基因演算法使用爬山與貪婪策略應用於桁架結構最佳化設計

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摘 要

基因演算法是一種在離散數值最佳化問題常被使用最佳化技術。然而 基因演算法在處理離散結構最佳化問題時常需要大量的計算量,尤其 是當問題解空間潛在的解答數目非常龐大時。傳統基因演算法工作參 數設定對於計算結果亦有影響,不佳參數有可能造成計算結果不穩 定,不利使用者評估解答是否可靠。本論文主要目的是在基因演算法 中加入爬山策略及貪婪想法,讓基因演算法對於工作參數的敏感性降 低,並用較少的計算就能獲得穩定且可靠的解答。爬山策略對於基因 演算法的主要功能是搜尋空間折減,避免基因演算法浪費時間在探索 沒價值的區域;貪婪想法主要功能是協助基因演算法發現有價值的搜 尋空間,希望因此降低挖掘解答的時間。為了驗證改良後基因演算法 的效能,四個經典的離散尺寸結構最佳化問題被選來測試新演算法。 測試結果指出,在相同工作參數下改良基因演算法較傳統基因演算能 獲得較穩定且較佳的計算結果。

關鍵字:離散數值最佳化問題、爬山策略、貪婪想法、搜尋空間折減

A hill-climbing and greedy genetic algorithm for the optimal design of truss structures

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ABSTRACT

Genetic algorithms (GAs) are commonly used methods for discrete valued optimization problems. However, GAs often spend a significant amount of computational time in searching for the optimal solution of discrete structural optimization problems, especially when the search space has enormous number of potential solutions. Moreover, GAs are possible perform unstable computational results as the set of bad working parameters is used for them. Therefore, this work attempts to optimize the design of truss structures with discrete sizing variables through an enhanced search performance by incorporating a hill-climbing strategy and two greedy notions into a simple GA. The hill-climbing strategy is integrated into the GA to reduce the search space, while the greedy notions help the GA to explore the search space for identifying the most promising search region. Four truss design problems selected from the literatures are adopted for the performance of tests of the proposed GA. The computational results indicate that the proposed GA has the strong capability and stability for finding the optimal design of truss structures with discrete sizing variables within a small number of iterations.

Keywords: discrete valued optimization problem, a hill-climbing strategy,

greedy notions, reduce the search space

四十歲進修真是一件累人事,不僅記憶力比不上年輕的學生,考前熬夜苦讀的本領也大大退步,幸好一路上有許多貴人相助才能順利取得學位。本論文能順利完成首先要感謝孫老師三年來的教誨與指導,他不計較我非資訊背景,對於我的研究方向也給予很大的自由;接著要感謝土木系洪士林教授在論文撰寫階段提供許多寶貴的經驗,他的協助使得本論文能更加完善;感謝在土木所勇奇學弟在程式撰寫上的大力幫忙,否則論文進度勢必更緩慢;最後感謝Lab的成員:王豪學長、小基學長、璽文...大家陪我度過三年有趣且充實的在職進修。

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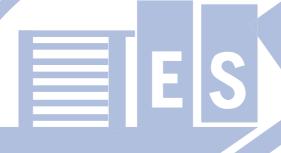
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