Elektrobit

UDACITY

Safety Plan Lane Assistance

Document Version: 1.0

Marcus Erbar, 2017-08-08

Document history

[Instructions: Fill in the date, version and description fields. You can fill out the Editor field with your name if you want to do so. Keep track of your editing as if this were a real world project.

For example, if this were your first draft or first submission, you might say version 1.0. If this is a second submission attempt, then you'd add a second line with a new date and version 2.0]

Date	Version	Editor	Description
2017-08-08	1.0	Marcus Erbar	Initial Draft

Table of Contents

Introduction

Purpose of the Safety Plan

[Instructions: Answer what is the purpose of a safety plan?]

The Safety Plan outlines steps to achieve Functional Safety for the lane assistance system. It defines roles and responsibilities for the development process and lists measures that will be used to achieve the targeted ASIL.

Scope of the Project

[Instructions: Nothing to do here. This is for your information.]

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

[Instructions: Nothing to do here. This is for your information.]

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?
OPTIONAL
Optionally, include information about these points as well. These were not included in the lectures, but you might be able to find this information online:

- **Operational and Environmental Constraints. This could especially be limited to camera performance; lane lines are difficult to detect in snow, fog, etc**
- **Legal requirements in your country for lane assistance technology**
- **National and International Standards Related to the Item**
- **Records of previously known safety-related incidents or behavioral shortfalls]**

The lane assistance system warns the driver of an unplanned lane departure and takes corrective measures if necessary.

It is designed to minimize accidents by addressing human error in the form of a distracted or drowsy driver.

Main Functions

Lane departure warning

The lane departure warning function shall apply an oscillating steering torque to provide the driver a haptic feedback.

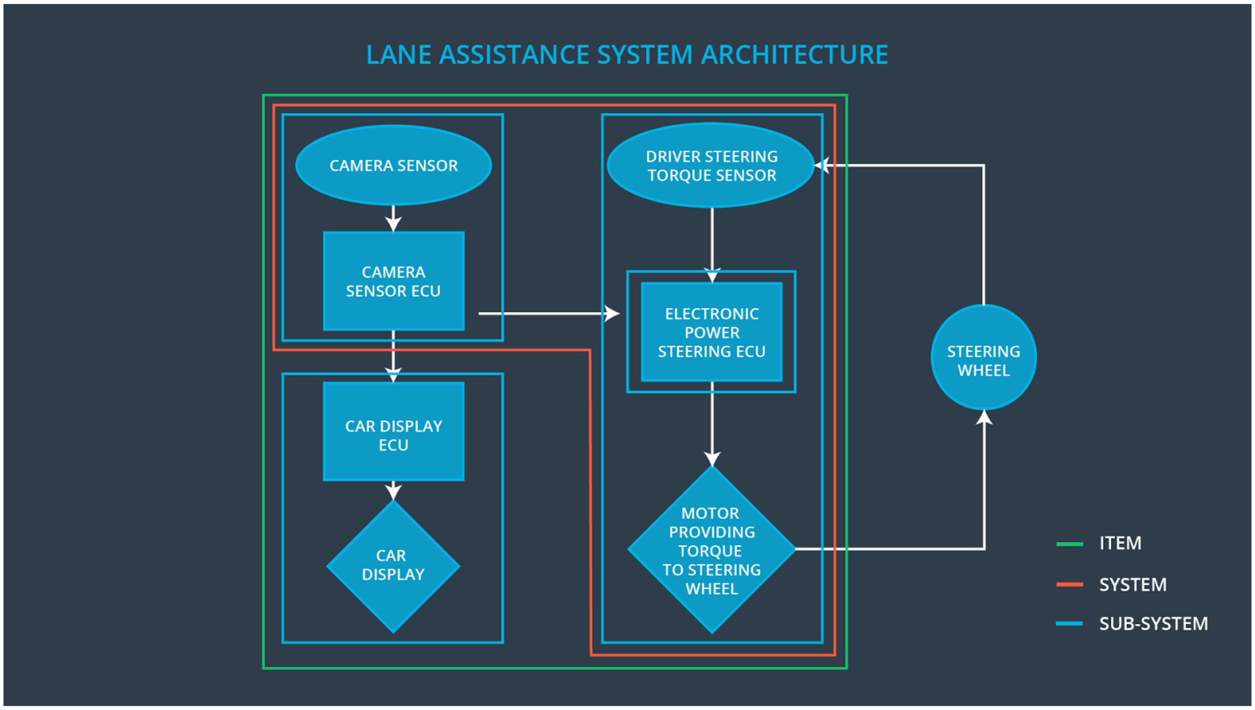
Lane keeping assistance

The lane keeping assistance function shall apply steering torque when active in order to stay in ego lane.

Architecture

The following subsystems are responsible for both functions:

- Camera system
- Car Display system
- Electronic Power Steering 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

The camera system detects lane departures and tells the steering wheel how hard to turn. The driver receives a warning on the vehicle display and also receives a warning via the steering wheel vibrating. Simultaneously, the wheel adds extra steering torque to help the driver move back towards the center of the lane.

Goals and Measures

[Instructions:
Describe the major goal of this project; what are we trying to accomplish by analyzing the lane assistance functions with ISO 26262?]

Goals

Ensure the safe operation and functional safety of the Lane Assistance System.

To capture electric and electronic failures that could lead to a hazardous situation and to minimize the risk of failures by transitioning the system into a safe state.

Measures

[Instructions:
Fill in who will be responsible for each measure or activity. Hint: The lesson on Safety Management Roles and Responsibilities.

The options are:
All Team Members
Safety Manager
Project Manager
Safety Auditor
Safety Assessor]

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	Project 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 assessment	Safety Assessor	Conclusion of functional safety activities

Safety Culture

[Instructions:
Describe the characteristics of your company's safety culture. How do these characteristics help maintain your safety culture. Hint: See the lesson about Safety Culture]

- Safety has the highest priority among competing constraints like cost and productivity
- Processes ensure accountability such that design decisions are traceable back to the people and teams who made the decisions
- The organization motivates and supports the achievement of functional safety
- The organization penalizes shortcuts that jeopardize safety or quality
- Teams who design and develop a product are independent from the teams who audit the work
- Company design and management processes are clearly defined
- Projects have necessary resources, including people with appropriate skills
- Intellectual diversity is sought after, valued and integrated into processes
- Communication channels encourage disclosure of problems

Safety Lifecycle Tailoring

[Instructions:
Describe which phases of the safety lifecycle are in scope and which are out of scope for this particular project. Hint: See the Intro section of this document
]

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

[Instructions:
This section is here for your reference. You do not need to do anything here. It is provided to help with filling out the development interface agreement section.
]

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

[Instructions:
Assume in this project that you work for the tier-1 organization as described in the above roles table. You are taking on the role of both the functional safety manager and functional safety engineer.

Please answer the following questions:

1. **What is the purpose of a development interface agreement?**

2. **What will be the responsibilities of your company versus the responsibilities of the OEM? Hint: In this project, the OEM is supplying a functioning lane assistance system. Your company needs to analyze and modify the various sub-systems from a functional safety viewpoint.]**

Purpose

A DIA (development interface agreement) defines the roles and responsibilities between companies involved in developing a product. All involved parties need to agree on the contents of the DIA before the project begins.

The DIA also specifies what evidence and work products each party will provide to prove that work was done according to the agreement.

The ultimate goal is to ensure that all parties are developing safe vehicles in compliance with ISO 26262.

Responsibilities

OEM shall supply a functioning lane assistance system.

Tier-1 shall analyze and modify the following sub-systems from a functional safety viewpoint:

- Camera system
- Car Display system
- Electronic Power Steering system

OEM shall arrange safety audits and the final safety assessment.

Confirmation Measures

[Instructions:
Please answer the following questions:

1. **What is the main purpose of confirmation measures?**
2. **What is a confirmation review?**
3. **What is a functional safety audit?**
4. **What is a functional safety assessment?**

]

Confirmation measures serve two purposes:

- that a functional safety project conforms to ISO 26262, and
- that the project really does make the vehicle safer.

The **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.

The **functional safety audit** checks to make sure that the actual implementation of the project conforms to the safety plan.

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

A safety plan could have other sections that we are not including here. For example, a safety plan would probably contain a complete project schedule.

There might also be a "Supporting Process Management" section that would cover "Part 8: Supporting Processes" of the ISO 26262 functional safety standard. This would include descriptions of how the company handles requirements management, change management, configuration management, documentation management, and software tool usage and confidence.

Similarly, a confirmation measures section would go into more detail about how each confirmation will be carried out.