Optimized tools for simulating vehicle dynamics
and driver assistance scenarios

Virtual
Road Construction

A car is traveling along a multilane road, surrounded by numerous other vehicles. To ensure the driver can relax and cope safely with any situation that arises, driver assistance systems evaluate the surroundings and intervene if necessary. To develop and test these systems efficiently, realistic simulations of all kinds of situations are needed. dSPACE has further optimized its Automotive Simulation Models for such applications.
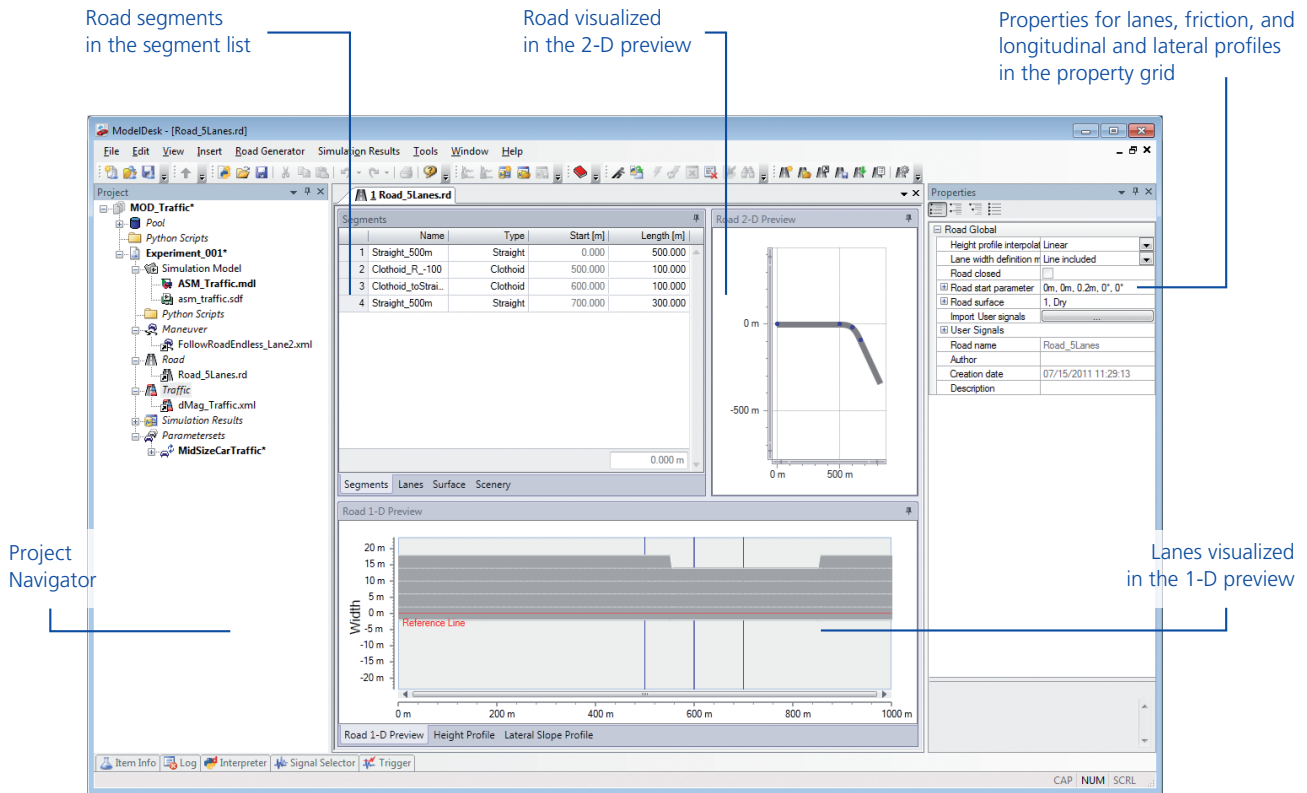
Simulating Multilane Traffic Scenarios

Advanced driver assistance systems (ADAS) evaluate data on the road and surrounding traffic obtained from devices such as radar and video sensors. These supply the data needed for adaptive cruise control (ACC), the parking assistant or the lane departure warning system. The Automotive Simulation Models (ASM) provide extensive simulation options for developing and testing

these systems. In a virtual environment, a test vehicle drives along a multilane road with other vehicles in the same way as in a real scenario. Virtual sensors detect the scene and provide data to the algorithms in the driver assistance systems. The simulation runs in real-time and can be visualized by 3-D animation. The animation can be integrated into the control loop by using real cameras that recognize virtual objects in the animation, such as traffic signs.

Construction Tool for Roads and Lanes

The functionality and handling of the simulation environment have been extended and optimized in dSPACE Release 7.3. Most of the new features are in ModelDesk, the graphical ASM control center for simulation, parameterization and parameter set management. The integrated Road Generator now lets users define multilane roads in addition to all its previous road-building

Road segments
in the segment list

Road visualized
in the 2-D preview

Properties for lanes, friction, and
longitudinal and lateral profiles
in the property grid

Project
Navigator

Lanes visualized
in the 1-D preview

The new Road Generator in ModelDesk is the construction tool for the virtual road.

◼ Easy definition and vivid visualization of roads and surface properties.

options. The new functions were designed for easy handling of complex definitions and greater flexibility in creating roads with and without lanes, for vehicle dynamics and driver assistance applications alike.

◼ *Basic Road*
The basic road is the foundation for a virtual simulation road. In the Road Generator, it is created by assembling segments such as straight sections, curves and splines, or alternatively, it can be imported as GPS coordinates. The basic road provides the reference line for defining other road features.

◼ *Road Profile*
The height and lateral incline of the road can be specified flexibly. A new option is to apply special height profiles (for curbstones, potholes, etc.) to selected areas of the road. The road's lateral profile can also be finely defined to create sections such as concave steep curves.

◼ *Surface Friction*
The road surface friction can be specified for any selected areas. These are placed on the road with freely definable lengths and widths.

◼ *Lanes*
The Road Generator provides detailed settings for up to 5 lanes

per road. Lanes can be added and removed at any point along the length of the road. Transition zones can also be defined for widening or narrowing the road.

◼ *Road Markings*
Each lane is marked, and the type of line (solid, dashed, etc.) can be set for each marking. The lines are then displayed in the 1-D preview and during animation.

Preview, Simulation and Animation
Dedicated views show users all their parameter properties at a glance: individual lanes, markings, surfaces and profiles, and also the entire road.

The Road Generator interacts with MotionDesk, the 3-D animation software, to produce realistic visualizations of simulated driving scenarios.

The overall view provides a complete picture of the road and surface features. There are synchronous zoom and scroll functions for easy handling. The next step is to simulate the road with the vehicles and a maneuver – such as "Follow the road" – in real-time. Complex driving maneuvers and complete traffic scenarios with up to 15 fellow vehicles can be simulated. During simulation, the scenario is visualized realistically by the MotionDesk 3-D animation software.

In Brief
Constructing virtual roads is now even more convenient and flexible with the new version of ASM/Model-Desk. With its integrated Maneuver Editor and Traffic Editor, it simulates complex traffic scenarios for fast, precise testing of test driver assistance systems. Vehicle dynamics

studies such as investigating brake maneuvers on a split-µ surface also profit from the new expanded functionality and handling. With all these features, the ASM/ModelDesk simulation environment is ideal for developing and testing modern driver assistance and safety systems from an early phase to the end of the development process. ■

Product Profile
ASM/ModelDesk

Simulation environment for vehicle dynamics and traffic (dSPACE Release 7.3)

- New Road Generator supports multilane roads
- Flexible definition of road features
- Intuitive definition of traffic scenarios
- Simulation of environment sensors