Elektrobit

UDACITY

Safety Plan Lane Assistance

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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
3/13/2018	1	Scott Schnelle	First draft of Safety Plan

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Introduction

Purpose of the Safety Plan

The purpose of the Safety Plan is to define a framework for safely implementing a Lane Assistance system on a vehicle. It includes the scope of the project, creates deliverables, defines what each item should do, develops goals and measures, and defines roles and responsibility for the systems 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 for this safety plan is a Lane Assistance System. The two main functions of this system are:

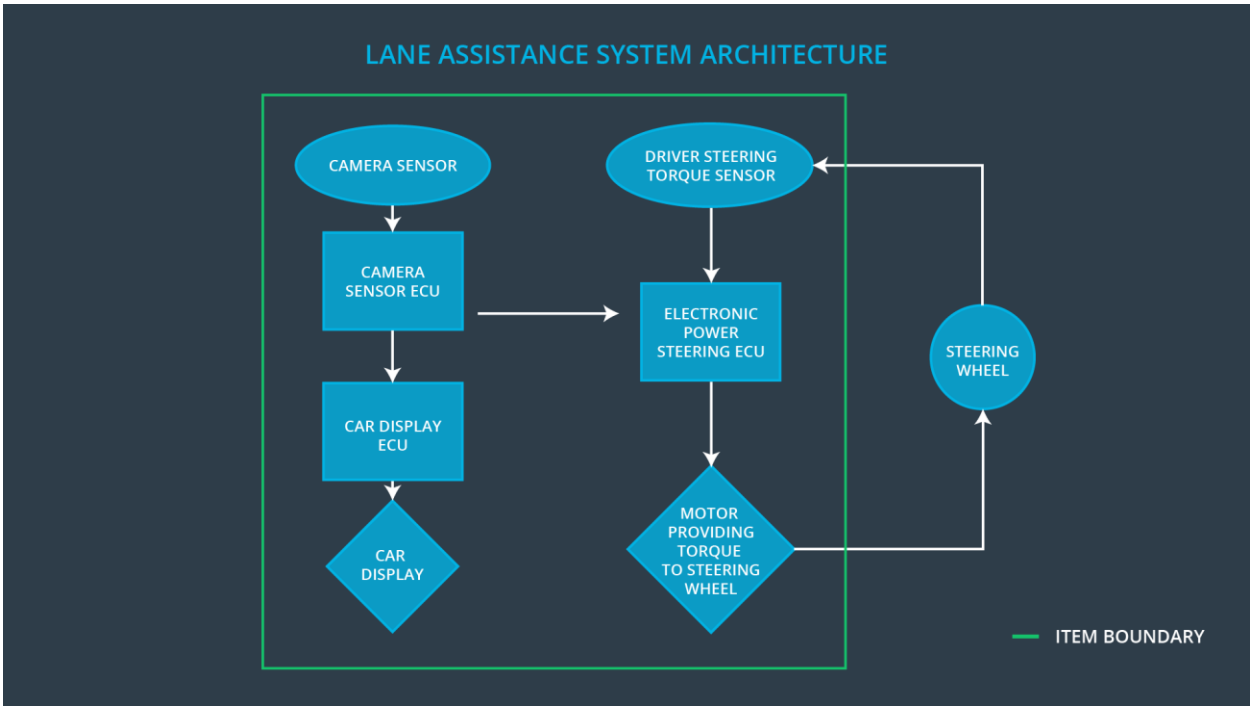
- **Lane Departure Warning:** When the vehicle drifts out of the desired lane, the vehicle provides haptic feedback by vibrating the steering wheel to alert the driver.

- **Lane Keeping Assistance:** When the vehicle begins to drift out of the desired lane, the vehicle provides a control input, either braking inside wheels or providing steering torque, to keep the vehicle in its desired lane.

The system uses the following subsystems and components to implement these functions:

- Cameras
  - Camera Sensor
  - Camera ECU
- Electronic Power Steering (EPS)
  - Driver Steering Torque Sensor
  - EPS ECU
  - Motor to provide corrective torque
- Car Display
  - Car Display
  - Car Display ECU

The following diagram shows how the subsystems are connected:



The camera senses the vehicles position within the lane and if it is departing its desired lane. If it is, it sends a signal to the electronic power steering unit to vibrate the wheel and provide corrective torque. The camera ECU also sends a signal to the car display to visually alert the driver with a warning light. The system should be able to differentiate between if the vehicle is drifting out of its lane or if the driver is attempting a lane change, with or without the turn signal on. The system can be turned on/off by a button on the steering wheel.
The driver is expected to have both hands on the steering wheel at all times. The EPS system should be able to detect the driver's presence via torque input.

The Lane Assistance system does not include the following:

- Adaptive Cruise Control
- Blind Spot Monitoring
- Traffic Jam Assist

Goals and Measures

Goals

The goals of this project are:

- Identify potential risk and hazardous situation that could arise with any malfunction in the Lane Assistance system
- Evaluate these risk
- Reduce these risk to acceptable levels

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

To implement a culture of safety, the following characteristics needs to be observed:

- 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 parties involved in the Lane Assistance project to ensure its development in compliance with ISO 26262.

- **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.
- **Functional Safety Manager - Component Level (Scott Schnelle)**: Pre-audits, plan the development for the components of the Lane Assistance item.
- **Functional Safety Engineer - Component Level (Scott Schnelle)**: Develop prototypes and integrate components conforming the Lane Assistance item.
- **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 purposes of the confirmation measures are to:

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

The Confirmation review ensure the projects comply 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 make sure the actual implementation of the project conforms to the safety plan. A Functional safety assessment confirms that the plan, design and developed product achieve functional safety.