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MULTIBODY SIMULATION OF CURVELINEAR DYNAMICS WHILE ENGINEERING SUPERLONG HIGHWAY MULTILINK TRUCKS

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ABSTRACT
The creation of new trucks generations for cargoes transportations on long and ultralong distances (between Europe, Asia and the Far East) is more and more actual task now. New trucks should reduce a quantity of vehicles on roads and amount of the drivers, which are busy in the transportation process, should raise economic efficiency and safety of transports and should reduce harmful emissions in environment.

An achievement of mentioned above purposes is really possible when multilink trucks are used. At same time they should be safe while straight linear moving and while moving on other highway parts. Taking into account that the length of such truck is more than 40 m, design engineers should choose such it parameters that it became mobile, highly stabile, handle and safely make a back motion.

At the present time in the modern scientific and technical literature there is an absence of methods that describe how to design such type of vehicles. That is why there is a necessity in the working out some theoretical foundations for research dynamics and engineering of superlong vehicles. Also it is required to use a new theory at the virtual product development.
The universal parametric multibody dynamic model of the multilink truck has been worked out in MSC.ADAMS for the analysis of its maneuverability, controllability and stability. The model allows to make a number of virtual tests by computer modeling. Such kinds of tests allow to find optimum parameters of steering, suspension, coupling device, etc. and to keep maneuverability and stabilization while truck is making a curvilinear motion. A mathematical algorithm was developed for modeling an operating influence of the driver on a steering wheel while the multilink truck is moving on the given route. Also the algorithm is used with a truck computer model when the superlong vehicle motion is modeled on real highway junctions.

Results of the simulation have shown that mass and geometrical parameters of the multilink truck make the great impact on its dynamics. In particular, to provide requirements defined by standards and regulations, the introduction of additional mechanisms improving curvilinear motion of a superlong vehicle is demanded.

An acknowledgement of adequacy of the created computer models is proved by real tests of the multilink truck in the Belarus proving ground. It has given the chance to specify theoretical methods, computer models and on the basis of truck dynamics studying to formulate recommendations how to improve and optimize its design parameters.