Driving Assistance System

ADAS-2

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Introduction

- This project aims to increase driver's safety and improve the driving experience through the integration of driver assistance technologies into existing vehicles with sensors and image processing technology.

Specifications and Design Requirements

- Optic sensor 1: Fatigue detection and steering wheel hand position monitoring.
- Optic sensor 2: Lane, traffic light, traffic sign, car and pedestrian detection.
- Audible warning and video recording system with User Interface.
- Data acquisition from CAN-BUS.

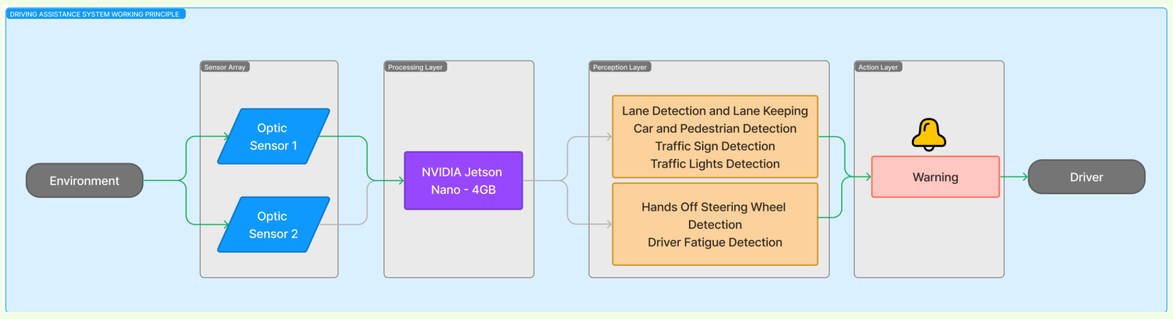

Figure 1: Driving Assistance System Working Principle

Results and Discussion

- The system detects cars, pedestrians and other traffic elements (bicycles and motorbikes) with high and therefore reliable confidence to provide intel for possible accidents.
- The system effectively identifies driver fatigue by analyzing eye closure. Tests indicate high accuracy in detecting reduced alertness levels. Hands-on wheel detection works by checking whether hands are in the wheel area. Sometimes false positives occur because of the camera angle in the car.

Figure 2: Lane Detection & Car-Pedestrian Detection

- The system can detect lanes and provide an alert when it detects that a lane has been changed. Challenging road conditions can sometimes lead to inaccurate lane detection.
- The speed data of the vehicle is received from CAN-BUS in real time and used by the necessary models.

Figure 3: Hands and Eye Detection & Complete System

- ***For future improvements:***
  - The system can also be operated at night.
  - The speed and efficiency of the codes can be increased.
  - Crash algorithm can be improved by using additional sensors such as LIDAR.
  - System's automation level can be increased with additional sensors, more precise algorithms, advanced modules.

Application Areas

- The product can be installed into old vehicles that are nonautonomous and provide a level of driving assistance.

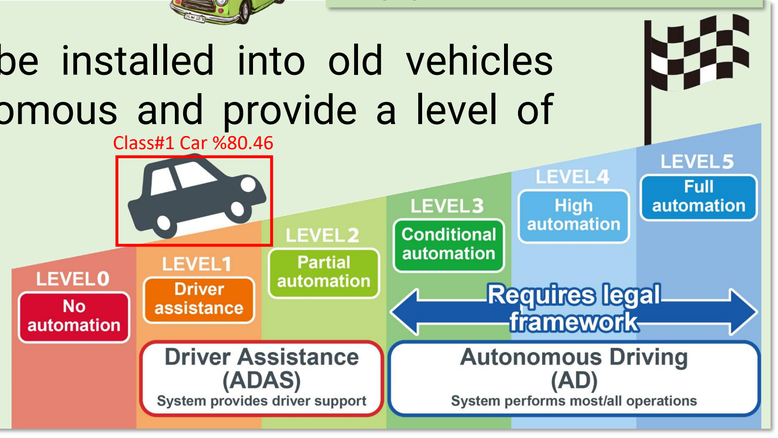

Figure 4: The Automation Levels

Solution Methodology

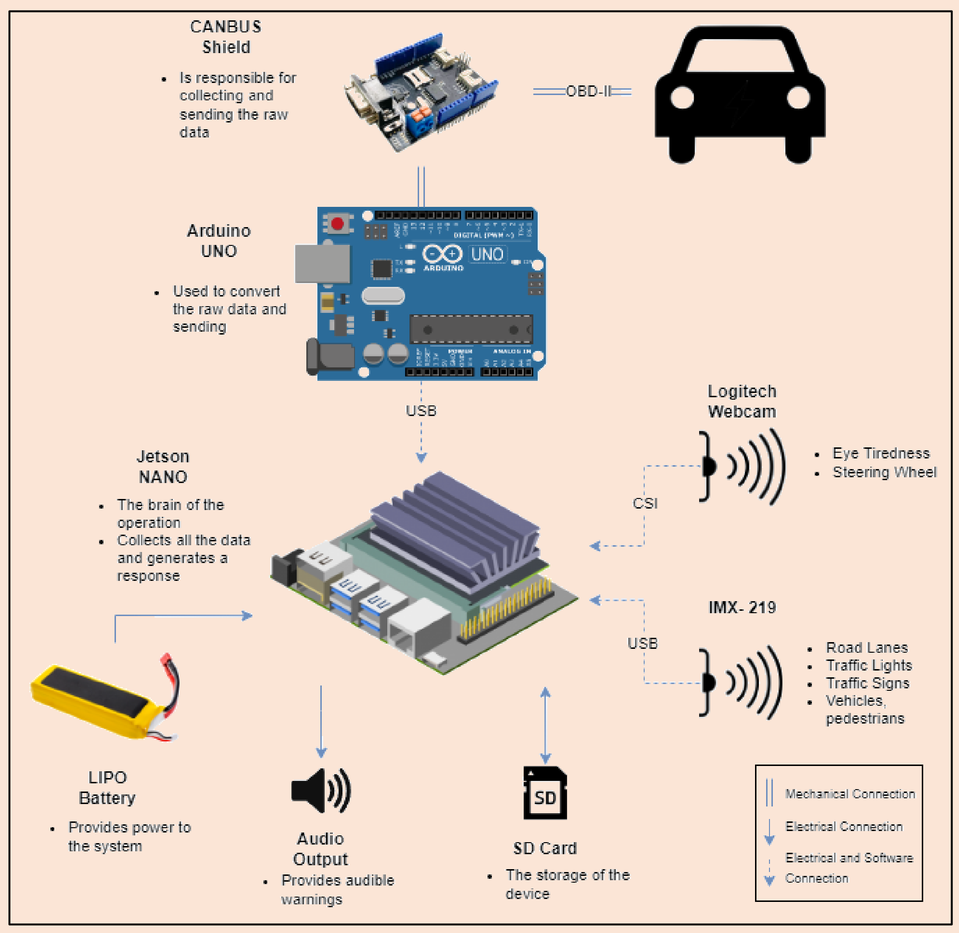

Figure 5: Project Hardware Hierarchy

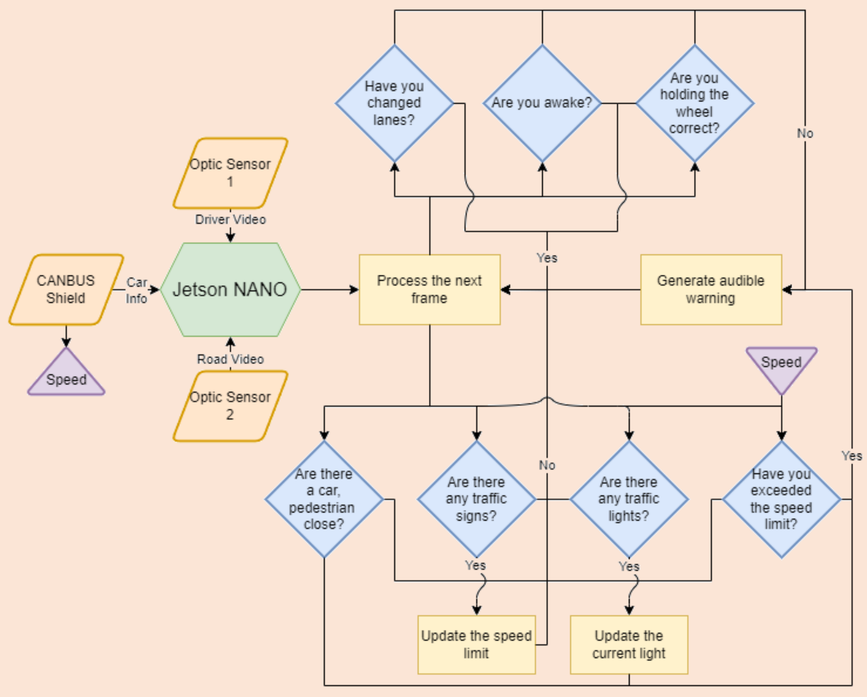

Figure 6: Project Flowchart

- Tools: Jetson Nano, CAN-BUS Shield, Arduino Uno, Detectnet, SSD-Mobilenet, TensorFlow, Numpy, OpenCV, Mediapipe, Yolov3, Darknet

Acknowledgements

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