Elektrobit

UDACITY

Safety Plan Lane Assistance

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Document history

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9/17/2017	1.0	Dr. Martin Pfeifle	Initial Version of Safety Plan for Lane Assistance System

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Introduction

Purpose of the Safety Plan

In this document we define roles and responsibilities to achieve a high level of safety for the Lane Assistance System of a highly autonomous vehicle in accordance with the functional safety standard ISO 26262. In addition, the goal of the project is describe as well as what goals are defined and what measures are taken to fulfill ISO 26262.

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 lane assistance item alerts the driver that the vehicle has accidentally departed its lane, and attempts to steer the vehicle back towards the center of the lane.

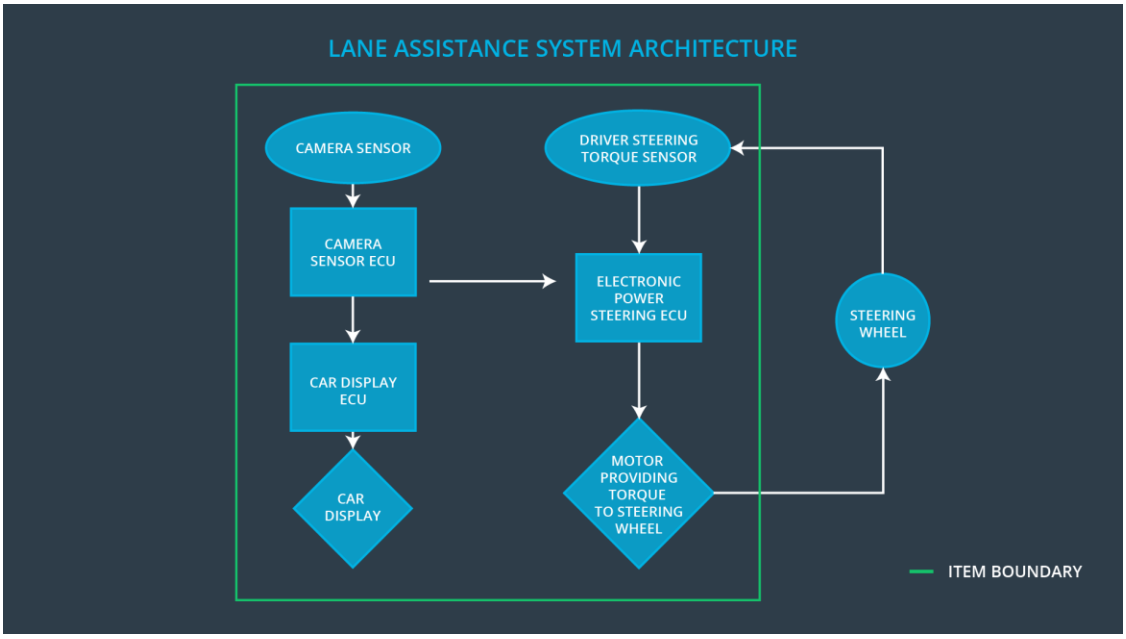
The Lane Assistance System will have two functions:

- Lane departure warning
- Lane keeping assistance

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

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

The camera subsystem, the electronic power steering subsystem, and the car display system are all responsible for each of the functions.



Goals and Measures

Goals

The goal is that to limit the impact of electrical and electronic failures (including software) of the two items lane departure warning and lane keeping assistance.

Measures

Measures and Activities	Responsibility	Timeline
Follow safety processes	All team members	Constantly
Create and sustain a safety culture	All team member	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 assessment	Safety Assessor	Conclusion of functional safety activities

Safety Culture

In our company we follow the following points:

- **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

The 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.

Here are major sections of a DIA:

- Appointment of customer and supplier safety managers
- Joint tailoring of the safety lifecycle
- Activities and processes to be performed by the customer; activities and processes to be performed by the supplier
- Information and work products to be exchanged
- Parties or persons responsible for each activity in design and production
- Any supporting processes or tools to ensure compatibility between customer and supplier technologies

The Tier-1 supplier(s) are responsible for developing each of the three main subsystems according to ISO 26262: the Computer Vision Subsystem, Instrument Cluster Subsystem and the Electronic Power Steering Subsystem. This includes all hardware and software for each subsystem, as defined above. The Tier-1 supplier(s) are responsible for sub-system testing.

The OEM is responsible for the complete lane assistance system. This includes all communication interfaces between subsystems, all ancillary devices (e.g. steering wheel, vehicle speed sensor, CAN bus network, camera mounting hardware, etc.). The OEM is responsible for any signals required to be provided for a given subsystem, such as vehicle speed. The OEM is responsible for testing the complete system.

Confirmation Measures

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 people who carry out confirmation measures need to be independent from the people who actually developed the project.

A 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.

A functional safety audit makes sure that the actual implementation of the project conforms to the safety plan.

A function 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.