SENSITIVITY OF A NONLINEAR TMD EFFECTIVENESS WITH RESPECT TO UNCERTAINTIES IN THE STRUCTURAL PARAMETERS

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Abstract.

Tuned mass dampers are found to be effective in enhancing structural performance of buildings subjected to wind and seismic loads. This paper provides insights on the sensitivity of a Nonlinear Hysteretic Tuned Mass Damper (TMD) in mitigation of seismic induced vibrations under uncertainties present in structural parameters. A 2-DOF reduced ordered model of the structure and TMD is used to optimize the parameters of TMD when structure is subjected to Nonstationary excitations. A 3- dimensional 5-storey scaled down building is modeled in Opensees to have a high-fidelity model of the structure. Modified Bouc-Wen Hysteresis model is implemented in Opensees to mimic the performance of the Nonlinear TMD. Optimal design parameters of Nonlinear TMD obtained using the 2-DOF reduced ordered model are employed in Opensees model.

When structural parameters are subjected to uncertainties, the effectiveness of the optimal Nonlinear TMD is studied. Various sensitivity analysis techniques are employed in ranking the parameters of the structure that are effecting the performance of the TMD. It is observed that, the damping in the structure and variation in the position of additional mass in orthogonal direction to direction of motion of structure are parameters that are effecting the performance of TMD.

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