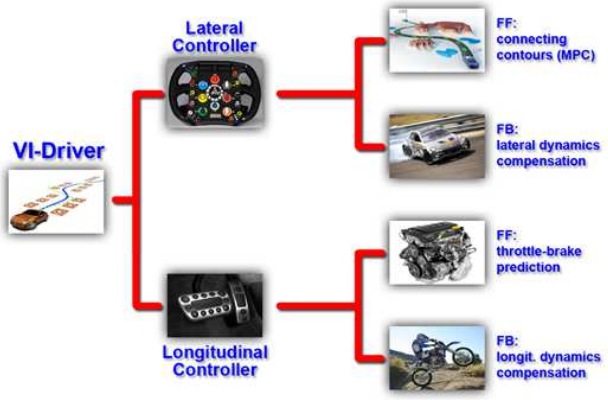
VI-Driver

The requirements of using vehicle simulation for the prediction of limit road handling of full vehicle models are increasing daily in the automotive industry. The need of including closed loop controllers in the system is fundamental, because more and more often the automatic control action takes over the drivers natural instinctive control, especially in very sudden unexpected events, such as instantaneous grip loss.

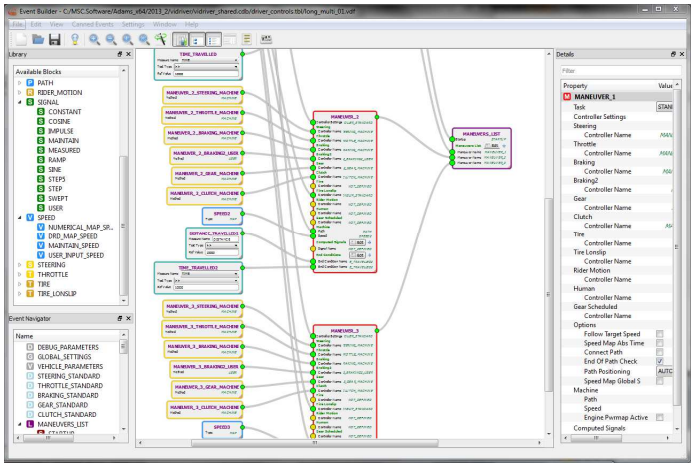
VI-grade's simulation technology supports the development of such integrated systems of increasing complexity: the vehicle plant is realized by means of a fast multibody symbolic simulator, featuring accurate suspensions, tires, aerodynamic and powertrain components; the road and the driveline profiles can be defined with all of their important characteristics, such as distributed unevenness, kerbs, bumps and potholes; an intelligent driver model is able to explore the vehicle limits by iterating several times on automatically determined road segments, changing the target line to be followed and its actuation strategy until the vehicle is able to stay on the road. The vehicle system can be equipped with all the required closed loop controllers and the target manoeuvres can be simulated in combination with existing and externally connectable controller models, using off and/or on-line simulation techniques also for Hardware-in-the-Loop testing.

VI-grade has profound experience in developing driver models and the result of more than 10 years of research and development activities is the VI-Driver product.



VI-Driver, through the usage of advanced longitudinal and lateral controllers, is able to take care of all driver channels, to follow a given speed profile (calculated by the VI-grade static solver or coming from telemetry measurements) and to find the maximum performance of a vehicle through an iterative process on a given 3D path defined by the user. VI-Driver is able also to accurately and smoothly drive the vehicle model on rough 3D roads.

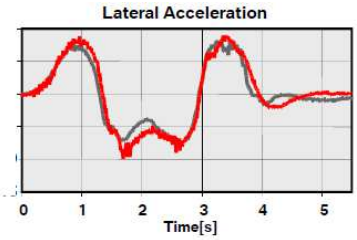
The VI-Driver configuration is defined through ASCII event files compatible with all the different environments supported by VI-Driver. A graphical interface (VI-EventBuilder) for generating and manipulating VI-Driver event files is included in the VI-Driver suite. VI-EventBuilder graphically renders the event structure using the block diagram approach. The package includes a comprehensive blocks library granting access to all the VI-Driver settings as well as a built-in canned event editor so that each user can easily build a custom library of parametric events.



Capabilities

VI-Driver has the ability to drive a virtual vehicle model through a number of different manoeuvres in order to allow users to accurately evaluate the dynamic beha-viour of the car.

- Open-loop manoeuvres (step steer, frequency sweep, …)
- Closed loop manoeuvres (Steering pad, ISO lane change, …)
- Combination of static and dynamic solver
- Lap time simulation
- Max performance evaluation



VI-Driver is available for many environments:

- VI-CarRealTime
- Adams Car
- MATLAB Simulink
- MODELICA FMI
- Any other real-time package

Benefits

The usage of a detailed vehicle model is a pre-requisite to obtain accurate results, but it is not enough! A vehicle model needs an accurate physical driver model in order to ensure that simulations are performed as close as possible to test conditions on the test track. VI-Driver is the best driver model available on the market, proven in several different projects performed by major automotive OEMs and leading racing teams all around the world.

- State-of-the-art longitudinal and lateral controller
- Robust and precise driveline following algorithm
- Advanced management of all driver channels (steering, throttle, clutch, brake and gear)

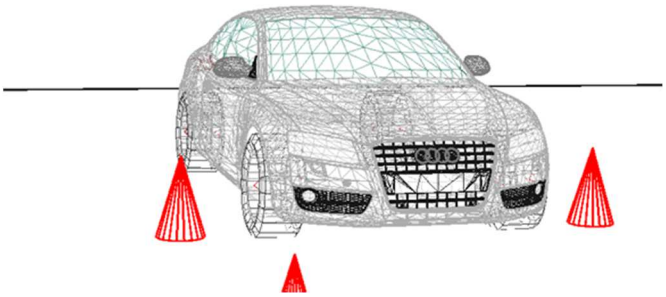
Another major advantage is that VI-Driver can be used throughout the entire tool chain from concept to detailed design for Software-in-the-Loop and Hardware-in-the-Loop development.

VI-Driver Press Maneuvers

The VI-Driver Press Maneuvers toolkit allows VI-Driver users to use VI-CarRealTime to easily optimize vehicle performances on following maneuvers: ISO Lane Change, ISO Lane Change (Consumer Report), Obstacle Avoidance, Slalom.

The user needs to select the vehicle model, the maneuver, the initial speed and few other parameters; VI- Driver, in conjunction with VI-CarRealTime, will determine the maximum velocity allowed for a given vehicle for the specified maneuvers using an automatic cone-hitting detection algorithm.

This very advanced toolkit allows in a short time to automatically evaluate vehicle performance on very demanding maneuvers, without time-consuming and error-prone manual iterations.



Key Topics of v16 release

- The new VI-EventBuilder module is now part of the VI-Driver suite to support users in creating, editing and converting event files through a practical block diagram-based interface
- Complete redesign of the human driver module to produce smoother control actions without losing robustness; the new module introduces the concept of runtime optimization of built-in cost function, computed using a dynamic internal reference model
- VI-Driver is now offered as an FMU allowing a straight-forward integration of the tool in Modelica-based softwares compatible with the FMI standard.

Success Stories

AUDI uses VI-Driver in conjunction with VI-CarRealTime to assess the influence of several different control systems on the vehicle dynamic behaviour. VI-Driver is used to drive vehicle model through different tests such as press manoeuvre and lap time simulation.

BMW has recently implemented an environment in which VI-Driver became the only driver model used through all different disciplines such as handling, durability, control system design, hard-ware-in-the-loop and custom driving simulator. BMW relies on VI-Driver to drive its real-time MATLAB-based vehi-cle model: the results are identical, even if they are coming from different modelling environments.

Nissan Motorsport International, also known as NISMO, uses VI-Driver with a VI-SportsCar vehicle model including detailed components. The objective of NISMO is to maximize the vehicle performance using virtual vehi-cle, driver and track. The usage of VI-SportsCar dramatically increases the efficiency of the development process. VI-Driver allows to model a profession-al driver who is able to drive a GT car.

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