عنوان مقاله:

QUANTUM-BASED JELLYFISH SEARCH OPTIMIZER FOR STRUCTURAL OPTIMIZATION

نویسندگان:
A. Kaveh
K. Biabani Hamedani
M. Kamalinejad
A. Joudaki

خلاصه مقاله:

Jellyfish Search (JS) is a recently developed population-based metaheuristic inspired by the food-finding behavior of jellyfish in the ocean. The purpose of this paper is to propose a quantum-based Jellyfish Search algorithm, named Quantum JS (QJS), for solving structural optimization problems. Compared to the classical JS, three main improvements are made in the proposed QJS: (۱) a quantum-based update rule is adopted to encourage the diversification in the search space, (۲) a new boundary handling mechanism is used to avoid getting trapped in local optima, and (۳) modifications of the time control mechanism are added to strike a better balance between global and local searches. The proposed QJS is applied to solve frequency-constrained large-scale cyclic symmetric dome optimization problems. To the best of our knowledge, this is the first time that JS is applied in frequency-constrained optimization problems. An efficient eigensolution method for free vibration analysis of rotationally repetitive structures is employed to perform structural analyses required in the optimization process. The efficient eigensolution method leads to a considerable saving in computational time as compared to the existing classical eigensolution method. Numerical results confirm that the proposed QJS considerably outperforms the classical JS and has superior or comparable performance to other state-of-the-art optimization algorithms. Moreover, it is shown that the present eigensolution method significantly reduces the required computational time of the optimization process compared to the classical eigensolution method.

کلمات کلیدی:

jellyfish search optimizer, quantum, structural optimization, dome structures, frequency constraints, optimal structural analysis.

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