應用混合式演化演算法於工作匹配與排程問題之求解

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摘 要

異質性叢集運算已被認為是極具發展潛力的方法，其可用以解決需要大量運算的科學問題。吾人可將某一平行程式分解為數個工作，並將這些工作以並行的方式指派給不同的處理單元來執行。一般而言，這些工作可以用工作圖來加以特徵化，並且以一個有向非循環圖來表示。本論文中，我們提出了一個混合式演化演算法，用以將工作圖中的工作分派給異質性叢集運算環境中的處理單元。此一方法係以遺傳演算法的基本架構為基礎。在交配與突變程序中，我們針對問題的特性分別設計出拓樸順序交配 (topological order crossover，TOX) 與導引式突變 (guided mutation，GM) 運算子。TOX 運算子經證明可用以產生完全符合問題限制條件的合法染色體。此外，相較於傳統的單一切點順序交配運算子(order crossover，OX)，我們也證明了 TOX 運算子具有較高的有效性。我們同時也將GM 運算子與模擬退火方法優異的區域搜尋能力整合在一起，用以強化突變的效能，避免無效的突變運算。我們還將本文中所提出之方法分別與禁制搜尋法、模擬退火法以及傳統的遺傳演算法進行效能的評估與分析。實驗結果顯示，在工作匹配與排程問題的求解中，我們所提出的演算法確實優於前述三種方法。

關鍵詞 : 工作匹配與排程 ; 遺傳演算法 ; 模擬退火演算法 ; 禁制搜尋法

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