Action and Analysis

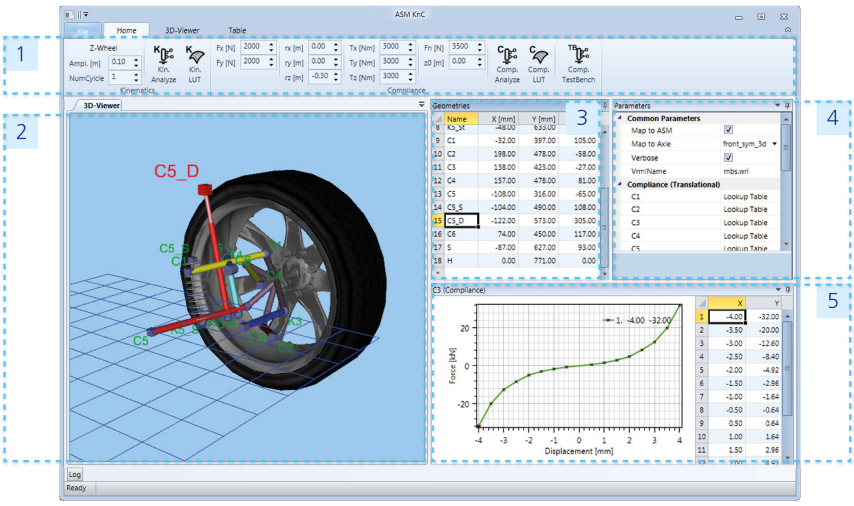
Designing and testing wheel suspensions more efficiently

Virtual test rigs shift complex mechanical axle designs and a majority of their trials away from the test track onto the developer's desk. In virtual test drives, the modeled suspensions have to prove what they are capable of.

Automotive Simulation Models (ASM) are a tool suite for the real-time simulation of automotive applications, such as in the field of vehicle dynamics. If the wheel suspensions of the simulated vehicle need to be examined more closely during the vehicle dynamics simulation, the special tool ASM KnC provides readily available help. ASM KnC (Kinematics and Compliance) is a virtual axle test rig that supports the design and analysis of wheel suspensions. It gives engineers the ability to run virtual tests on the wheel suspensions of many vehicle variants, optimize the suspensions, and reuse them for hardware-in-the-loop (HIL) tests.

Intuitive Graphical Handling

The current version of ASM KnC, 7.0, comes equipped with a completely redesigned user interface and improved user navigation. From the included templates, users choose the suspension type. The templates include customary suspensions, such as McPherson, double wishbone, 3-link, 4-link, multi-link, and more. The exact geometry, the pivot points, and the bushing stiffness can be defined intuitively, either graphically or numerically. CAD data or informa-



The graphical user interface of ASM KnC:
1) test rig control, 2) interactive 3-D preview window, 3) definition of axle geometry
4) configuration management, 5) definition of bushing stiffness.

tion from the supplier's data sheets, for example, provide the basis for this. The axle design can be animated immediately with a relevant wheel excitation on the test rig. Thus, the design can be rotated freely in space and inspected visually.

Workflow and Advantages

An ASM KnC test rig lets users simulate and examine the kinematic rotations and displacements of the wheel under the influence of vertical deflection and steering rod movement/displacement, and the elastokinematic dependencies under the influence of forces and torques. The defined design can be inserted as look-up tables into the ASM Vehicle Dynamics simulation model, where it is used for real-time-capable vehicle dynamics simulations. Because ASM KnC can be completely automated, users can conduct parameter studies iteratively without manual adjustments. For example, a script can be used to automatically alter a coupling point and analyze the influence on the vehicle dynamics simulation. This helps determine the most suitable axle design for the defined driving maneuvers, thereby reducing the test effort involved in using test vehicles and real test rigs. ASM KnC is therefore one of the key factors in frontloading tests, speeding up vehicle development. ■

Application Examples

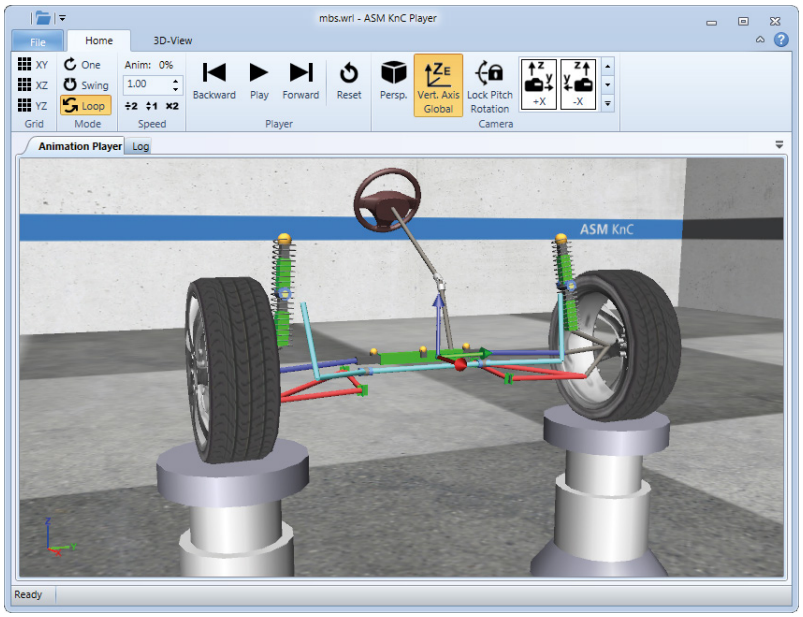
Model parameterization –
Generating kinematics and compliance look-up tables for vehicle dynamics models.

Analyzing wheel suspensions –
Checking the axle modifications via clear visualizations.

Analyzing vehicle dynamics –
Checking the effect of axle modifications (kinematics and bushing compliance) in complete vehicle dynamics models. Faster than in real time.

Virtual optimizations –
Optimizing wheel suspensions automatically. The goal: Improving the behavior of the vehicle's dynamics early on.

This video shows the workflow with ASM KnC.
www.dspace.com/go/dMag_20153_KnC



Animation of the front wheel suspension and steering.