Autonomous Drive Emulation (ADE)

Accelerate the Development of Advanced Driver-Assistance Systems

The forecast for connected autonomous vehicles (CAVs) remains optimistic. However, those predictions are dependent on unshakable confidence in the minds of consumers, regulators and the insurance industry. Building confidence in advanced driver-assistance systems (ADAS) means hundreds of millions of miles of road testing—actual or simulated—to fully explore corner cases and thoroughly validate new designs.

More testing, done sooner, enhances ADAS performance

Today, software-based simulation systems are being used to develop and test ADAS functionality. However, traditional integration- and system-level tests cannot ensure proper ADAS operation under real-world conditions. Further, these tests are usually performed late in the development process, making design changes costly and time-consuming, and potentially delaying start of production (SOP).

Staying on track with your target SOP date starts with higher-level scenario testing performed earlier in the development process, ideally with minimal use of scarce and costly prototype vehicles. Detailed emulation of real-world conditions enables thorough debugging and troubleshooting of complete subsystems long before vehicles take to the road.

Utilize real test scenarios in a complete virtual environment

Working in collaboration, Keysight Technologies, IPG Automotive and Nordsys have created a highly realistic, lab-based solution for the testing of multi-sensor systems. Through time-synchronized, closed-loop testing, the Autonomous Drive Emulation (ADE) platform complements traditional open-loop testing of individual modules and components.

Accelerating the CAV learning curve

Think about all of the decisions we make while driving a car. Now think about how long it took for that process to become second nature. Therein lies the challenge for CAVs, and that's why Keysight and its technology partners are creating highly realistic test solutions for ADAS designs.

Highly Realistic Testing Can Now Be Done in The Lab

Open-loop, single-unit testing is certainly necessary, but it cannot test the whole system (e.g., the vehicle). The crucial complement is time-synchronized testing of complete sensor subsystems. Using detailed simulations and a closed-loop approach, this method exercises sensors, electronic control units (ECUs), and AI algorithms as an integrated whole.

As implemented in the Keysight ADE solution, a real-time 3D engine creates a virtual environment that includes two essential capabilities: full-motion video to test camera subsystems; and dynamic signal emulation to exercise radar subsystems. For further realism, the congestion-testing capability produces 5G-based C-V2X scenarios that emulate real-world driving situations.

Because ADE is an open platform, it simplifies integration with a wide range of commercial 3D modelers, hardware-in-the-loop (HiL) systems, and existing test-and-simulation environments (Figure 1).
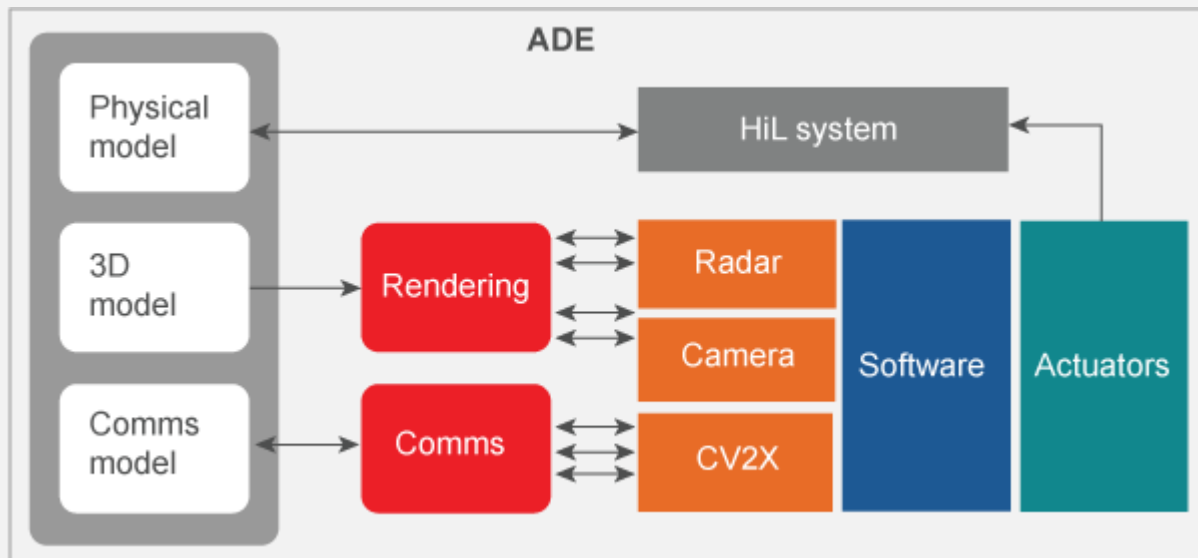

Figure 1. Through integration with broader solution elements and time-synchronized testing of key subsystems, ADE saves time and money—and provides better test coverage—when compared to single-unit testing.

Rendering the virtual environment

Software from IPG Automation allows for the transfer of real test scenarios, including the entire environment, into a virtual world rendered with a high level of detail. This powerful, real-time-capable modeling technology synchronizes with Keysight test hardware that creates physical-layer signals for realistic testing in a lab setting.

Adding congestion scenarios

Nordsys adds software-controlled applications focused on V2X communications to emulate the RF congestion that occurs in real-life traffic situations. For example, Nordsys WaveBEE Creator simplifies the development of scenarios that include hundreds of vehicles traveling on multi-lane roads. To further test congestion algorithms, you can add a power profile that accounts for details such as distance and periodicity. And, for maximum realism, you can add security certificates to every vehicle in the simulation.
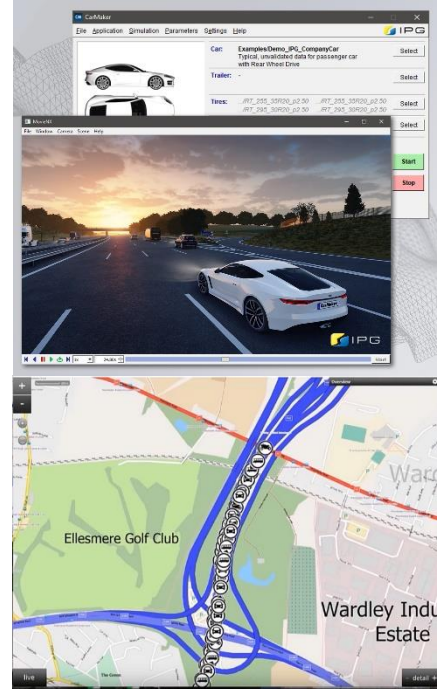
Locking in time synchronization

Keysight adds tightly controlled synchronization between the HiL controller, the rendering software, and signal generators and signal analyzers. To help you fully exercise ADAS components, software and systems, our detailed signal simulations include GNSS, V2X, radar, and LIDAR.

Verification of standards compliance is also essential

Ensuring compliance at the physical layer, including standards-based testing, will continue to be a requirement across radar and V2X systems. In 5G and other crucial technologies, Keysight is an active participant in the creation of standards and the associated test requirements and methodologies. For example, we cover formal 3GPP GCF-certified test cases for 5G, and we also cover test cases developed by the OmniAir Consortium for C-V2X device certification in North America.

Work with us to realize your vision of mobility

With CAVs, market acceptance and sales growth depend on confidence built from highly realistic testing. The open ADE platform is ready to streamline the test pipeline and speed the development of new-generation ADAS systems.

As you continue to create what comes next, Keysight is ready with test solutions that can accompany you from concept to reality. Our goal is to help you excel—and accelerate—in those areas that are redefining future mobility: sensor systems, wireless links, in-car networks, batteries and cells, and beyond. It's all about getting there first and realizing your company's vision of mobility.

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