Elektrobit

UDACITY

Safety Plan Lane Assistance

Document Version: 1.0

Template Version 1.0, Released on 2017-06-21

Document history

Date	Version	Editor	Description
08.01.2018	1.0	Liang Zhang	First attempt

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Introduction

Purpose of the Safety Plan

The safety plan provides an overall framework for the **lane assistance** item, for example, the scope of the project and the lane assistance item. It also assigns roles and responsibilities for this project.

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

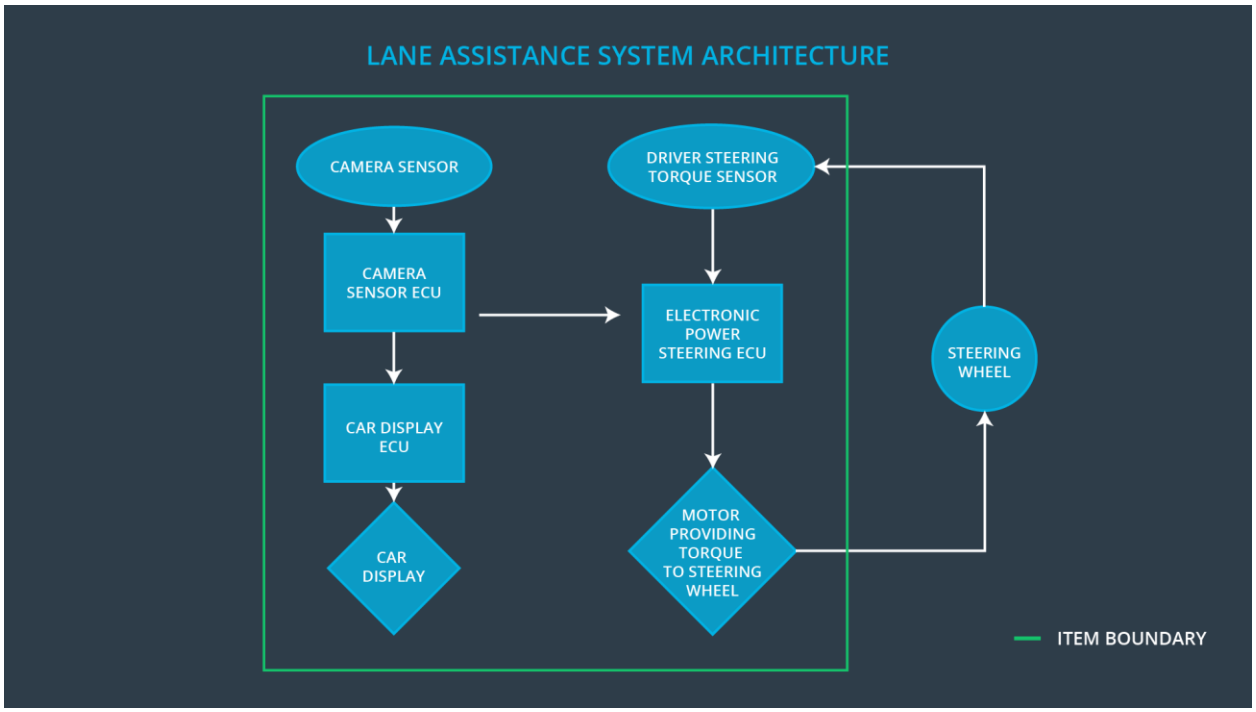
Item Definition

The item we consider in this plan is a Lane Assistance System, which alerts the driver when the vehicle has accidently departed the lane and attempt to steer the vehicle back to the center of the lane.

The Lane Assistance System will have two functions:

- Lane departure warning: When the driver drifts towards the edge of the lane, this function will vibrate the steering wheel
- Lane keeping assistance: When the driver drifts towards the edge of the lane, this function will move the steering wheel so that the wheels turn towards the center of the lane

The item boundary is defined in the following system architecture diagram.

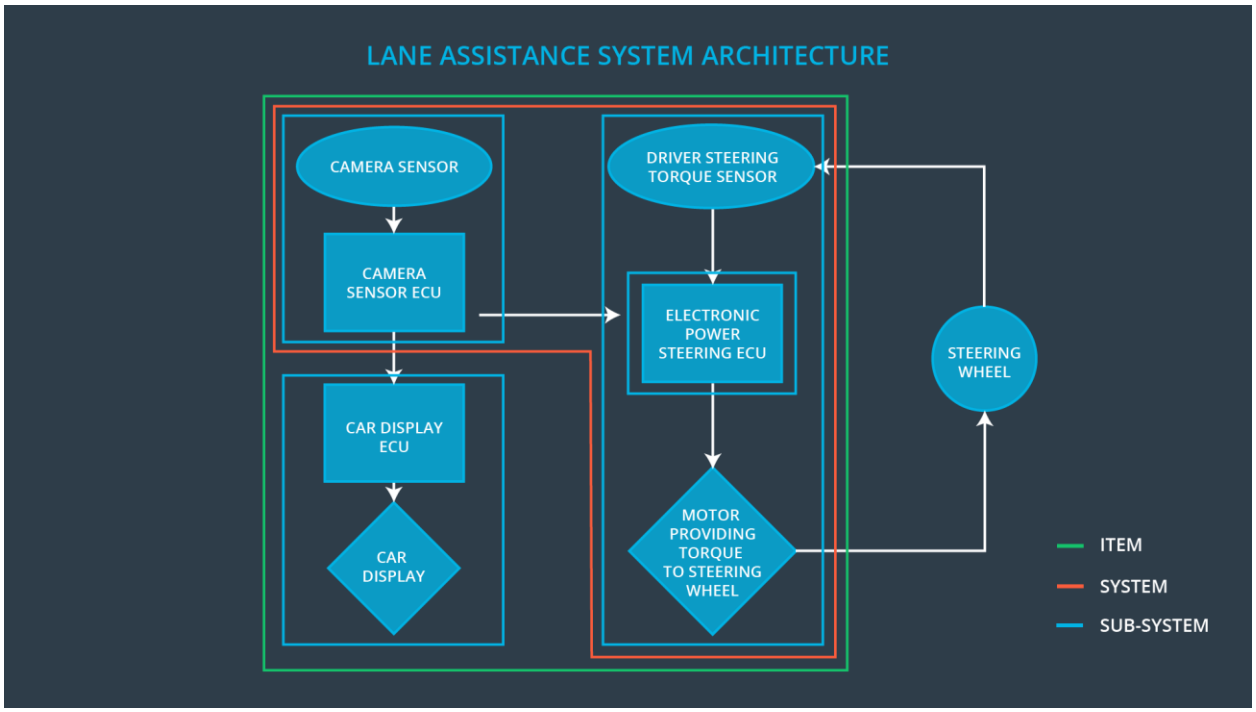


From the diagram below, it shows that the item includes three sub-systems:

- **Camera system**
  This sub-system is composed of two components
  - camera sensor
  - camera sensor ECU
- **Electronic Power Steering system**
  This sub-system is composed of two components

    - driver steering torque sensor
    - electronic power steering ECU
    - motor providing torque to steering wheel
- **Car Display system**
  This sub-system is composed of two components
    - car display
    - car display ECU

To summarize the functionality, 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 a **steering wheel vibrating**. Simultaneously, the wheel adds extra **steering torque** to help the driver move back towards the center of the lane.



Note that **steering wheel** is out of the item.

Goals and Measures

Goals

The goal of this project:

- Identify hazard situations in the lane assistance item.
- Evaluate risk of each hazard situation.
- Derive requirements to lower the risks to the acceptable level by the society.

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	All team members	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

The following characteristics of safety culture should be followed during the Lane Assistance project:

- **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
Functional Safety Assessor	OEM

Development Interface Agreement

A DIA (development interface agreement) defines the *roles* and *responsibilities* between companies involved in the Lane Assistance project. The DIA also specifies *evidence* and *work products* each party will provide to prove that work was done according to the agreement. The ultimate goal of DIA is to ensure that all parties are developing safe vehicles in compliance with ISO 26262.

For OEM

- **Functional Safety Manager**: pre-audits, plans the development phase for the Lane Assistance item.
- **Functional Safety Engineer**: develop prototypes, integrate subsystems combining them into the Lane Assistance item from a functional safety viewpoint.
- **Project Manager**: allocates the resources needed for the item.
- **Functional Safety Auditor**: make sure the project conforms to the safety plan.
- **Functional Safety Assessor**: judges where the project has increased safety.

For Tier One

- **Functional Safety Manager (Liang Zhang)**: pre-audits, plan the development for the components of the Lane Assistance item.
- **Functional Safety Engineer (Liang Zhang)**: develop prototypes and integrate components conforming the Lane Assistance item.

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.

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 is 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.

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.