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Distributed Real-Time Hybrid Simulation of Base Isolated Buildings Employing the Connected Control Method

S. Lobo-Aguilar, M. Avci, F. Peña, Richard E. Christenson*, Shirley J. Dyke, Erik A. Johnson

* *Presenting Author*

Corresponding Author: Richard E. Christenson
Contact Email: rchriste@engr.uconn.edu

ABSTRACT
The use of base isolation to provide seismic protection of buildings is a well understood practice that has continued to increase. The behavior of a base-isolated structure during an earthquake is highly affected by the characteristics of the base isolation system. To effectively filter out the high frequencies of long-period earthquakes, more flexible isolation systems are needed. This increased flexibility in the isolation layer can lead to large horizontal base displacements, requiring large seismic gaps. This paper proposes the use of semiactive Magneto-Rheological (MR) fluid dampers connecting two adjacent base-isolated building structures to provide for effective isolation and limited horizontal base displacements. Analytical and simulation studies demonstrate the efficacy of the connected control method for base isolated structures. Further, real-time hybrid simulation (RTHS) is used to conduct a series of experiments with the MR dampers as physical components in order to characterize the system-level performance of the system. With MR dampers located at both the University of Connecticut and Purdue University, the RTHS are conducted as distributed RTHS (dRTHS) tests.

KEYWORDS: *Distributed real-time hybrid simulation, MR damper, base isolation, seismic gaps*