

عنوان مقاله:

Seismic Isolators Layout Optimization Using Genetic Algorithm Within the Pymoo Framework

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خلاصه مقاله:

In most previous studies, seismic base isolation system optimization has mainly focused on determining isolation layer parameters. However, the subsequent steps of isolator device selection and positioning can significantly impact overall system performance. To address these shortcomings, we propose an alternative optimization approach demonstrated through two models: regular and irregular λ -storey reinforced concrete structures. This approach utilizes the Pymoo framework and commercially available isolators to find optimal isolator layout configurations in two steps. First, using the equivalent lateral force (ELF) procedure, an initial population of seismic isolators meeting shear strain, base shear coefficient, and buckling requirements was randomly selected from suppliers' elastomeric bearing catalogs. Second, the Non-dominated Sorting Genetic Algorithm II (NSGA-II) was used to improve the seismic response of the models under the fast nonlinear analysis (FNA) method by minimizing peak roof acceleration, inter-story drift ratio, displacement of the isolated base layer, as well as maximizing the fundamental period. The results underscore the effectiveness of this approach in improving seismic response. Compared to fixed-base structures, the optimal solutions achieved more than double the fundamental period, reduced peak roof acceleration by over 70%, and diminished base shear force by approximately 50%. This methodology can serve as a reference for future research across various structure types, including hybrid isolation systems and steel structures. Doi: 10.28991/CEJ-2024-010-08-07 Full Text: PDF

کلمات کلیدی:

.Seismic Isolation; Metaheuristic Algorithms; Rubber Bearings; Multi Objective Optimization; Pymoo

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