
Active Lane Centering System

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MODULE II: FINAL REPORT

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The design that is described in this report has been carried out in accordance with the
TU/e code of scientific conduct

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Abstract

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Active Lane Centering System

by ASD Group ALC

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Chapter 1

Introduction

Chapter 2

System Model and Simulation Results

Chapter 3

System Implementation

Chapter 4

Test Cases and Results

Chapter 5

Conclusion and Future Work

Bibliography

- [1] Alvaro Arrue (IDIADA) Alba Fornells. "Cooperative dynamic formation of platoons for safe AND energy-optimized goods transportation". In: *Companion : Current State Of EU Legislation*. 28-05-2014.
- [2] Frank S Barickman, Larry Smith, and Robert Jones. "Lane departure warning system research and test development". In: *Transportation Research Center Inc.*, (07-0495) (2007).
- [3] Altera By Frank Noha. "<http://www.automotive-eetimes.com/content/functional-safety-considerations-adas-designs-using-fpgas>". In: *Functional safety considerations for ADAS designs using FPGAs*. 15-07-2014.
- [4] M Ellims, H Monkhouse, and A Lyon. "ISO 26262: Experience applying part 3 to an in-wheel electric motor". In: *IET Conference Proceedings*. The Institution of Engineering & Technology. 2011.
- [5] Ford. "<https://owner.ford.com/how-tos/vehicle-features/safety/lane-keeping-system.html>". In: *Lane keeping system*.
- [6] "<http://owners.honda.com/vehicles/information/2016/Accord-Sedan/features/Lane-Keeping-Assist-System>". In: *Lane Keeping Assist System*.
- [7] Sung-Hoon Hong Hyeon Ae Jang Hyuck Moo Kwon. "A Study on Situation Analysis for ASIL Determination". In: *Journal of Industrial and Intelligent Information Vol. 3, No. 2*. Engineering and Technology Publishing, 2015.
- [8] ISO. "Intelligent transport systems — Lane keeping assistance systems (LKAS) — Performance requirements and test procedures". In: *ISO 11270:2014(en)*. 2014.
- [9] ISO. "Road vehicles Functional safety Part 3: Concept phase". In: *INTERNATIONAL STANDARD ISO 26262-3*. 2011.
- [10] Rami Debouk General Motors Company Joseph G. D'Ambrosio General Motors Company. "ASIL Decomposition: The Good, the Bad, and the Ugly". In: *SAE Technical Paper 2013-01-0195*. 2013.
- [11] UNITED NATIONS. "Uniform provisions concerning the approval of motor vehicles with regard to the Lane Departure Warning System (LDWS)". In: *UNECE 130: 2013*. 2013.
- [12] Euro NCAP. "TEST PROTOCOL – Lane Support Systems. Version 1.0". In: *EUROPEAN NEW CAR ASSESSMENT PROGRAMME*. November 2015.
- [13] Ian Riches. "Strategy Analytics: Automotive Ethernet: Market Growth Outlook." In: *Keynote Speech 2014 IEEE SA - Ethernet and IP at Automotive Technology Day*. 2014.
- [14] wikipedia. "https://en.wikipedia.org/wiki/Lane_departure_warning_system". In: *Lane departure warning system*.

Appendix A

Appendix A: Euro NCAP Requirements

Appendix B

Scenarios

Appendix C

HARA and Safety Goals

Appendix D

Functional Safety Requirements

Appendix E

Decomposed Functional Safety Requirements

Appendix F

Appendix F: Benchmarking

Appendix G

Appendix G: Controllability justification

Appendix H

Appendix H: Glossary

1	ALC	: Active Lane Centering
3	LKA	: Lane Keep Assist
	ALKA	: Active Lane Keep Assist
5	LDW	: Lane Departure Warning
	Euro NCAP	: European New Car Assessment Programme
7	ASIL	: Automotive Safety Integrity Level
	FSG	: Functional Safety Goal
9	SG	: Safety Goal
	FSR	: Functional Safety Requirement
11	TSR	: Technical Safety Requirement
	DFSR	: Decomposed Functional Safety Requirement
13	HARA	: Hazard Analysis and Risk Assessment
	FMEA	: Failure Mode Element Analysis
15	LSS	: Lateral Support System
	VUT	: Vehicle Under Test
17	HMI	: Human Machine Interaction