

Semi-Active Structural Control of a 2-Story Shear Building

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With continuing urban development across the world, it is becoming ever more important to provide increased structural safety against events such as earthquakes and strong winds. The field of structural control has recently been growing to meet these challenges through the use of semi-active control methods, such as the Magnetorheological (MR) Damper. However, due to the non-linearity of the device, the knowledge base surrounding the MR Damper and its various control algorithms still needs to be strengthened before large-scale implementation of this control method can occur. To address these issues, this study will examine a two story benchmark structure using MR Dampers controlled by the Clipped Optimal, Lyapunov, and Viscous Damping Negative Stiffness (VDNS) control algorithms. In preliminary simulation, these algorithms have been noted to significantly reduce vibrational effects over both the uncontrolled and passive cases. To prepare for small scale experimentation, both the prototype MR Damper and the structure were numerically identified. This preparation was performed with sufficient accuracy as to facilitate the implementation of the control algorithm in both precise simulation and physical experimentation. Using the information obtained in these preliminary tests it is the hope that better controllers can be developed, thus keeping our societies better protected from natural disasters.