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Application of Semi-Active Control Method for Seismically Isolated Structures

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Research shown in this paper focused on the development of a semi-active control law as a simplified semi-active control algorithm for seismic response reduction. The strategy of the method is to produce desirable hysteretic loops to absorb as much energy as possible by semi-active devices. The control method only requires information on the device's displacement and velocity.

The hysteretic loops produced by the semi-active control herein provide energy absorption capacity similar to those by friction dampers, while minimizing the disadvantages of the friction dampers, such as residual displacement after strong earthquakes and the generation of high frequency contents in the damping forces.

Utilizing a variable oil damper and an actuating system and measuring the response of the damper, the applicability of the control method on the oil damper is studied in practice. The experimental device and experiment procedure are explained. The time histories and hysteresis curves of the damping force produced by the variable damper device are presented. Effect of the control design parameters and performance of the oil damper are studied during the experiment.

The structure used for numerical simulation is the benchmark problem for control of base isolated buildings provided by the journal of Structural Control and Health Monitoring. The results show that the simplified control strategy is effective for a variety of ground motion