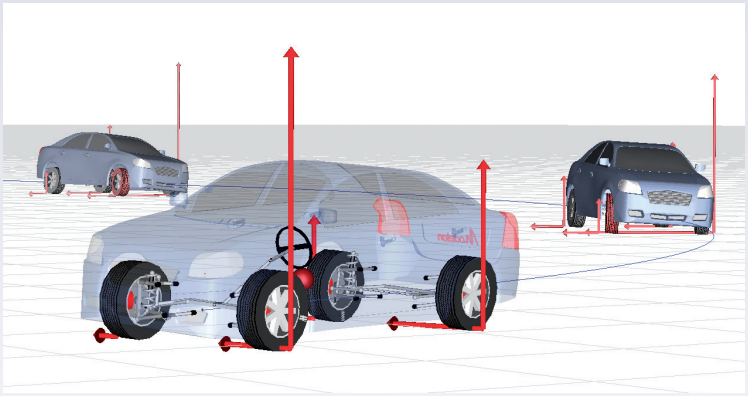
Vehicle Dynamics Library
Cars

For CATIA V6 and Dymola



Vehicle performing an open loop J-turn maneuver as specified by NHTSA

OVERVIEW

- Modeling, simulation, and analysis of the dynamics of passenger cars and light trucks

KEY FEATURES

- Full vehicle modeling
- Actuation and control
- Roads and drivers
- Test rigs
- System integration
- Powerful openness and flexibility

BENEFITS

- Unique tool for full vehicle and sub-system modeling for both conceptual designs and routine analysis
- Time savings and state-of-the art engineering with ability to deploy simulation code throughout the organization

Vehicle Dynamics Library (VDL) is setting new standards for the simulation of vehicle behavior and handling. It enables easy construction and efficient simulation of detailed and realistic models of ground vehicles. VDL offers a platform for seamless integration of subsystems from different engineering domains, thus saving time, improving collaboration between departments, and promoting concurrent engineering. The VDL simulation code can be deployed throughout an organization as with no other simulation software, leading to more accurate predictions and better decisions, from concept evaluation to race-track tuning.

Complete vehicle modeling

The VDL Cars library gives a complete environment for vehicle system design. Hierarchical structure, templates and predefined components, make the investigation of different configurations of vehicle and experiments efficient and straight-forward.

Evolves with user

The VDL Cars library features an open, object-oriented architecture with access to the model source-code. New components and systems may be easily developed, modified, and archived in the library database.

CATIA

Chassis modeling

The chassis contains suspensions, wheels, and body in a flexible structure facilitating various levels of detail that share a common interface. A set of standard tire models are included in the library. The open architecture allows the modification of all the constituent systems, sub-systems and components. This is achieved so as to promote the reuse of these systems/components in future models and simulations.

Propulsion systems

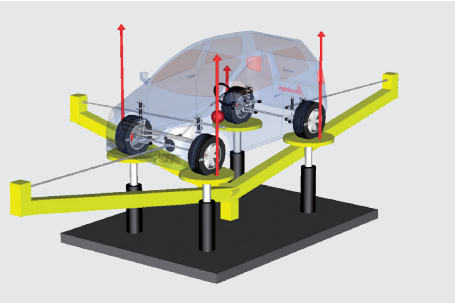
Powertrain systems include many engine, transmission and driveline configurations. Engines with tabular characteristics and throttle dynamics, as well as different transmissions are supplied. Driveline models are available for front, rear and four wheel drive topologies. Each model may be modified and extended with losses, compliances, additional gear sets and more.

Brakes

Braking systems include typical components such as the pedal, booster, valves, cylinders, and wheel brakes. The models are well-suited for studies on brake system dimensioning, methods of brake force distribution, and active systems such as ABS and ESP. Interaction with other subsystems such as the steering/suspension systems permit detailed analysis of the effect of brake vibration and steering feel.

New Concepts and Active Systems

Active components and sensors may be introduced at any location.
The sub system architecture facilitates the inclusion of both conventional, hybrid and electric propulsion systems including any configuration of brake and suspension system. Integrated models allow for complete vehicle simulation including all system-level detail, evaluating any vehicle conceptual design. Integration with other platforms such as Simulink® highlights CATIA V6/Dymola and VDL as the complete simulation platform for model-based development process.



Full vehicle mounted in four post test rig for out-of-plane dynamics verification.

3D Roads & Surfaces

The interaction between the road and the vehicle may be studied with driver or robot-based control of the vehicle on road or open surfaces. Full 3D roads are used for tests where a given track is to be followed. Examples are following a curvy road, performing a lane change, negotiating a turn while braking, going through a slalom course or avoiding an obstacle. A further benefit of the 3D road is that performance of observers and vehicle state estimators may be evaluated under realistic driving conditions.

Robots and drivers

Driver models look ahead along the road to control the positioning of the car, as, for example, when negotiating a curve. Drivers may also work on a time basis, for example, following a prescribed drive cycle. In addition, an event-based driver which undertakes a sequence of instructions such as accelerating to a certain speed, applying brakes, shifting gears, or maintaining a yaw velocity. Robots are used with chassis/vehicles on flat ground, controlling the motion in either open-loop or closed-loop based on vehicle states.

Test rigs

Test rigs are used to isolate vehicle behavior that requires specific constraints.
A vehiclemay, for example, be mounted in a rig to excite vertical motion of the wheels, and hence the roll, pitch and bounce dynamics, to study ride and road holding.
Test rigs are frequently used to evaluate/correlate subsystem performance.
A typical example is the kinematic and compliance characteristics analysis of suspensions or force-slip characteristics of tires.

The VDL Cars Library is developed, supported, and maintained by Modelon AB, a Dassault Systèmes technology partner.

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