

Model of a pneumatic tire and road cooperation based on 3-state flexible elements.

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Abstract: The problem of wheel-ground cooperation has been investigated and modeled for hundreds of years, but still new models are created for various purposes like tire designing, power train simulations, driver's training devices or for computers games. Wheels are the most important parts in vehicle because they are the contact points between road and vehicle. The problem is more and more important for remote controlled or autonomous vehicles, where pilot cannot rely on its direct sensors. The control systems have to foresee the vehicle's behavior in dynamic state and dynamically changing conditions. In this paper author presents overview of most important models of wheel ground cooperation with its characteristic. Based on models synthesis new concept of modelling is presented based on flexible element modeling. This model is based on simple and intuitive models of elementary processes, with a simple mathematical description. The main aim of this model is to eliminate the advanced mathematical operations which can hide from the designer the real physical phenomena like deformation of a tire and a ground and sliding effect. Based on this phenomenon we can react on process running changes and track the optimal work parameters like propelling/braking torques. It became not so difficult when we take into account electric drive systems.

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