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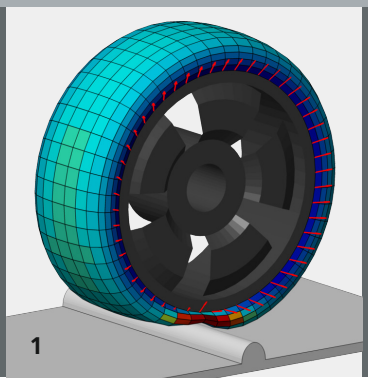
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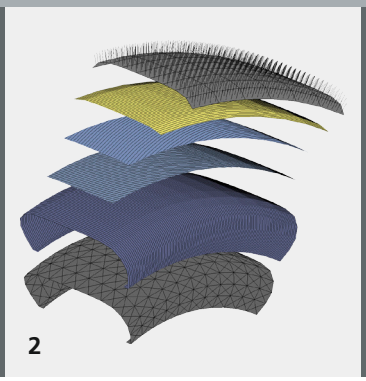
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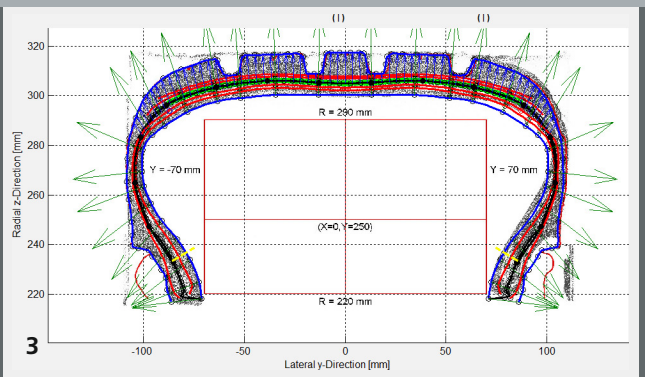

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1 *CDTire/3D: Cleat run*

2 *CDTire/3D: Functional layer concept*

3 *CDTire/PI: Tire construction assistant*

CDTire: SCALABLE TIRE MODEL FOR FULL VEHICLE SIMULATIONS

CDTire is a tire model family for passenger car, truck and agricultural tires that supports engineers in almost all analysis scenarios used in modern vehicle development processes from within multibody simulation tools. Special focus on tire dynamics and interaction with 3D road surfaces accurately captures the vibrations in both amplitude and frequency behaviour with additional capabilities in static and stationary tire behaviour.

During the multibody simulation CDTire computes the spindle forces and moments acting on each wheel in the model as well as the local contact forces while driving on 3D road surfaces or advanced tire coupled test rigs.

Typical applications include:

- Ride comfort studies on digitized road surfaces
- Harshness analysis on artificial obstacles such as cleats
- Durability analysis to predict spindle forces while driving on a durability test track
- Steering moment analysis during parking manoeuvres
- NVH analysis using transient simulation in time domain or simulations in frequency domain based on linearized models
- Tire coupled test rig applications with up to all 6 directions driven for each tire
- Handling analysis on flat and 3D roads
- Active safety (ABS, ESP, …)
- Safety analysis with different fourth wheel
- Variation of inflation pressure
- Interaction with flexible rim
- Realtime applications like MIL/SIL/HIL

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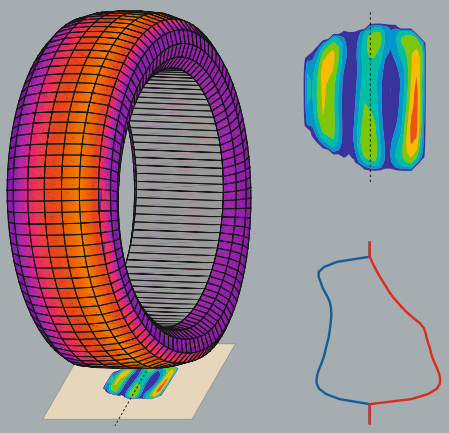

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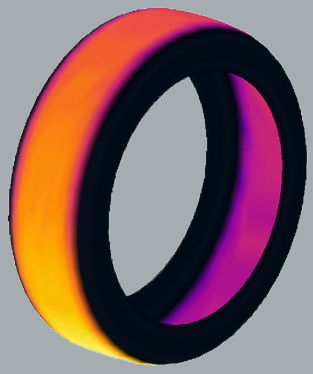

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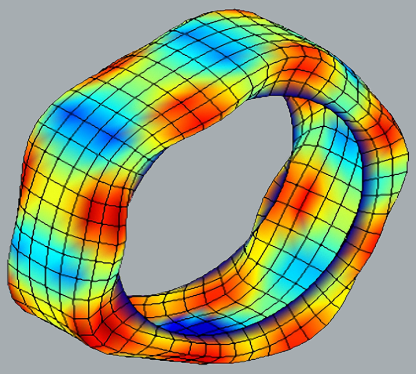

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CDTire is a family of physical tire models

CDTire is a physical tire model family with different physical models for belt, side-wall and tread to balance accuracy and performance for different applications. Changing the tire inflation pressure allows quick what-if studies for different inflation pressures on different tires in the model. CDTire contains the following models:

CDTire/3D

- Complete 3D shell based model of side-walls and belt
- Separate modelling and parameterization of all functional layers of a modern tire
- Includes dedicated models for belt, carcass, cap plies and tread
- Same deformation capability as FE models
- Capturing of belt/rim contact (ground out)
- Flexible rim support
- Dedicated local brush-type contact model
- Fully scalable in discretization and functional capabilities
- Suitable to handle inflation pressure variations during application up to total pressure loss

CDTire/Realtime

- Hard realtime capable
- Accurate in frequency range up to 150 Hz
- Scalable discretization
- Suitable for all applications from ride/comfort to durability

CDTire/Thermal

- Detailed thermo-dynamical model to predict temperature creation and propagation in a tire
- Fully 3D finite volume based description
- Scalable resolution in all dimensions
- Auto-meshing functionality
- Runs with real time factor below 0.1
- Easy to parameterize
- Can be coupled with CDTire/3D, CDTire/MF++ and CDTire/Realtime

CDTire/MF++

- Temperature enhanced Magic Formula for coupling to CDTire/Thermal in advanced handling applications
- Based on MF 5.2 with relaxation length concept
- Empirical tread model to predict contact patch shape under various driving conditions
- Additional factor based formula add-ons to feature the temperature dependence

CDTire/NVH

- Software toolbox to derive a linear model from CDTire/3D for a rolling tire
- Can be used for modal analysis and imported into NVH tools
- Discrete local contact area excitation
- Export of A, B, C, D matrices (1st order) or M, C, K matrices (2nd order), alternatively export of transfer functions

CDTire/PI

- Standalone software tool for parameter identification
- Standard tire measurements and formats (.tdx, .xls, …)
- Automatic execution of test rig simulation scenarios
- Dedicated alignment and comparison procedures
- Cross section construction assistant

Road surface models

CDTire needs geometric road surface models that return surface positions and a road-side friction coefficient. The associated road body can be arbitrarily driven in both translational and rotational directions for accurate, more complex poster test rig applications. Next to MBS built in models, the following road surface models are available:

- RSM 1000: parametric obstacles
- RSM 1002: rolling drum surface for 1 axle
- RSM 1100: user defined
- RSM 2000: 3D digitized test track
- RSM 3000: OpenCRG

Supported simulation platforms

- Altair MotionSolve
- LMS Virtual.Lab Motion
- MATLAB and Simulink
- MSC.ADAMS
- SIMPACK

Supported operating systems

- Windows (32-bit and 64-bit)
- Linux (32-bit and 64-bit)

1 *CDTire/3D: Advanced contact patch analysis*

2 *CDTire/Thermal*

3 *CDTire/NVH: Mode shape*