Design and Hardware in the Loop Testing of AEB Controllers

ISSN: 0148-7191, e-ISSN: 2688-3627
DOI: https://doi.org/10.4271/2022-01-0099 (https://doi.org/10.4271/2022-01-0099)
Published March 29, 2022 by SAE International in United States

Technical Paper
2022-01-0099

Sector: Automotive
Event: WCX SAE World Congress Experience
Language: English

Abstract

Current ADAS systems can improve vehicle safety directly influencing its dynamics, reducing the impact of human error while driving. These functionalities have a high impact on the complexity of each unit installed on the car, potentially increasing the development time. In this work, a Hardware in the Loop testing bench and methodology for Autonomous Emergency Braking system is presented, aiming to enable a faster system development process. A commercial production brake by wire unit has been installed on a real-time driving simulator. The AEB functionality of the unit is activable in real-time during the simulation, by the means of a customizable control strategy. Two different AEB controllers have been implemented: the first one reproduces the unit stock functionality, while the second computes the requested deceleration using a PID control strategy. The two controllers have been tested in standardized EuroNCAP Car-to-Car Rear (CCR) collision scenario, implemented on the static simulator. The performances are then compared in terms of time to collision threshold necessary to avoid the impact, deceleration request and jerk, and vehicle-obstacle distance. The proposed methodology highlights the role of the static simulator as a development tool, allowing complete and immersive testing of both hardware and control strategies, greatly reducing the development time.

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Topic

- Hardware-in-the-loop

- Brake-by-wire
- Simulation and modeling
- Test procedures
- Simulators
- Test equipment and instrumentation
- Braking systems
- Human factors
- Autonomous vehicles

Citation

Alfatti, F., Garinei, M., Annicchiarico, C., and Capitani, R., "Design and Hardware in the Loop Testing of AEB Controllers," SAE Technical Paper 2022-01-0099, 2022, https://doi.org/10.4271/2022-01-0099 (https://doi.org/10.4271/2022-01-0099) .

Also In

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