Random Idea:

- Vehicle Safety Features: Create a concept for a low-cost safety feature, like a simple alert system for seatbelt usage or door closure.
- Advanced Driver Assistance System (ADAS): Implement a Verilog design for various ADAS features, such as adaptive cruise control, lane-keeping assistance, and collision avoidance, integrating multiple sensor inputs.
- Automotive Ethernet Interface: Design a Verilog module for an automotive Ethernet communication interface, enabling data transmission between various electronic control units (ECUs) in a vehicle.
- Real-Time Tire Pressure Monitoring System (TPMS): Develop a Verilog-based TPMS that processes sensor data to monitor tire pressure in real time and alerts the driver when pressure falls below a threshold.
- Automatic Headlight Control System: Create a digital design in Verilog that automatically adjusts headlight intensity based on ambient light conditions and vehicle speed.
- Electronic Stability Control (ESC) System: Implement a Verilog model for an ESC system that processes inputs from accelerometers and gyroscopes to maintain vehicle stability during sharp turns.
- Smart Battery Management System (BMS): Create a Verilog design for monitoring and managing battery parameters (voltage, current, temperature) in electric vehicles, ensuring safety and efficiency.

More Info:

Adaptive Cruise Control (ACC):

- **Functionality**: Automatically adjusts the vehicle's speed to maintain a safe following distance from the vehicle ahead.
- **Verilog Implementation**: The system continuously measures the distance and speed of the leading vehicle and adjusts the throttle and braking signals accordingly.
- **Key modules**:
    - Speed and distance measurement using radar or cameras.
    - Control algorithm to modulate vehicle speed and maintain safe distance.
    - Speed control signal generation for the throttle and braking systems.

Lane Departure Warning (LDW) System:

- **Functionality**: Monitors the vehicle's position on the road and alerts the driver when the vehicle drifts out of its lane.

- **Verilog Implementation**: The system can process input from a camera or sensors to detect lane markers, then use logical operations to identify lane departure.
- **Key modules**:
    - Image processing to detect lane boundaries.
    - Logic to compute vehicle position relative to the lane markers.
    - Decision-making module to trigger warnings based on deviations.

Blind Spot Detection (BSD) System:

- **Functionality**: Detects vehicles in the blind spot and warns the driver when changing lanes.
- **Verilog Implementation**: Use radar or camera sensors to monitor the vehicle's blind spots. Implement logical operations to compare vehicle positions and determine whether to trigger an alert.
- **Key modules**:
    - Sensor data processing to detect objects in blind spots.
    - Logic to check proximity to the vehicle and trigger warnings.

Obstacle avoidance robot using FPGA:

a trigger generator and a counter. The trigger generator generates a 10uS pulse at every 100ms. Then the ultrasonic sensor output an echo pulse proportional to the distance. This pulse is fed into a counter as the enable input. The counter outputs a number proportional to the distance. At each trigger the counter resets its value to '0'. A faster response could be gain if the time between triggers could be minimized

According to the VHDL program the FPGA chip takes input from the ultrasonic sensor and detect obstacles. Then according to a rule base the movement of the motors are controlled in order to get away from the obstacle and move forward. The distance to keep away is defined by the designer

there is an array of three ultrasonic sensors, three inputs are fed into the top level entity. Then according to the rule base, the motors are operated. The PWM changes dynamically in order to get the desired movement For example, to move backward in right direction a low PWM value is set for the right motor wheel and a high PWM value is set for the left motor.