Video Interface Box X

Tests of camera-based systems made easy through direct injection of image data

In the steadily progressing development towards automated driving, camera-based assistance functions play a key role. To ensure that the systems function reliably, they must undergo intensive advance testing carried out by the development departments. When testing these systems on simulation test benches, a lack of synchronization between the image generation on the screen and the image capturing of the camera can result in "torn" images. Additionally, digital flat-screen displays are often too dim and weakly contrasting to be able to supply concrete input data for light assist functions. The Video Interface Box X of IPG Automotive facilitates the direct injection of image data into a standard camera control unit in order to circumvent these issues, enabling closed-loop testing and validation of the camera ECU.

The software solutions of the CarMaker product family allow relevant elements such as the vehicle, road, road users and traffic objects to be virtually modeled to mirror real test drives. The simulation offers several options for feeding generated image data into the control unit under test. Monitor HIL is the quickest method. The virtual image data are displayed on a monitor and the entire camera system under test (lens, image sensor and ECU) is placed in front of the screen so that it can capture and process the simulated data.

However, particularly in scenarios with significant differences in brightness, such as when approaching oncoming traffic at night or when exiting a tunnel, the Monitor HIL method reaches its limits. The lack of synchronization between the image generation on the screen and the image capturing of the camera can result in torn images. In addition, the monitor's required response time can lead to ghosting. As a result, a traffic sign shown on the screen might not be recognized correctly, or an oncoming vehicle might be interpreted as several objects, giving rise to false responses. For tests of camera systems with ultra wide-angle lenses (fisheye lenses), a flat monitor is entire unsuitable. On the whole, therefore, a different method is needed.

Avoiding false responses by directly injecting image data

Image data can be directly fed into the ECU under test via the Video Interface Box X. The image sensor and lens are separated from the rest of the camera system. For the resulting interface, off-the-shelf standard hardware interfaces are available as well as customized solutions. As the optical path, consisting of the lens and the color filter attached to the sensor, is removed, these components must be modeled within the visualization. This is achieved using the Physical Sensor Models, an add-on to the visualization software IPGMovie.

SOLUTIONS FOR VIRTUAL TEST DRIVING

The hardware interface, an application-specific circuit board within the Video Interface Box X, can be exchanged, enabling the test system to be reused for other projects as well. IPGMovie is then utilized for the parameterization of the image output. The software is connected to the Video Interface Box X via the DisplayPort output of a standard graphics card, ensuring an efficient and low-latency transmission of the image data with exact and reliable timing. The Video Interface Box X distributes the image data across up to four different channels and adds information which corresponds to that of a real camera. Different algorithms can now be tested via the ECU.
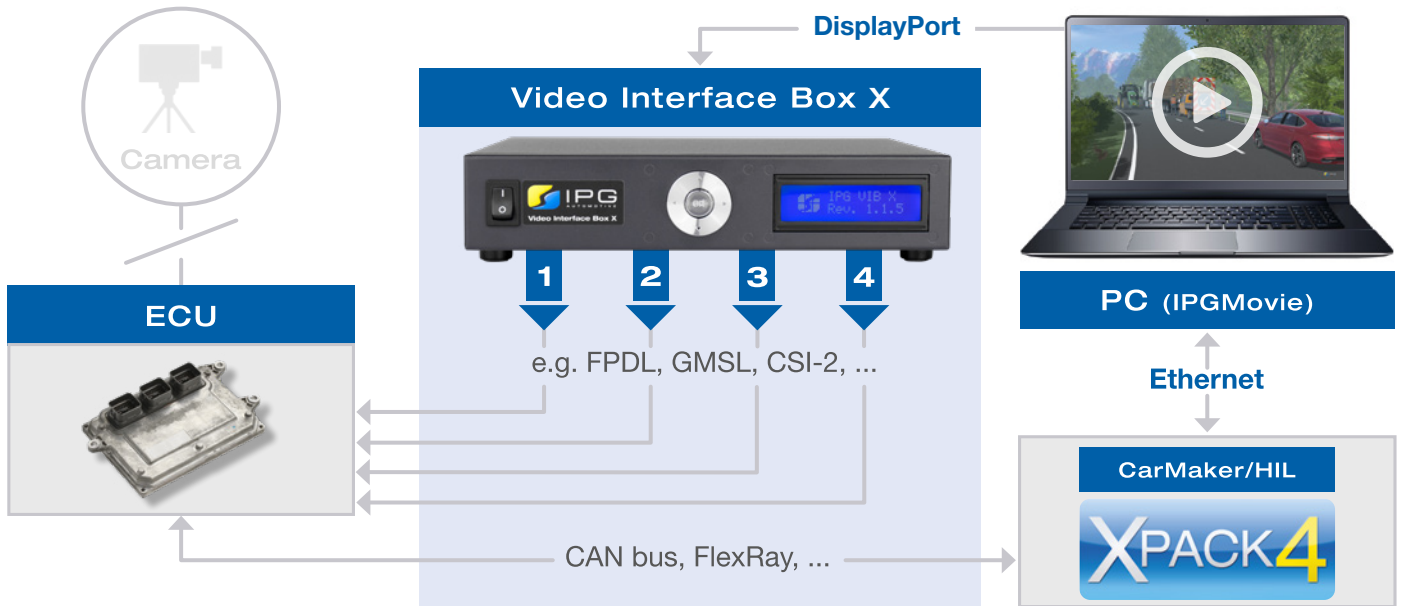
Schematic of the HIL setup with the Video Interface Box X

Your benefits at a glance

- Improved tests of camera-based assistance systems thanks to direct injection of image data
- Avoiding imprecise input data for light assist functions caused by monitors with low light intensity and low contrast
- Preventing false responses of the algorithms due to a lack of synchronization between the image generation on the screen and the image capturing of the camera on the Monitor HIL
- Ability to test camera systems with ultra wide-angle lenses (fisheye lenses)
- No support required to update the software

> Find more information on the Video Interface Box X on our website at **www.ipg-automotive.com/video-interface-box-x**

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