Elektrobit

UDACITY

Safety Plan Lane Assistance

Document Version: 1.0

Document history

Date	Version	Editor	Description
11/24/2017	1.0	Chris Ferone	First draft of document.

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Introduction

Purpose of the Safety Plan

The purpose of the Safety Plan is to define roles and outline the steps needed to achieve 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

[Instructions:

REQUIRED

Discuss these key points about the system:

What is the item in question, and what does the item do?

What are its two main functions? How do they work?

Which subsystems are responsible for each function?

What are the boundaries of the item? What subsystems are inside the item? What elements or subsystems are outside of the item?

The Lane Assistance System has two functions: **Lane departure warning** and **Lane keeping assistance.** When the driver drifts towards the edge of the lane, two things will happen:

1. the lane departure warning function will vibrate the steering wheel. In other words, the vehicle quickly moves the steering wheel back and forth to create a vibration.
2. the lane keeping assistance function will move the steering wheel so that the wheels turn towards the center of the lane

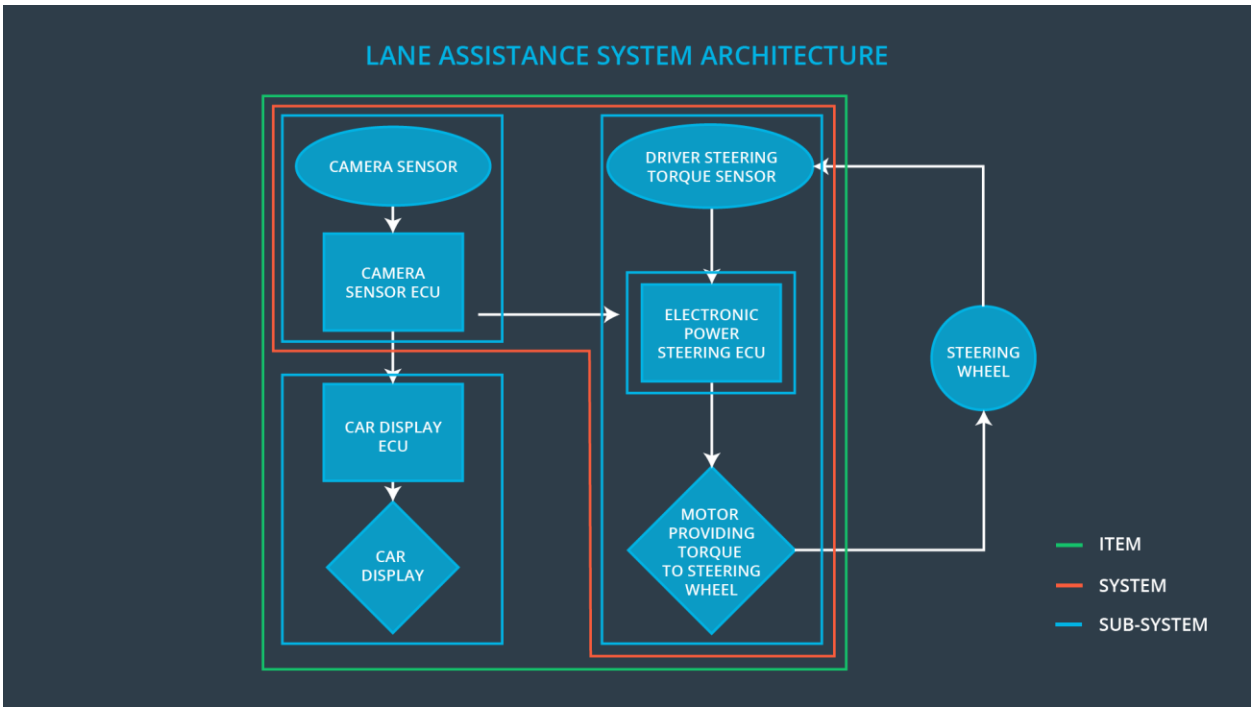
When the camera senses that the vehicle is leaving the lane, the camera sends a signal to the electronic power steering system asking to turn and vibrate the steering wheel.

The camera sensor will also request that a warning light turn on in the car display dashboard. That way the driver knows that the lane assistance system is active.

If the driver uses a turn signal, then the lane assistance system deactivates so that the vehicle can leave the lane. The driver can also turn off the system completely with a button on the dashboard.

The driver is still expected to have both hands on the steering wheel at all times. The electronic power steering subsystem has a sensor to detect how much the driver is already turning. The lane keeping assistance function will merely add the extra torque required to get the car back towards center. The extra torque is applied directly to the steering wheel via a motor.

The following diagram shows the boundaries between each system:


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
SYSTEM
SUB-SYSTEM

Goals and Measures

Goals

The goals of this project are to identify hazards within the lane assistance system, evaluate the risk of those hazards, and use system engineering to lower the risk.

Measures

Measures and Activities	Responsibility	Timeline
Follow safety processes	All Team Members	Constantly
Create and sustain a safety culture	All Team Members	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 Auditor	3 months prior to main assessment
Perform functional safety assessment	Safety Assessor	Conclusion of functional safety activities

Safety Culture

Safety is paramount. Safety cannot be ignored in order to meet deadlines or lower costs. Therefore, the following steps are being taken to ensure everyone within the company prioritizes safety:

1. Managers shall be responsible for ensuring that all design decisions, test plans, validation results, and other safety-related documentation clearly indicate their authorities to ensure accountability. Requirements tracking software shall be use to ensure traceability from requirements to design to testing and validation.
2. Each year one person within the company will be recognized for exceptional work promoting and prioritizing safety. This person will be awarded a one-time $1000 bonus.
3. Anyone who reports unsafe designs practices, or deficiencies in safety procedures is immune from any disciplinary action.
4. Any employees who willfully disregard safety plans, best practices, etc. will be subject to disciplinary action, including but not limited to suspension, demotion, and termination.
5. Those who design systems shall not be solely responsible for testing and validation nor hazard analysis.
6. Each engineer shall have clearly defined roles. A single person cannot manage all aspects of functional safety.

Safety Lifecycle Tailoring

Because the OEM is supplying a functioning lane assistance system, only 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

The purpose of the Development Interface Agreement (DIA) is to clearly define and delineate the roles and responsibilities between the OEM and supplier.

In this project, the OEM is supplying a functioning lane assistance system. My company needs to analyze and modify the various sub-systems from a functional safety viewpoint.

Confirmation Measures

The main purpose of confirmation measures is to ensure that the functional safety project conforms to ISO 26262 and does indeed make the vehicle safer.

The confirmation review is an audit conducted by an independent person to verify that the project is in compliance with ISO26262.

The functional safety audit confirms that actual implementation of the project confirms to the safety plan.

The functional safety assessment confirms that the plans, designs and developed products actually achieve functional safety.