Vehicle Fatigue Load Prediction based on Finite Element TIRE/ROAD Interaction implemented in an Integrated Implicit-Explicit Approach

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Abstract: *This work describes a numerical methodology based on the Finite Element approach able to simulate the dynamic maneuver of the full vehicle running on fatigue reference roads. The basic idea of present work stays in combining a moderately complex and general tire model with traditional full-vehicle methods, including both implicit and explicit finite element techniques, in order to predict – within the early design phases when no prototypes are available - the loads transmitted to the vehicle running on the real fatigue reference roads. Some issues related to application of tire finite element model to a long simulation time in an explicit solution have been discussed. The real fatigue load is digitalized and implemented as a rigid body in the explicit code. The methodology has been successfully applied to Fiat light commercial vehicle, New Fiorino, chosen as test case for this work.*

Keywords: *Connectors, Constitutive Model, Coupled Analysis, Dynamics, Elasticity, Experimental Verification, Fatigue, Fatigue Life, Hyperfoam, Hyperelasticity, Impact, Inertia Relief, Interface Friction, Low-Cycle Fatigue,Mechanisms, Minimum-Weight Structures, Multi-Body Dynamics, Output Database, Plasticity, Postprocessing, Powertrain, Probabilistic Design, Residual Stress, Response Spectra, Rubber, Rubber Bushing, Safety, Scripting, Shell Structures, Shrink Fit, Soil-Structure Interaction, Springback, Substructures, Suspension, Tires, Vibration, Viscoelasticity, Visualization.*

1. Introduction

The current trend in car cycle development is strongly oriented in reducing the Time To Market after the concept phase, together with cost saving and structural performances improvement. In this process, building prototypes and performing experimental tests represents an heavy and expensive duty. Consequently, after the prototype is built, one of the main goals is to rely on good

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