**2- Design and formation of Advanced Driver Assistant System (ADAS) with an automobile working model (SRH, Berlin)-**

Situation

During my final year at SRH University, Berlin, I was part of a capstone project in the Automotive Engineering program, where we were challenged to address real-world automotive safety issues. The growing number of road accidents due to human error inspired our team to focus on enhancing vehicle safety through technology. We decided to design and develop an Advanced Driver Assistance System (ADAS) integrated into a working automobile model, aligning with industry trends toward semi-autonomous driving and safety innovation.

Task

My task was to lead the design and implementation of a functional ADAS prototype just to understand the working and basic functionality of ADAS systems. The system needed to include key features such as lane departure warning, collision avoidance, and adaptive cruise control. Additionally, we had to ensure the system was cost-effective, reliable, and capable of real-time performance on a physical model. The project required collaboration with teammates, integration of hardware and software, and adherence to a tight timeline for demonstration at the university’s engineering showcase.

Action

Took the following steps to accomplish the project objectives:

1. Research and Planning: Conducted in-depth research on ADAS technologies, studying components like ultrasonic sensors, cameras, and microcontrollers used in industry-standard systems. Used Arduino and Raspberry Pi as the core processing units for our prototype due to their affordability and versatility.
2. System Design: I led the team in designing the ADAS architecture, which included:
   * Lane Departure Warning: Using a camera module to detect lane markings and alert the driver via a buzzer if the vehicle deviated.
   * Collision Avoidance: Implementing ultrasonic sensors to measure distances to obstacles and trigger automatic braking.
   * Adaptive Cruise Control: Programming the model to maintain a safe distance from a leading vehicle by adjusting speed. I created detailed circuit diagrams and flowcharts to ensure seamless integration of sensors, actuators, and control algorithms.
3. Prototype Development: We built a small automobile model using a chassis, DC motors, and a servo for steering. I programmed the ADAS algorithms in Python (for image processing), ensuring real-time responsiveness. I also calibrated the sensors to minimize false positives, such as incorrect lane detection under varying light conditions.
4. Testing and Iteration: I organized multiple testing phases, simulating real-world driving scenarios like obstacle avoidance and lane changes. When the lane detection algorithm struggled with low-light conditions, I refined the image processing code by adjusting contrast thresholds, improving accuracy by 20%. I also documented all test results to ensure transparency.
5. Team Coordination and Presentation: As the team lead, I delegated tasks based on team members’ strengths (e.g., hardware assembly, software debugging) and ensured regular progress reviews. I prepared a comprehensive project report and a live demonstration for the showcase, explaining the system’s functionality to faculty and industry guests.

Result

The ADAS prototype was successfully demonstrated at SRH University’s engineering showcase, earning praise for its functionality and practical design. The system accurately performed lane departure warnings, avoided collisions in 95% of test cases, and maintained adaptive cruise control within a 5% error margin. Our project received a grade of 1.0 (German grading scale) and was highlighted by faculty as a strong example of applying theoretical knowledge to practical engineering challenges. Personally, I developed skills in embedded systems, project management, and teamwork, which prepared me for a career in automotive engineering.

A video of the working model could be found clicking on the link below.