J.Marzbanrad et al. 2010. *Int. J. Vehicle Structures & Systems*, 2(1), 1-8
ISSN: 0975-3060 (Print), 0975-3540 (Online)
doi: 10.4273/ijvss.2.1.01

International Journal of Vehicle Structures & Systems
Available online at www.ijvss.maftree.org

Vibration Isolation of a GA Optimized Biomechanical Model of a Railway Passenger Using Magnetorheological Damper Seat Suspension

Javad Marzbanrad[a], Yousef Amiri Rad[b], and Amir Afkar[c]

School of Automotive Engineering,
Iran University of Science and Technology, Farjam St, Tehran 16846-13114, Iran.
[a]*Corresponding Author, Email: marzban@iust.ac.ir*
[b]*Email: y.amiririad@yahoo.com*
[c]*Email: amir.afkar@yahoo.com*

ABSTRACT:

Driver tiredness during long term travel might result in many unwilling accidents. Hence, isolating the vibration transmitted to the driver plays a major role in keeping the driver restful and consequently having a safe trip. In this study, the transmitted vibration of a wagon suspension to a passenger model is isolated by a semi active control strategy using a magnetorheological (MR) damper. First, a revised linear lumped parameter biomechanical model of seated human body exposed to vertical vibrations is optimized. To this end, the parameters of the human body model, including mass, damper and stiffness coefficients are simulataneously optimized using genetic algorithm by employing a multi-objective function. Next, the optimized human body model is integrated on a nonlinear seat suspension model. This integrated model is excited by a sinusoidal frequency range as applicable to railway vehicles. The responses in time and frequency domains are derived. Finally, by using a MR damper instead of conventional dampers in the seat suspension, it is shown that the transmitted acceleration from the rail to the driver is reduced. Finally, a comparison of the performances of passive conventional dampers, semi-active MR dampers and active actuator assisted dampers is presented in detail.