

Virtual Vehicle Dynamics with ModelDesk

Vehicle dynamics simulations with the ASM Vehicle Dynamics Simulation Package

Parameterization in ModelDesk

Working with the Road Generator and Maneuver Editor

Straight, circular, clothoid, and cubic spline segment types are joined to form roads in the Road Generator and immediately visualized.

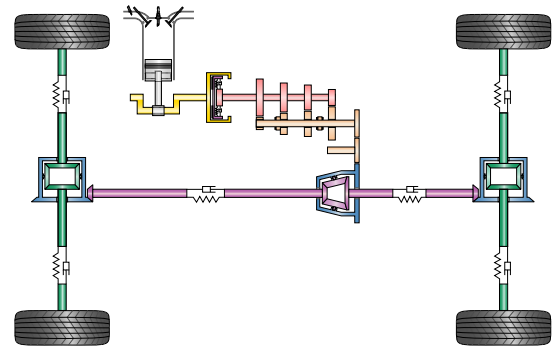
A year ago this June, dSPACE announced a new product line: the Automotive Simulation Models (ASM). Since then, the models available for engine and vehicle dynamics applications have successfully gone into action in industry. What users particularly appreciate is the openness of the models, which goes right down to the Simulink standard block level. But that's not all they have to offer. The vehicle dynamics model, for example, has parameterization software that sets new standards in ergonomics and performance.

An Integrated Solution

While the vehicle dynamics model is used in real-time in an HIL simulator or executed directly in a Simulink environment, the parameterization software, ModelDesk, provides the graphical front end for the user. The model is parameterized in experiments, which are self-contained simulation projects with complete project management. ModelDesk and the vehicle dynamics model are both in the ASM Vehicle Dynamics Simulation Package.

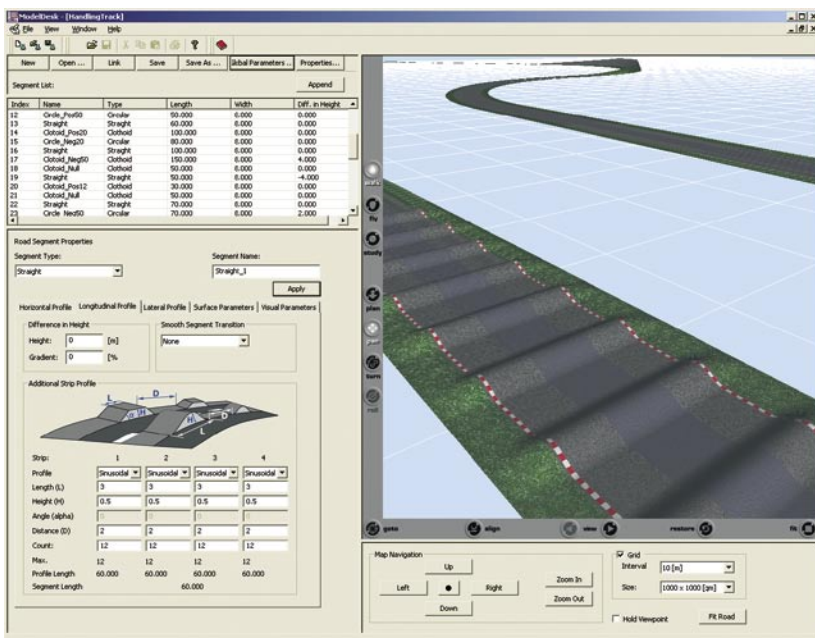
Vehicles, Roads, and Maneuvers

When using ModelDesk, you begin by configuring the vehicle you want to use in vehicle dynamics simulation.

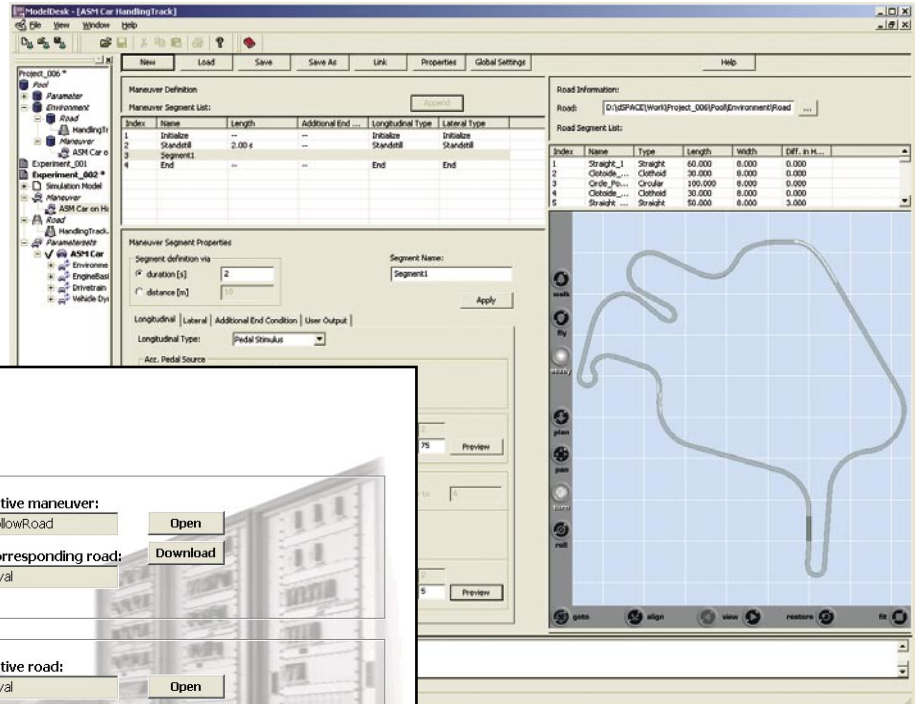
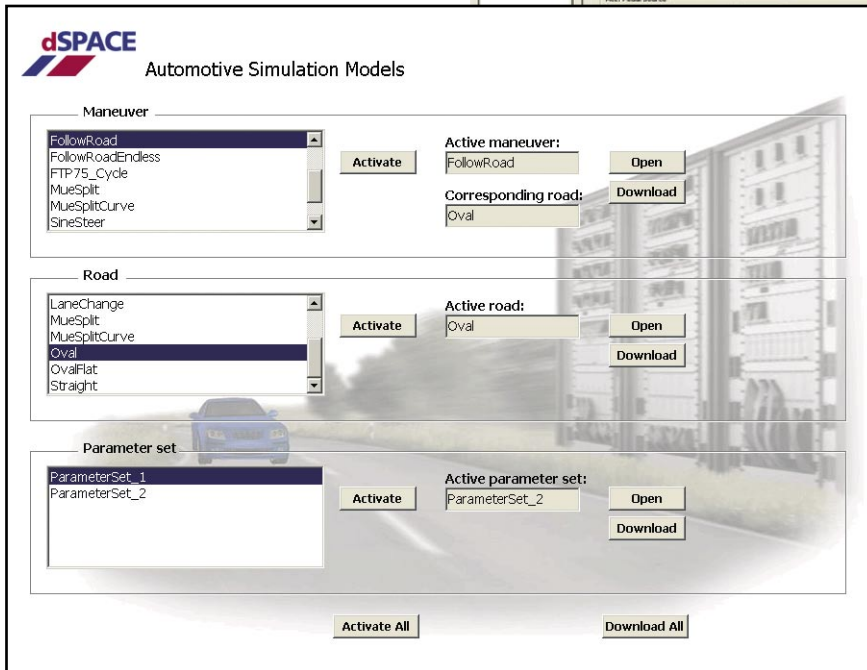


▲ Configuring the drive train.

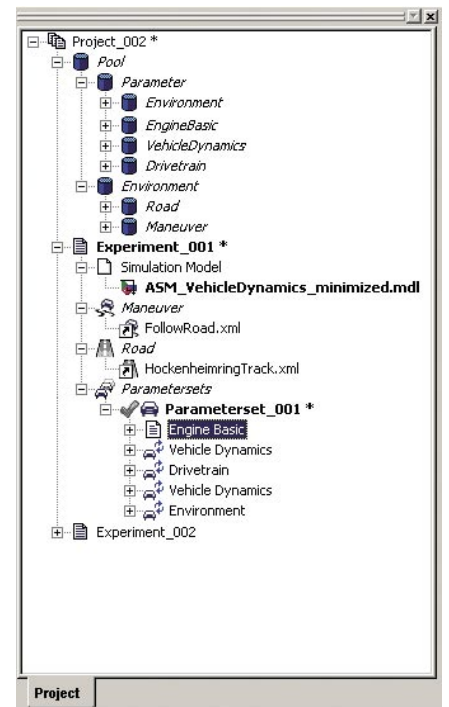
Configuration includes choosing the drive axes, the transmission type, and the tire model to be used. Next you have to select a road – you can either use one of the ready-made roads or create one of your own. The final stage in the process is the driving maneuver, which defines how the vehicle should actually move along the road. There is a selection of standard maneuvers that are frequently used for vehicle dynamics tests (steady-state cornering, lane changes, braking on roads with different frictions, etc.). And of course you can add any maneuvers in the Maneuver Editor, and even make optional user inputs during simulation (man-in-the-loop). A mouse click in ModelDesk transfers the parameter set to the model, and the simulation can start. If you want to compare two vehicles, you can create a parameter set for another vehicle configuration – for example, by selecting a different drive type, such as all-wheel instead of rear-wheel drive. This new vehicle now goes through exactly the same maneuver on the same road, allowing the effects of a different drive type to be observed directly.



▼ This page provides access to all the defined parameter sets, to make parameterization quick and easy.



▲ The driving behavior on the road is defined in the Maneuver Editor.



▲ The Navigator is used to manage experiments and their parameter sets.

Road Construction

To provide sections of road appropriate to each experiment, ModelDesk has an integrated Road Generator. This is used to create roads segment by segment. A 3-D preview means you can see the entire road, or sections of it, while you are building. The length, curve radius, gradient, etc., of each segment are defined and handled in a segment list. The segment selected from the list is shown in the road preview. Special road features such as lateral slope, bumps, and surface properties can be defined either per segment or globally. To present real challenges to the vehicle chassis, there are numerous options for including road surface irregularities (road damage).

Driving Maneuvers

Once the vehicle and the road have been defined, ModelDesk's Maneuver Editor is used to specify the vehicle's actual movements. Maneuvers are also cre-

ated in segments, which are defined on either a time or distance basis. The road and its segments can be imported into the Maneuver Editor as a reference. Each maneuver segment can then be defined individually. For example, if you use "Follow Road", the driver integrated into the model simply follows the road. In other segments, you could perform steering maneuvers, for example, to avoid obstacles. The vehicle's longitudinal behavior is defined by stimuli for the pedals and the gears. You can also leave the speed to the internal driver, who will then use a target speed appropriate to the road features.