

Response sensitivity of damper-connected adjacent structural systems subjected to fully non-stationary random excitations

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Abstract: In the last decades, due to the growing population, civil engineers faced with the problem of the design of adjacent buildings in limited areas; this could lead to mutual pounding if those structures are subjected to dynamic excitation such as ground motion accelerations. Among the possible solutions to this problem, the connection with vibration control devices, such as dampers, could be an innovative way. The sensitivity analysis represent a powerful tool in the optimization procedure, especially when the design of vibration control devices is required; in fact it is possible to determine the alterations of the structural response with the reference structural parameters changes. In this paper a method for the evaluation of the sensitivity of the response of two adjacent buildings connected through fluid dampers is presented; the sensitivity of the structural response statistics is obtained through very simple frequency domain integrals. The proposed approach requires the evaluation of explicit closed form solutions of the derivatives of time-frequency response vector functions with respect to the parameters that define the modified structural model. To do so it is necessary to write governing motion equations in state-variables. A numerical application shows the effectiveness of the proposed approach thanks to the comparison with Monte Carlo Simulation

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