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Automatic Minimization of the Rigidity Eccentricity of 3D Reinforced Concrete Buildings

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Abstract:	The objective of this paper is to obtain the optimum design of 3D reinforced concrete buildings in terms of their performance under earthquake loading. This goal is achieved by considering the minimization of the eccentricity between the mass center and the rigidity center of each storey layout as the optimization objective in order to produce torsionally balanced structures. This problem is considered as a combined topology and sizing optimization problem. The location and the size of the columns and the shear walls of the structure of each storey layout constitute the design variables. Apart from the constraints imposed by the seismic and reinforced concrete structure design codes, architectural restrictions are also taken into account. The test examples studied, showed that a reduction in the structural cost of the building is achieved by minimizing the eccentricity between the mass center and the rigidity center of each storey layout. Evolutionary optimization algorithms and in particular a specially tailored algorithm based on Evolution Strategies is implemented for the solution of this type of structural optimization problems.