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Parameter optimisation design for a six-DOF heavy duty vehicle seat suspension

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Abstract

In this paper, the stiffness and damping parameters of a six-degree-of-freedom (DOF) heavy duty vehicle seat suspension are optimised on the base of different vibration excitations with genetic algorithm (GA). Optimisations are implemented under two conditions, that is, all the legs have same stiffness and damping, and legs which are symmetric with x axis have same stiffness and damping. Swept sinusoidal vibrations are applied as excitations. Translational vibration along x and y axes and rotational vibration around x and y axes are carried out, respectively. The optimisation results show that a smaller weighted value of root mean square (RMS) acceleration in six DOFs according to ISO 2631-1 can be obtained under the second condition, which means the suspension can be more comfortable. But higher acceleration transmissibility from the vibration excitation to the same DOF acceleration output around the resonance frequency is also obtained under the second condition. These results indicate that when optimising multi-DOF heavy duty vehicle seat suspension, the dominant vibration DOF will cause vibrations in other DOFs due to the structural coupling. So the dominant vibration DOF and its related vibration DOFs should be considered at the same time.

Keywords: six-DOF, seat suspension, GA.