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Evolutionary low frequency steering vibration control towards human spine

(Conference Paper)

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Abstract

This paper demonstrated a simulation study of an active vibration control using particle-swarm optimisation based proportional, integral and derivative (PSO-PID) control scheme to suppress steering vibration towards human vertebrae impact. The vertebrae dynamic model is identified based on grey-box modelling technique. This technique combines physical behaviour information of the spine via mathematical model and robust black-box model of the spine with added vehicle speed variation. The performance of PID-PSO control scheme is validated and compared with the conventional PID control scheme. PSO falls under the umbrella of evolutionary algorithms which is used to optimise and tune the PID controller parameters (Kp, Ki and Kd) based on a predefined performance index. The main objective is to minimise the mean square error (MSE) of the vibration signal. The optimum PSO-PID parameters are then used to suppress vibration induced by steering vehicles to the spine. This study showed that PSO-PID is better tuned than the conventional tuning method in terms of transient response. © Springer International Publishing Switzerland 2014.

Author keywords

Evolutionary algorithms Mean square error Particle swarm optimisation Proportional integral derivatives

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