

Application of homogenous transformations in dynamic analysis of truck trailers

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Abstract: A dynamic analysis of the combination of truck with trailer, constituting a multi-body system, is presented in the paper. A mathematical model of this combination of vehicles was developed by using formalism of Lagrange's equations of motion. based on the joint coordinates and matrices of homogeneous transformations, taken from robotics. The main elements of truck and trailer (frames, axes and wheels) can be treated as branched open kinematic chain containing links (wheels) which are in contact with the road. The considered system has 156 degrees of freedom. In the analysed model, a rear drive system was assumed. Driving torques were applied to rear wheels of the truck. The generalized forces, included in the equations of motion, result from driving torques and reaction forces of the road surface which act on the wheels of truck and trailer. A selected model of tires should be taken into account. The constraint equations result from assumed courses of steer angles of the front wheels of the truck in the case of different road maneuvers. The negative phenomenon, called as "snaking motion of the trailer", was also analysed. According to the authors, the proposed method can have practical significance and it can be used in designing the trailers.

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