نویسندگان:

M. Mohebbi

H. Dadkhah

خلاصه مقاله:

Semi-active base isolation system has been proposed mainly to mitigate the base drift of isolated structures while in most cases, its application causes the maximum acceleration of superstructure to be increased. In this paper, designing optimal semi-active base isolation system composed of linear base isolation system with low damping and magneto-rheological (MR) damper has been studied for controlling superstructure acceleration and base drift separately and simultaneously. A multi-objective optimization problem has been defined for optimal design of semi-active base isolation system which considers a linear combination of maximum acceleration and base drift as objective function where Genetic algorithm (GA) has been used to solve the optimization problem. H2/Linear Quadratic Gaussian (LQG) and clipped-optimal control algorithms have been used to determine the desired control force and the voltage of MR damper in each time step. For numerical simulation, a four-story base isolated shear frame has been considered and for different values of weighting parameter in objective function, optimal semi-active base isolation system has been designed under various design earthquakes. The results show that by using base isolation system and supplemental MR damper, the superstructure acceleration and base drift can be suppressed significantly. Also, it has been concluded that by selecting proper values for maximum acceleration and base drift related weighting parameters in objective function, it is possible to mitigate the maximum acceleration and base drift simultaneously. Furthermore, semi-active control system has worked successfully under testing earthquakes regarding design criteria.

کلمات کلیدی:

semi-active base isolation, MR damper, clipped-optimal control, genetic algorithm.

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