**1. Introduction** The Blind Spot Detection (BSD) module is an integral part of the Advanced Driver Assistance System (ADAS) designed to enhance driver safety by providing timely warnings about vehicles in the blind spot area during lane-changing maneuvers. This document outlines the detailed requirements for the BSD module to ensure accurate implementation and integration into the automotive system.

**2. Overall Description** The BSD module utilizes sensor data, processing algorithms, and user interfaces to detect and warn the driver about vehicles approaching from the rear in adjacent lanes. It operates seamlessly with other ADAS components to provide a comprehensive safety solution for the vehicle occupants.

**3. Specific Requirements**

**3.1 Functional Requirements**

1. **Vehicle Detection:**
   * The system shall utilize radar sensors with a minimum detection range of 50 meters and a detection angle of 120 degrees to detect vehicles in the blind spot area.
   * The system shall employ signal processing algorithms to filter out noise and false positives from sensor data.
2. **Warning Generation:**
   * When a vehicle is detected in the blind spot area and the driver initiates a lane change by activating the turn signal, the system shall generate a visual warning on the side-view mirrors.
   * The system shall also emit an auditory warning through the vehicle's audio system to alert the driver.
3. **Warning Suppression:**
   * The system shall suppress warnings if the vehicle's speed is below a predefined threshold (e.g., 20 km/h) to avoid unnecessary alerts during parking maneuvers.
   * The system shall also suppress warnings if the detected vehicle is stationary or moving in the same direction as the host vehicle.
4. **User Interface:**
   * The system shall provide a dedicated menu in the vehicle's infotainment system for configuring BSD settings.
   * The user interface shall allow drivers to adjust the sensitivity of the BSD system and customize warning preferences (e.g., volume level, visual display duration).

**3.2 Non-Functional Requirements**

1. **Reliability:**
   * The system shall achieve a minimum detection accuracy of 98% under typical driving conditions, including varying speeds and environmental factors.
   * The system shall undergo rigorous testing to ensure reliability, with a Mean Time Between Failures (MTBF) of at least 10,000 hours.
2. **Real-time Performance:**
   * The system shall provide warnings within 500 milliseconds of detecting a vehicle in the blind spot area to ensure timely driver notification.
   * The processing latency shall not exceed 50 milliseconds to maintain responsiveness during high-speed driving.
3. **Robustness:**
   * The system shall be robust against environmental factors such as rain, fog, and sunlight, with minimal degradation in performance.
   * The system shall perform self-calibration and sensor recalibration periodically to compensate for sensor drift and environmental changes.
4. **Safety:**
   * The system shall prioritize safety-critical warnings over non-critical alerts to prevent driver distraction and ensure compliance with automotive safety standards.
   * The system shall incorporate fail-safe mechanisms to mitigate the risk of false negatives and false positives in detection.

**4. External Interface Requirements**

* **Sensor Interfaces:**
  + The system shall interface with radar sensors via CAN bus communication protocols for data exchange.
* **User Interface:**
  + The system shall interface with the vehicle's infotainment system through a graphical user interface (GUI) for configuring BSD settings and displaying warnings.
* **Vehicle Integration:**
  + The system shall interface with the vehicle's Controller Area Network (CAN) for receiving vehicle speed and turn signal status.
* **Diagnostic Interface:**
  + The system shall provide diagnostic interfaces for service technicians to retrieve sensor data and perform system diagnostics.

**5. System Features**

* **BSD Activation:**
  + The system shall be activated automatically upon vehicle ignition and remain operational during driving.
  + The system shall deactivate automatically when the vehicle is parked or turned off to conserve power.
* **Customizable Settings:**
  + The system shall allow drivers to save personalized BSD settings to individual driver profiles for convenience.
  + The system shall provide default settings for new users and offer guided setup procedures for initial configuration.
* **Diagnostic Alerts:**
  + The system shall monitor sensor health and generate diagnostic alerts if sensor performance falls below predefined thresholds.
  + The diagnostic alerts shall be displayed in the vehicle's instrument cluster and logged for future reference.

**6. Other Requirements**

* **Regulatory Compliance:**
  + The system shall comply with relevant automotive safety regulations and standards, including ISO 26262 Functional Safety Standard.
* **Documentation:**
  + The system shall be accompanied by comprehensive documentation, including user manuals, technical specifications, and compliance certificates.
* **Localization:**
  + The system shall support multiple languages for user interfaces to accommodate diverse user preferences and international markets.

**7. Glossary**

* BSD: Blind Spot Detection
* ADAS: Advanced Driver Assistance System
* CAN: Controller Area Network
* GUI: Graphical User Interface
* MTBF: Mean Time Between Failures
* ISO 26262: Road vehicles – Functional safety

**8. References**

* ISO 26262: Road vehicles – Functional safety
* Automotive Safety Standards (e.g., FMVSS, ECE regulations)