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Advanced Simulation Technology for Closed Loop Limit Vehicle Handling Performance

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ABSTRACT

The requirements of using vehicle simulation for the prediction of limit road handling of full vehicle models is increasing daily in the automotive industry. The need of including closed loop controllers in the system is fundamental, since more and more often the automatic control action could take over the ability for the driver to have his natural instinctive control, especially in very sudden unexpected events, such as instantaneous grip loss.
VI-grade simulation technology for automotive industry helps developing such integrated systems: the vehicle plant is realized by means of a fast multibody symbolic simulator, featuring accurate suspension, tire, aerodynamic and powertrain components; the road and the driverline profiles can be defined with all of their important characteristics, such as distributed uneveness, kerbs, bumps and potholes; an intelligent driver model is able to explore the vehicle limits by automatically iterating several times on road segments, changing the target line to be followed and its actuation strategy until when the vehicle holds the road satisfactory. The vehicle system can be equipped with all the required closed loop controllers, and the target maneuvers can be simulated in combination with existing externally connectable controller models, using off and/or on-line simulation techniques.