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Semi-active vibration control using experimental model of magnetorheological damper with adaptive F-PID controller (Article)

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Abstract

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The aim of this research is to develop a new method to use magnetorheological (MR) damper for vibration control. It is a new way to achieve the MR damper response without the need to have detailed constant parameters estimations. The methodology adopted in designing the control structure in this work is based on the experimental results. In order to investigate and understand the behaviour of an MR damper, an experiment is first conducted. Force-displacement and force-velocity responses with varying current have been established to model the MR damper. The force for upward and downward motions of the damper piston is found to be increasing with current and velocity. In cyclic motion, which is the combination of upward and downward motions of the piston, the force with hysteresis behaviour is seen to be increasing with current. In addition, the energy dissipated is also found to be linear with current. A proportional-integral-derivative (PID) controller, based on the established characteristics for a quarter car suspension model, has been adapted in this study. A fuzzy rule based PID controller (F-PID) is opted to achieve better response for a varying frequency input. The outcome of this study can be used in the modelling of MR damper and applied to control engineering. Moreover, the identified behaviour can help in further development of the MR damper technology. Copyright © 2017 Techno-Press, Ltd.

SciVal Topic Prominence

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Author keywords

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