HMR Institute of Technology and Management
Plot No. 326, Hamidpur, Delhi-110036.

Synopsis of Minor Project

Date:

Minor Project Title: Advanced Driver Assistance System

Name of Guide(s):

Programme: B.Tech. CSE		Year/Semester: IV year, 7th semester	
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Name:

Approval by Board of Faculty

Member	Signature	Remark

ABSTRACT

Autonomous vehicles are apparently being implemented in today's vehicles as keeping a car on the regular track or lane is an important and common task for people of all ages. It may be difficult for the elderly, physically disabled people, or young drivers at night or in varying weather conditions. As a result, this driver assistance system will undoubtedly assist such individuals and potentially avoid accidents. In this paper, we analyse the lane deduction to keep the car going in the right direction using the canny edge algorithm to deduct edges and curves so as to reduce night accidents and ensure a safe drive.
Artificial Intelligence (AI) is one of the most critical components in ADAS. AI technologies such as deep learning vastly outperform traditional software techniques when it comes to real-time perception, prediction and decision-making tasks. As future ADAS systems tackle more complex self-driving scenarios, even more AI will be required.

PROBLEM STATEMENT

Among the reasons for traffic accidents, distractions are the most common. Although there are many traffic signs on the road that contribute to safety, variable message signs (VMS's) require special attention, which is transformed into distraction. ADAS (advanced driver assistance system) devices are advanced systems that perceive the environment and provide assistance to the driver for his comfort or safety.
The role of ADAS is to prevent deaths and injuries by reducing the number of car accidents and the serious impact of those that cannot be avoided. Essential safety-critical ADAS applications include: Pedestrian detection/avoidance. Lane departure warning/correction.

BACKGROUND OF THE PROBLEM

Roads have a significant role in transportation in India. In addition to making life and work simpler for individuals, the increase in auto mobile ownership and the use of public transit compromises road traffic safety. Poor road upkeep, bad weather, misinterpreting traffic signals due to cloudy weather, fading or missing signage, etc. all contribute to accidents. A study found that 1.2 million individuals worldwide pass away just on streets each year. In order to assure public safety, lower accident rates, and minimize damage to public property, assistance driving technology was developed. In this research, a driver assistance system for multitasking has been suggested. The driver may make advance plans and take the necessary action since the technology provides actual facts on lane markings. In the case that the motorist misses a signal or is not paying attention to the lanes, this technology makes driving safer. With the safety of people as its primary priority, this technology seeks to recognize lanes and evaluate transportation situations from uninterrupted driving scenes under diverse circumstances.

INTRODUCTION

ADVANCED DRIVER ASSISTANCE SYSTEM

An ADAS or Advanced Driver Assistance System is a combination of software and hardware, used as a single system in vehicles (usually in land vehicles) to assist the driver of the vehicle both physically and mentally. The system is designed to reduce the number of road fatalities due to carelessness of the driver or factors that might affect the drivers driving abilities such as alcohol or a stroke. Also it is used to ensure the safety of pedestrians, passengers, public properties, vehicles and animals.

ADAS is enabled by technologies that allow on-board computers to perceive the external environment, through an array of onboard sensors. Sensors like cameras, radar, ultrasonic sensors and, in some instances, LiDAR collect vast amounts of data from the vehicle's surroundings and uses the data to process and decide output according to the situation. These distributed onboard sensors help provide the vehicle and the driver with 360° awareness.

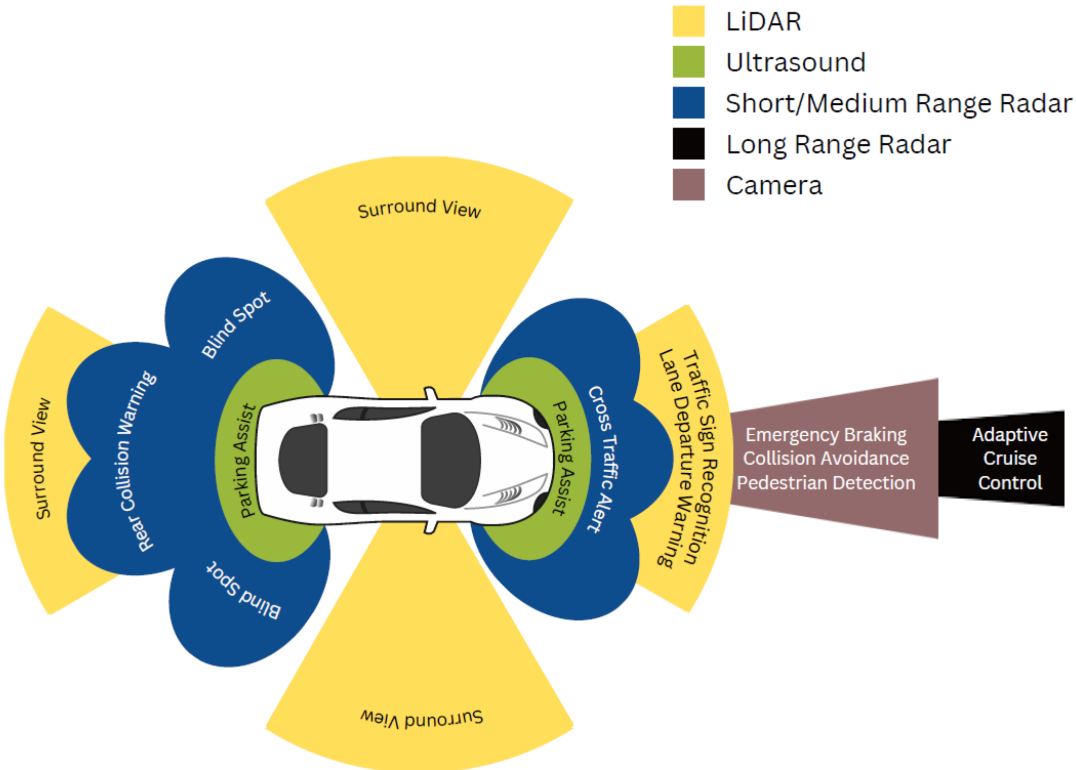
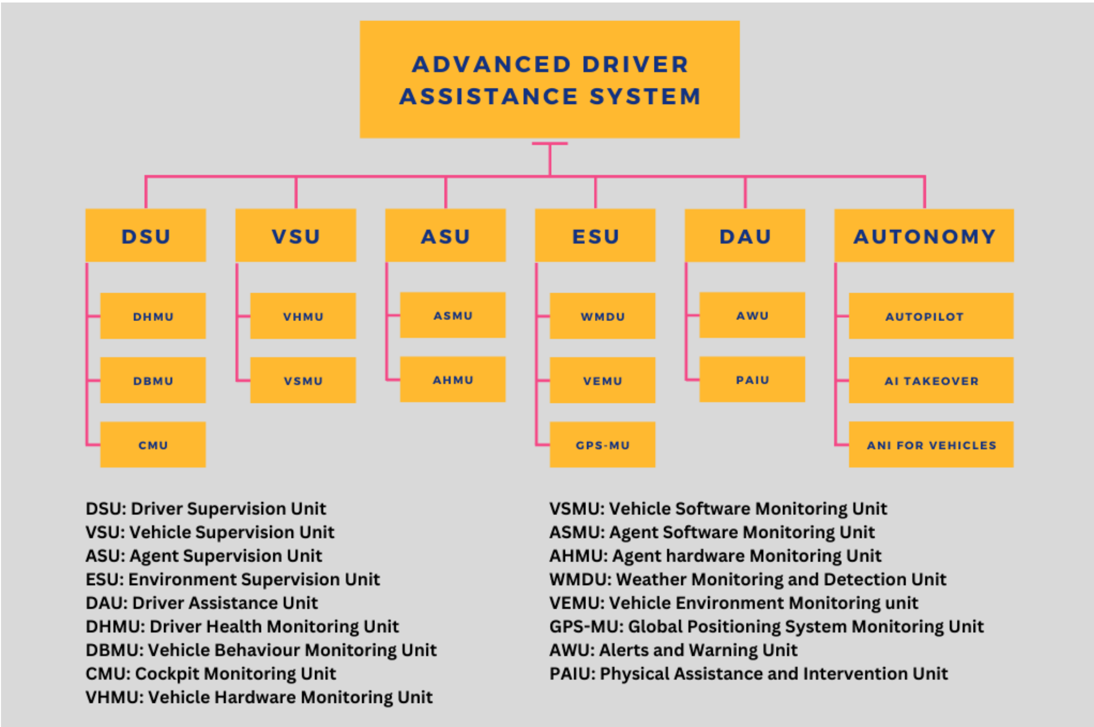


Fig. 1.1: Example ADAS Sensors

Due to the fact that a machine can be quick and accurate, we can rely on the decisions that the machine makes as far as we ensure that the data it gets as inputs and the algorithms involved in data processing are cutting edge and flawless. Data collected is processed quickly to provide real time response hence minimising the response time.

OBJECTIVE OF THE PROJECT

We plan to develop the whole system till E in the below list till the end of final semester of the academic year. So this project will be continued in final semester as major project. The following research based taxonomy will be used to plan and design every part of the system and to follow divide and conquer methodology. Then every individually created and tested units will be combined to get the final product.



TAXONOMY

A. Driver Supervision Unit

1. Driver Health Monitoring Unit (DHMU)
   - Blood Pressure
   - Heart Rate
   - Blood Sugar
   - Body Temperature
   - Oxygen Saturation

2. Driver Behaviour Monitoring Unit (DBMU)
   - Driver Pose Detection
   - Driver Action Monitoring
   - Driver Facial Expression Monitoring
   - Driving Interference Detection

3. Cockpit Monitoring Unit (CMU)

- Detecting presence of unwanted life forms
- Cockpit environment monitoring (inside the vehicle)

B. Vehicle Supervision Unit

1. Vehicle Software Monitoring Unit (VSMU)
    - Software Crash Report
    - Connection and Communication Monitoring
    - Software Updates
    - Software Malfunction

2. Vehicle Hardware Monitoring Unit (VHMU)
    - Door Lock
    - Engine, Brakes and other Mechanical Parts
    - Tire Pressure Monitoring
    - Fuel Tank Meter
    - Hardware Integrity Determination
    - Chassis Pressure and Hull Damage Detection

C. Agent Supervision Unit

1. Agent Software Monitoring unit (ASMU)
    - CPU Utilization
    - Memory Utilization
    - Software Crash Report
    - Agent OS Monitoring
    - Connection and Communication Monitoring
    - Software Updates

2. Agent Hardware Monitoring Unit (AHMU)
    - CPU Temperature
    - Machine Integrity
    - Connection and Communication Hardware Monitoring
    - Machine Health
    - Machine Malfunction

D. Environment Supervision Unit

1. Weather Monitoring and Detection Unit (WMDU)
    - Temperature
    - Humidity
    - Time
    - Season
    - Weather
    - Climate detection and prediction, etc.

2. Vehicle Environment Monitoring Unit (VEMU)
    - Object and vehicle detection

- Signs and boards detection
- Lane and road marks detection
- Calculation of velocity of nearby objects
- Predicting possible rash drivers
- Vehicles in blind spot through V2V communication
- Detecting traffic rule violation, etc.

3. GPS-Monitoring Unit (GPS-MU)
    - Maps and directions
    - Upcoming locations of interest
    - Detecting best route, etc.

E. Driver Assistance Unit (DAU)

1. Alerts and Warning Unit (AWU)
    - Alerts and warnings
    - Notifications
    - Acknowledgements
    - AI voice assistant, etc.

2. Physical Assistance and Intervention Unit (PAIU)
    - Intersection assistance
    - Intelligent speed adaptation
    - Pedestrian protection system
    - Adaptive Cruise control
    - Parking Assistance
    - Hill start assist and hill descent control
    - Lane changing, etc.

F. Autonomy

1. AI Takeover
2. Autopilot or ANI for Vehicles
3. Artificial General Intelligence

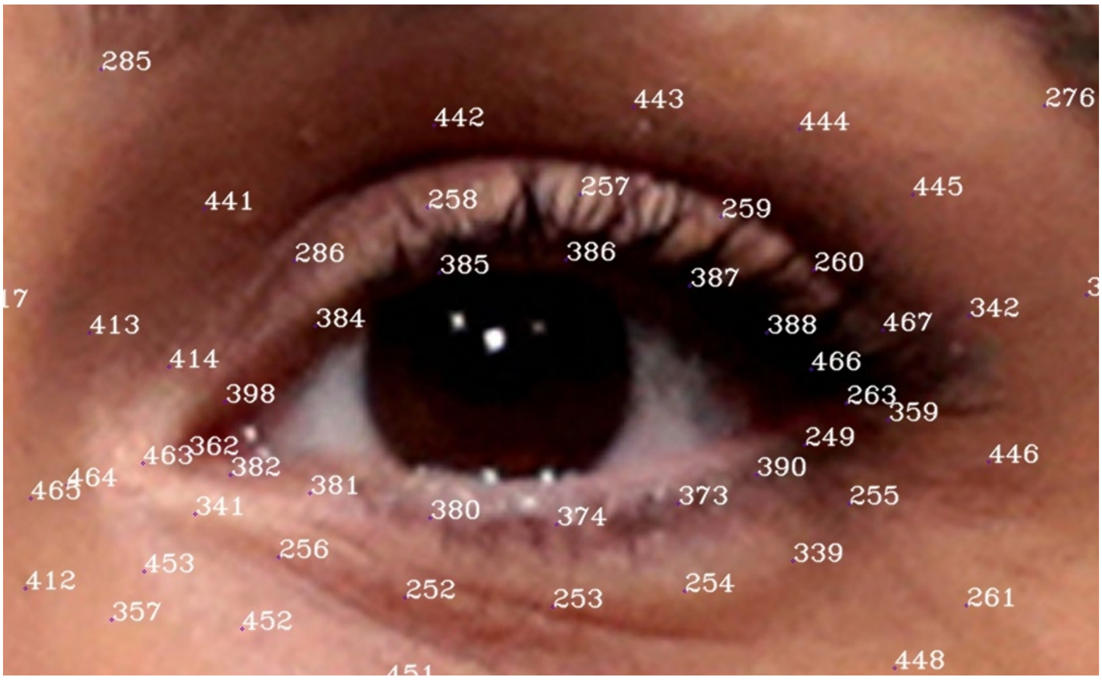
A perfect ADAS must contain all the functions till DAU in the above list, addition of any of the autonomy part will make the vehicle fully autonomous i.e. we could say that the vehicle has attained level 5 autonomy.

CURRENT PROGRESS

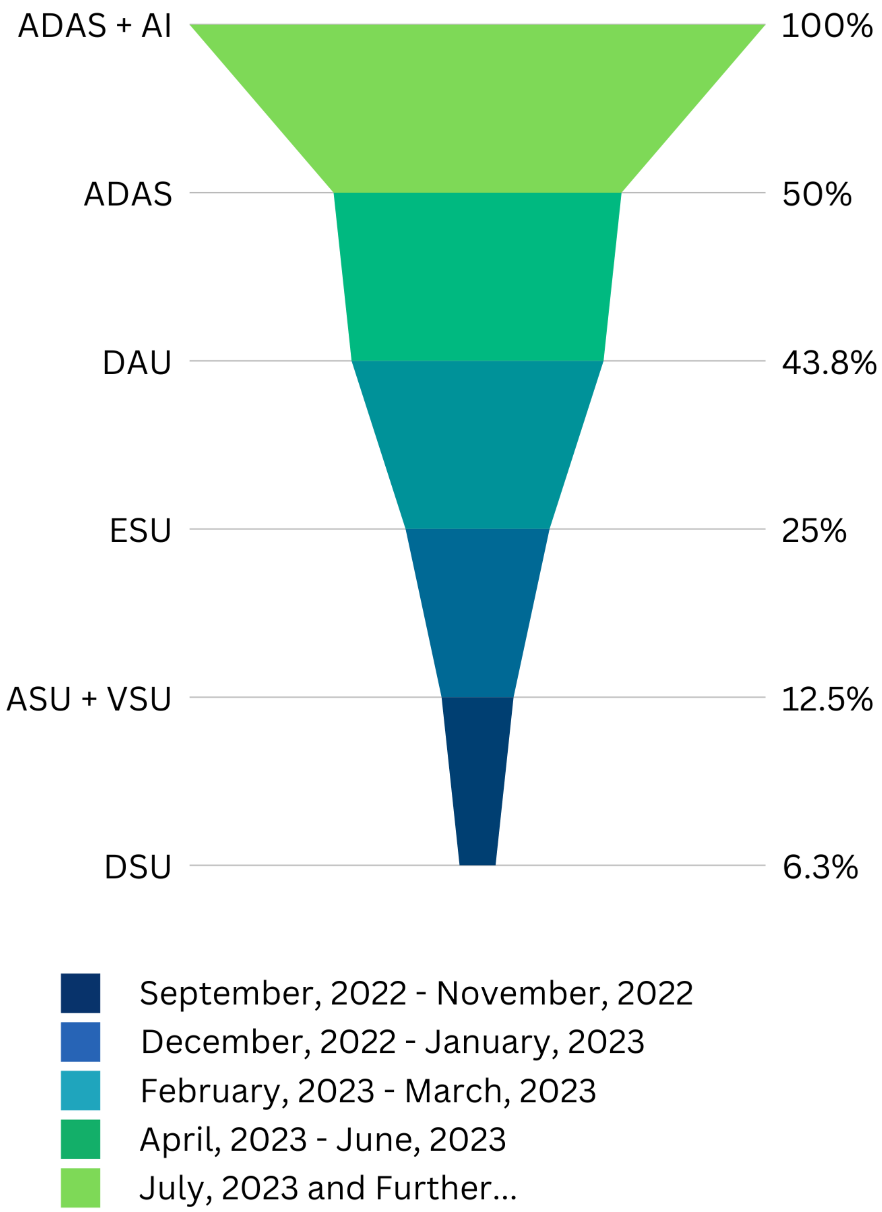
At present, we are almost done with the driver behaviour monitoring unit and working on driver health monitoring unit. Below are some screenshots of the driver behaviour monitoring unit demonstrating the counting of number of times the person in subject is blinking and also shows the frames number of the input video.

Below is an image showing the face landmarks traced using googles mediapipe facemesh module.

For calculating number of blinks, the eye landmarks are calculated using mediapipe. The calculation of number of blinks is important to track driver behaviours like drowsiness, sleeping and other behaviours.



TIME FRAME


ADAS + AI
100%
ADAS
50%
DAU
43.8%
ESU
25%
ASU + VSU
12.5%
DSU
6.3%
September, 2022 - November, 2022
December, 2022 - January, 2023
February, 2023 - March, 2023
April, 2023 - June, 2023
July, 2023 and Further...

SOFTWARE & HARDWARE

SOFTWARE

1. **Anaconda** is a distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment.

2. **Jupyter Notebook** is the original web application for creating and sharing computational documents.

3. **Visual Studio Code** is a streamlined code editor with support for development operations like debugging, task running, and version control.

4. **PyCharm** is a dedicated Python Integrated Development Environment (IDE) providing a wide range of essential tools for Python developers, tightly integrated to create a convenient environment for productive Python, web, and data science development.

5. Other software.

HARDWARE

1. Arduino

2. Raspberry Pi

3. Electric Motorcycle

4. Other Hardware.

REFERENCE

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