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1 Overview

1.1 Introduction

ADAS sensors identify objects in road traffic. The Driver Assistance option allows you to capture sensor data and conveniently verify it against reality.

The Driver Assistance option is available in CANape, CANape log and vSignalyzer.

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1.2 Properties and Advantages

1.2.1 Validation and visualization of ADAS sensors

The detected objects are displayed as graphical symbols (e.g. as rectangles and polygons) in different display windows. Both during the measurement and based on measurement data.

A video of a reference camera recorded synchronously to the measurement serves as a basis for the verification of the sensor data. The sensors provide the coordinates of the objects, which are then displayed at the corresponding positions of the reference image. For a better overview, the sensor objects can also be displayed in a three-dimensional, freely configurable scene window.

This direct comparison between sensor data and reality allows you to verify the quality of your sensor data quickly and reliably.

![Figure 1: Display of sensor data in the video window and in two different views of the scene window. Detected objects are superimposed on the image of the reference camera and additionally displayed in a bird’s eye view and a lateral perspective.](image-url)
1.2.2 Recording ADAS Sensors with Very High Data Rates

For the development of driver assistance systems and autonomous driving vehicles, as much raw sensor data as possible is recorded to use it later in a re-simulation for testing new software versions. The data rates from radar and video sensors are particularly high.

With the Driver Assistance option, special recorders (DHPR: Distributed High Performance Recorder) are available for the various ADAS sensors. We are happy to integrate new sensors for you at any time.

The DHPRs are controlled from CANape via TCP/IP. The entire measurement task can easily be distributed across multiple measurement computers, making it fully scalable.

1.1 Application Areas

The flexible configuration options of the Driver Assistance option cover a wide range of applications in ADAS development:

- Complete vehicle logging for verification and simulations
- Verification of object recognition algorithms for e.g. ACC (Adaptive Cruise Control), Stop&Go systems as well as parking assistants with the help of object overlaying
- Development of lane keeping systems or adaptive cornering lights by representing lanes as curves
- Support for testing traffic sign recognition systems by integrating bitmaps

1.2 Further information

Various documents are available on the Internet for CANape and vSignalizer. With the demo versions, you receive detailed online help in which all functions of the two tools are described. You also benefit from valuable know-how in the form of technical articles, recorded webinars, and application notes. More information on the Vector website.

2 Functions

The GFX Editor is used to conveniently assign detected sensor data (vehicles, lane markings, traffic signs, etc.) to graphical elements (polygons for lane detection and rectangles for vehicle identification) that are displayed in the video and map windows.
In addition, image processing algorithms can be integrated into CANape in the form of DLLs. In this case, video inputs and outputs are linked to video streams via CANape. The results of the algorithm are visualized in CANape. This allows you to optimize the parameterization of the algorithm in online operation, just as you would with an ECU.

3 Configuration creation for object verification

3.1 From detected traffic participant to data object

Sensors describe objects by several attributes, such as coordinates, probability, and type classification. Depending on the sensor, however, the information arrives in CANape in different ways.

Data transmission by signals

ADAS sensors send the object descriptions signal-based via available bus systems such as CAN, FlexRay or Ethernet. The Signal-Object Adapter in CANape provides a convenient interface for creating object descriptions or object lists from these signals. Signals can be assigned to objects both online during the measurement and later from the measurement data. The created measurement objects are stored in the measurement file.

Data transmission through structures

In the sensor, the object attributes are mapped in the form of structures in the software. They are described in an A2L file and measured via XCP as an array of structures. Thus, the data object is directly available in CANape.

Vendor-specific protocols

A LIDAR supplies its object information via a vendor-specific protocol. In CANape, when integrating a LIDAR, you select the appropriate device driver that can interpret the respective data stream. Thus, the supplied data objects are already available in CANape.

3.2 Creating graphical overlays for the display windows

The assignment of a data object to its symbolic representation is done in the GFX editor.

Numerous predefined drawing objects, such as point clouds, crosses, squares, triangles, or polygons, are available. In addition, you can also display bitmaps and CAD models. Each drawing object can be assigned a suitable coordinate system, such as geographic, Cartesian, pixel.
4 Presentation and evaluation

Data objects are represented as graphical elements and superimposed on other information:

- Perspective, time-synchronous display of the evaluated object information in the video image, scene or map window.
- Objects can be individually activated or deactivated in the individual windows via the ADAS Explorer for optimized display during measurement or measurement data evaluation.
- Objects, texts and parameter values can be drawn as additional information at a fixed or variable pixel position
- Relative speed or lateral deviation can be displayed as horizontal and vertical deflection lines
- Additional text and numeric information can be displayed for the object
- Arbitrary zoom and rotation mechanisms in the scene window provide exactly the section you need for your evaluation
- Subsequent adjustment of all object parameters (size, color, text/digit field, etc.) for measurement data evaluation
- The visualization of measurement data from LiDAR sensors (e.g. from Velodyne, Ibeo and Quanergy) is carried out via the scene window, in which the received point cloud objects are displayed in 3D.
4.1 Keep an overview of ADAS windows and objects: ADAS Explorer

The ADAS Explorer gives you an overview of all objects you see in the different ADAS windows. Activate and deactivate the displays comfortably from this one window.

![ADAS Explorer](image)

Figure 2: Select the objects you want to see in the windows.

4.2 The map shows you the exact position

In the Map Window, you can display the associated position data and use it for evaluation. In addition, detected objects can be displayed in the Map Window.

![Map Window](image)
4.3 For universal use: The Scene Window

From different angles (e.g. top view, driver’s view, ..) the Scene Window shows the different sensor data of e.g. radar or LIDAR.

Figure 3: The same scene twice from different angles and a different selection of objects.

Figure 4: Reliable acquisition of LIDAR sensor data and meaningful visualization as point clouds.
4.4 Camera image display in the Video Window

In the Video Window, you can see the image from the reference camera. By overlaying the GFX objects over the video image, you can see directly where your sensor has detected an object.

![Video Window](image)

Figure 5: Video window shows the image of the reference camera.

4.5 Data from GFX objects and their source objects

To keep the overview of the numerous possible sensor data within a window, you can have the information on each individual object displayed directly.

![Displaying Object Attributes](image)

Figure 6: Select an object and have the attributes displayed in detail.
5 Calibration of the reference cameras

To display object data from the control unit as geometric elements in the video window, a coordinate transformation between the spatial coordinates and the pixel positions is necessary. In calibration mode, the reference camera is presented with a grid - like a chessboard - and several images are generated. The calculation of the coordinate transformation then takes place automatically. The calibration process is only necessary once, provided that the system configuration (camera or lens type) does not change.

![Camera Calibration Tool](image)

Figure 7: Calibrating a reference camera in the Camera Calibration Tool.

6 Further solutions for ADAS development

Vector offers you comprehensive solutions in the form of software and hardware tools as well as embedded components for the various tasks involved in the development of driver assistance systems (ADAS) and systems for autonomous driving:

- measurement acquisition of sensor data up to complete ADAS logging solutions
- verification and optimization of ECU function
- software components
- algorithm design


7 Trainings

Within the scope of the training offer, we offer various workshops and trainings in our seminar rooms. Specially tailored training courses, in which the contents are combined or expanded according to your ideas, are also possible - of course also at your site in English or German.

More information on the individual training courses and the dates can be found on the Internet at: [vector-academy.com](http://vector-academy.com).
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