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Optimization of Reinforced Concrete Frames by Harmony Search Method

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Abstract

The aim of this work is to present a procedure developed in order to minimize the cost of reinforced concrete building frames. To achieve this objective the cross sections dimensions, the area of steel and the concrete strength of beams and columns were taken as design variables. The constraints related to dimensions and strength were based on the Brazilian standard ABNT NBR 6118 [1]. The total cost, composed by the costs of concrete, steel and formworks, was minimized by the usage of Harmony Search Algorithm (HS), an optimization method developed by Geem, Kim and Loganathan [2], inspired by the observation that the aim of music is to search for a perfect state of harmony. The search process is compared to a musician's improvisation process. Along with the inclusion of the variable parameters of Improved Harmony Search Algorithm [3], other variations in original algorithm were proposed and incorporated into present work. Some structures were analyzed, and the results were compared to those obtained from the conventional design procedure, in an attempt to identify the influence of factors such as resistance class, material costs and beams/columns costs on the optimal design of reinforced concrete building frames. To the examples analyzed, the optimization method was quite efficient in minimizing structural cost. This work is a sequence of former studies of the authors regarding optimization of grillages and columns sections by heuristics methods (e.g. [4-5]).

References

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