A Biomechanical Seven DOF Model as a Seated Human Exposed to Vertical Vibration Using Genetic Algorithm

Javad Marzbanrad[1], Amir Afkar[2], Yousef Amirirad[3]

School of Automotive Engineeringt, Iran University of Science and Technology, Tehran, Iran.
Email: [1]marzban@iust.ac.ir, [2]amir.afkar@yahoo.com, [3]y.amirirad@yahoo.com

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Abstract – *In this paper, a lumped-parameter biomechanical model with seven degrees of freedom as a seated human without backrest support exposed to vertical vibration is presented. This model incorporates seven concentrated masses connected in the vertical direction by means of springs and dampers representing dynamic of the body parts. Experimental data is used to find the stiffness and damping parameters of the model. The data includes values of seat to head (STH) transmissibility, driving point mechanical (DPM) impedance, and apparent (AP) mass when the frequency is varied in the range between 0.5 to 20 Hz. The solution of differential equations of the system is transformed into the frequency domain. The multi-objective function is used to obtain theoretical results similar to three different experimental data. The unknown coefficients are calculated by a genetic algorithm within MATLAB. Improved results, in comparison with previous models, are achieved from the presented model. Finally, modal analysis of the model is performed within ADAMS and the resonance frequencies of the human body are calculated. The results may be used to design the seat and suspension parameters so that the transmitted vibrations are reduced and ride comfort is enhanced.*

***Keywords**: Human model, Vertical vibration, Genetic algorithm, Multi-objective optimization*
