

VEHICLE DYNAMICS

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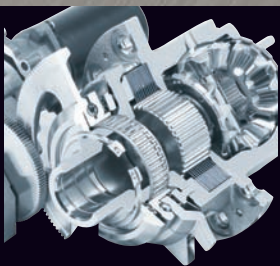


GT3

Lighter, faster, more adjustable: Porsche takes its trackday plaything to a whole new level

Behind the wheel

New series: John Miles road tests the Mk6 Volkswagen Golf



Touring force

The inside track on SEAT Sport's WTCC León TDI


Torque on corners

How electronic differentials can help dynamicists

Winning moves

On location with Ford of Europe's dynamics team

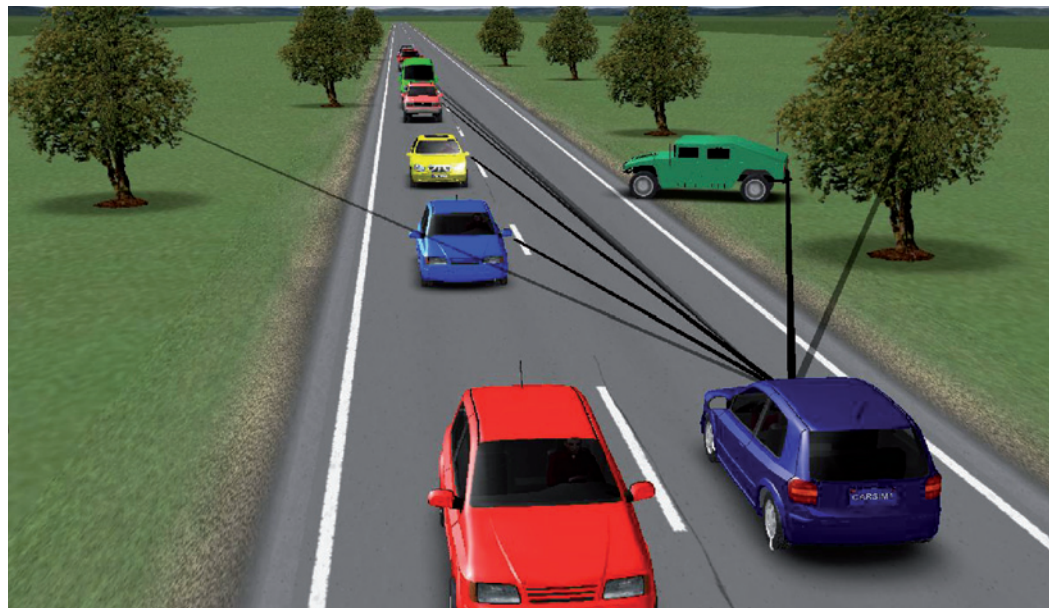
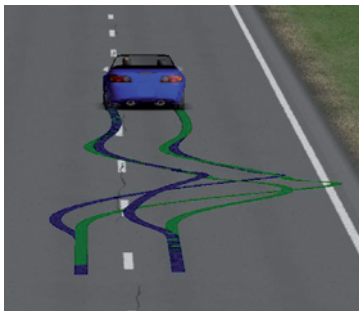
Simulation developments

 Mechanical Simulation has just released the most recent version of its software for simulating dynamics of cars, light trucks, and trailers. CarSim 8 contains innovations tailored to meet the needs of engineers developing vehicles, chassis systems, electronic controls, and advanced driver assistance systems (ADAS).

Many ADAS systems rely upon radar, lidar or visual sensors detecting target objects, evaluating potential traffic conflict situations, and then warning the driver or intervening in control. CarSim 8 helps developers by simulating nine sensors in traffic environments with 99 targets on 3D roads. Object motions are completely programmable, ranging from simple placement and speed, to complicated motions governed by differential equations.

The example animation shows one sensor operating in a complex traffic environment. The sensor detects multiple objects denoted by the ray extending from the forward-facing sensor to each object. The darkness of each ray is indicative of signal strength. Graphical analysis of each sensor is automatically plotted for engineering evaluation.

Automotive product development often involves collaboration between OEMs and Tier 1 suppliers. To reduce time and cost, CarSim now enables exchange of encrypted vehicle or component data sets that can easily be emailed to co-developers while keeping confidential details hidden. The partners import these encrypted 'parsfiles' to their copy of CarSim and can run any test with a fully functional simulation model, but are unable to view encrypted data.



VS Commands is an internal scripting language that enables the user to modify the model at runtime. These, combined with the Events feature, enable users to build complex testing maneuvers such as the NHTSA Fishhook Rollover Test or the FMVSS 126 ESC performance test. Procedures for these are included in the example data sets that come with CarSim.

The power of these tools for constructing complex driving maneuvers is illustrated in a bootleg turn. In this maneuver, the vehicle accelerates in reverse to about 45km/h, then the steering is turned to begin a yaw rotation. When sufficient yaw rate has built up, the brakes are locked so the vehicle can spin around to face the opposite direction and drive away. In the picture shown, the vehicle started in the foreground facing the camera. The tire tracks generated in CarSim show the path of travel as it accelerates backward, spins around and accelerates away from the camera. Animations of these simulations are available on the CarSim website (see below right).

CarSim has always accommodated multiple tire models because vehicle dynamics experts favor different models for particular applications. CarSim has its own internal model

based on classical combined slip theory, and options for Pacejka 5.2 or MF-Tyre. FTire and TNO Swift tire model options provide a higher frequency response when needed. CarSim also includes a tire-test simulator to generate curves of force and moment behavior in familiar forms as means to check proper function of the model.

A common problem for many vehicle dynamics simulations is finding the extensive set of data values needed to describe a car. Mechanical Simulation's staff has dealt with this problem for 30 years, and has extensive experience and access to vehicle information needed to characterize a vehicle. CarSim includes a family of vehicles covering A- to F-class cars, sports cars, SUVs, vans, pickup trucks, and trailers. The data sets represent typical vehicles in each class. Most users start with the CarSim example closest to the vehicle of interest, and refine the data as more information becomes available.

FIGURE 1 (ABOVE): CARSIM VEHICLE WITH SENSORS OPERATING IN A COMPLEX TRAFFIC ENVIRONMENT

FIGURE 2 (BELOW LEFT): EXAMPLE OF A COMPLEX BOOTLEG TURN MANEUVER SHOWING TIRE TRACKS

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