

啟發式桁架斷面尺寸最佳化設計

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摘要

傳統的結構最佳化方法大都基於數學最佳化理論，需要大量梯度資訊且搜尋的起始值也非常重要以確保結果可以落在全域的最佳解。近十年來，遺傳演算法 (genetic algorithm, GA) 普遍地應用在結構最佳化上，它雖然可以成功地收斂在全域最佳解，但是往往需要大量的電腦計算才可完成搜尋。

本論文提出一個新且簡單的啟發式桁架斷面尺寸最佳化設計，其中啟發式演算是由結構學中的單位載重所發展。在設計過程中，原本多變數的問題被轉換成單變數的搜尋，並且能夠在少量的搜尋次數下完成設計。數個平面與空間桁架用來證實新方法的可行性，計算結果發現，啟發式桁架斷面尺寸最佳化設計確實為一個過程簡單且非常有效率的方法。

關鍵字：結構最佳化、遺傳演算法(GA)、尺寸最佳化、單位載重法

Heuristic method for cross-sectional size optimization of truss-structures

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Abstract

Traditional structural optimization methods are based on mathematical optimization algorithms that require substantial gradient information. In order to search for the global optimum, the selection of the initial value is also important. In the last decade, Genetic algorithm (GA) has been broadly applied to structural optimization. Although it can successfully converge on the search space which the global optimum is located, it often takes large computational effort as the increase of variables.

This study proposes a novel and simple heuristic method for cross-sectional size optimization of truss-structures, where the heuristic algorithm is based on unit load method. In the process of design, the original multi-variable problem is transformed into one-variable search and the procedure can be converged quickly. Several planar and space truss problems are adopted to verify the feasibility of new method. The results indicate that the proposed method is effective to optimize the cross-sectional size of truss-structures.

Keywords: Structural optimization; Genetic algorithm; Size optimization; Unit load method