Elektrobit

UDACITY

Safety Plan Lane Assistance

Document Version: 3.0

Template Version 1.0, Released on 2017-06-21

Document history

Date	Version	Editor	Description
15.02.2018	1.0	VIvanov	Draft version of document
16.02.2018	1.1	VIvanov	Item Definition update
19.02.2018	2.0	VIvanov	Minor updates before submit
20.02.2018	3.0	VIvanov	Review fixes

Table of Contents

Introduction

Purpose of the Safety Plan

This document defines a safety plan of Lane Assistance project as a goal of safety achievement during project development. Document includes the goals of the project, what activities will be included, defines roles on the team, who will develop the project and confirmation measures for proving achieved functional safety.

Scope of the Project

For the lane assistance project, the following safety lifecycle phases are in scope:

Concept phase
Product Development at the System Level
Product Development at the Software Level

The following phases are out of scope:

Product Development at the Hardware Level
Production and Operation

Deliverables of the Project

The deliverables of the project are:

Safety Plan
Hazard Analysis and Risk Assessment
Functional Safety Concept
Technical Safety Concept
Software Safety Requirements and Architecture

Item Definition

The item investigated in this plan is Lane Assistant project.
The Lane Assistance project has two functions:

- Lane Departure Warning
- Lane Keeping Assistance

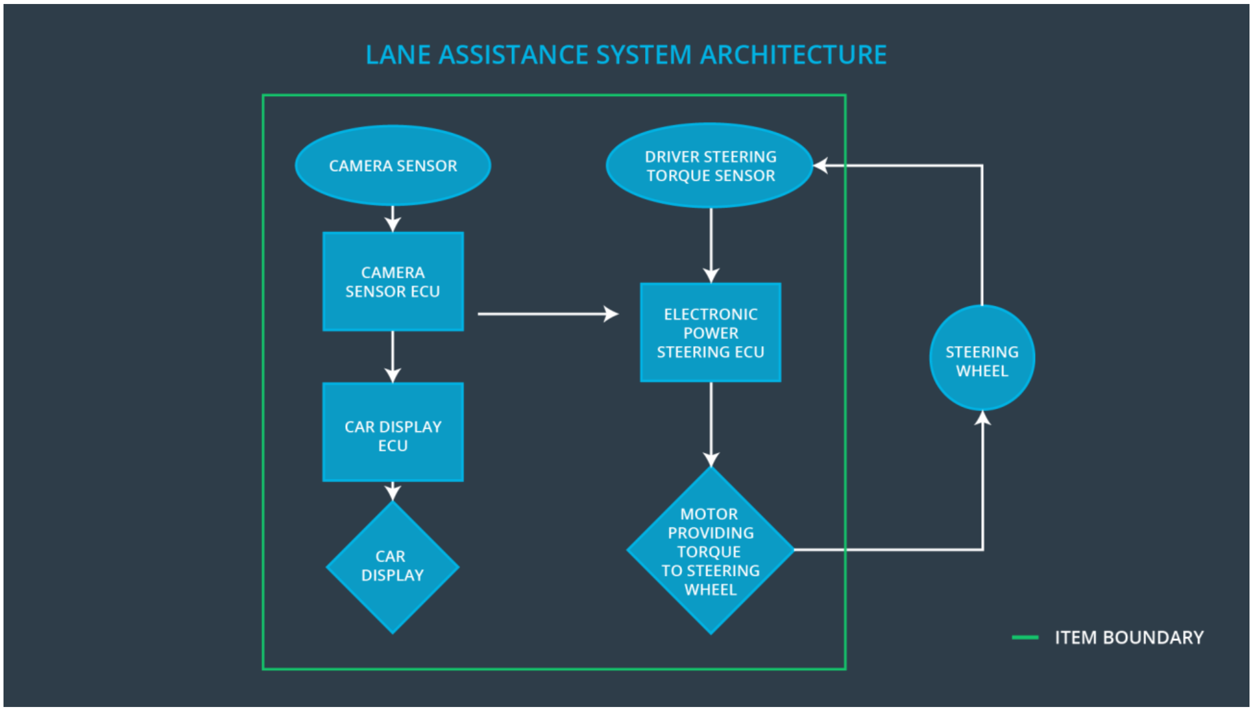
Lane Departure Warning behavior: When the car departs a lane without using a turn signal the system will vibrate the steering wheel to warn the driver.

Lane Keeping Assistance behavior: When the car departs a lane without using a turn signal the system will move the steering wheel back towards the lane center.

The item consists following sub-systems and components:

1. **Camera Subsystem**
    a. Camera sensor.
    b. Camera sensor ECU (Electronic Control Unit).
2. **Electronic Power Steering Subsystem**
    a. Driver Steering Torque Sensor.
    b. Electronic Power Steering ECU.
    c. Motor Proving Torque to Steering Wheel.
3. **Car Display Subsystem**
    a. Car Display ECU.
    b. Car Display.

Lane Assistant project Architecture:


LANE ASSISTANCE SYSTEM ARCHITECTURE
CAMERA SENSOR
CAMERA SENSOR ECU
CAR DISPLAY ECU
CAR DISPLAY
DRIVER STEERING TORQUE SENSOR
ELECTRONIC POWER STEERING ECU
MOTOR PROVIDING TORQUE TO STEERING WHEEL
STEERING WHEEL
ITEM BOUNDARY

The Lane Assistant project does not include following functionalities:

- Adaptive Cruise Control
- Automatic Parking
- Blind Spot Monitoring
- Tire Pressure Monitoring
- Pedestrian Protection

Goals and Measures

Goals

The goals of project are:

- Identify risk and hazardous situations caused by the Line Assistance project components malfunction for persons in car and for other cars.
- Evaluate the risk level of the hazardous situations.
- Low to risks of the malfunctions to a reasonable level.

Measures

Measures and Activities	Responsibility	Timeline
Follow safety processes	All Team Members	Constantly
Create and sustain a safety culture	Safety Manager	Constantly
Coordinate and document the planned safety activities	Safety Manager	Constantly
Allocate resources with adequate functional safety competency	Project Manager	Within 2 weeks of start of project
Tailor the safety lifecycle	Safety Manager	Within 4 weeks of start of project
Plan the safety activities of the safety lifecycle	Safety Manager	Within 4 weeks of start of project
Perform regular functional safety audits	Safety Auditor	Once every 2 months
Perform functional safety pre-assessment prior to audit by external functional safety assessor	Safety Manager	3 months prior to main assessment
Perform functional safety	Safety Assessor	Conclusion of functional safety activities

assessment		

Safety Culture

In order to ensure that safety culture is in a good shape following characteristics shall be tracked:

- **High priority:** safety has the highest priority among competing constraints like cost and productivity
- **Accountability:** processes ensure accountability such that design decisions are traceable back to the people and teams who made the decisions
- **Rewards:** the organization motivates and supports the achievement of functional safety
- **Penalties:** the organization penalizes shortcuts that jeopardize safety or quality
- **Independence:** teams who design and develop a product should be independent from the teams who audit the work
- **Well defined processes:** company design and management processes should be clearly defined
- **Resources:** projects have necessary resources including people with appropriate skills
- **Diversity:** intellectual diversity is sought after, valued and integrated into processes
- **Communication:** communication channels encourage disclosure of problems

Safety Lifecycle Tailoring

For the lane assistance project, the following safety lifecycle phases are in scope:

Concept phase
Product Development at the System Level
Product Development at the Software Level

The following phases are out of scope:

Product Development at the Hardware Level
Production and Operation

Roles

Role	Org
Functional Safety Manager- Item Level	OEM
Functional Safety Engineer- Item Level	OEM
Project Manager - Item Level	OEM
Functional Safety Manager- Component Level	Tier-1
Functional Safety Engineer- Component Level	Tier-1
Functional Safety Auditor	OEM or external
Functional Safety Assessor	OEM or external

Development Interface Agreement

This section defines the roles and responsibilities between OEM and Tier-1 involved in in the Lane Assistance project development.

The OEM provides a functioning Lane Assistance System. Tier-1 is going to analyze and modify sub-systems, listed in **Item Definition** according to functional safety requirements.

- **OEM:**
    - **Functional Safety Manager - Item Level**: Pre-audits, plans the development phase for the Lane Assistance item.
    - **Functional Safety Engineer - Item Level**: Develop prototypes, integrate subsystems combining them into the Lane Assistance item from a functional safety viewpoint.
    - **Project Manager - Item Level**: Allocates the resources needed for the item.
- **Tier-1 (Camera Subsystem):**
    - **Functional Safety Manager - Component Level**: Pre-audits, plan the development for the components of the Lane Assistance item:
        - Camera Subsystem components
    - **Functional Safety Engineer - Component Level**: Develop prototypes and integrate components into the Lane Assistance item:
        - Camera Subsystem components
- **Tier-1 (Electronic Power Steering Subsystem):**
    - **Functional Safety Manager - Component Level**: Pre-audits, plan the development for the components of the Lane Assistance item:
        - Electronic Power Steering Subsystem components

    - **Functional Safety Engineer - Component Level**: Develop prototypes and integrate components into the Lane Assistance item:
        - Electronic Power Steering Subsystem components
- **Tier-1 (Car Display Subsystem):**
    - **Functional Safety Manager - Component Level**: Pre-audits, plan the development for the components of the Lane Assistance item:
        - Car Display Subsystem components
    - **Functional Safety Engineer - Component Level**: Develop prototypes and integrate components into the Lane Assistance item:
        - Car Display Subsystem components
- **OEM/External:**
    - **Functional Safety Auditor**: Make sure the project conforms to the safety plan.
    - **Functional Safety Assessor**: Judges where the project has increased safety

Confirmation Measures

The confirmation measures have following purposes:

- That the Lane Assistance project conforms to ISO 26262.
- That the Lane Assistance project really does make the vehicle safer.

Confirmation review ensures that the project complies with ISO 26262. As the product is designed and developed, an independent person would review the work to make sure ISO 26262 is being followed.

Functional safety audit checks to make sure that the actual implementation of the project conforms to the safety plan is called a functional safety audit.

Functional safety assessment confirms that plans, designs and developed products actually achieve functional safety is called a functional safety assessment.