The use of Adaptive Fuzzy-PID for Vibration Control in the Suspension System of a Rail Car

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Abstract

The use of classic and advance controls to minimize unwanted motions and vibrations in the rail car system is aimed at significant reduction in the vehicle body acceleration, suspension travel and increased rail holding ability. This study employs the use of the Fuzzy-PID control system for the control of the rail car suspension system. The modelling and intelligent control of the suspension system was done using the Fuzzy-logic PID system and simulated in the MATLAB 2018b environment. The equations of motion was generated from the free body diagram of the rail car suspension system and the overall equation was used an input into the Fuzzy-PID control system. The optimal gains of PID was first obtained followed by the subsequent design of the Fuzzy-logic control with tuning abilities for the PID. Compared to other control systems employed, the results obtained showed that the Fuzzy-logic control system showed significant control ability in ensuring the system recovers quickly from the any offset from the normal position triggered by the disturbances with minimal acceleration, vibration and displacement.

Keywords: advanced controls, classic controls, modelling, rail car, vibration