EngOpt2018 - 6th International Conference on Engineering Optimization
Instituto Superior Técnico, Lisbon Portugal • 17-19 September, 2018
Editors: H.C. Rodrigues, J. Herskovits, C.M. Mota Soares, et al.

**Abstract ID 1051**

# BIO-INSPIRED OPTIMIZATION ALGORITHMS FOR LIMIT ANALYSIS OF FRAME STRUCTURES

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**Keywords:** Limit analysis; Seismic behaviour; Elementary mechanisms method; Ant colony system optimization; Genetic algorithms; Immune algorithms

**Abstract:** The present study applies the method of combination of elementary mechanisms to the evaluation of collapse conditions of planar frames. The col- lapse load is evaluated seeking the absolute lowest value among all the mecha- nisms that can be obtained combining the elementary ones. The optimization procedure is developed through three different bio-inspired optimization algorithms. In particular, genetic, immune and ant colony algorithms are considered. Original codes developed in the agent-based programming language NetLogo allow building into a virtual metrical space and visualizing in the user interface every single mechanism and the correspondent collapse load. The elementary mechanisms are then combined and the minimum collapse load, together with the corresponding collapse mechanism, is obtained. Several applications have been performed with reference to frames of different size subjected to a seismic load scenario consisting of horizontal forces with increasing magnitude acting on each floor, and permanent vertical loads applied to the beams. The collapse loads and related mechanisms, obtained by means of the proposed optimization procedures, have been compared to the correspondent ones provided by nonlin- ear push over analysis, showing a very good correspondence.