Preface

Real-time simulations of the behaviour of a rail vehicle require realistic solutions of the wheel-rail contact problem which can work in a real-time mode. Examples of such solutions for the online mode have been well known and are implemented within standard and commercial tools for the simulation codes for rail vehicle dynamics.

The overall aim of this investigation is to develop a real-time wheel-rail contact model accounting for wheel and rail geometry, the behaviour of a solid wheelset, friction parameters and load characteristics. The behaviour of a wheelset is limited to the motions in the lateral and vertical directions, and an angular movement around the longitudinal axis.

The model design approach basically uses combinations of the assemblies from the well-known theories, which have been developed using the rules of the "MISRA-C" coding standard and the requirements of real-time applications with dSpace systems. Additional improvements have been made to delineate the contact points between the wheel and rail surfaces and the calculation of creepages for the classical wheel-rail contact, and the contact between wheels and rollers in the case of the test rig application. Furthermore, the improvements also include the determination of adhesion forces based on the introduction of variable friction coefficient dependant on the rolling velocity and the longitudinal creepage, instead of a standard model of creep forces with a constant static friction coefficient.

This book presents work on the project for the development of a real-time wheel-rail contact model and provides the simulation results obtained with dSpace real-time hardware. Besides this, the implementation of the contact model for the development of a real-time model for the complex mechatronic system of a scaled test rig is presented in this book and may be useful for the further validation of the real-time contact model with experiments on a full scale test rig.

http://www.springer.com/978-3-642-36245-3

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2013, XIII, 119 p., Hardcover
ISBN: 978-3-642-36245-3