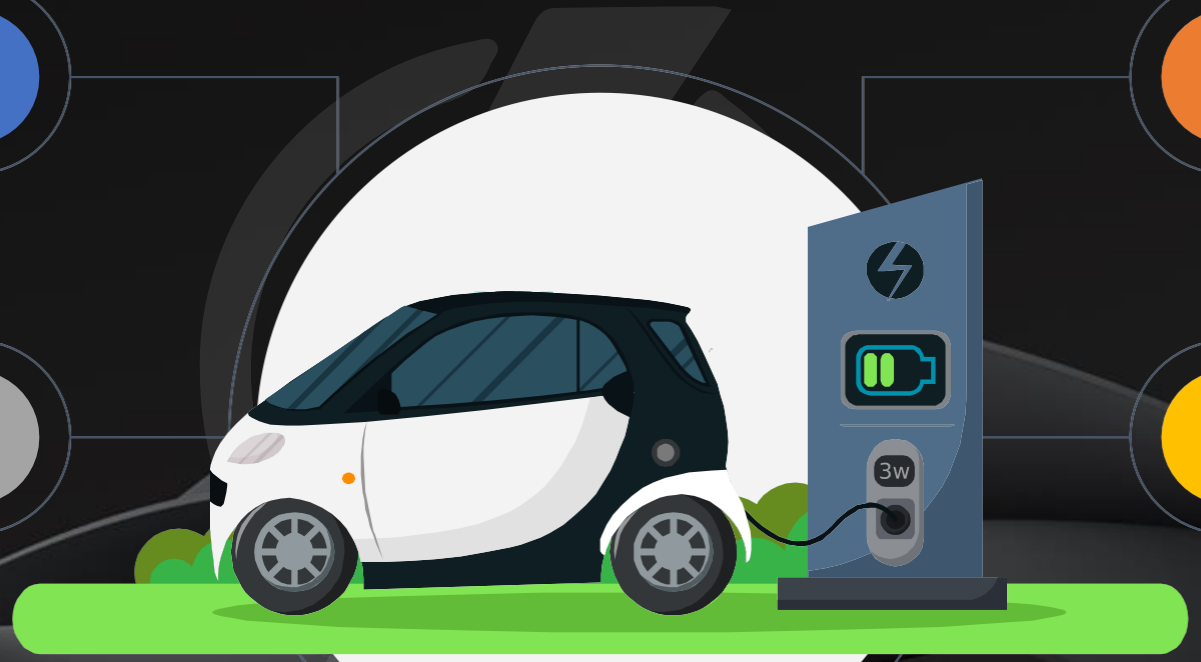
ZephyrAuto+

Level – 2 ADAS

Autonomous Driver Assistance System

CONTENTS



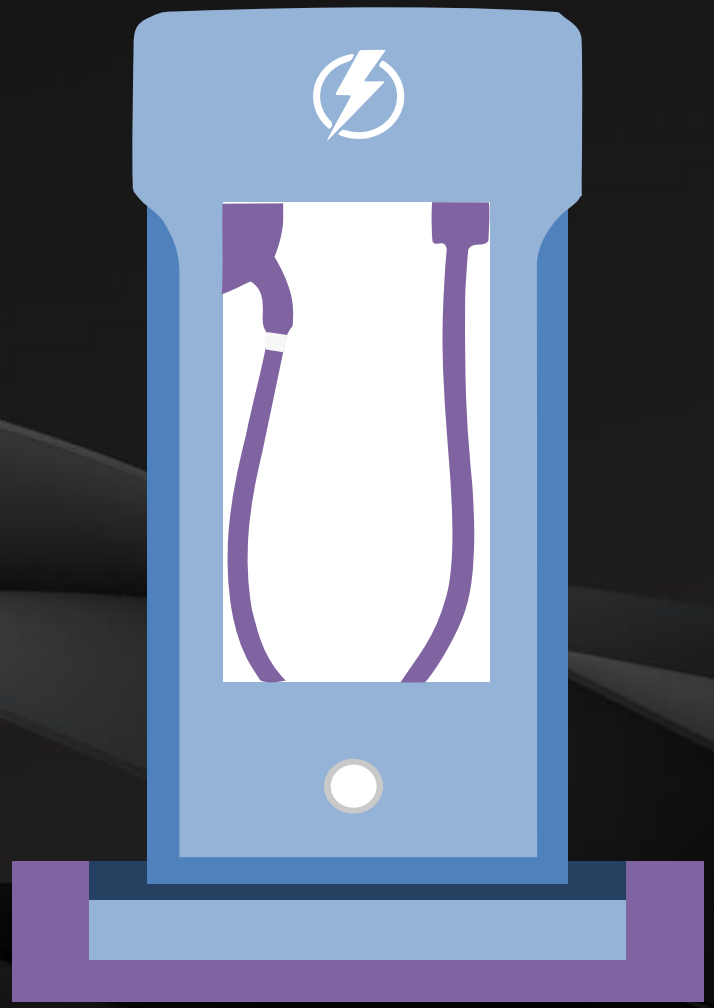
INTRODUCTION TO ZEPHYRAUTO+

1 **Advanced Driver Assistance System** ADAS enhances driver safety by detecting and mitigating hazards like collisions and lane departures.

2 **A Combined Approach**
It assists drivers with features such as adaptive cruise control, lane-keeping assist, Reverse cross traffic alert, Collision Mitigation System and Collision avoidance System.

3 **Sensor Reliability**
ADAS relies on microcontrollers and an array of sensors that are strategically placed in vehicles to gather real-time data about the vehicle's surroundings.

4 **Safety Enhancement**
This system is designed to provide drivers with additional support and assistance, such as warnings and automated interventions, to prevent accidents and reduce the severity of collisions.



OBJECTIVE OF ZEPHYRAUTO+

1 | **Elevate Your Safety**

ADAS is the future of road safety, utilizing innovative technology to reduce accidents and make your journeys safer.

2 | **Convenience Redefined**

Seamlessly navigate lanes with lane-keeping assist, and savor a more relaxed driving experience. ZephyrAuto+ is meticulously designed to simplify your life, one mile at a time.

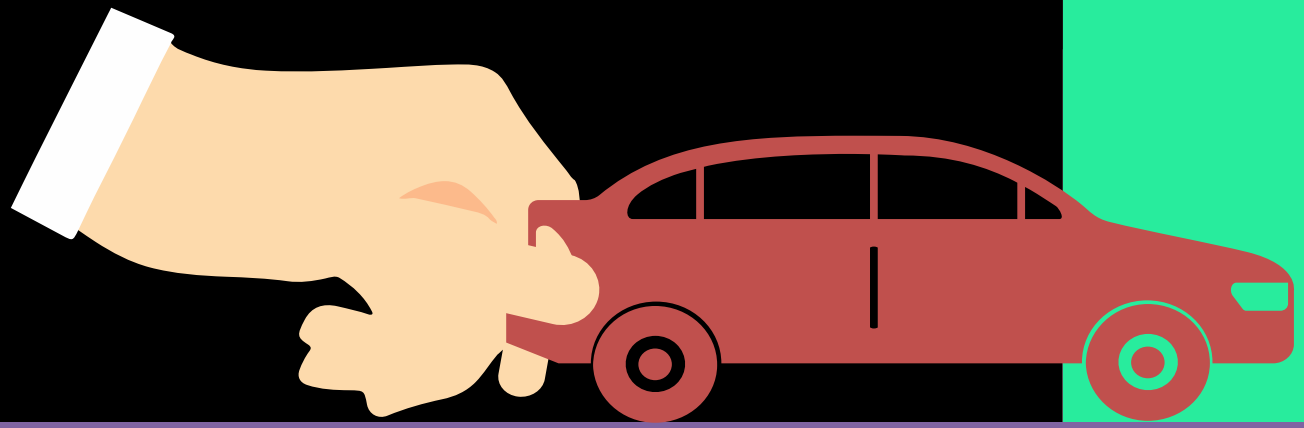
3 | **Seamless Automation**

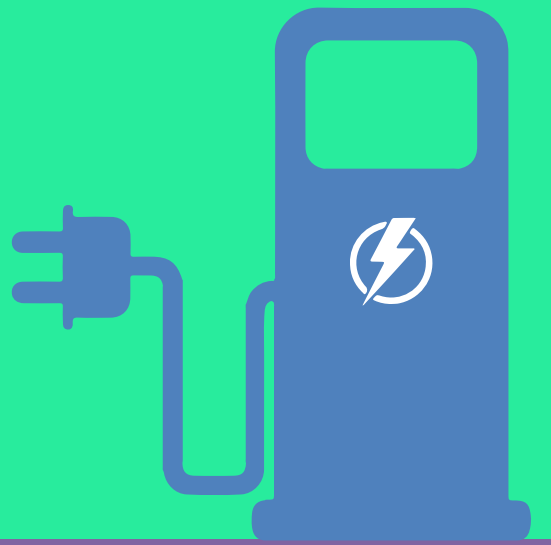
Discover the joy of stress-free driving with features like adaptive cruise control and automatic emergency braking. Let ZephyrAuto+ take care of the intricate details while you focus on what truly matters.

4 | **Informative and Empowering**

With ZephyrAuto+, you're always in control. Our system even provides sensory information and battery level indications through voltage sensors, ensuring you're informed about your vehicle's power status.

PROBLEMS SOLVED – Transition to Autonomous Vehicles





ADAS represents a significant step in the progression towards fully autonomous vehicles. The development and deployment of ADAS technologies lay the foundation for higher levels of vehicle automation. ADAS systems can accurately perceive the environment and detect potential risks or hazards. This information enables ADAS to provide timely alerts, warnings, or even intervene to prevent or mitigate potential accidents.

Up to

3.59

Million Crashes Avoided

Up to

37%

Injury Reduced

The primary objective of ADAS is to improve road safety by assisting drivers in avoiding accidents. These systems provide alerts, warnings, or automatic interventions to prevent or reduce the severity of collisions. By utilizing real-time data about the vehicle's surroundings, ADAS can detect obstacles, pedestrians, lane departures, and other potential risks, helping drivers by making them informed and takes decisions and respond appropriately.

PROPOSED SYSTEM

ZephyrAuto+ systems use advanced technologies to perceive the world around the vehicle and then either provide information to the driver or take action when necessary. Here are three steps that explain how ADAS works:

1. Sensing

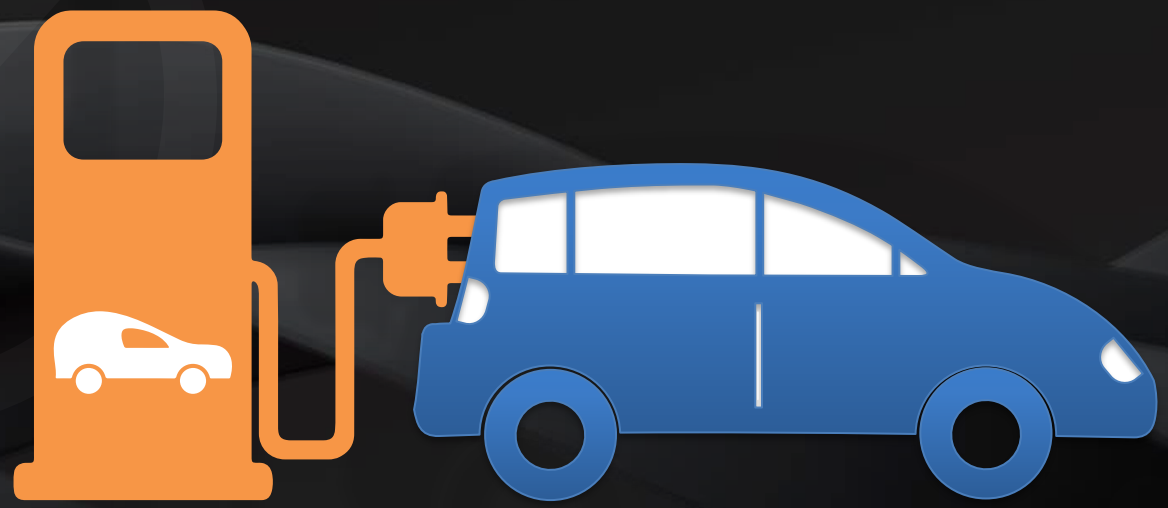
ADAS uses a combination of sensor technologies to perceive the world around the vehicle. These sensors detect nearby obstacles, pedestrians, and other vehicles and provide information to the ADAS system.

2. Processing

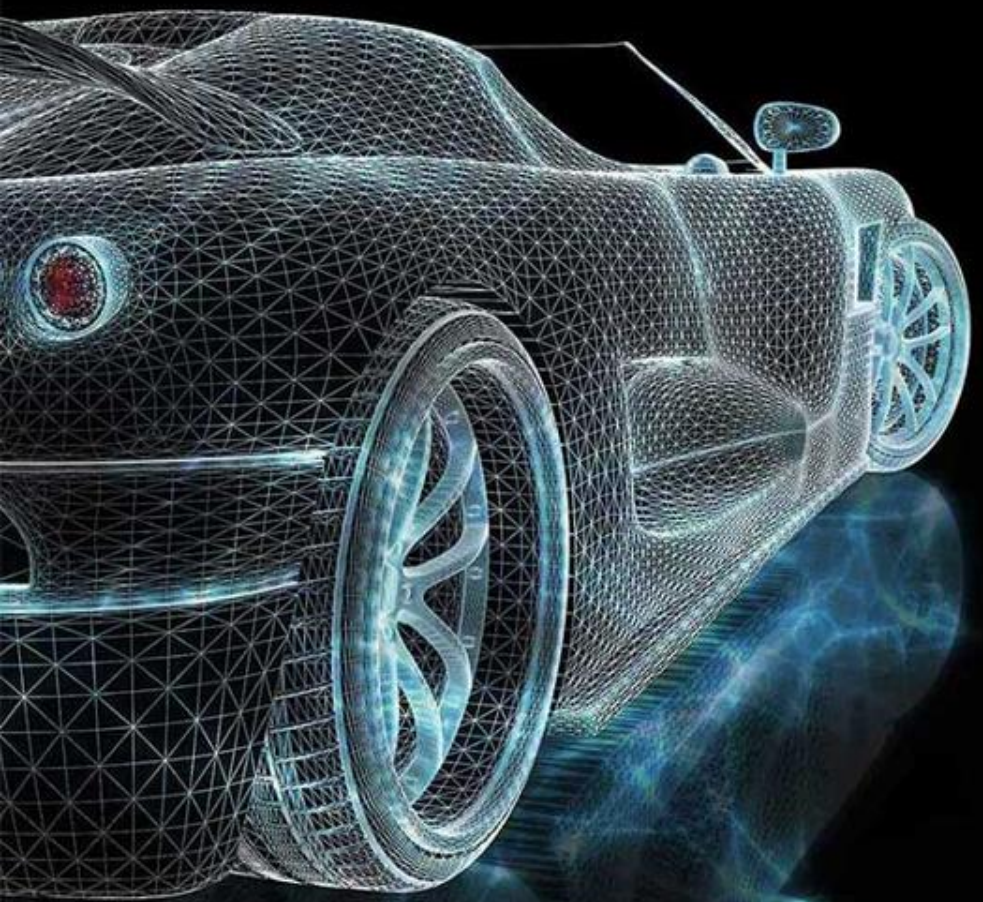
The ADAS system processes the information received from the sensors and determines if any action is required. The system can alert the driver to danger or even take action to avoid an accident.

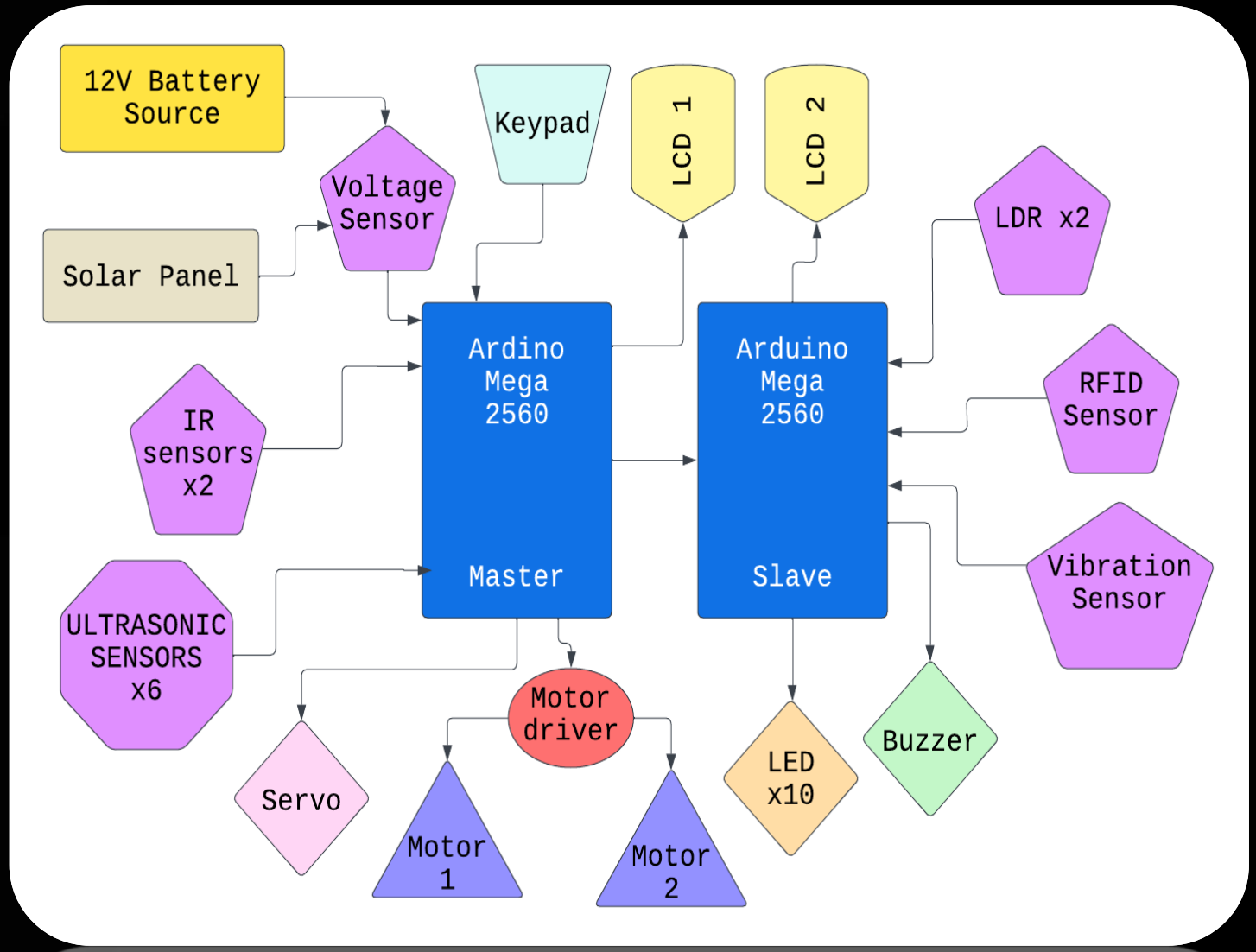
3. Action

Based on the information received and processed, the ADAS system can take action to avoid an accident. For example, if the system detects that a collision is imminent, it can apply the brakes to slow down or stop the vehicle.

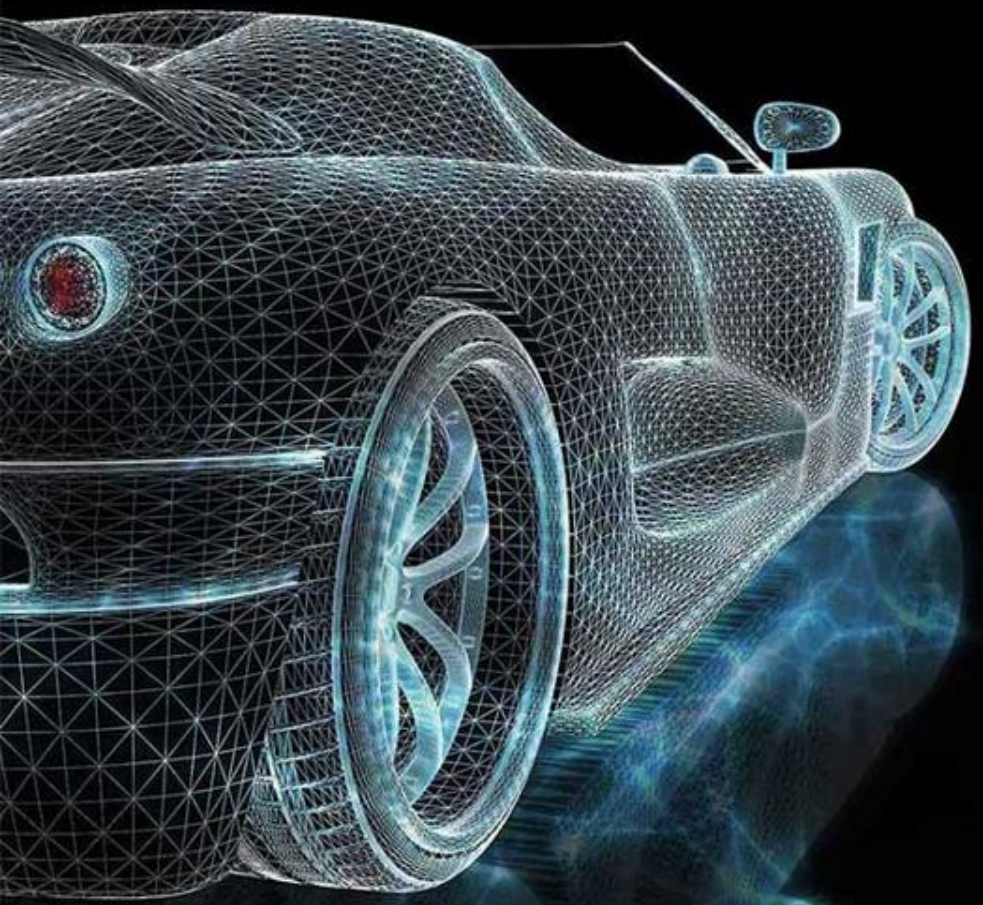


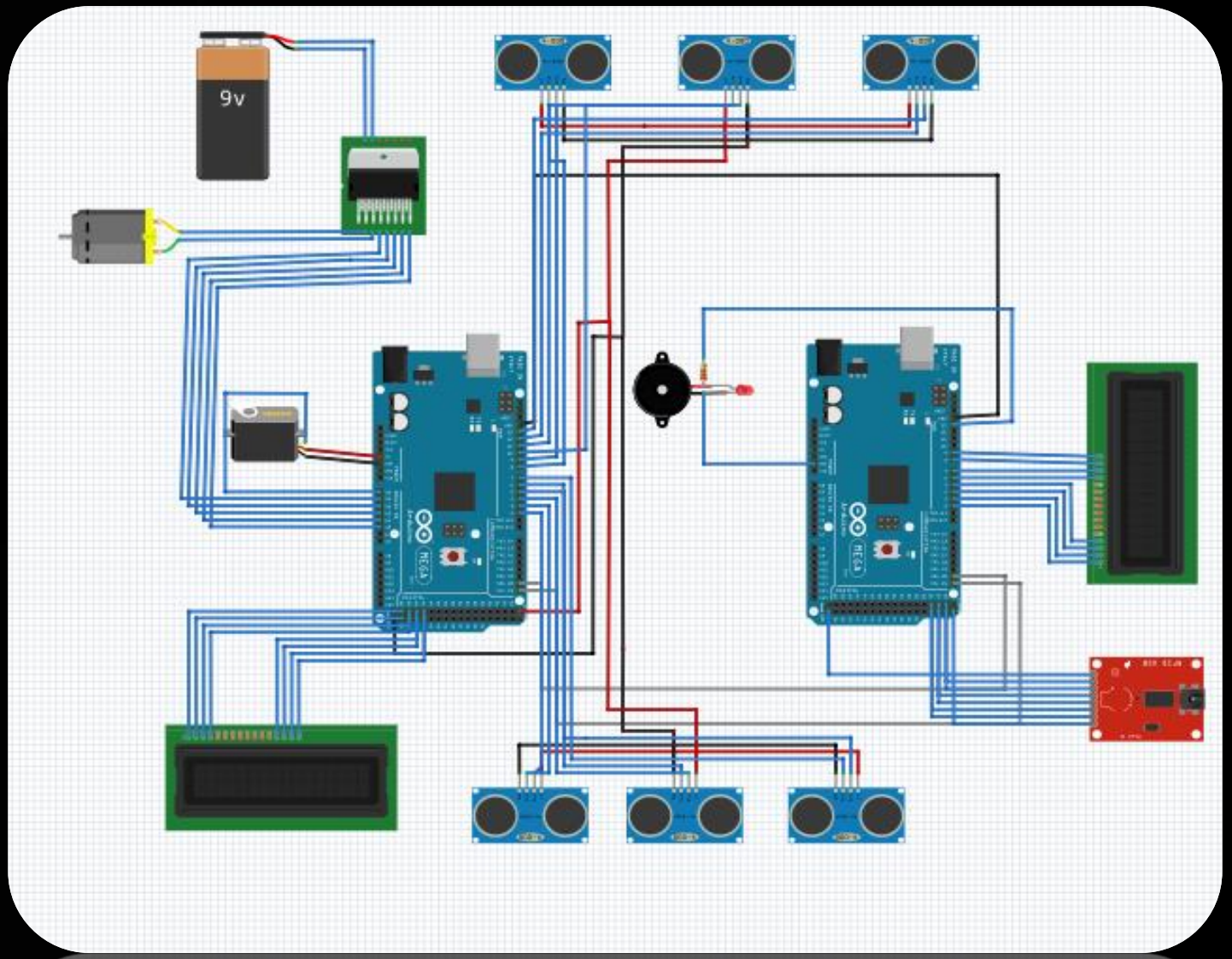
BLOCK DIAGRAM





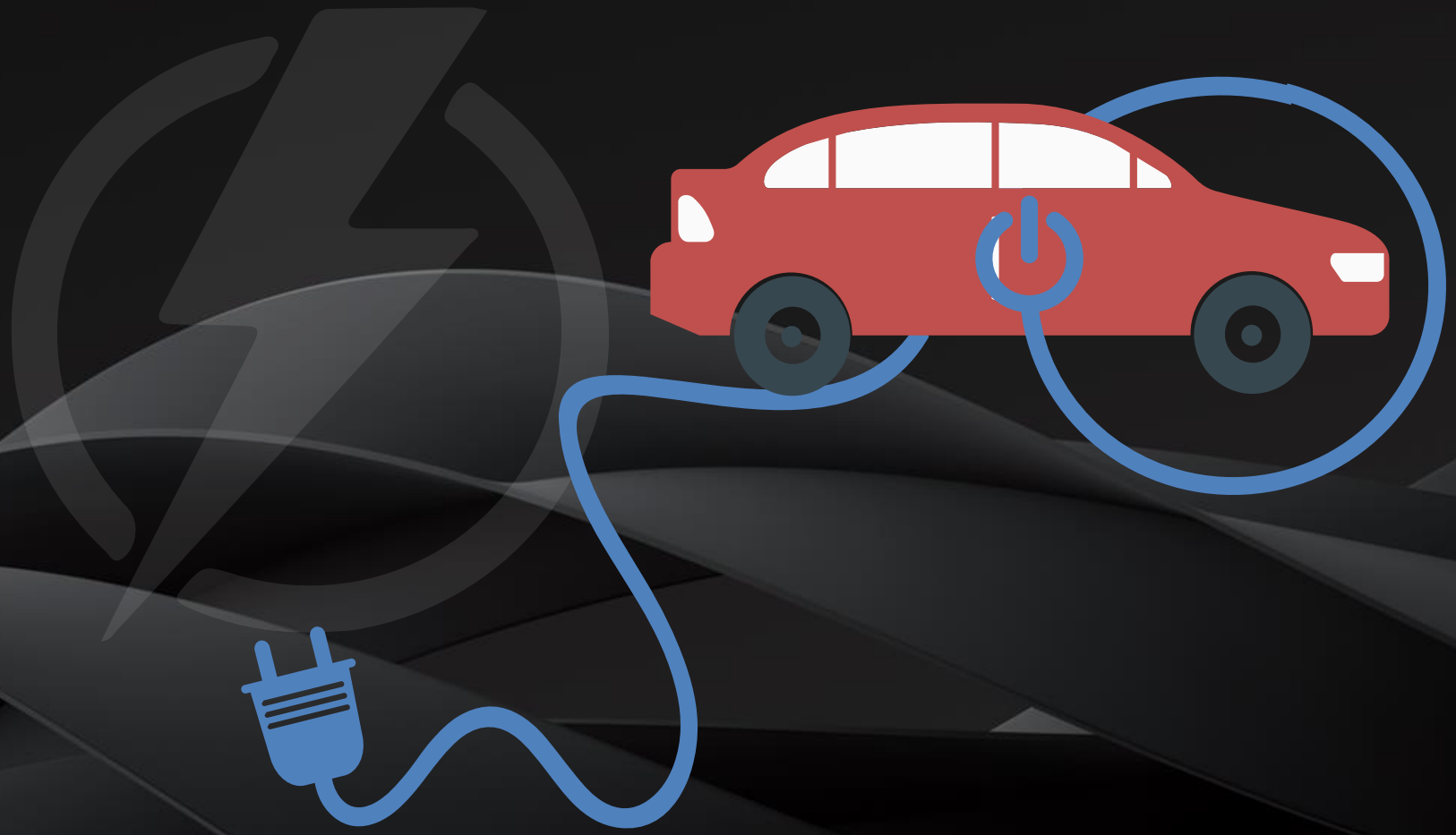
CIRCUIT DIAGRAM





FEATURES

1. Forward Collision Mitigation System
2. Adaptive Cruise Control (ACC)
3. High Beam Assist (HBA)
4. Enhanced Lane Guidance System
5. Safe Exit Warning (SEW)
6. Blind-spot Collision Avoidance (BCA)
7. Leading Vehicle Departure Alert (LVDA)
8. Rear Cross Traffic Alert (RCTA)
9. Adaptive Evasive maneuvering(AEM)



FORWARD COLLISION MITIGATION SYSTEM

1 Detection

Forward collision mitigation systems use ultrasonic sensor to detect other vehicles, pedestrians, cyclists, and animals in the path of a moving vehicle. The system monitors vehicle's speed, the speed of the vehicle in front of it, and the distance between the vehicles

2 Autonomous Action

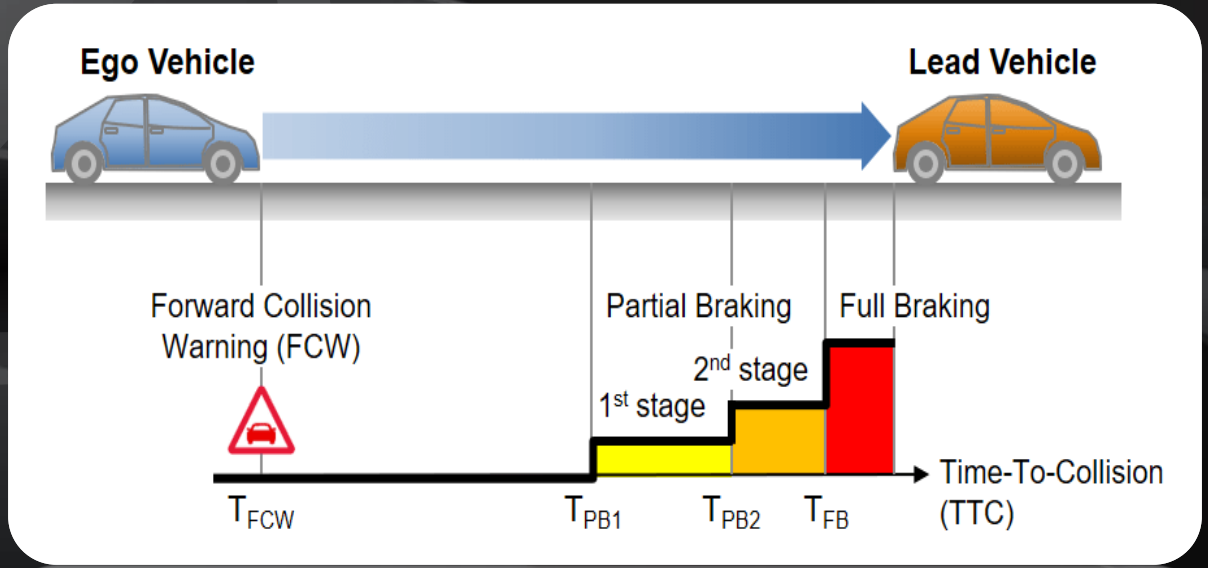
If the driver takes no action, the system can take action autonomously without any driver input (by braking or steering or both). Collision avoidance by braking is appropriate at low vehicle speeds, while collision avoidance by steering may be more appropriate at higher vehicle speeds if lanes are clear

3 Warning

Once an impending collision is detected, the system provides a warning to the driver. The warning can be visual or audible, depending on the system. Some systems provide a two-stage warning to alert the driver, and if the driver takes no action, the system automatically engages the brakes to mitigate the collision speed and impact

4 Ultrasonic Sensors:

FCMS uses Ultrasonic sensors, which emit sound waves respectively, to measure the distance and relative speed of objects in front of the vehicle. These sensors create a detailed map of the vehicle's surroundings.



ADAPTIVE CRUISE CONTROL (ACC)

1 **Speed Control :**

ACC allows the driver to set and run at desired speed. It then automatically adjusts the vehicle's speed to maintain a safe distance from the vehicle ahead..

2 **Warning Activation :**

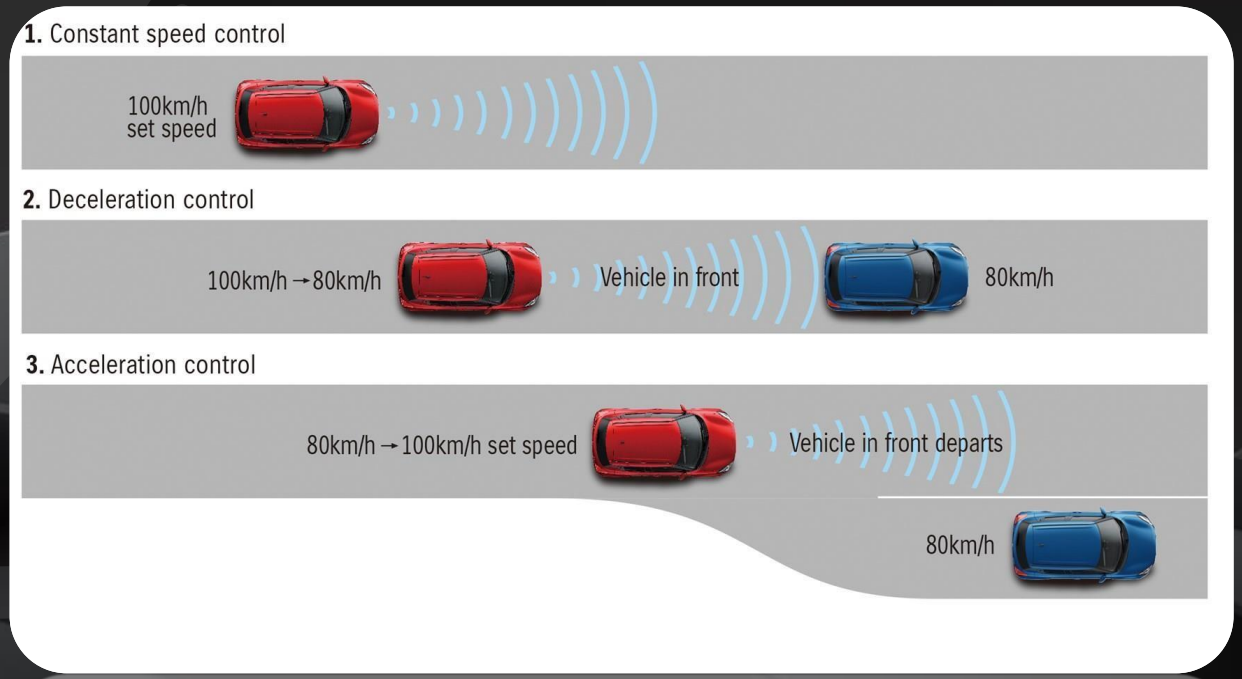
When ACC detects a slower-moving vehicle or a stopped vehicle in front, it automatically reduces your vehicle's speed by braking to maintain a safe following distance.

3 **Sensors :**

ACC uses sensors to monitor the vehicle ahead, detecting the distance and speed of the vehicle in front.

4 **Risk Assessment :**

Based on the speed and distance data, the system assesses the likelihood of a collision. It evaluates whether the current trajectory and speed of vehicle could lead to a collision with the detected object.



HIGH BEAM ASSIST

1 **Light Sensors :**
HBA utilize light sensors (photodetectors) to measure the ambient light levels around the vehicle. These sensors detect changes in the surrounding light conditions, such as oncoming headlights or streetlights.

2 **Automatic High Beam Control :**
HBA adjusts the vehicle's headlights automatically based on the data from the light sensors. When it senses low ambient light levels or detects oncoming vehicles, it will switch the headlights to high beam mode for improved visibility.

3 **Dynamic Dimming :**

This system provides dynamic dimming of the high beams, meaning it can quickly switch between high and low beams as needed to avoid blinding other drivers while maximizing illumination of the road ahead.

4 **Enhanced Safety and Convenience :**
HBA enhances driving safety by ensuring that the driver has optimal visibility without causing discomfort or glare to other road users. It also offers convenience by eliminating the need for the driver to manually switch between high and low beams, allowing them to focus on driving.

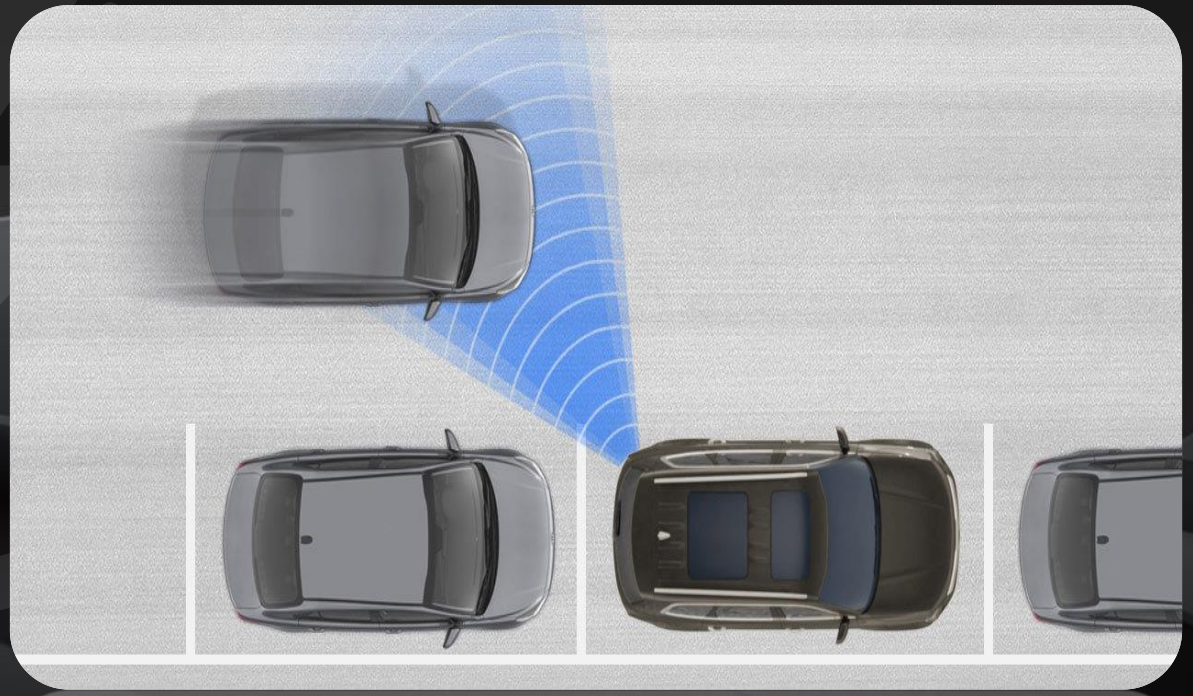
SAFE EXIT WARNING

1 **Detection:**
SEW uses sensors, such as radar or ultrasonic sensors, to monitor the area around the vehicle, especially the sides and rear.

2 **Warning Activation:**
If the system detects a potential hazard in the vicinity of the vehicle, typically when the vehicle is stationary or parked, it activates a visual or audible warning. This warning is meant to alert the occupants, especially passengers in the back seat, that it may not be safe to exit the vehicle.

3 **Passenger Monitoring:**
It specifically focuses on detecting the presence of pedestrians, cyclists, or vehicles approaching from the side or rear of the vehicle.

4 **Driver or Passenger Response:**
When the warning is triggered, the driver and passengers are encouraged to assess the situation before exiting the vehicle. This helps prevent accidents that can occur when a vehicle's occupants inadvertently open a door into the path of an approaching cyclist, pedestrian, or vehicle



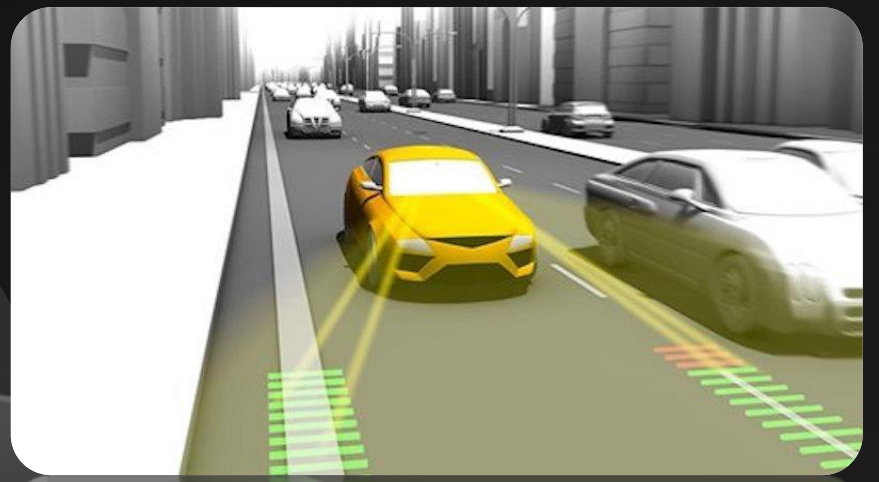
ENHANCED LANE GUIDANCE SYSTEM

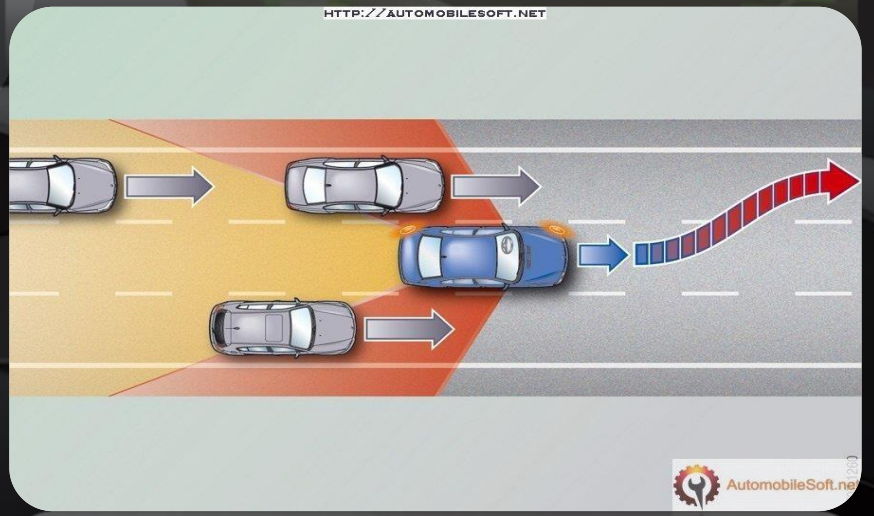
1 **Sensor Fusion Integration:**
Utilizing a combination of advanced sensors such as ultrasonic sensors, infrared sensors, and radar technology to detect and monitor the vehicle's position within the lane.

2 **Lane Drift Detection:**
Utilizing IR Sensors to detect the lane markings on the road and send information to the controller to take necessary action. Recognizes any event of lane drift using the lane markings.

3 **Lane Position Correction:**
Employing real-time data from the sensor fusion system to apply gentle steering corrections and ensure the vehicle remains within the designated lane, enhancing stability and safety.

4 **Feedback and Auditory Alerts:**
Implementing feedback through steering wheel and auditory alerts to notify the driver of potential lane drift, encouraging prompt corrective action and promoting driver attentiveness.





BLIND SPOT COLLISION ASSIST

1 Sensor Technology

Blind-spot detection systems use sensors installed in the rear bumper. These radar sensors emit radio waves that bounce off nearby objects and vehicles. By analysing the time it takes for the radio waves to return, the system can determine the distance and speed of objects in adjacent lanes.

2 Data Analysis

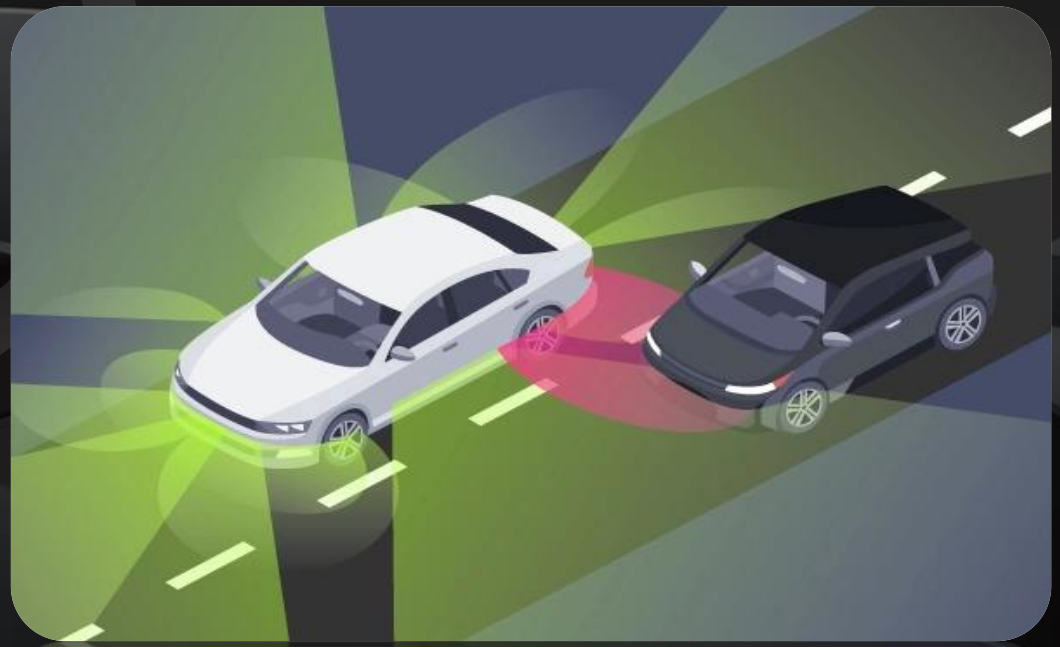
The data collected by or ultrasonic sensors is continuously analysed by the vehicle's onboard computer. The computer processes this information to determine if there is a vehicle or obstacle in the blind spot and calculates its relative position and speed in real-time.

3 Ultrasonic Sensors

Ultrasonic sensors use high-frequency sound waves to detect objects around the vehicle. They are often placed in the rear and side areas of the car. When an object enters the blind spot, the sensor can detect its presence and proximity to the vehicle.

4 Alert and Intervention

If the system detects a vehicle in the blind spot, it can provide visual or auditory alerts to the driver. System offers active intervention features, such as steering assistance or gentle braking, to prevent a potential collision when the driver attempts to change lanes.



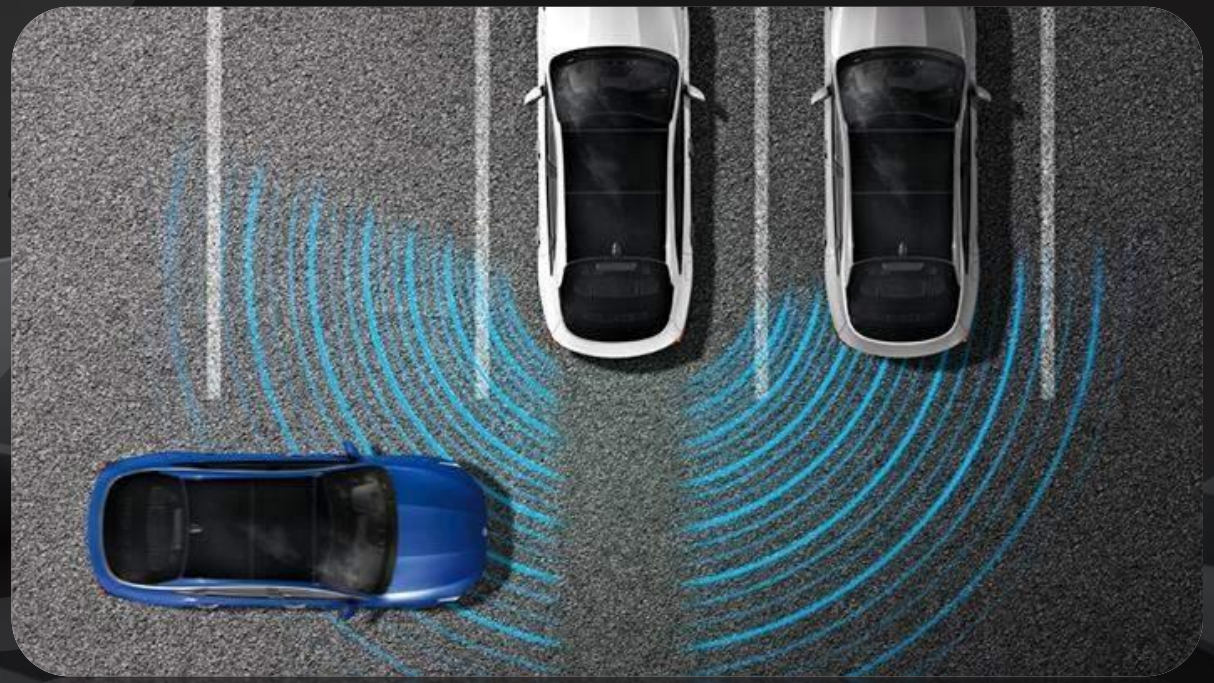
REAR CROSS TRAFFIC ALERT

1 **Sensor-Based Detection:**
This systems use sensors, often radar or ultrasonic sensors, to monitor the area behind and to the sides of the vehicle, especially when the vehicle is in reverse.

2 **Warning Activation:**
When the system detects a potential collision risk with cross-traffic, it activates visual and audible warnings. These warnings are meant to alert the driver to the presence of approaching cross-traffic.

3 **Cross-Traffic Detection:**
The sensors detect the presence of objects, vehicles, or pedestrians moving across the rear of the vehicle, outside the driver's direct field of view.

4 **Driver Response**
Upon receiving the warnings, the driver can assess the situation and take appropriate action, such as stopping or steering to avoid a collision.



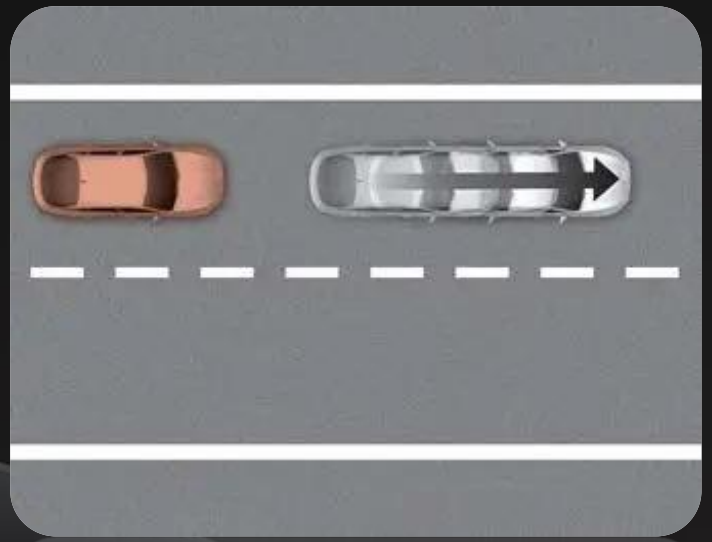
LEADING VEHICLE DEPARTURE ALERT

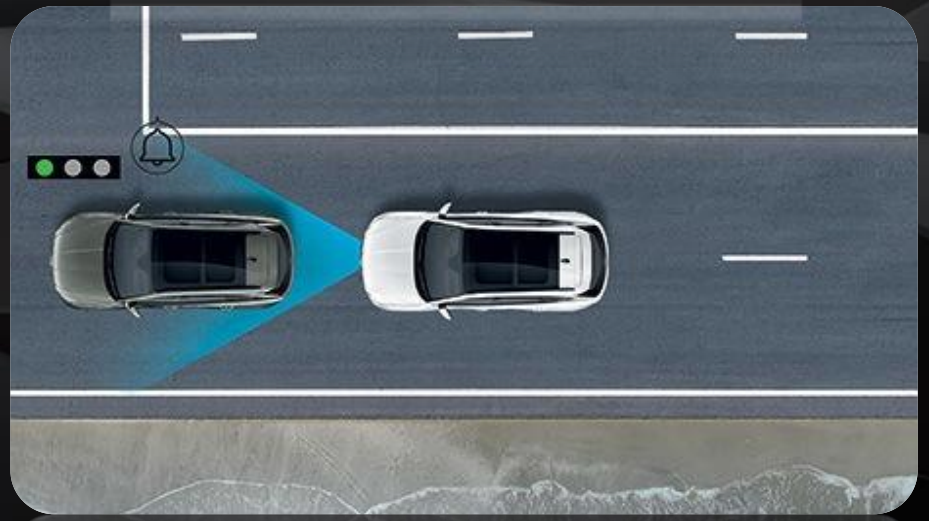
1 **Sensor-Based Object Detection:**
Utilizing various sensors such as radar or ultrasonic sensors to detect the presence and movement of vehicles in front, without relying on camera input.

2 **Speed and Acceleration Tracking:**
Monitoring the leading vehicle's speed and acceleration to anticipate potential departures and provide timely warnings to the driver.

3 **Real-Time Distance Monitoring:**
Constantly measuring and analyzing the distance between the host vehicle and the leading vehicle to provide immediate alerts in case of sudden or unexpected departure.

4 **Intelligent Alert System:**
Employing an intelligent alert system that triggers audible alarms, visual alerts on the dashboard, to notify the driver of the leading vehicle's departure, ensuring quick reaction and preventing collisions.





ADAPTIVE EVASIVE MANEUVERING

1

Sensor-Based Detection:

The system relies on ultrasonic sensors, to continuously monitor the vehicle's surroundings and detect potential obstacles, vehicles, or hazards.

2

Automatic Execution:

When the system determines that a collision risk is imminent, it autonomously executes the calculated evasive maneuver. This might involve swerving, steering, or braking to avoid the obstacle or reduce the impact of a collision.

3

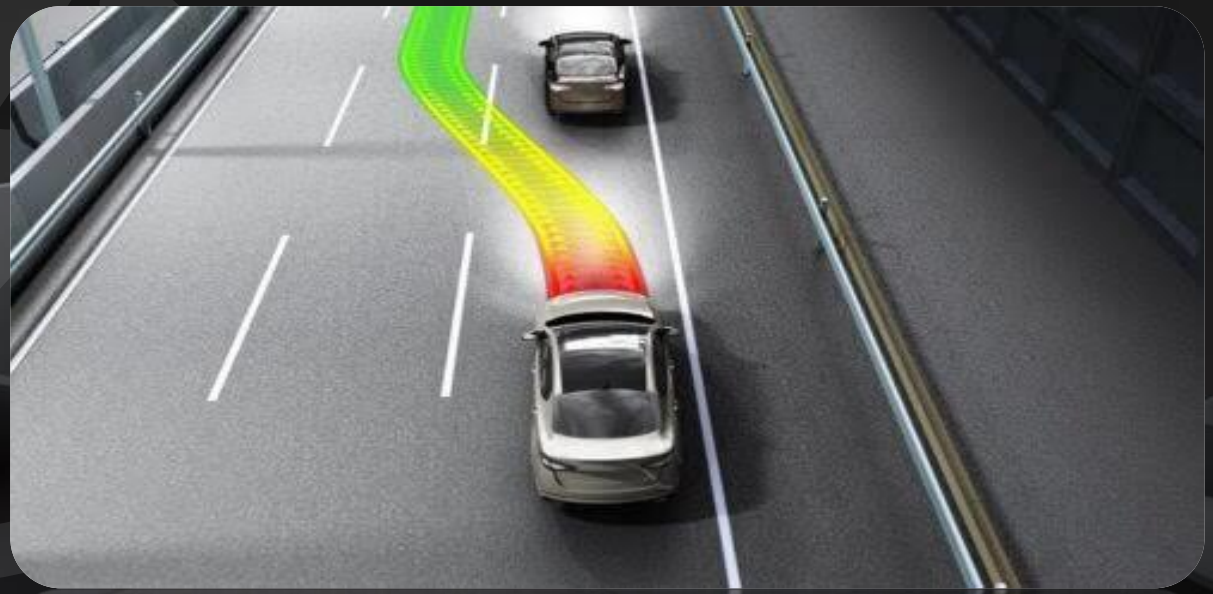
Evasive Maneuver Calculation:

Based on the data from these sensors, the system calculates the optimal evasive maneuver needed to avoid a collision or mitigate its severity. This can involve steering, braking, or accelerating as necessary.

4

Driver Alert:

Simultaneously, the system can alert the driver through visual and audible warnings to prepare for the evasive maneuver, providing the driver with the best chance to respond appropriately and safely.



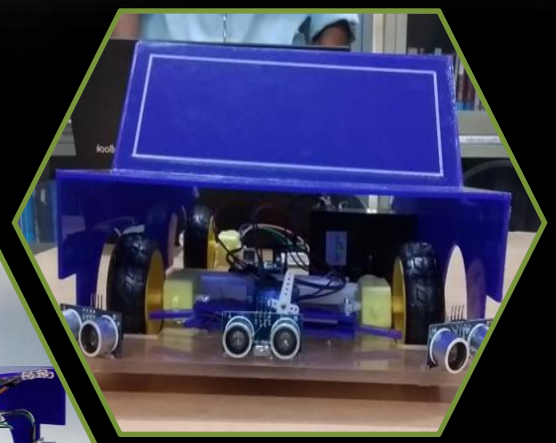
CONCLUSION

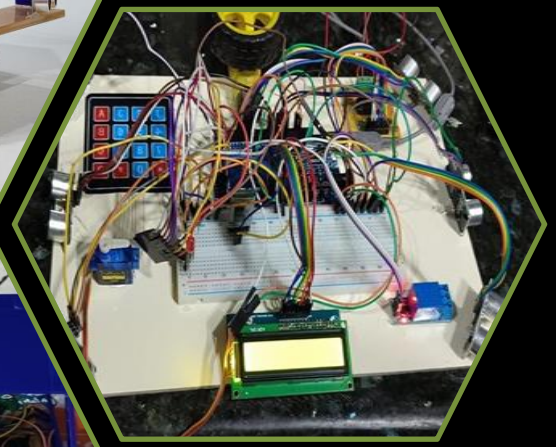
- **Enhanced Safety:** Advanced Driver Assistance Systems (ADAS) play a pivotal role in enhancing road safety by reducing accidents and saving lives through features like automatic emergency braking and lane-keeping assist.

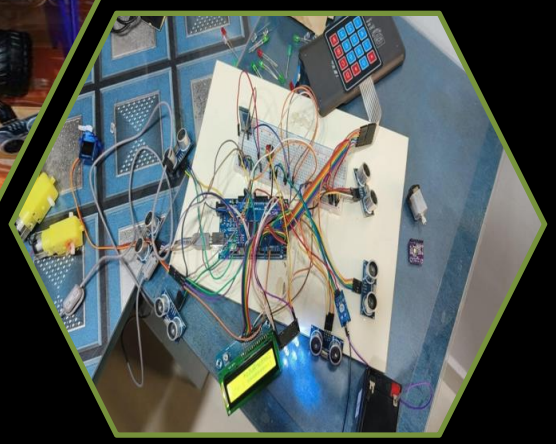
- **Improved Convenience:** ADAS not only prioritize safety but also elevate driving convenience. Features like adaptive cruise control and parking assistance make daily commuting more comfortable and less stressful.

- **Constant Evolution:** ADAS is a rapidly evolving field. As technology advances, we can expect even more sophisticated and capable systems, ultimately paving the way for autonomous vehicles.

FINAL OUTPUT

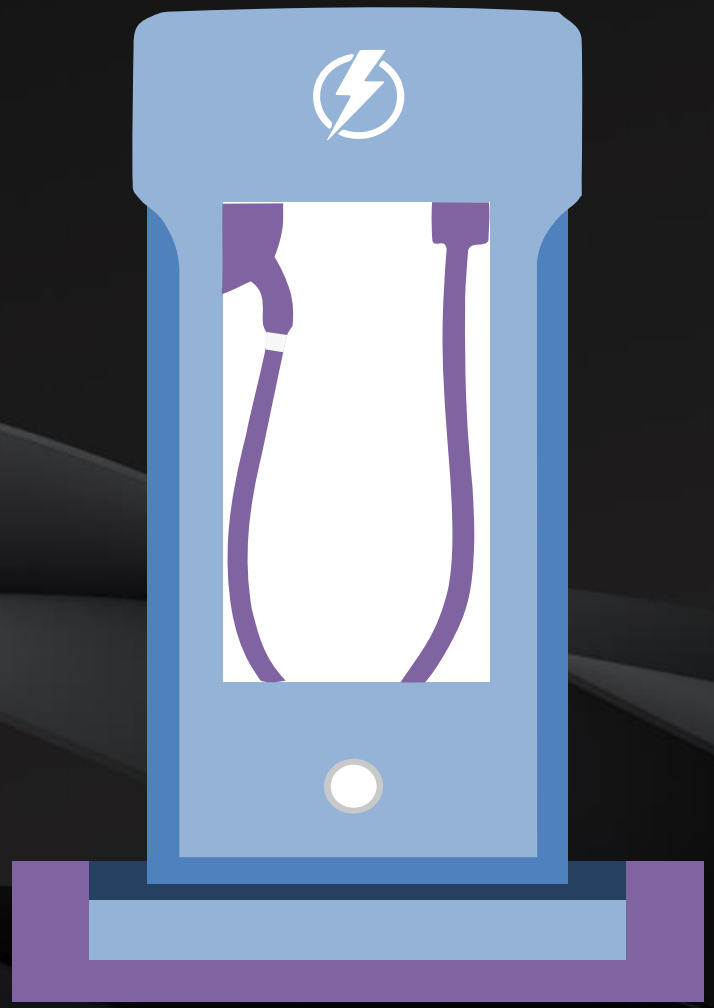


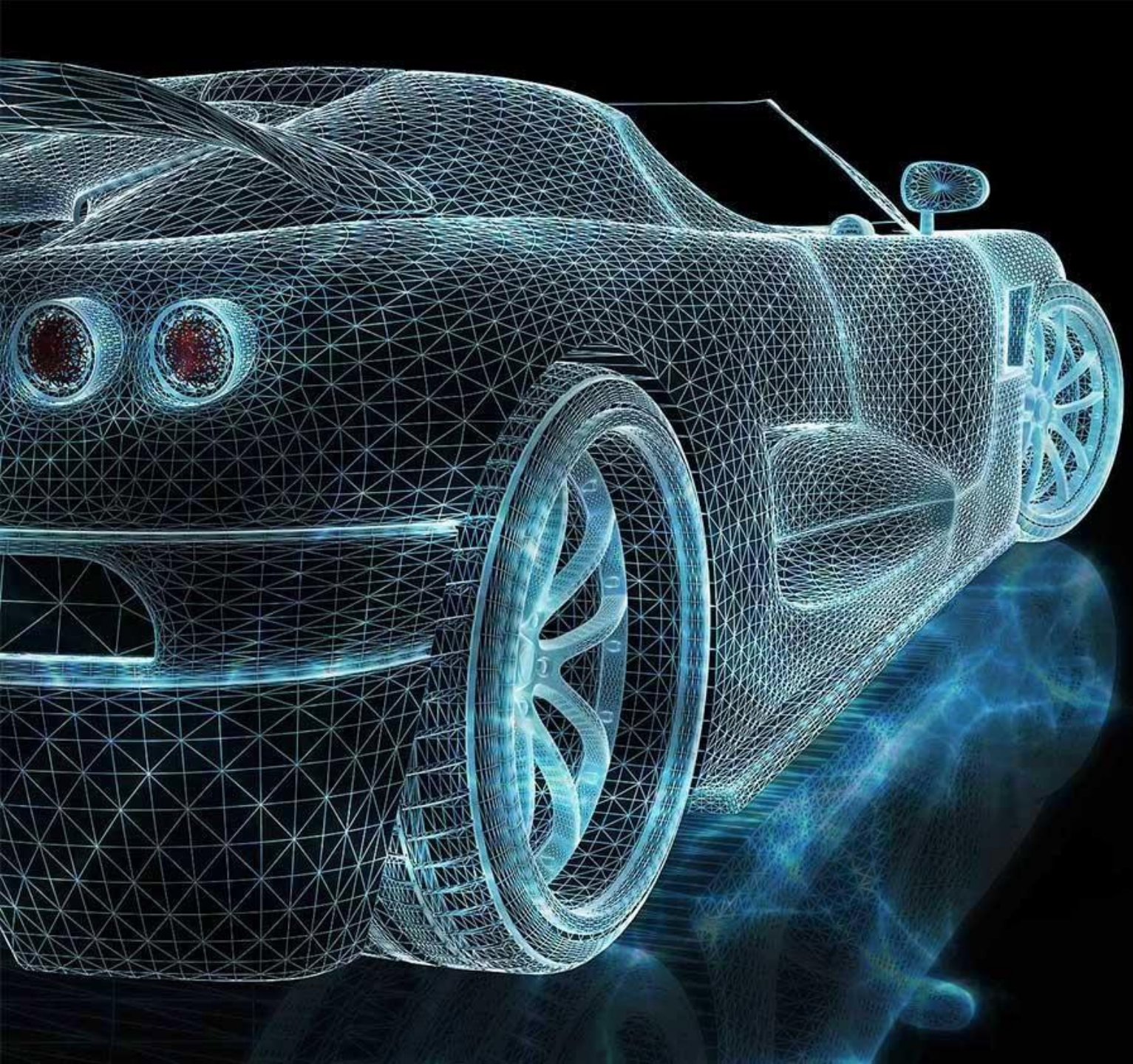




FUTURE IMPLEMENTATIONS

1. RFID Parking Tracking Solutions
2. Bluetooth Control for the Locomotion
3. Wind Energy Implementation in EV
4. GPS System for Precise Tracking





Thank You

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