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Simulation of tire tread block dynamics with respect to complex contact phenomena

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Vibrations of the tire structure are caused by the interaction between the rolling tire and the road surface. The tread block is the only tire component which is directly in contact with the cleft road surface texture and therefore of special interest. The contact due to the rough surface leads to complex contact phenomena e.g. friction characteristics depending on normal contact pressure and relative velocity, non-linear contact stiffness and wear effects changing the tread block geometry and in hence the local contact forces. These contact phenomena strongly influence the dynamical behaviour of the tread block and the whole tire. A modular model based on a modal reduction method will be presented to investigate the tread block dynamics under consideration of the local friction characteristic, the non-linear contact stiffness and wear which are also analyzed experimentally on a concrete road surface to identify the model parameters.