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Design and Development of an Innovative MR Damper Based on Intelligent Active Suspension Control of a Malaysia's Model Vehicle

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Abstract : This paper exhibits the alternatives towards active suspension systems revised based on the classical passive suspension system to improve comfort and handling performance. An active Magneto rheological (MR) suspension system is proposed as to explore the active based suspension system to enhance performance given its freedom to independently specify the characteristics of load carrying, handling, and ride quality. Malaysian quarter car with two degrees of freedom (2DOF) system is designed and constructed to simulate the actions of an active vehicle suspension system. The structure of a conventional twin-tube shock absorber is modified both internally and externally to comprehend with the active suspension system. The shock absorber peripheral structure is altered to enable the assembling and disassembling of the damper through a non-permanent joint whereby the stress analysis of the designed joint is simulated using Finite Element Analysis. Simulation on the internal part where an electrified copper coil of 24AWG is winded is done using Finite Element Method Magnetics to measure the magnetic flux density inside the MR damper. The primary purpose of this approach is to reduce the vibration transmitted from the effects of road surface irregularities while maintaining solid manoeuvrability. The aim of this research is to develop an intelligent control system of a consecutive damping automotive suspension system. The ride quality is improved by means of the reduction of the vertical body acceleration caused by the car body when it experiences disturbances from speed bump and random road roughness. Findings from this research are expected to enhance the quality of ride which in return can prevent the deteriorating effect of vibration on the vehicle condition as well as the passengers' well-being.

Keywords : active suspension, FEA, magneto rheological damper, Malaysian quarter car model, vibration control
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