

**F2010-E-028**

## **USAGE OF A DYNAMIC DRIVING SIMULATOR FOR THE DEVELOPMENT OF DRIVER ASSISTANCE SYSTEMS**

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**KEYWORDS** – Driver Assistance Systems, Development, Testing, Driving Simulator, DiL (Driver in the Loop)

### **ABSTRACT**

In the development of a new vehicle, there is always the need to reduce time and costs. Also, with electronics playing a major role, there is the need for new comfort, communication and safety functions. The usage of virtual simulation software tools has come to mate these two requirements: fast and reliable development and new functions introduction. HiL (Hardware in the Loop) and SiL (Software in the Loop) testing and development are currently carried out in most of automotive manufacturers and suppliers with the goal to boost performance and reliability.

Some of the most popular facilities over the last few years are Driving Simulators. They have been widely used to assess and validate HMI solutions, as they can provide a safe and repetitive environment for testing and evaluation. Nevertheless, they can also expand their range of activities to the development of Driver Assistance Systems (ADAS), as they can provide support to the algorithm definition and early testing.

When developing Driver Assistance Systems, a fast migration from the in-desk solution to road testing is required. Sometimes, first results are disappointing, as previous validation is done just through existing non-changeable gathered data. Introducing the driver in a safe environment would provide then a step forward in the design and development of such systems. Thus, the usage of a Dynamic Driving Simulator has been considered as an additional tool, introducing the driver in the test phase (DiL, Driver in the Loop).

The Driving Simulator is updated to support this new functionality: it must be capable to provide a suitable output for the inputs of the ADAS system being tested. The control / actuation / warning algorithms of this system are integrated in the simulator (Matlab Simulink block) and collects inputs from virtual sensors, simulating those finally used in the real system, and vehicle ego-data, also simulated. Driver input is of course also another input for the system.

Outputs will be represented in the driving environment (braking, accelerating, warnings...) and logged on, being produced by the Simulink Block. This way, the developers will be able to understand in a very intuitive manner the performance of the system and perform repetitive and safe tests of the system prior to the real driving validation.

This paper will introduce the results of the development of several state-of-the-art ADAS systems using a Dynamic Driving Simulator as a support for the testing and validation phase.