CONCEPT FOR COMPUTATIONAL MODELLING OF TIRE PAVEMENT INTERACTION PHENOMENA UNDER CONSIDERATION OF FLEXIBLE PAVEMENT STRUCTURES

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ABSTRACT

In the scientific literature, no complex three-dimensional and coupled modelling of the tire-pavement-system has been reported so far. Usually, one of the components, either pavement or tire, is strongly simplified. Thus, the outcome of the investigation is limited according to the modelling constraints. With the proposed approach at hand, these restrictions can be overcome. For the first time, a realistic sensitivity study for both subsystems leading to the relevant influence factors can be achieved. A structural understanding of the mechanics of the coupled systems will be developed which will give insight into detailed parts of the subsystems.

The mechanical impact of tires on pavements is usually modelled as a spatially stationary load distributed over a certain contact area. To eliminate the drawbacks associated with a simplified modelling of the pavement loading, it is aimed to use an ALE-formulation for the tire as well as for the pavement structure. This formulation permits to use FE-models for pavements that are based on a Lagrangian approach, and requires additionally an Eulerian formulation to account for the relative displacement between tire and pavement materials during rolling of the tire.

Relevant model parameters will be determined by means of material tests. The coupled model will be verified against field measurements of tire-pavement interaction.

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