**TASK 2: For the problem you have prepared a software development model, V&V checkpoints, and quality targets, prepare a Software Requirements Specification (SRS) template.**

1. Introduction

1.1 Purpose

This document defines requirements for a safety-critical autonomous vehicle (AV) navigation system, ensuring compliance with ISO 26262 (functional safety), ISO 21448 (SOTIF), and UL 4600 (autonomy safety).

1.2 Scope

Covers perception, localization, path planning, decision-making, and vehicle control subsystems. Excludes hardware manufacturing or infrastructure updates.

The following requirements are expressly excluded from this SRS:

Sensor and actuator hardware specifications.

External communication infrastructure to the car's internal network.

Passenger interaction user interface components (if a separate system).

Production and implementation procedures.

1.3. Intended Audience

Software Development Team for the purpose of creating and executing the software.

Verification and Validation (V&V) Team for developing test cases and guaranteeing adherence to regulations.

Project management for organizing and monitoring the project's development.

Safety Engineers to evaluate the system's safety and compliance with rules.

Stakeholders to comprehend the capabilities and constraints of the system.

1.4 Definitions

Automotive Safety Integrity Level, or ASIL (A-D).

SOTIF stands for Safety of the Intended Function.

Hazard Analysis and Risk Assessment, or HARA.

2. Overall Description

2.1. Viewpoint on the Product

One important embedded software system that will be housed in the vehicle's central processing unit or units is the autonomous vehicle navigation and decision-making system. It will communicate with different actuators, sensors, and possibly other onboard systems. Under a variety of driving circumstances, the system must function in real-time and guarantee the security of the car's occupants and the surrounding area.

2.2. Features of the Product

The system's primary capabilities are as follows Environmental Perception Gathering and analyzing sensor data to produce a thorough understanding of the static and dynamic environment Self Localization and Mapping for locating the vehicle precisely on a local or global map; and Path Planning and Trajectory Generation for producing practical and ideal paths and trajectories in accordance with the environment, destination, and safety restrictions.

2.3 Limitations in Design and Implementation

Safety Standards with a target ASIL (Automotive Safety Integrity Level) of the system must be developed and put into operation in accordance with pertinent safety standards .

Strict real-time deadlines must be met by critical functions.

The system must function within the constraints of the onboard computing resources, such as processing power, memory, and power consumption.

Hardware Interfaces that the system needs to work properly with the designated sensors and actuators.

Software Architecture so a modular and maintainable software architecture should be followed in the design.

Coding Standards to guarantee code quality and safety, development must adhere to established coding standards.

Verification and Validation at every stage of development, the system must be built to support thorough testing and verification.

3 Requirements for Function (FR)

3.1 Perception (PER)

Within the sensor's range, the system must be able to identify and categorize static objects, such as road signs, lane markings, and obstacles.

Verification Method to synthetic data simulation, recording and replaying of sensor data, and real-world testing. PER-002 this system must be able to identify and track dynamic objects (such as cars, pedestrians, and cyclists) within the sensor range, including their position, velocity, and anticipated trajectory. Sensor fusion testing, simulation with dynamic scenarios, and real-world testing with controlled dynamic objects. PER-003 this system must be resilient to environmental changes (such as weather and lighting changes) and sensor noise. Using noisy sensor data and testing in a range of simulated and actual environmental settings.

**TASK 3: Use suitable methods to analyze stakeholder requirements and prepare a documented SRS.**

We'll use a mix of the following techniques to efficiently gather and examine stakeholder needs:

1.Interviews: Speaking with important stakeholders in semi-structured or structured interviews. This makes it possible to examine their priorities, worries, and expectations in great detail.Executives from automotive companies, safety engineers, regulatory compliance officers, possible end users , development team leads, and testing team leads are examples of stakeholders. Focus on being aware of the overarching vision, safety objectives, legal restrictions, technical viability issues, and quality standards.

2.Workshops: Leading cooperative workshops with a wide range of interested parties. This encourages dialogue, identifies competing needs, and aids in group requirement prioritization. Members of each of the major stakeholder groups.Focus on defining system boundaries, resolving ambiguities, identifying critical functionalities, and brainstorming features.

Examining current, pertinent documents, such as

High-level system architecture documents and project charters.

Standards for industry safety (such as ISO 26262).

legal frameworks and regulatory requirements.

3.Use Case Analysis: Developing use cases to describe how different actors (including the vehicle itself and external entities) will interact with the system to achieve specific goals. Actors: Autonomous Vehicle System, Pedestrian, Other Vehicle, Traffic Signal System, Cloud-based Map Service . Focus: Defining system functionalities from a user (or system interaction) perspective, identifying scenarios of operation, and outlining the system's responses. Scenario-Based Analysis: Creating detailed scenarios of various driving situations Focus: Eliciting specific functional and non-functional requirements by considering how the system should behave in diverse and challenging situations, particularly those with safety implications.

**TASK 4:Perform verification of the requirements and manage the report on version control using Git.**

Participants: **Include representatives from all key stakeholder groups (development, testing, safety, regulatory).**

* Process: Conduct formal review meetings where each requirement in the SRS is examined against the verification criteria mentioned above.
* Focus: Look for conflicting requirements within the same section or across different sections. For example, a performance requirement might contradict a safety requirement if not carefully considered. Completeness: Ensure all core functionalities identified during stakeholder analysis are documented. Verifiability: For each functional and non-functional requirement, discuss how it will be verified . If a requirement cannot be verified, it needs to be rephrased. For instance, a requirement like "The system shall be safe" is not directly verifiable and needs to be broken down into measurable safety requirements.
* Preparation: Create a checklist based on the characteristics of good requirements (consistent, complete, correct, unambiguous, verifiable, traceable).
* Application: Each reviewer uses the checklist to independently assess a section or the entire SRS.
* Outcome: The completed checklists provide a structured way to identify potential issues and areas of concern.
* Process: A more formal and structured review process with defined roles (e.g., moderator, reader, recorder, inspector).
* Focus: In-depth analysis of the SRS to identify defects and ensure adherence to quality standards.
* Output: A formal inspection report documenting the findings.