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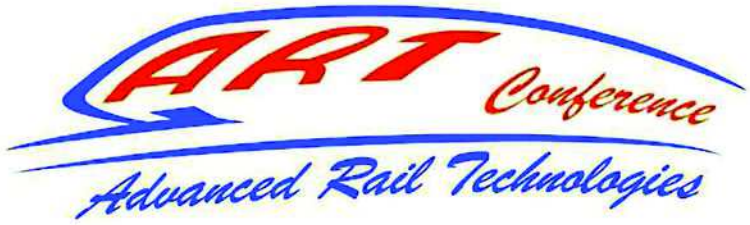
ADVANCED RAIL TECHNOLOGIES



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MODELLING OF SPECIAL TRAIN DYNAMIC FOR CONSTRUCTION SIMULATOR TO TRAIN DRIVERS TRAINING WITH USING VBS3

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Introduction

Due to the fact that training simulators of railway vehicles must fulfill unique requirements resulting from the specific properties of the simulated vehicles [1], in this article on determining the main criteria for modeling the dynamics of such systems was presented. A methodology used in the study on the selection of parameters of the modeled vehicle and its driveline [2,3] based on experimental studies was described. Adaptation of parameters obtained from the experimentally test into the dynamics model of vehicle was presented. Currently used solutions in simulators as well as issues related to animation and presentation of the image was provided. The requirements for the operation of the rail vehicle simulator, as well the design requirements for visualization of the image were defined and discussed [4].

Considered problem

The heavy-duty, 4-axle motor tower cars are specific railway vehicles structures that are designed to pull, push wagons and repair traction. Depending on their purpose, they are equipped with various types of power units and equipment on their decks. Maximum speed achieved by these vehicles do not exceed 90 km / h, but in spite of this the operators of such vehicles a lot of experience and skills are required. The high inertia of such vehicles is one of the features that make driving them can be complicated and requires proper prediction of more situations. In this paper problems related to the construction of a general numerical model constituting the main element describing the movement dynamics of special rail vehicles and their drivetrain [2] was discussed. This model to build simulators for the training of operators using such vehicles was used. Such a simulator must take into account not only the aforementioned conditions but a number of different requirements, which primarily concern the functioning of the vehicle and its ability to reflect real operating conditions, track geometry and weather conditions [1]. In the article, the results of experimental tests done on real vehicles to describe unique them parameters and working conditions were presented.

Considered railway vehicle

MTW 100 - a network emergency train manufactured by the Austrian company Plasser & Theurer, designed for repair and maintenance of the traction network was considered. Structure of the vehicle was presented in fig 1.

Fig. 1. Considered real railway vehicle

VBS3 comes equipped with several built-in applications that support development training capabilities. These include the following: mission editors, which allow users to add, modify or delete objects before and during training, and an after-action review module, which allows administrators and users to conduct post-training analysis with the ability to fast-forward or rewind to events; a full development suite, allowing users to create buildings and railway line, edit terrains and convert 3D models to the VBS3 simulation environment; a massive content library, including more than 9,000 entities; an HLA/DIS gateway that connects VBS with other simulations or interconnects many VBS servers together. The Virtual Battlespace 3 (VBS3) is a flexible simulation training solution for multiplayer scenario training, mission rehearsal and more. The Virtual Battlespace (VBS3) to visualize the motion of the rail traffic was used (fig. 2).

Fig. 2. View of model of the special train created in the Virtual Simulator (VBS3) and the cabin inside

Summary
The use of numerical technologies to study the processes accompanying the operation of specialized rail vehicles used on railway infrastructure in Poland was presented. The used of numerical technologies to study the phenomena accompanying the dynamics longitudinal ride of specialized rail vehicles used on railway infrastructure in Poland was occurs. The experimental methodology used to obtain the unique parameters of the vehicles considered was also discussed. The results of these studies to validate the resulting numerical models describing the dynamics of vehicles during operation were used. The obtained results of the theoretical convergence with the experiment results indicated. The Virtual Battlespace (VBS3) to visualize the motion of the rail traffic was used.

Reference

1. Brona P., Dąbrowski A., *Simulators of railway vehicles in the process of education and qualifications of drivers and the candidate's drivers*, "Transport i Komunikacja" 2014, nr 2
2. Konowrocki R., *Analysis of electromechanical interaction in an electric drive system used in the high speed trains*, ART Conference 2016, Advanced Rail Technologies - 5th International Conference, 2016-11-09/11-11, Warsaw (PL), pp.1-2, 2016
3. Konowrocki R., Szolc T., *An influence of electromechanical coupling effects on stability of the drive systems of machines and railway vehicles driven by electric motors*. 25th French-Polish Seminar of Mechanics, Bourges, France, 15-16 May 2017
4. Wantoch-Rekowski R. (red.), *Programmable virtual simulation environment VBS2*, PWN, Warszawa 2013