Minimizing the Constrained Weight of Frames coupling Genetic Algorithms with Nash Strategies

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ABSTRACT

The hybridization of evolutionary algorithms with game strategies has been shown recently as a methodology to improve performance and results of the optimum design procedure in aeronautical engineering and CFD problems [1], as well as in structural engineering problems [2].

In this study we solve the minimum constrained weight optimization problem (taking into account constraints of allowable stresses and displacements) quite often considered in structural engineering using a game-theory based Nash evolutionary algorithm (Nash GAs). The Nash GAs procedure performance is analyzed on different sets of variable splitting of the problem on a test case problem consisting of a discrete real cross-section types 55 member structure and compared also with a standard panmictic evolutionary algorithm.

Numerical results of this approach of the handled structural test case indicate that a significant increase of performance can be achieved using the Nash strategy, both with significant advantages in convergence speed-up and also in algorithm robustness in finding the optimum design solution and illustrate the potential of Nash games for more complex structural problems.

REFERENCES

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