

Adaptive Control for improving the Seismic Performance of Nonlinear Adjacent Buildings Linked with MR Dampers

Omar A.S. Al-Fahdawi, Luciana R. Barroso, and Rachel W. Soares

Texas A&M University, USA

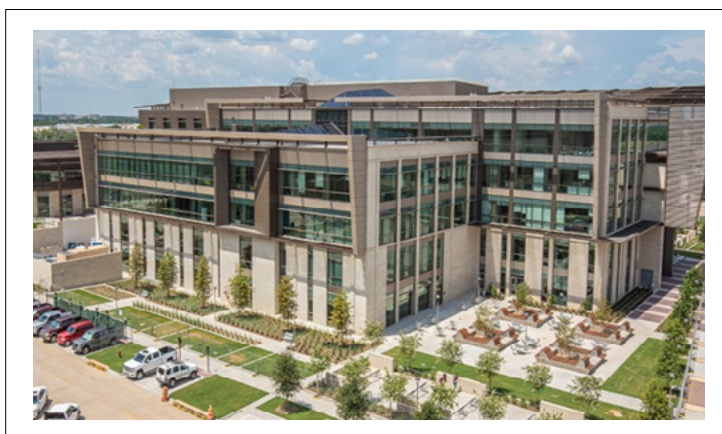


Abstract

The efficacy of using the simple adaptive control method for alleviating the seismic responses of two nonlinear adjacent buildings connected at multiple levels with magneto-rheological dampers is investigated. The connected system is formed by two shear-type model buildings of the same height but have different dynamic characteristics so that the fundamental frequencies of the individual buildings do not coincide. A stable hysteretic behavior of the structural system is considered in the current study, which captures the variation in flexibility and energy loss under various intensity levels of seismic events. The Bouc-Wen's nonlinear differential equation is utilized to model the hysteretic behavior of the restoring force-displacement smooth curve of the developed nonlinear structural system which is then integrated into a semi-active adaptive control system. The advantage of using the Bouc-Wen model is that it has the ability to mathematically track various shapes of the force-displacement curves by adjusting its non-dimensional parameters. The proposed nonlinear model is validated through a finite element model. Adaptive control is well suited to handle the nonlinear behavior because the adaptive control gains can be adjusted depending on the situation through a closed-loop action to yield better performance. The results show that using the adaptive controller to drive the magneto-rheological dampers connecting two adjacent nonlinear buildings can be used to effectively alleviate the seismic responses and reduce permanent deformations. However, the performance improvement is not the same under all ground motions considered in this study.

Biography

Omar has completed his Ph.D. at the age of 35 years from Texas A&M University, USA. He is currently working as a Civil Structural Engineer for Iraqi government, Iraq. He has eight publications and some are still in the review process in reputed journals. He reviewed many papers for different journals and conferences.



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