MODELING AND SIMULATION OF MAGNETORHEOLOGICAL DAMPERS FOR THE REDUCTION OF THE SEISMIC RESPONSE OF STRUCTURES USING SIMULINK

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ABSTRACT

The control devices can be used to dissipate the energy of structures subjected to dynamic loads, in order to reduce structural damage and prevent the failure of structures. The semi-active control devices that have received great attention in recent years are magnetorheological fluid dampers due to their mechanical simplicity, high dynamic range, large temperature operating range and low power requirements. In the present research work MATLAB and SIMULINK are used as computational tools for the modeling and simulation of magnetorheological dampers. To begin with, the modeling is carried out through block diagrams of the governing differential equations of representative mathematical models of magnetorheological dampers. Next, a series of simulations is performed in order to replicate experimental results and to be able to validate the modeling step. Finally, the magnetorheological dampers are integrated together with a semi-active control algorithm and an idealized one-degree-of-freedom structure. The main expected outcome is the reduction of the seismic response (response histories, drifts, shear forces and turning moments).

Keywords: magnetorheological dampers, structural control, MATLAB, SIMULINK.