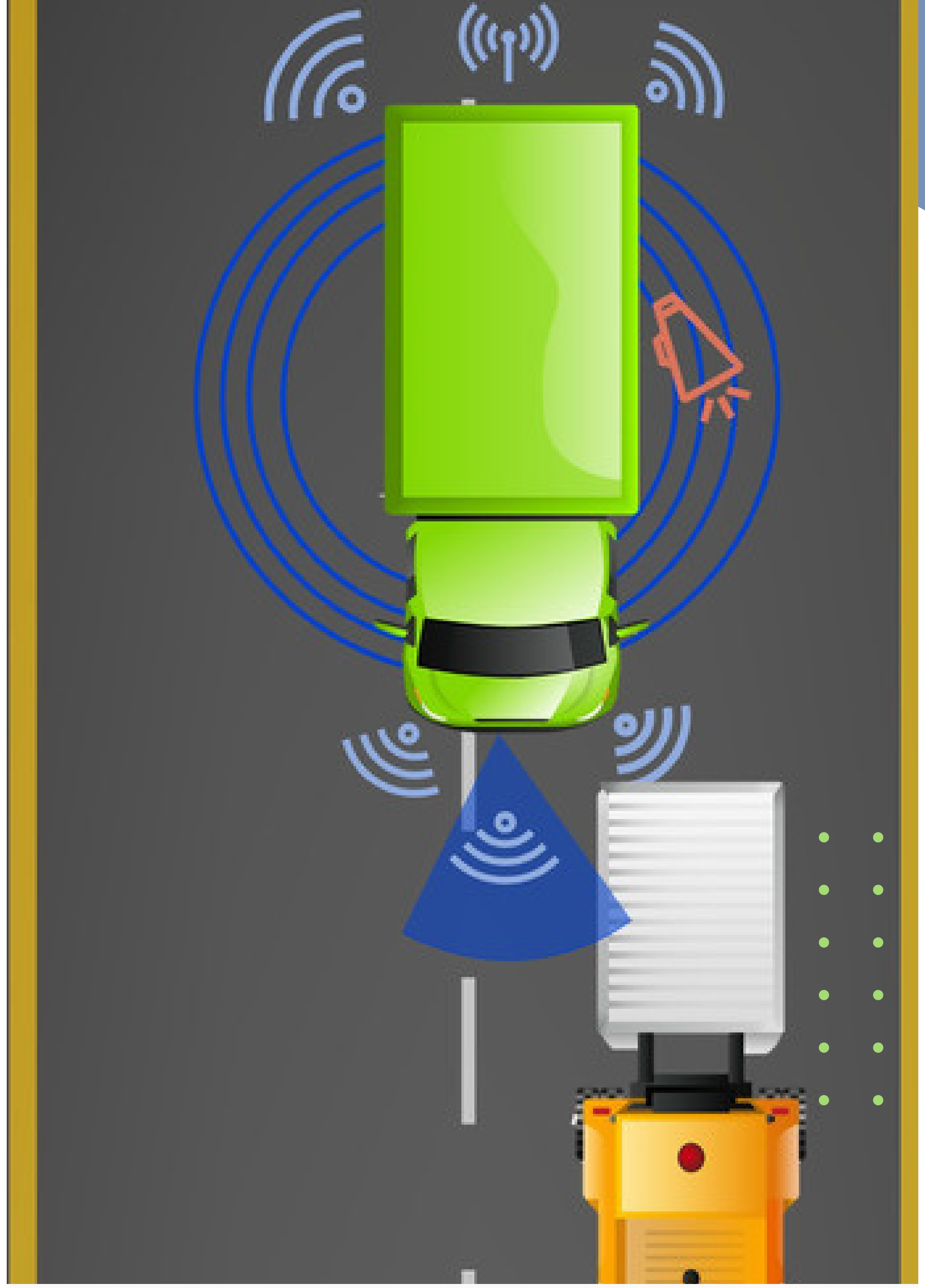
Upon detecting critical fatigue indicators, the ASCS takes control of the vehicle's speed, reducing it to a safer level.

The alert system promptly notifies the driver through visual, auditory, or haptic cues, ensuring that the driver can take immediate corrective action.

The system can also initiate external notifications, alerting nearby vehicles and authorities about the drowsy driver. It extends its vigilance to other vehicles, preventing collateral damages through

- strategic brake light blinking
- honking patterns.

The AAS employs advanced sensor technology and artificial intelligence (AI) algorithms to continuously monitor the driver's state of alertness.



Key components include

- facial recognition
- eye tracking
- steering behavior analysis.

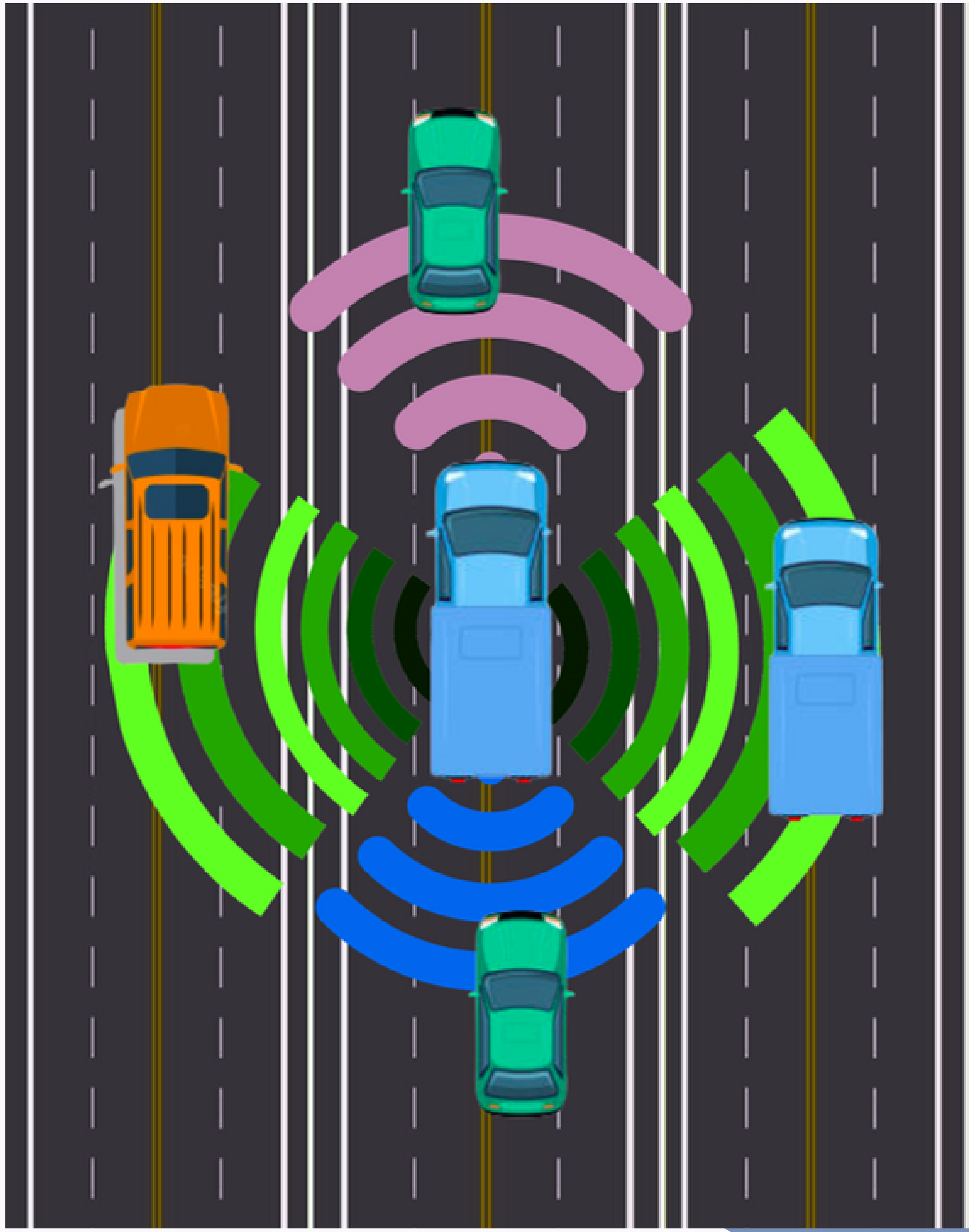
Full Auto Parking System (FAPS) :

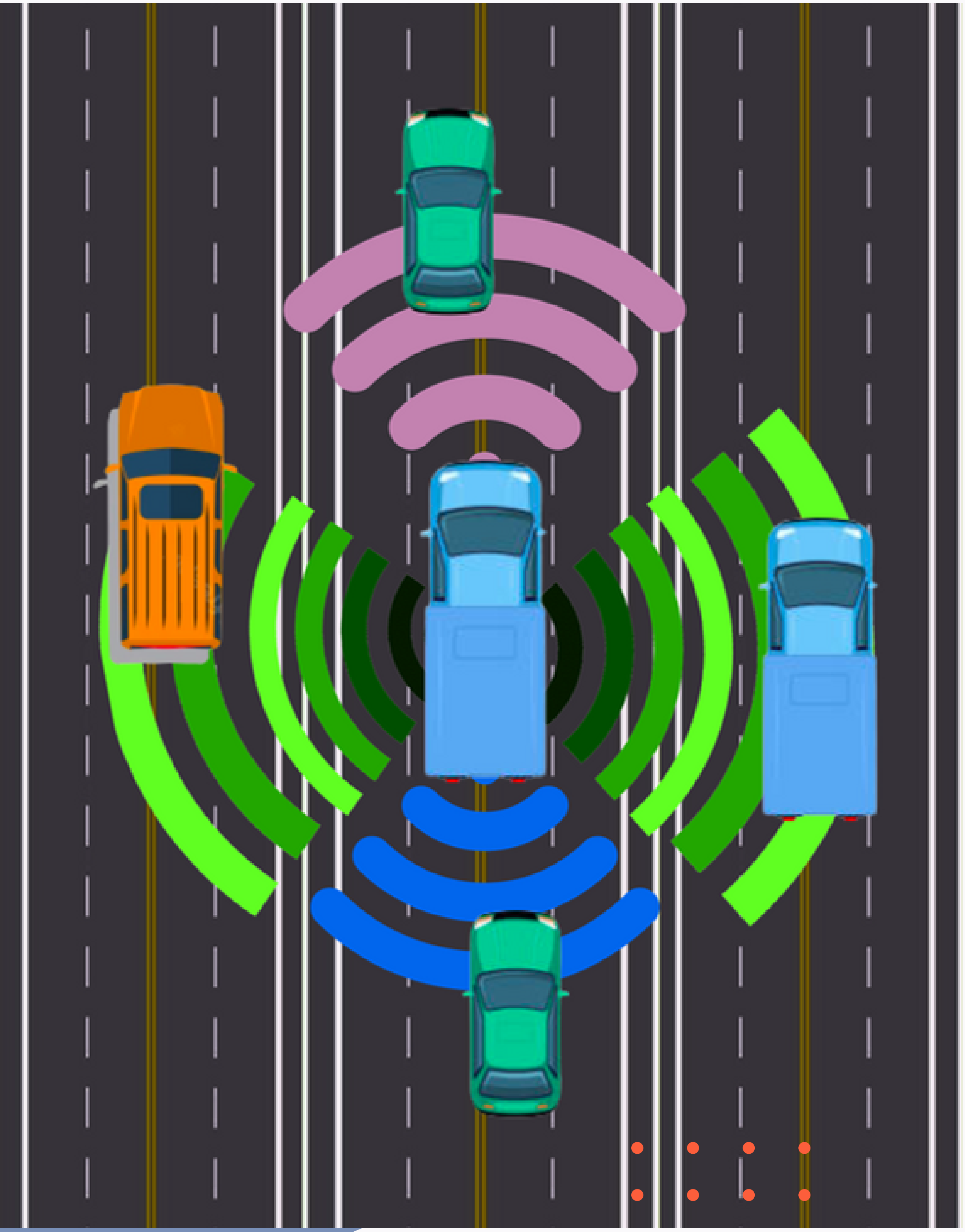
V2V communication enables vehicles to exchange crucial information such as speed, position, and intent, creating a cooperative network among nearby vehicles.

In cases where the driver's level of drowsiness reaches a critical threshold or if the driver does not respond to the alerts, the Full Auto Parking Mechanism takes control of the vehicle and lead it to the left side of the road and.

Key Components:

- **Sensor Fusion**: Autonomous vehicles blend V2V communication with sensors like cameras, lidar, radar, and ultrasonic sensors to create a comprehensive environment view. V2V data enriches this by sharing nearby vehicle intentions, aiding in anticipating and responding to traffic changes.





Full Auto Parking System (FAPS) :

Key Components:

- **Enhanced Situational Awareness**: Merging with cameras boosts situational awareness. Cameras identify road elements. V2V data supplements this by revealing nearby vehicles' behaviours, such as lane changes and braking, enhancing overall perception.

- **Obstacle Detection and Collision Avoidance:** Integrationwith radar and ultrasonic sensors enhances obstacle detection and collision avoidance. When a vehicle detects an obstacle, it allowing proactive trajectory adjustments for safer roads.

- **Redundancy and Reliability:** The combination offers redundancy. If one sensor falters due to weather or malfunction, V2V compensate, ensuring system reliability and robustne

Challenges Faced

1 Lack Of Proper facility

We are deficient in the necessary resources, including laboratories and essential materials, to construct the prototype.

2 Hardware side

This project involves tasks on both the software/algorithm and hardware aspects. However, our hardware resources are insufficient, and we will require assistance from the OEMs.

Our Scope in this project is the algorithm as well the technical part.

3 Guidance

In the absence of guidance, uncertainty and decision-making complexity become prominent challenges, potentially leading to inefficient or misguided actions.

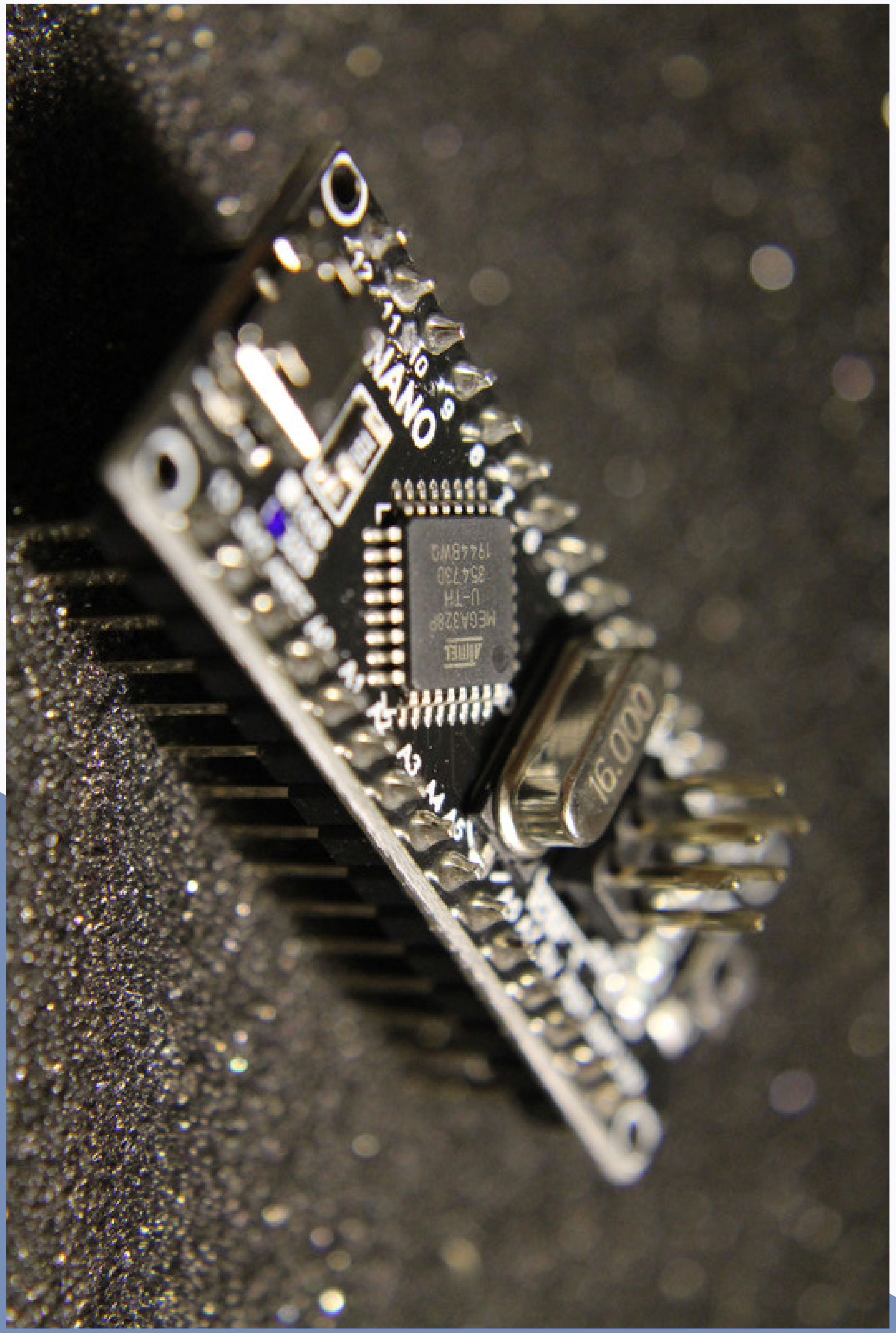
Technical Implementation

Artificial Intelligence Product Overview

Such a comprehensive system involves multiple disciplines including computer vision, machine learning, robotics, and automotive engineering.

Programming Languages and Libraries:

- **Python:** For most of the software components including drowsiness detection, image processing, and machine learning.
- **C++:** For real-time processing, hardware control, and performance-critical tasks.
- **TensorFlow or PyTorch:** For building and training machine learning models.
- **OpenCV:** For computer vision tasks.



Technical Implementation

Artificial Intelligence Product Overview

Hardware Components:

- **Cameras:** To capture images and video streams for analysis.
- **Sensors:** Ultrasonic sensors, LiDAR, radar for distance measurement and obstacle detection.
- **Actuators:** Motors, servos, and other actuators for vehicle control.
- **Microcontroller/Computer:** Raspberry Pi, Arduino, or other similar platforms for processing and control.

Technical Implementation

Algorithm of LivSOS

Here is a high-level overview of the algorithm's structure and key components which uses deep learning and computer vision.

Technical Implementation

DDS

Drowsiness Detection Sys

Drowsiness is identified by using vision-based techniques like eyes detection, yawning, and nodding.

SDS

Surrounding Detection Sys

Implemented using Python integrates sensors, cameras and v2v communication to monitor the environment. It uses computer vision and machine learning to detect and track.

LDS

Lane Detection Sys

These systems use sensors, cameras, and computer vision algorithms to detect lane markings and determine the vehicle's position relative to the lane boundaries.

AAS

Automatic Alert Sys

implemented using Python typically involves monitoring various sensors and vehicle parameters, such as speed, proximity to obstacles, and driver behavior.

Technical Imlementation

DDS

51%

Libraries and Technologies Used:

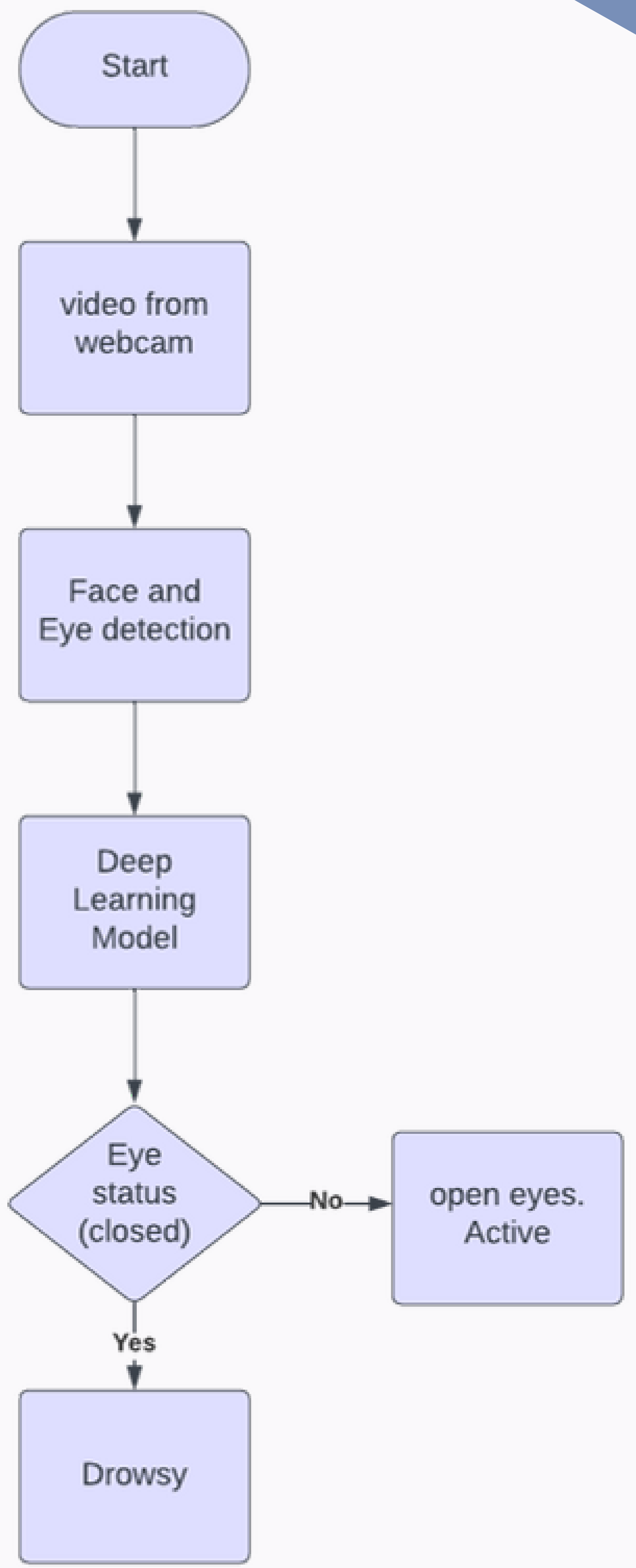
- **Python**: The primary programming language for the project.
- **OpenCV**: Utilized for image processing and computer vision tasks, specifically for face and eye detection.
- **TensorFlow**: Employed for building and training deep neural networks, particularly for image classification.
- **Keras**: A user-friendly Python library for creating artificial neural networks, likely used in conjunction with TensorFlow.

Technical Imlementation

DDS

Methodology:

1. Video Capture: The project starts by capturing video from a webcam mounted in the vehicle.
2. Face Detection: OpenCV is used to detect faces in the video stream, possibly using a Haar Cascade Classifier for this purpose.
3. Eye Detection: Following face detection, the project proceeds to detect eyes within the detected faces.
4. Deep Learning Model: A deep learning model, likely built using TensorFlow and possibly Keras for simplicity, is used to determine the status of the detected eyes. If the eyes are open, the system classifies them as "Active."
5. Drowsy Detection: If closed eyes are detected, the system checks for a few seconds to confirm drowsiness and subsequently triggers an alarm (e.g., beeping) if drowsiness is detected.



Results

Enhanced Safety

Reduces the chances of accidents caused by drowsy driving, which can be as dangerous. It also minimizes the risk of parking-related accidents due to misjudging distances or poor visibility.

Reduced Traffic Congestion

Park vehicles more efficiently and accurately, potentially reducing the time spent searching for parking spaces, thus alleviating traffic congestion in urban areas.

Insurance Benefits

Drivers with vehicles equipped with safety-enhancing features like drowsiness detection and auto parking may enjoy reduced insurance premiums due to lowered accident risks general market.

Driver Convenience

Simplifies the challenging task of finding and maneuvering into parking spaces, making driving convenient. It ensures drivers stay alert and safe on long journeys, improving the overall driving experience.

Fuel Efficiency

Optimize parking maneuvers, potentially reducing unnecessary idling and fuel consumption during parking attempts and speed up the parking process

Technological Advancement

These systems showcase the advancements in automotive technology, promoting the adoption of more sophisticated features and fostering innovation within the automotive industry

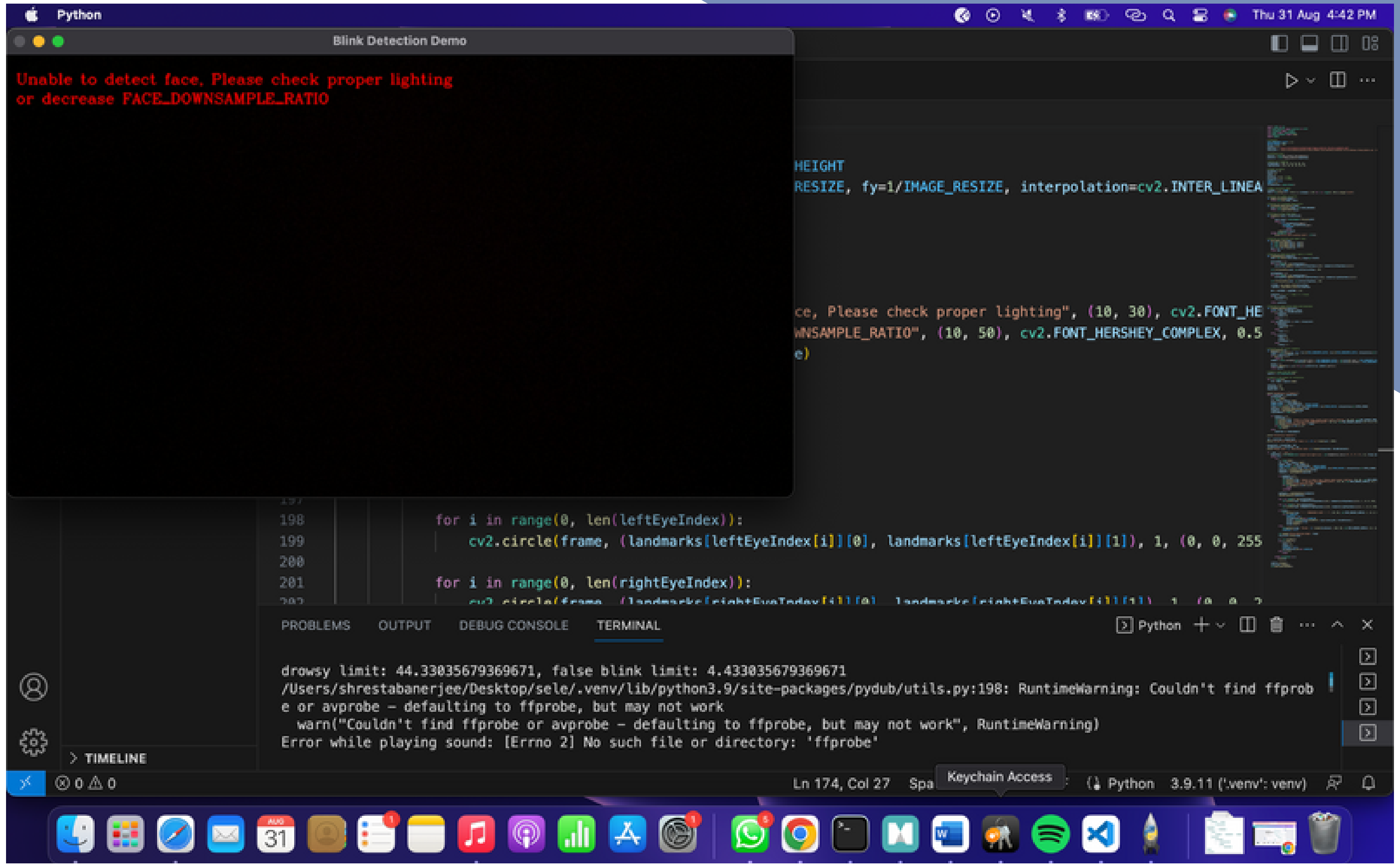
DEMONSTRATION

```python
# Function to check eye status (open or closed)
def checkEyeStatus(landmarks):
    mask = np.zeros(frame.shape[:2], dtype=np.float32)

    hullLeftEye = []
    for i in range(0, len(leftEyeIndex)):
        hullLeftEye.append((landmarks[leftEyeIndex[i]][0], landmarks[leftEyeIndex[i]][1]))

    cv2.fillConvexPoly(mask, np.int32(hullLeftEye), 255)

    hullRightEye = []
    for i in range(0, len(rightEyeIndex)):
        hullRightEye.append((landmarks[rightEyeIndex[i]][0], landmarks[rightEyeIndex[i]][1]))

    cv2.fillConvexPoly(mask, np.int32(hullRightEye), 255)

    leftEAR = eye_aspect_ratio(hullLeftEye)
    rightEAR = eye_aspect_ratio(hullRightEye)

    ear = (leftEAR + rightEAR) / 2.0

    eyeStatus = 1  # 1 -> Open, 0 -> Closed
    if ear < thresh:
        eyeStatus = 0

    return eyeStatus
```

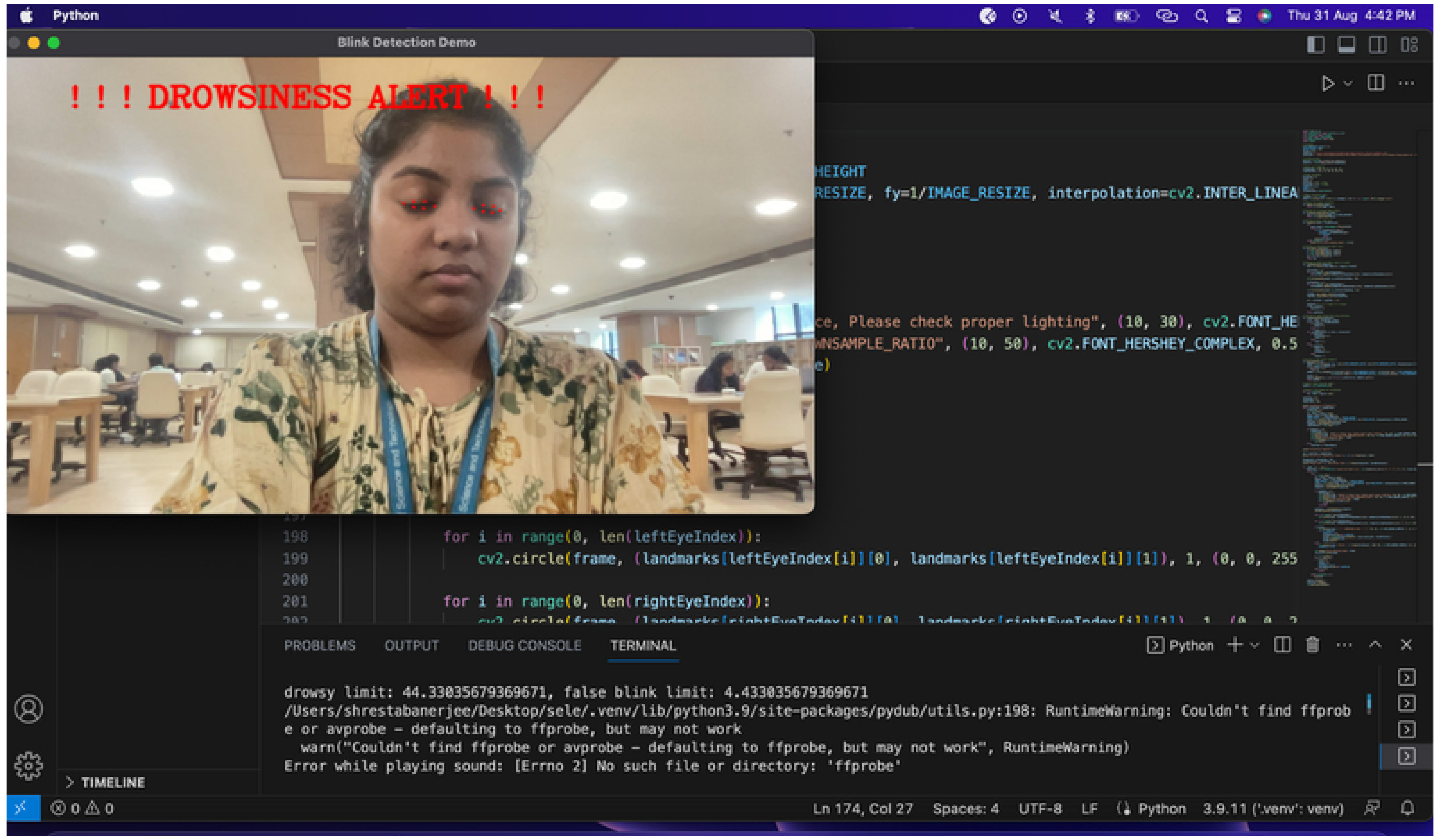
DDS Snippet

DEMONSTRATION

DDS PROTYPE OUTPUT



Case 1: When the camera has not establised connection



Case 2: Drowsiness Detected

Future Enhancements

Additionally, an integral facet of our forthcoming initiatives involves the integration of an emergency feature tailored to address situations where drivers encounter unforeseen medical conditions such as sudden cardiac arrests. This feature will be designed to promptly dispatch notifications to the closest medical facilities, conveying precise details regarding the location of the stationary vehicle through the utilization of the aforementioned sensors.

Moreover, this system will extend its functionality to include the dissemination of health-related alerts to nearby vehicles. By doing so, these neighboring vehicles will be adequately informed about the medical exigency at hand, thus enabling them to undertake suitable measures, including the safe conveyance of the affected driver to the medical facility, should the circumstances necessitate such action.

Future Enhancements

The future objectives of our project involve the incorporation of V2V sensors. These sensors will be responsible for notifying vehicles in close proximity about the driver's fatigue. Upon detection, the system will issue an alert message indicating the impending transition to autopilot mode, resulting in the automatic initiation of the parking procedure.

Project plan

Scope of the project

Drowsiness Detection System Requirements: Develop facial recognition for driver identification and eye-tracking technology to monitor drowsiness signs. Create an algorithm for calculating drowsiness scores and a multi-tier alert system. Design a user interface for real-time status updates.

Autonomous Parking Mechanism Requirements: Integrate lidar and ultrasonic sensors for accurate object detection. Develop path-planning algorithms and control systems for precise parking. Implement obstacle detection and avoidance mechanisms. Include a manual override option for drivers and safety measures.

The system's integration, testing, compliance with standards, and comprehensive documentation are vital.

Project plan

hardware setup

- Infrared/depth-sensing cameras for facial recognition.
- High-resolution cameras for eye tracking.
- Processing unit for real-time analysis.
- Dashboard display for alerts.
- Lidar and ultrasonic sensors for mapping and obstacle detection.
- Processing unit for sensor fusion, planning, and control.
- Electric actuators for steering, throttle, and brakes.
- Manual override controls.
- Redundant sensors for safety.

Project plan

Research done

A Research done by the National Library of Medicine shows that:

It is possible to detect driver drowsiness in its early stages and alarm the driver to avoid any potential accident. Drowsy drivers exhibit various signs, which include repeated yawning, frequent eye closure, and repeatedly departing street lanes [6]. In fact, driver drowsiness detection (DDD) techniques have been researched intensively in recent years

Project plan

A tentative and comprehensible timeline is:

Week 1
Finalizing the project scope and requirements.
Week 2-3Algorithm Development
- Complete development of the drowsiness detection algorithm.
- Finalize the algorithm for autonomous parking.
- Begin pseudocode implementation of both algorithms.

Week 4-5Hardware Assessment and Procurement
- Assess and confirm the required hardware components.
- Initiate the procurement process for necessary sensors and hardware.
 and Research and Documentation
- Conduct in-depth research on recent advancements in drowsiness detection and autonomous parking algorithms.
- Document findings and potential improvements for your project. Hardware Setup and Integration
- Receive procured hardware and sensors.
- Integrate sensors with the code and perform initial tests.

Week 6-8Code Implementation and Testing
- Translate the pseudocode into actual code for both algorithms.
- Begin testing of individual algorithms on simulation platforms.

Week 10-11 Safety Measures Integration
- Develop and integrate safety mechanisms like emergency braking and obstacle avoidance.
- Test safety measures in controlled environments.
Week 11-12Algorithm Refinement and Testing
- Continuously refine and optimize the algorithms based on initial testing results.
- Conduct comprehensive testing of both algorithms in different scenarios. and Full System Integration**
- Integrate the drowsiness detection, autonomous parking, and user interface modules.
- Test the complete system with both algorithms and hardware.

THANK YOU