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Research Article

Predictive Control for Earthquake Response Mitigation of Buildings Using Semiactive Fluid Dampers

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A predictive control strategy in conjunction with semiactive control algorithms is proposed for damping control of base-isolated structures employing semiactive fluid dampers when subjected to earthquake loads. The controller considers the delays resulting from the device's dynamics and an observer for state estimation. Twenty artificial accelerograms were generated according to the Eurocode 8 for the Portuguese territory and considered for the numerical simulations of the base-isolated structure representative model. The results of a parametric study on a single degree of freedom model provide an indication for controller design in this type of problems. To evaluate the effectiveness of the proposed strategies, the response of a 10-storey base-isolated dual frame-wall building employing semiactive systems is compared with the original, passive solution and with an earlier proposed optimal controller for this type of problems. It is shown that a well-tuned controller could outperform the original structure, the structural system with a passive device (optimized) as well as with the semiactive optimal controller, in terms of relative displacement and absolute acceleration reductions.